U.S.-China Tension

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Abstract

We quantify tension between the U.S. and China and examine its economic transmission. We first present a text-based index of U.S.-China tension (UCT) that shows close alignment with the views expressed by business and policy decision makers, both in rhetoric and action. Using our UCT index, we document that elevated tension is associated with reduced U.S. corporate investment—especially for more exposed firms—and reconfiguration of U.S. firm supply chains away from China. U.S.-China tension is also reflected in cross-sectional stock returns, in patterns consistent with investor expectations of deteriorating economic opportunities. These effects predate the 2018 trade disputes. Decomposing our index into a component reflecting concrete *actions* that directly impede bilateral engagement and a component driven by *uncertainty* surrounding the trajectory of such frictions, we find that transmission operates primarily through the uncertainty channel, though both are important. Our findings reveal nuanced implications of continued tension: should uncertainty surrounding the relationship subside, even a high-tension, new norm could see contained economic effects.

Keywords: U.S.-China relation, Economic measurement, Economic transmission of bilateral tensions, Uncertainty effects
JEL Classifications: F4, F5, F6.

1 Introduction

Relations between the U.S. and China have evolved from distant observation to tense standoffs that have featured a dynamic blend of intensified diplomacy, escalating rivalry, and entwined economies.[1] The continued uptick in trade disputes exemplifies a marked stiffening in the bilateral relationship. This tension transcends partisan divides and is rooted in a broad spectrum of issues, including information security, trade and currency practices, technological innovation, and military expansion. As such, U.S.-China tension is cited by investors, corporate executives, and policymakers in ever-growing discourses on the significance of the bilateral relationship to global welfare.[2]

The relationship between the world's two largest economies has not escaped analysis by academics, of course. Much of the literature's focus has been on trade diversion and relocation effects from the recent U.S.-China trade war.[3] Left unstudied, however, is the role of U.S.-China tension—especially tension originating outside trade conflicts—in shaping economic outcomes over a long time period. Such empirical research has been hindered by the lack of an indicator that can quantify the intensity of bilateral tensions and is available consistently over time. In this paper, we fill the gap by measuring the time-varying intensity of public concerns over U.S.-China tension and quantifying its economic consequences.

We make three primary contributions. First and foremost, we produce a text-based measure of U.S.-China tension (UCT) and thoroughly validate that it meaningfully captures fluctuations in the bilateral relationship, as perceived by major economic agents. In particular, our UCT index shares concurrent movement with the expressed views of business and policy decision-makers. We also complement our aggregate U.S.-centric mea-

[1] Isaacs (2015) classifies the history of American attitudes toward China into periods of: respect in the 18th century, contempt from 1840 to 1905, benevolence (1905–1937), admiration (1937—1944), disenchantment (1944-–1949), and hostility after 1949.

[2] "U.S. Manufacturers Seek China Alternatives as Tensions Rise," Wall Street Journal, 31 May 2023; "U.S. China Tensions could Slow Down Global Economy, UN Warns," The Guardian, 16 January 2020; "U.S.-China tension Rise – Bill Ackman and others on how to view the market," Trading Nations, 22 July 2020; "Readout of President Joe Biden's Meeting with President Xi Jinping of the People's Republic of China," White House Press Briefing, 15 Nov 2023.

[3] See Fajgelbaum, Goldberg, Kennedy, Khandelwal & Taglioni (2021), Freund, Mattoo, Mulabdic & Ruta (2023), Flaaen, Hortacsu & Tintelnot (2020), and Alfaro & Chor (2023).

sure with firm-level proxies that reveal varying degrees of firm vulnerability to tension, alongside foreign-country metrics that capture international viewpoints.

Second, we examine the economic transmission of rising tensions, utilizing extensive firm-level panel data and aggregate data spanning the last four decades. We document that heightened U.S.-China tension depresses U.S. firm investment, induces U.S. supply chain shifts away from China, and is priced in the cross-section of U.S. stock returns in ways suggesting investor expectations of diminished economic prospects. These effects predate the 2018 trade disputes.

Third, we investigate the transmission channels, recognizing that an increase in U.S.-China tension could lead to concrete *actions* that obstruct bilateral interactions and their surrounding *uncertainty*. To separate the transmission operating through these two channels, we construct an action and an uncertainty subindex. We find that both components are important in the transmission of tension, with the effects typically operating more strongly through the uncertainty channel. Thus, while the imposition of tangible frictions, such as tariffs, undoubtedly generates economic responses, the mere threat of such measures alone can also precipitate significant adverse economic reactions. Our findings reveal nuanced implications regarding the economic effects of persisting U.S.-China tension. While an enduring environment of elevated bilateral tensions is expected to negatively affect economic activity between the two countries, the deleterious effects could be partially mitigated if uncertainty surrounding the policy trajectory wanes. That is, should uncertainty subside, even a high-tension state characterized by substantial policy frictions may see relatively contained economic disruptions.

Our approach to constructing the UCT index involves examining textual data in leading U.S. newspapers. We augment the search-based textual analysis pioneered by Baker, Bloom & Davis (2016) with machine learning techniques. Specifically, we utilize topic modeling algorithms, including K-means, guided LDA, and Newsmap analysis, to identify likely relevant words in a large sample of manually identified articles that discuss increasing U.S.-China tension. Consolidating the output from these algorithms, we divide frequently-used terms in news discussions of U.S.-China tension into the following

three categories: (i) terms related to the United States and China, (ii) terms related to contentious issues in the bilateral relationship, and (iii) terms suggestive of tension. We then construct the UCT index by computing the monthly share of articles containing at least one phrase from each of the three categories.

The baseline monthly UCT index, shown in Figure 1, spikes around the U.S. bombing of the Chinese embassy in Belgrade in 1999 and the Hainan Island spy plane incident in 2001. The index rises notably in 2008, due to separatist unrest in Tibet and Xinjiang, to China's rapid military buildup, and to China becoming America's largest foreign creditor in that year. More recently, our index sees significant spikes in December 2018 following the arrest of a Huawei executive, in May and June 2019 amidst the escalation of U.S. tariffs on Chinese imports, and again in September 2019 surrounding U.S. accusations of China manipulating its currency. The index also surges in March 2020, coinciding with the mutual blaming and hostility over the coronavirus pandemic, and in February 2022 with the Beijing Winter Olympics boycott and the outbreak of the war in Ukraine.[4] Through a human audit, we find that our index accurately identifies newspaper articles that contain discussions pertinent to U.S.-China tension.

To our knowledge, our UCT index is the first to quantify the intensity of bilateral tensions between the U.S. and China over time.[5] Our approach builds on a rapidly growing literature demonstrating that news-based metrics contain significant information about economic variables that are otherwise difficult to quantify (e.g., Baker, Bloom & Davis (2016), Caldara & Iacoviello (2022), Baker, Davis & Levy (2022), among others).[6] Additionally, we assess the information value of our index by employing distinct,

[4]Other points of note are the increases when the U.S. pivoted towards other parts of Asia to counter China's growing clout and reached an agreement on the Trans-Pacific Partnership in 2011; an incident where a Chinese dissident fled to the U.S. embassy in the midst of rising trade tension in 2012; and during disputes over South China Sea in 2015.

[5]Existing work on tensions between countries tends to focus on military expenditures, terrorism, and trade (Garfinkel (1990), Alesina, Özler, Roubini & Swagel (1996), Abadie & Gardeazabal (2003), Eckstein & Tsiddon (2004), Guidolin & La Ferrara (2007), Cerra & Saxena (2008), and Garfinkel, Syropoulos & Yotov (2020)). Although they represent salient features of international hostilities, they miss important, and arguably more subtle, aspects that our news-based approach improves upon.

[6]Shiller (2002), for example, argues that news reporting serves an essential vehicle for the spread of ideas and for coordinating beliefs. For our study, newspapers have been the dominant source of public information in a large part of our sample. Moreover, the newspapers we use represent the leading daily newspapers by circulation.

independent approaches to measure bilateral tensions, discovering substantial common variability between them. In particular, we quantify the apprehensions of business and policy decision makers about U.S.-China tension, and find that our UCT index closely aligns with related concerns that business and policy decision makers articulate through rhetorical statements, policy actions, and real economic decisions.

We perform three distinct exercises to quantify concerns expressed by business and policy decision makers. First, we find that fluctuations in the share of discussions dedicated to U.S.-China tensions during U.S. firms' earnings calls parallel movements in our UCT index. This result indicates that our index aligns with firm communications about the impacts on their operations and outlook, which is also in line with a robust negative response of firm investment to rising UCT, a pattern more pronounced among more exposed firms, we subsequently document. Furthermore, we present evidence from surveys of U.S. firms that highlights the primacy of concerns about the bilateral tension. Second, we examine the content of U.S. congressional legislation, finding that the fraction of bills categorized as "anti-China" mimics movements in our newspaper-based UCT index. Such movements are also reflected in the intensity of discussion about China during U.S. presidential State of the Union addresses over time. Third, we document that U.N. voting discordance —the percentage of times the two nations cast different votes on resolutions in the U.N. General Assembly and Security Council—closely tracks our UCT index. Leveraging disparate measurement approaches and data sources, we document data patterns indicating that our news-based UCT index reflects the perspectives about U.S.-China tension by key stakeholders whose decisions govern the economic interactions between the two nations.

We buttress these out-of-sample validation exercises by constructing a large number of alternative "in-sample" indices to assess the robustness of our baseline UCT measure. First, to address concerns that U.S. news coverage of China can be biased by political orientation, we construct separate indices from "right-wing" vs. "left-wing" newspapers. They track each other closely. Second, we create an index that scales the monthly count of UCT articles by the number of articles mentioning China instead of the total article count,

thereby adjusting for the time-varying media attention to China. Additionally, since contentious issues between the U.S. and China may evolve over time, we also construct an index that excludes issue-specific search terms in category (ii) to facilitate out-of-sample relevance. The alternative series are nearly identical to our baseline UCT index. Third, we conduct placebo tests by constructing counterpart indices that capture U.S. tensions with other countries, including Japan, U.K., Russia, and Canada. These comparisons provide additional assurance that our index uniquely captures U.S.-China tension and is not an artifact of the news methodology. Moreover, we employ an alternative textual analysis methodology and construct an "intensive-margin" index by computing the frequency of tension words within each article. The resulting series is highly correlated with our baseline index. Finally, we show robustness to a large number of permutations involving exclusion terms that control for the influence of false positives.

Our UCT index should facilitate applied research in multiple areas, akin to predecessors such as economic policy uncertainty index of Baker, Bloom & Davis (2016) and the geopolitical risk index of Caldara & Iacoviello (2022). We undertake three applications in this paper, leveraging extensive firm-level data. First, we show that our UCT index correlates with U.S. firm investment in ways indicative of rising tensions: as bilateral tensions and associated uncertainties rise, firms delay investment, an effect that is more pronounced among firms that are *a priori* more exposed to the bilateral tension.[7] Second, we find that heightened tension is associated with U.S. firms' diversifying their business relationships away from Chinese suppliers and customers. Third, we find that UCT is reflected in the cross-section of stock returns in a manner that reflects investor expectations of deteriorating economic prospects amid periods of intensified tension. Consistently, we find negative transmission of rising UCT in the aggregate data.

With an eye toward further facilitating research, in the final section of the paper we construct UCT indices using newspapers from Canada and the U.K., as well as indices using the People's Daily, China's longest running newspaper, and the South China Morning Post from Hong Kong. These foreign UCT indices provide an international perspective

[7]In the process, we construct several proxies of U.S. firms' exposure to China. These should also be useful in facilitating future research.

and, in conjunction with our indices on the tension between the U.S. and other countries such as Russia and Japan, should enable research that deepens our understanding about longer-term economic consequences of bilateral relationships in the global economy.

2 Measuring tension between the U.S. and China

In this section, we describe how we construct the U.S.-China tension index by measuring public concerns over U.S.-China tension from media coverage in leading U.S. newspapers. Our notion of U.S.-China tension thus encompasses bilateral conflicts that stem from a growing number of issues that include trade but also extend well beyond it.

2.1 Index construction

Using the ProQuest Global Newsstand database, we construct our index by computing the share of articles that contain keywords related to U.S.-China tension in major U.S. newspapers. Following the dictionary approach pioneered by Baker, Bloom & Davis (2016), we search for articles containing (i) mentions of the United States (or U.S. or Washington) and China (or Chinese or Beijing), (ii) phrases related to contentious issues in the bilateral relationship, and (iii) phrases indicating tension. We conduct this search each month in the following leading U.S. newspapers: Boston Globe, Chicago Tribune, Los Angeles Times, New York Times, USA Today, Wall Street Journal, and Washington Post. The raw counts are scaled by the total number of articles for each newspaper and month to adjust for changing publication volumes over time. These shares of articles are then normalized to have a unit standard deviation for each newspaper over the sample period. Our UCT index is aggregated by summing the resulting series and scaling them to have a mean of 100 over the entire sample. This keyword search-based approach makes our index easily interpretable and readily updateable essentially in real time.

To select the search terms for our index, we augment the methodology in Baker, Bloom & Davis (2016) by employing machine learning techniques to identify likely relevant words from a large sample of manually selected articles that discuss rising U.S.-China tension. We begin by extracting all articles that mention the United States and China (i.e. the pre-

selected category (i) terms). We randomly choose 5% of these articles (around 4000) and have six Federal Reserve Board research assistants rate these articles and identify those that discuss increased bilateral tensions between the U.S. and China. This procedure results in a sample of over 900 articles. We pre-process the text corpus by removing common stopwords, such as "the" and "of" that appear frequently in all texts, and by converting the remaining terms into their linguistic roots through stemming (e.g., Loughran & McDonald (2016), Calomiris & Mamaysky (2019)).

We perform topic modeling on the sample of articles discussing U.S.-China tension using K-means, the most popular and empirically successful clustering algorithm (Jain (2010)).[8] The algorithm classifies articles into topics and identifies words associated with each topic. As there is no agreed upon metric for choosing an optimal K in the literature, we select the number of clusters through experimentation and find that $K = 3$ produces the best interpretability of the implied topics. More specifically, setting $K = 3$ partitions the sample of articles into categories related to: (i) economic issues in the U.S.-China relationship, (ii) security issues, and (iii) ideology.

With the three topic categories in hand, we additionally apply two semi-supervised machine learning classification algorithms, guided LDA, following Hansen, McMahon & Tong (2019) and Newsmap, based on Watanabe (2018), to further identify terms associated with each topic.[9] Since we now have an idea of how articles discussing tension should be categorized, we provide these algorithms a set of seed words to guide them on which articles belong to each topic.[10] We combine the terms identified by K-means,

[8] K-means takes as input an unlabeled body of documents and a cluster number, n. The algorithm partitions the documents into n clusters such that the sum of squared errors between the empirical mean of each cluster μ_k and the points in the cluster c_k is minimized. Each point corresponds to a term frequency-inverse document frequency (tf-idf) vectorization of a document.

[9] The inputs for guided LDA and Newsmap are unlabeled text data, a topic count, and seed words for each topic. As with K-means, both algorithms classify documents into topics and identify words associated with each topic. As a Bayesian factor model for discrete data, LDA determines the probabilities of each topic being associated with a particular document and estimates the probability distribution of words over each topic. This probabilistic approach contrasts with K-means and Newsmap, where every article is uniquely assigned to one cluster. For each topic, the Newsmap algorithm scores words based on co-occurrences of that word in documents containing the seed words for that topic. The topic assigned to each document is the one with the highest sum of scores weighted by word frequency. After K-means, these semi-supervised algorithms are the natural next step because, while our goal is still to classify articles into topics and identify relevant terms, we now have a general idea of what each topic looks like.

[10] The seed words are "economic","trade" and "currency" for the economic topic; "military", "defense" and "security" for the security topic; and "human rights", "activist" and "rule of law" for ideology.

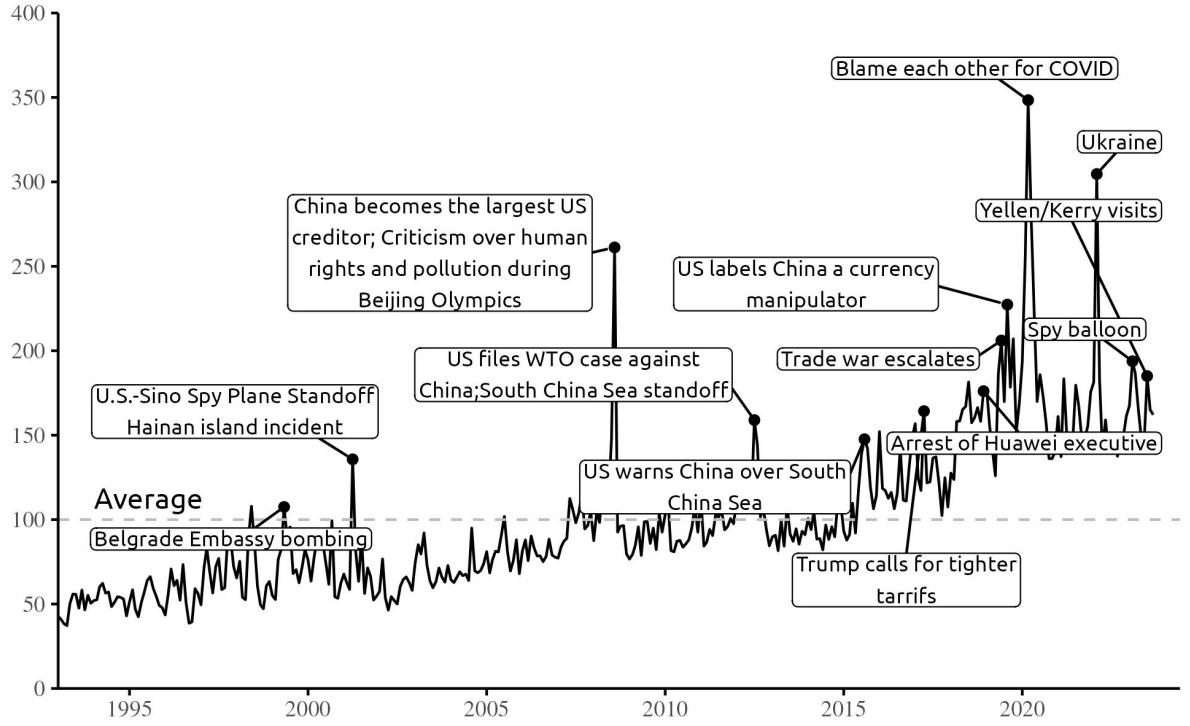
guided LDA, and Newsmap, over which there is a substantial amount of overlap, and select all interpretable words and phrases. Through an extensive human audit, certain words such as "virus", "bar", and the last names of Chinese leaders are not included in order to mitigate false positives. We then create our list of search keywords by allocating the selected terms into category (i) words related to the U.S. and China, category (ii) words related to controversial issues, and category (iii) tension phrases. The full list of search terms is displayed in Table A2.

2.2 The baseline UCT index

Figure 1 displays the baseline UCT index. The index spikes around the Belgrade embassy bombing in 1999, the Hainan Island incident and U.S.-Sino spy plane standoff in 2001, and again in 2008 due to separatist unrest in Tibet and Xinjiang, to China's rapid military buildup, and to China becoming the largest U.S. foreign creditor. In addition, the index increases when the U.S. pivoted towards Asia to counter China's growing influence and reached agreement on the Trans-Pacific Partnership in 2011, when a Chinese dissident fled to the U.S. embassy during rising trade tensions in 2012, and during disputes over the South China Sea in 2015. Our index is elevated in May and June 2019 during the high-profile raising of U.S. tariffs on Chinese imports. The index reaches its largest value in March 2020, coinciding with the U.S. administration blaming China for the initial mass outbreak of coronavirus in the United States, and spikes again in February 2022 during the onset of the war in Ukraine. Overall, bilateral tensions have been trending upwards over time and have remained consistently above average levels since 2015.

Because we follow the Baker, Bloom & Davis (2016) approach, we contrast our index with their economic policy uncertainty (EPU) index, as well as with the geopolitical risk (GPR) index of Caldara & Iacoviello (2022), which is constructed using similar tools, in Figure 2. Our measure shares little comovement with EPU, except for the trade war, when US-China tension was the root cause of policy uncertainty (Davis (2019)), and at the onset of the pandemic, when the relation plummeted as both sides traded accusations amid heightened uncertainty in policymaking in a spectrum of areas. With GPR, UCT

Figure 1: The U.S. Newspaper-Based U.S.-China Tension Index



Note: The monthly baseline UCT index from Jan. 1993 to Sep. 2023. The index is normalized to a mean of 100 over the plotted period.

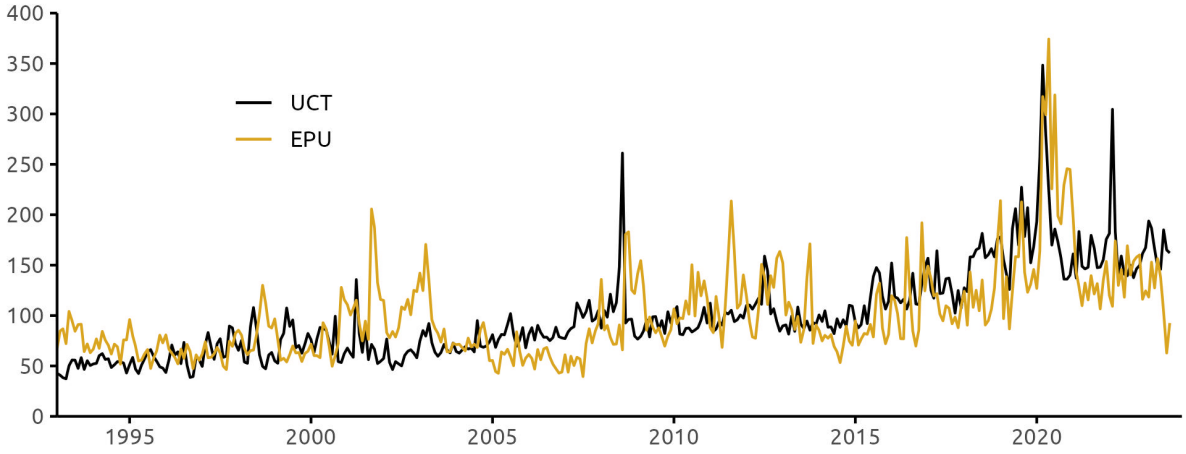
shares only a single spike in February 2022 following the Russian invasion of Ukraine. The EPU and GPR indices are both elevated during the September 11 attacks and the War on Terror, while the UCT is quiescent. The EPU index also rises at the onset of the global financial crisis in September 2008 and during the Euro Area debt crisis. While UCT surges in July 2008 around China's rapid military buildup and the unrest in Tibet and Xinjiang, it declines significantly following the onset of the financial crisis. The correlation between UCT and EPU is 0.599 while the correlation between UCT and the GPR index is 0.005.[11]

3 Information content of the index

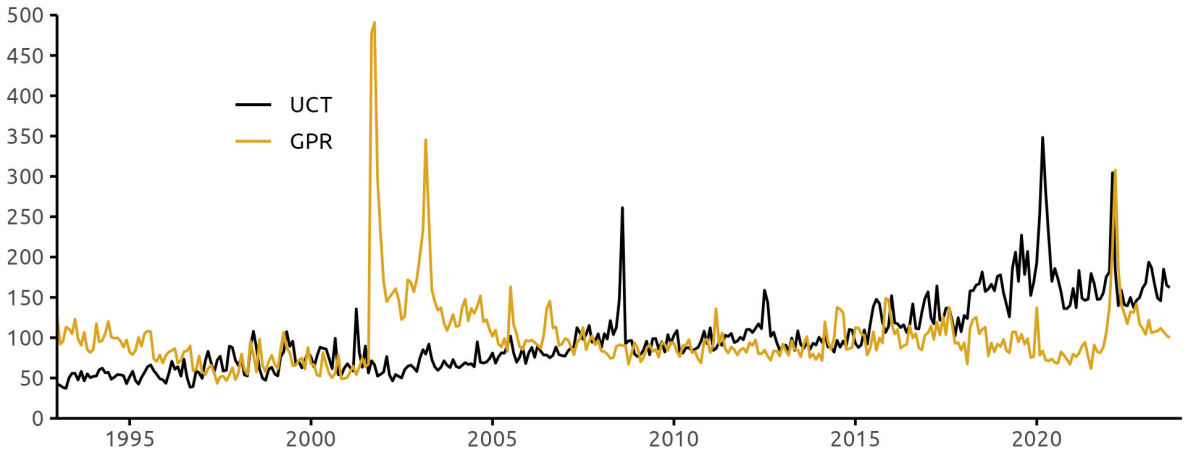
Our index captures concerns over U.S.-China tension as discussed by leading U.S. newspapers. To the extent that news coverage reflects reader opinion and also shapes it, our index can, in theory, measure public perceptions of U.S.-China tension. Are these perceptions shared by business decision-makers and policymakers? To assess the index's

[11]The correlation between UCT and the EPU's trade policy uncertainty component is 0.344.

Figure 2: U.S.-China Tension, Economic Policy Uncertainty (Baker, Bloom & Davis (2016)), and Geopolitical Risk (Caldara & Iacoviello (2022))



(a) UCT and U.S. EPU



(b) UCT and GPR

Note: The baseline UCT index with the EPU (panel a) and GPR (panel b) indices from Jan. 1993 to Sep. 2023. All indices are normalized to a mean of 100 over the plotted period.

information value, we quantify the apprehensions of business and policy decision-makers about U.S.-China tension. Using a diverse set of data sources, we find that our UCT index indeed moves in tandem with such apprehensions.

3.1 Business decision-maker perspectives

In its annual surveys of the business climate in China as perceived by member (U.S.) firms operating there, the American Chamber of Commerce in the People's Republic of China reports that "Rising Tensions in U.S.-China Relations" was the top business challenge from 2021 to 2024, up from third in 2019 and 2020. According to the 2024

survey, this top business challenge was cited—from a pre-specified list of a few dozen options—by more than double the number of firms citing challenges 2 through 5, which are: Inconsistent regulatory interpretation and unclear laws & enforcement; Rising labor costs; Concerns about data security; and Increasing competition from privately owned Chinese companies, respectively.

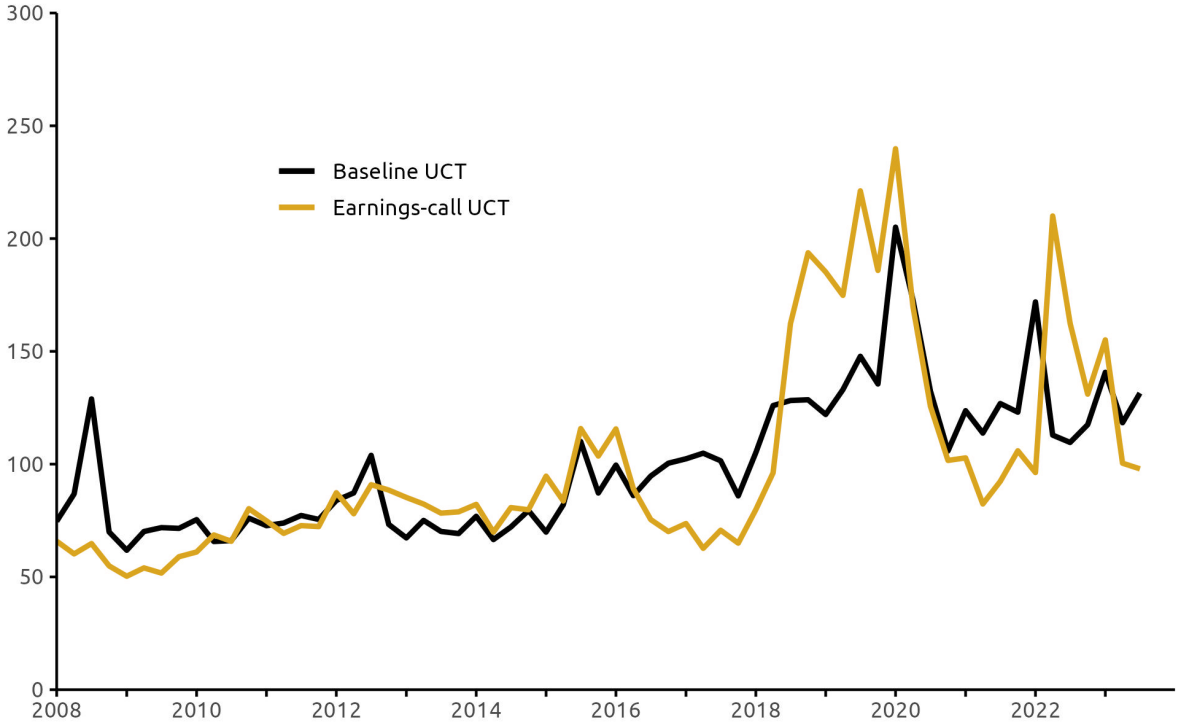
Earnings calls of publicly-listed U.S. firms

Digging more deeply into the perceptions of business decision-makers, we construct a firm-specific measure of U.S.-China tension from the quarterly earnings calls of all publicly-listed firms in the United States. These conference calls are the primary communication venue for public firms, where management discusses important aspects of firm performance with interested parties. Using the S&P Global Transcript Data Feed, our sample consists of 318,000 earnings call transcripts over a period spanning from 2008 to 2023.[12] We follow Hassan, Hollander, van Lent & Tahoun (2019) and apply computational linguistics tools to measure the fraction of transcripts each quarter that discuss U.S.-China tension. Specifically, we count the number of transcripts where a "tension" term (i.e. category (iii) terms used in the creation of the news-based index) appears within ten words of "China," "Chinese," or "Beijing". We scale this count by the total number of transcripts each quarter. For consistency, we employ the same set of keywords as with the news-based measures.

This "earnings call UCT", rescaled to have a mean of 100, is plotted in Figure 3 alongside the news-based UCT index, aggregated to a quarterly frequency. The two indices track each other closely, with a correlation coefficient of 0.735 (0.850 at the annual frequency). This close alignment suggests that our baseline measure of U.S.-China tension meaningfully captures firm concerns over the issue. Notably, both the earnings call UCT and the news-based measure are especially elevated from 2018 to 2020, concurrent with the U.S.-China trade war and the onset of the COVID-19 pandemic, as well as in the first half of 2022 during the Russian invasion of Ukraine.

[12]The S&P Global Transcript Data Feed begins in 2005, but the number of transcripts available each quarter is limited before 2008.

Figure 3: News-based and Earnings-Call UCT indices



Note: The quarterly baseline and earnings-call UCT indices from 2008 Q1 to 2023 Q3, with both normalized to a mean of 100 over the plotted period.

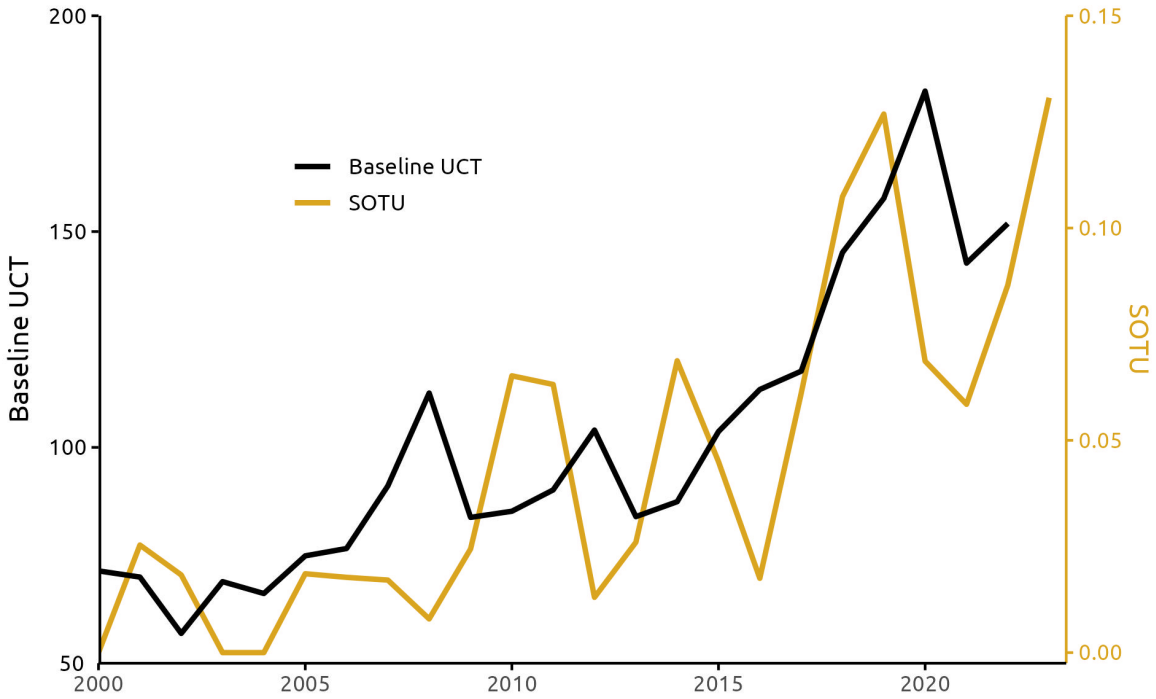
3.2 Policymaker perspectives

Having established the commonalities between our index and the concerns expressed by the U.S. business sector, we now investigate the viewpoints of policymakers. To motivate this discussion, observe from Figure 4 the positive co-movement between our UCT index and the intensity of discussion on China in U.S. presidential State of the Union addresses, the mise-en-scène of American economic performance, international relations, and politics delivered each year in front of a joint session of Congress. For each address, the attention given to China is measured as the number of occurrences of China-related keywords normalized by total word count. The correlation between this series and baseline UCT is 0.72.

Congressional legislation

We further assess U.S. politicians' stance through analysis of legislation considered by the U.S. Senate and House of Representatives. We begin by analyzing all congressional bills put forth between January 1993 and December 2023 that contain the words "China"

Figure 4: News-based UCT index and the Fraction of China Words in SOTU Addresses



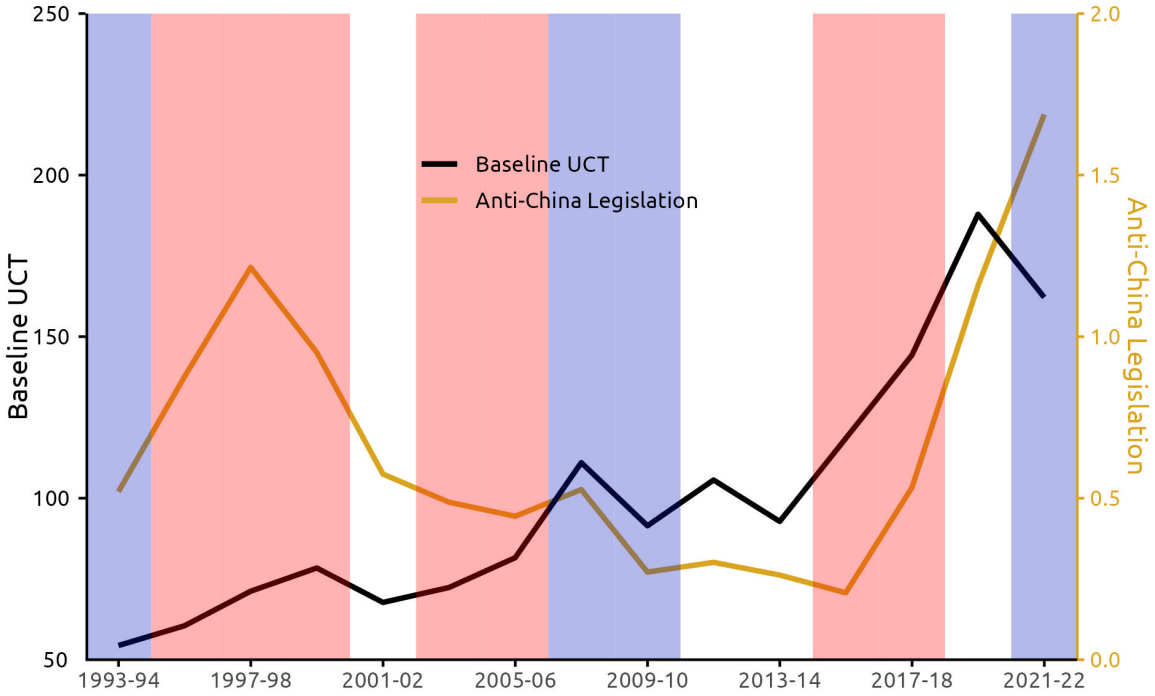
Note: The annual news-based UCT index and the share of discussion on China in State of the Union addresses from 2000 to 2024. UCT is normalized to a mean of 100 over the plotted period (left axis) while the SOTU measure is the count of China-related keywords in each address as a fraction of total words, in percentage points (right axis).

or "Chinese" or "Beijing" or "Taiwan" or "Xinjiang."[13] There are 2,067 of them. We perform a human audit on this set, scoring each bill as either a 1 when we deem a 'yes' vote to be consistent with rising tension ("anti-China"); a 2 for bills whose enactment would be indicative of lower tension ("pro-China"); or a 3 for bills that are expected to have either a neutral effect or one we cannot make an inference about.[14] Figure 5 plots the number of anti-China bills as a percentage of total bills in Congress alongside

[13]We use the GovTrack.us database as the source for congressional legislation: https://www.govtrack.us/congress/bills/.

[14]Examples of legislation scored a 1 include the "Ostracize China Act", H.R. 7411 (117th), introduced on 12/30/2022, and the "China Hurts Economic Advancement Through Subsidies Act or CHEATS Act, which "Amends the Tariff Act of 1930 to authorize the administering authority or the U.S. International Trade Commission (USITC) to impose countervailing duties on products from a nonmarket economy country that have been provided a countervailable subsidy." H.R. 4071 (112th), 2/17/2012. Examples of 2's include (i) H.Con.Res. 106 (106th) introduced on 5/12/1999, which "Declares that Congress joins the President and the Secretary of State in: (1) expressing its regret and apologies for the mistaken North Atlantic Treaty Organization bombing of the Chinese embassy in Belgrade, Yugoslavia; and (2) extending its deepest sympathies and condolences to the Chinese Government, citizens, and families of the bombing's victims."; and (ii) H.Res. 1195 (110th), introduced on 5/20/2008, "Expressing condolences and sympathy to the people of the People's Republic of China for the grave loss of life and vast destruction caused by the earthquake of May 12, 2008 in Sichuan Province."

Figure 5: News-based UCT Index and Anti-China Legislation



Note: The news-based UCT index and the fraction of Congressional bills that are anti-China from 1993 to 2022 at the bi-annual frequency corresponding to terms of Congress. UCT is normalized to a mean of 100 over the plotted period (left axis), while the anti-China legislation measure is in percentage points (right axis). Blue (red) shading indicates when Democrats (Republicans) control both chambers of Congress.

the news-based UCT, both displayed at the bi-annual frequency that corresponds to the two-year terms of Congress.[15] The surge in anti-China legislation starting in 2015-16 coincides with a steep increase in the news-based UCT index.[16]

Voting disagreement at the United Nations

Tension between the U.S. and China can also manifest as disagreement on policy issues between their governments, in ways that may or may not be reported by newspapers. To measure this form of tension, we examine the disagreement between the U.S. and China using their United Nations voting records on resolutions put forth to the U.N. General

[15]Similar patterns hold when we display the series annually. We choose the biannual configuration because over our sample there are always more bills—and more China bills and hence more anti-China bills–in the odd years than in the even years, with the exception of 2019-20 and the outbreak of COVID in the latter year. Congress has much time and energy in the first year of a session but more congestion in the second.

[16]The two series have a correlation of 0.62 beginning in 2000 and 0.82 starting in 2009. Elevated values of the anti-China legislation index in the 1997-98 session reflect repeated attempts of Congress to derail China's admission to the World Trade Organization, as well as broader implications of Hong Kong's official handover on 1 July 1997.

Assembly and Security Council.[17] There are approximately 400 resolutions per year, the large majority of which take place in December. Because of this, we construct the U.N. disagreement measure only at the annual frequency. Each year, we compute the number of resolutions where the U.S. and China vote differently, including when one of them abstains, as a percentage of total resolutions voted on.[18] This measure is displayed in Figure 6, alongside the news-based UCT, also at annual frequency. As with the baseline index and the measures constructed from firm earnings calls and congressional legislation, the voting disagreement index also rises noticeably after 2015 and remains relevant. Its correlation with the news-based index is 0.70.

3.3 Robustness checks

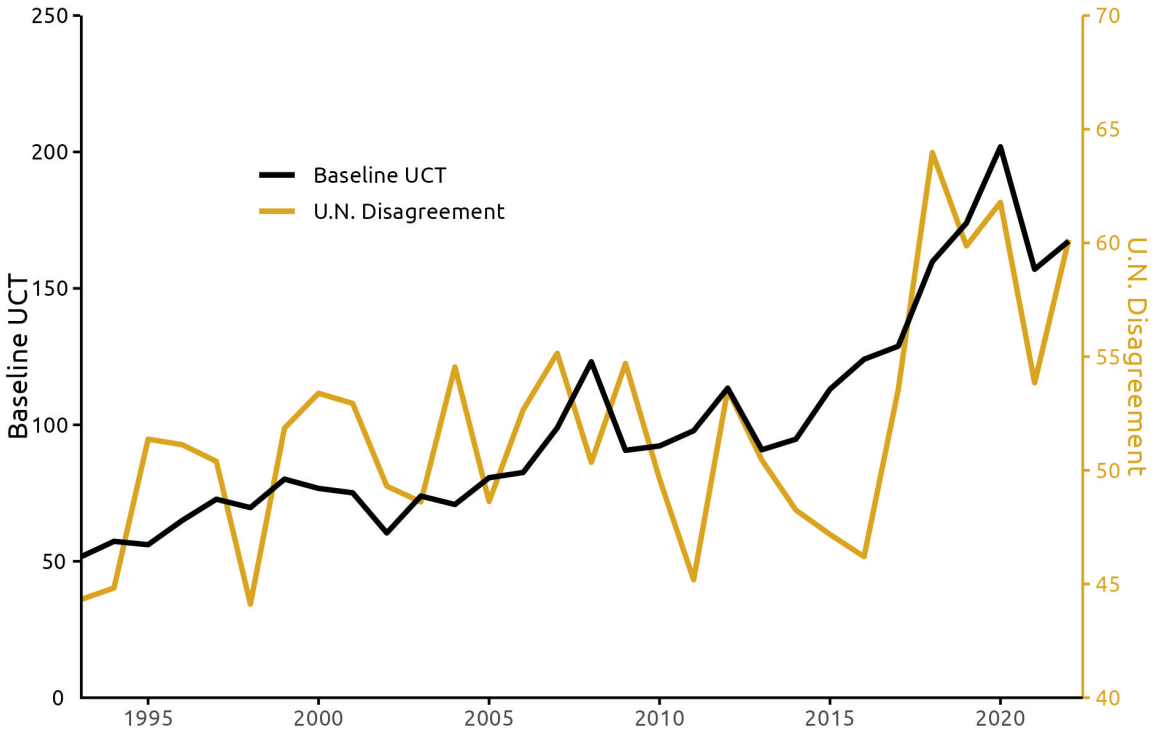
As "in-sample" robustness checks of our methodology, we construct several alternative indices and display them in the appendices. First, to address concerns that news reporting may be biased by political leanings, we compare UCT indices constructed from "right-wing" vs. "left-wing" newspapers. As detailed in Appendix B, the left and right-leaning UCT indices track each other closely, in line with the notion that attitudes towards China have evolved similarly across the political spectrum and that increased tension cuts across partisan lines.

Second, to address potentially time-varying media attention on China, we create a rescaled index that normalizes the monthly count of articles discussing tension by the number of articles mentioning China. This rescaled UCT index is plotted in Figure A2 in Appendix C. It also exhibits a strong upward trend over time and has a correlation of 0.860 with the baseline index. Together with the upward trend observed in the earnings calls, U.N. votes, and congressional legislation measures, there is consistent data indicating that

[17] Voting records are obtained from the United Nations website (https://research.un.org/en/unvoting)

[18] Resolutions are either: A1. Without vote (all are adopted) or A2. With vote. Among the resolutions with a vote, we classify: B1. Agree votes, when the (China, U.S.) votes are: YY, NN, AA (never happens); and B2. Disagree votes, when the voting goes: YN, NY, AY, AN, YA, NA. The measure we display is B2/(B1+B2), as we focus only on observed voting outcomes. Alternatively, we could assume that all "adopted without vote" resolutions are cases of disagreement and measure UN Tension as (A1+B2)/(A1+A2). On the other hand, if we assume that in all "adopted without vote" cases there is agreement between the U.S. and China, then a more conservative measure is B2/(A1+A2). The alternative measures (available on request) take into account the "unobserved" or "potential" votes, with the former being an upper bound, and the latter a lower bound.

Figure 6: News-based UCT Index and U.N. Voting Disagreement



Note: The annual news-based UCT index and the U.N. disagreement measure from 1993 to 2022. UCT is nomralized to a mean of 100 over the plotted period (left axis) while the U.N. disagreement measure is the fraction of General Assembly and Security Council resolutions where the U.S. and China vote differently, in percentage points (right axis).

the recent rise in our index informatively captures an important feature of U.S.-China relations, rooted in China's global ascendance and increased rivalry.

Third, we compute an "intensive-margin" measure by altering our textual analysis methodology. Specifically, we compute the frequency of category (iii) tension words within each article, thereby capturing the intensity of concerns reflected in each article. We subsequently average the frequencies across all articles each month and normalize the series in the same way as our baseline UCT index. This alternative measure exhibits common movements with the baseline index, including elevated levels in recent years, as seen in Appendix C, Figure A3.

Fourth, we conduct placebo tests by constructing counterpart tension indices for other country pairs. As shown in Appendix D, the U.S.-Japan, U.S.-Canada, U.S.-U.K., and U.S.-Russia tension indices each exhibit substantial independent variation apart from the UCT index, and are not strongly correlated despite being constructed using an identical

methodology on the same set of U.S. newspapers. Of particular note, the U.S.-Japan tension index declines over the sample period, while the U.S.-Canada tension index exhibits no time trend. These placebo indices provide additional assurance that the important properties of the UCT index, including the upward time trend, are specific to U.S.-China relations and not an artifact of the news methodology. Moreover, in Appendix D, we re-estimate our investment regressions outlined in the following section and find that the relationship between UCT and firm investment remains robust to the inclusion of the placebo tension indices as additional controls. This suggests that the economic effects we document are uniquely attributable to U.S.-China tension.

Finally, Appendix E examines the robustness of the UCT index to the influence of false positive articles. Following Caldara & Iacoviello (2022), we introduce exclusion terms to our search process, which are selected to filter out articles covering a wide range of irrelevant topics from arts and entertainment to natural disasters and obituaries.[19] We experiment with different sets of exclusion terms and in each case, the correlations of these robust indices with the baseline UCT are at 0.9 or above.

4 Applications

Having substantiated the information content of the UCT index, we expect it to be useful in many applications. We undertake three here. First, we show that UCT is negatively associated with U.S. firms' investment spending, and that this effect is larger for firms that are more exposed to China. Second, we document that higher UCT is negatively correlated with net realizations of U.S. firms' relationships with Chinese suppliers and customers. Third, we show that U.S.-China tension is priced in the cross-section of U.S. firm stock returns in ways that are consistent with investor expectations of deteriorating economic prospects amid escalating tensions. We conclude the section by showing that these economic effects of UCT predate the U.S.-China trade war.

[19] We also construct a related robust index that uses ProQuest Newstand's subject indexing system to filter irrelevant articles. Here, we search for all articles whose text mentions the United States (or U.S. or Washington), China (or Chinese or Beijing) as well as a tension term, but keep only those articles that have a subject tag matching one of the category (ii) issue terms.

4.1 Firm investment

Our earnings call analysis reveals that the extent to which firms discuss U.S.-China tension closely mirrors the news coverage of this issue. An important question then arises: do firms' real economic decisions also respond to this tension, as proxied by our UCT index? If so, how and why?

Heightened bilateral tension increases both the likelihood of escalating barriers that impede economic exchange between the two nations and the uncertainty surrounding such impediment. In terms of the payoffs to firms' investments, this implies a downward shift in the mean and an increase in the mean-preserving spread, both of which should depress investment. Frictions that decrease expected investment returns unambiguously discourage capital commitments. Moreover, increased uncertainty generates incentives to delay costly and irreversible investments (e.g., Pindyck (1988); Bloom, Bond & Reenen (2007)). That is, heightened uncertainty around core instruments governing bilateral economic engagement makes firms reluctant to undertake investments that may be difficult to reverse. We therefore investigate the relationship between U.S.-China tension and U.S. firm investment, and explore how this relationship varies across firms.

We begin by examining the association between UCT and firm investment in an otherwise standard specification of the Q theory of investment:

$$\frac{CAPX_{i,t+\ell}}{TA_{i,t+\ell-1}} = \alpha_i + \beta_1 UCT_t + \beta_2 Q_{i,t} + \beta_3 \frac{CF_{i,t}}{TA_{i,t-1}} + \beta_4 SG_{i,t} + \beta_5 \mathcal{M}_{i,t} + \epsilon_{i,t}, \qquad (1)$$

where the main dependent variable, investment rate, is measured as capital expenditures (CAPX) scaled by lagged total assets (TA), i indexes firm, t calendar quarter, and ℓ represents the quarter lag between the investment rate and explanatory variables. The firm-level controls include the explanatory variables commonly employed for testing the Q theory: cash flows ($\frac{CF_{i,t}}{TA_{i,t-1}}$), sales growth ($SG_{i,t}$, the year-on-year growth in quarterly firm sales), and Tobin's Q ($Q_{i,t}$), computed as the market to book value of assets. To control for macroeconomic conditions ($\mathcal{M}_{i,t}$), we use quarterly GDP growth. We also include the EPU and GPR indices to control for economic policy uncertainty and general geopolitical risk as well as a firm fixed-effect α_i. Standard errors are clustered at both

firm and quarter levels in all our regressions. We use quarterly data from COMPUSTAT from 1993 Q1 through 2019 Q4, chosen to match the availability of our UCT index and abstract from the influence of the pandemic. This provides a sample of 414,633 firm-quarter observations for these investment regressions. As can be seen from the summary statistics shown in the first three columns of Table 1, our sample is quite similar to that of the classic reference Gulen & Ion (2016).[20]

Table 1: Firm Summary Statistics

	Investment Sample			Suppliers Sample			Customers Sample		
	Mean	Median	Std. Dev.	Mean	Median	Std. Dev.	Mean	Median	Std. Dev.
CAPX to Lagged TA	0.015	0.008	0.023	0.010	0.006	0.015	0.010	0.006	0.013
CAPX	27.8	1.14	79.6	59.9	5.36	142.6	49.4	4.90	127.7
Total Assets	1,578.1	133.6	5,225.9	5,709.0	935.6	10,909.5	4,446.2	757.1	9,375.5
Cash Flows	39.4	0.947	157.6	145.0	9.45	338.1	114.8	9.66	287.1
Sales	343.9	31.8	1,109.6	1,427.0	233.4	2,484.1	872.5	135.5	1,924.4
Tobin's Q	2.66	1.58	3.70	2.0	1.46	1.87	2.23	1.72	1.99
Cash Flows to Lagged TA	-0.007	0.013	0.097	0.009	0.018	0.061	0.006	0.018	0.066
Sales Growth	0.302	0.079	1.14	0.148	0.045	0.791	0.153	0.052	0.767
Sample Size	414,633			3,703			11,615		

This table reports the summary statistics for the firm-level panel samples used in the empirical analysis. The *Investment Sample* panel shows the summary statistics for the sample used in the firm investment analysis in Section 4.1 and extends from 1993 Q1 to 2019 Q4. The *Suppliers Sample* and *Customers Sample* panels correspond to the samples used in the supply chain analysis in Section 4.2. Both samples extend from 2003 Q1 to 2019 Q4.

We estimate four specifications of Equation 1, one for each of $\ell \in \{1, 2, 3, 4\}$, to examine the persistence of the effect of UCT on firm investment. We display estimates of Equation 1 in Table 2. In the first four columns, we control for U.S. EPU, GPR, and GDP growth. To the extent that UCT is correlated with changes in expected future economic conditions and hence investment profitability, these estimates may be biased due to omitted variables. Therefore, we show estimates that also control for expectations about future economic conditions: 6-month-ahead GDP growth, obtained from the Federal Reserve Bank of Philadelphia's Survey of Professional Forecasters, as well as the expected next-year business conditions and consumer sentiment index, both constructed by the University of Michigan. Estimates with these additional controls are shown in

[20]Following convention (e.g., Gulen & Ion (2016); Farre-Mensa & Ljungqvist (2016)), we exclude financials (SIC between 6000 and 6999), utilities (SIC between 4900 and 4999), and all observations with total assets, sales or book equity less than or equal to zero. We winsorize all variables at the 1st and 99th percentiles in order to minimize the effect of data errors and outliers. All variables are normalized by their sample standard deviation to facilitate comparison of magnitudes across covariates. Each estimated coefficient thus represents the change in investment rate as a proportion to its standard deviation, following a one-standard-deviation increase in the respective independent variable.

Columns (5) through (8) of Table 2.

The results indicate that UCT has a persistent negative relationship with corporate investment. The economic magnitude of this effect is large, as expressed directly in the rows labelled "Raw Investment Effects". As seen using the estimates in column (1), for example, a one-standard-deviation increase in UCT is associated with a decline of 0.094 standard deviations in firm investment in the next quarter. This is a 21-bp decrease, equivalent to 13.9% of the average in-sample investment level.

We check robustness to the use of alternative measures of UCT. We substitute baseline UCT with either earnings-call UCT, China-scaled UCT, or intensive margin UCT—displayed in Appendix C—and re-estimate the investment regressions. As seen in Appendix F, we continue to find a strong negative association between firm investment and each of the alternative measures of UCT.

Interaction effects 1: investment and firm exposure to UCT

One way of assessing the information content of our index is to see whether the negative effects of heightened tension are stronger among firms that have greater exposure to U.S.-China tension. We thus examine whether the negative investment response varies across firms, depending on how much firms are exposed to U.S.-China tension. As there are no such existing exposure metrics, we construct one by adopting the efficient-market view that more exposed firms tend to experience sharper declines in their stock returns in periods of heightened tensions, all else equal. That is, we compute "UCT betas" for stocks trading on the NYSE, AMEX, and NASDAQ exchanges by estimating the sensitivity of idiosyncratic stock returns to movements in our UCT index.[21] To ensure that it is UCT driving any return responses, we follow the convention and control for a large number of factors that predict stock return differentials, including the market (MKT), size (SMB), book-to-market (HML), momentum (MOM), liquidity (LIQ), investment ($R_{I/A}$), and

[21] Following convention, we keep only securities with at least 60 monthly returns observations and whose monthly price remains between \$5 and \$1000 per share throughout our time-window. We also require all securities to be trading as of December 2019. This results in a sample of 1,299 securities.

Table 2: UCT and U.S. Firm Investment

Dependent Variable:	Investment							
	$\ell = 1$	$\ell = 2$	$\ell = 3$	$\ell = 4$	$\ell = 1$	$\ell = 2$	$\ell = 3$	$\ell = 4$
Model:	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Variables								
UCT Index	-0.094***	-0.110***	-0.121***	-0.117***	-0.090***	-0.104***	-0.116***	-0.110***
	(0.014)	(0.013)	(0.014)	(0.014)	(0.016)	(0.013)	(0.015)	(0.014)
EPU	-0.045***	-0.036***	-0.029***	-0.021**	-0.031**	-0.026**	-0.017	-0.021
	(0.010)	(0.010)	(0.009)	(0.009)	(0.014)	(0.013)	(0.014)	(0.015)
GPR	-0.042***	-0.038***	-0.035***	-0.030***	-0.038***	-0.033**	-0.029**	-0.023**
	(0.009)	(0.011)	(0.010)	(0.008)	(0.012)	(0.013)	(0.012)	(0.011)
GDP Growth	0.006	0.017*	0.012	0.028***	-0.002	0.010	0.004	0.023**
	(0.010)	(0.010)	(0.009)	(0.009)	(0.010)	(0.010)	(0.009)	(0.010)
Expected GDP Growth					0.015	0.013	0.010	0.007
					(0.011)	(0.010)	(0.010)	(0.009)
Consumer Sentiment					-0.033	-0.044	-0.038	-0.064
					(0.050)	(0.048)	(0.049)	(0.047)
Expected Bus Cond					0.054	0.061	0.060	0.070
					(0.046)	(0.046)	(0.045)	(0.044)
Raw Investment Effects								
UCT Index	-0.210	-0.244	-0.268	-0.260	-0.200	-0.232	-0.257	-0.245
	[-13.9%]	[-16.4%]	[-18.2%]	[-17.9%]	[-13.3%]	[-15.6%]	[-17.5%]	[-16.9%]
Fixed-effects								
Firm	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Fit statistics								
Observations	399,123	384,713	372,948	361,752	399,123	384,713	372,948	361,752
R^2	0.434	0.440	0.440	0.442	0.434	0.440	0.441	0.442
Within R^2	0.034	0.035	0.031	0.029	0.035	0.035	0.032	0.029

This table reports the regression results for Equation 1. Columns (1)-(4) show the results where the lag is between 1 and 4 quarters. Columns (5)-(8) correspond to the expanded specification that includes GDP growth forecasts, consumer sentiment, and expected business conditions as additional controls. In the top panel, all variables are standardized by Z-score. The *Raw Investment Effects* panel quantifies the magnitude of the firm investment response to a 1 standard deviation UCT index shock. The top row expresses the investment response in percentage points. The bracketed values underneath show the response as a percentage of the sample average investment rate. The sample period is 1993 Q1–2019 Q4.
Clustered (Year-Quarter & Firm) standard-errors in parentheses
*Signif. Codes: ***: 0.01, **: 0.05, *: 0.1*

profitability (R_{ROE}). We estimate the following equation:

$$R_{i,t} = \alpha_{i,t} + \beta_i^{UCT} UCT_t + \beta_i^{MKT} MKT_t + \beta_i^{SMB} SMB_t + \beta_i^{HML} HML_t + \beta_i^{MOM} MOM_t + \beta_i^{LIQ} LIQ_t + \beta_i^{R_{I/A}} R_{I/A,t} + \beta_i^{R_{ROE}} R_{ROE,t} + \epsilon_{i,t} \quad (2)$$

Security returns are from CRSP and are adjusted for dividends. We use the one-month Treasury Bill rate as the risk-free rate, which, along with the market, book-to-market, and momentum factors, are taken from Kenneth French's data library. The size, investment, and profitability factors are from Hou, Xue & Lu (2015), while the liquidity factor is from Lubos Pastor's data library.

A negative UCT beta indicates that a firm's excess stock returns fall when the UCT index rises and vice versa. We thus interpret firms with negative UCT index betas as being vulnerable to U.S.-China tension and firms with positive UCT betas as being immune or providing hedge against UCT. Appendix G describes the distributional properties of UCT betas. We find that industries with the most negative UCT betas concentrate in the computer and electrical equipment industries, as well as in telecommunications. Industries with the largest positive betas include utilities, and real estate. Furthermore, we show that firm UCT betas are significantly linked to the frequency of China mentions in the firm's earnings call transcripts and correlate with firm attributes in economically logical ways (see details in Appendix H).

Having bolstered confidence that UCT stock betas can be informative about firm-specific exposure to U.S.-China tension, we then incorporate the UCT betas into the firm investment regression (Equation 1). Since our measure is inevitably rough, we construct dummies indicating whether a firm's UCT stock beta falls under 10^{th}, 20^{th}, 30^{th}, 40^{th} and 50^{th} percentile of the UCT stock beta distribution. We then introduce each of the five UCT beta dummies and an interaction term between UCT and each dummy. As shown in Table 3, firms with low betas—that is, firms whose stock returns are most vulnerable to rising tensions—are associated with a significantly stronger negative investment response.

Interaction effects 2: investment and firm exposure to China

Next, we create measures of firm-specific exposure to China that are *independent* from our UCT index and use them to examine the heterogeneity in firm investment responses

Table 3: UCT and Investment Effects of UCT Beta

Dependent Variable:	Investment				
	10th	20th	30th	40th	50th
Model:	(1)	(2)	(3)	(4)	(5)
Variables					
UCT Index	-0.105***	-0.097***	-0.090***	-0.088***	-0.090***
	(0.014)	(0.014)	(0.013)	(0.013)	(0.013)
UCT Beta Dummy	0.261***	0.239***	0.176***	0.172***	0.115***
	(0.018)	(0.011)	(0.009)	(0.007)	(0.006)
EPU	-0.045***	-0.046***	-0.045***	-0.045***	-0.044***
	(0.012)	(0.012)	(0.012)	(0.012)	(0.012)
GPR	-0.044***	-0.045***	-0.044***	-0.044***	-0.044***
	(0.013)	(0.013)	(0.013)	(0.013)	(0.013)
GDP Growth	0.006	0.007	0.007	0.007	0.007
	(0.013)	(0.013)	(0.013)	(0.013)	(0.013)
UCT Index × UCT Beta Dummy	-0.051***	-0.065***	-0.064***	-0.051***	-0.032***
	(0.014)	(0.010)	(0.009)	(0.007)	(0.006)
Fit Statistics					
Observations	55,800	55,800	55,800	55,800	55,800
R^2	0.040	0.046	0.044	0.045	0.040

This table reports the regression results after incorporating the UCT beta dummy and its interaction with UCT into Equation 1. Columns (1)-(5) correspond to specifications where the UCT beta dummy equals 1 for firms whose UCT betas fall below the 10th to 50th percentiles, and zero otherwise. The lag between investment and the independent variables is 1 quarter. All other variables are standardized by Z-score. The sample period is 1993 Q1–2019 Q4.
Clustered (Year-Quarter) standard-errors in parentheses
*Signif. Codes: ***: 0.01, **: 0.05, *: 0.1*

to UCT. In this subsection, we construct two such measures, using proxies for firm's (i) trade exposure to China and (ii) overall exposure to China.

(i) Trade exposure We first examine whether the investment effect of UCT varies with trade exposure to China. We obtain the value of imports and exports for every industry by NAICS code from the the U.S. Census Bureau. Based on the average value over the sample period, we create a dummy variable for the top 10% of U.S. industries exporting to China and another dummy for the top 10% of U.S. industries importing from China. We include these indicators of high trade exposure to China, one at a time, into Equation 1, and interact them with the UCT index. As shown in Column (1) of Table 4, we find that firms operating in industries that export heavily to China are capital intensive and, on

Table 4: UCT and Investment Effects of Trade Linkages

Dependent Variable:	Investment	
	Exporting	Importing
Model:	(1)	(2)
Variables		
UCT Index	-0.064***	-0.096***
	(0.012)	(0.012)
Top Trade Dummy	0.109***	-0.069***
	(0.005)	(0.007)
EPU	-0.037***	-0.041***
	(0.010)	(0.010)
GPR	-0.052***	-0.051***
	(0.011)	(0.011)
GDP Growth	0.008	0.006
	(0.010)	(0.010)
UCT Index × Top Trade Dummy	-0.043***	-0.005
	(0.005)	(0.008)
Fit statistics		
Observations	218,412	215,939
R^2	0.021	0.023

This table reports the regression results after incorporating the top trade dummy and its interaction with UCT into Equation 1. The top trade dummy equal 1 for firms in the top 10% of U.S. industries importing from or exporting to China, and zero otherwise. The lag between investment and the independent variables is 1 quarter. All other variables are standardized by Z-score. The sample period is 1993 Q1–2019 Q4.
Clustered (Year-Quarter) standard-errors in parentheses
*Signif. Codes: ***: 0.01, **: 0.05, *: 0.1*

average, scale back on their investment more when UCT rises. Firms that import heavily from China appear to be labor-intensive (having a significantly lower level of capital), and consistently, the amplification effect is not statistically significant (Column 2).

(ii) Overall exposure to China U.S.-China tension spans a broad spectrum of issues extending beyond trade, as does our UCT index. To construct a general measure of firm-specific exposure to China that is not restricted to trade, we estimate each firm's "China beta," following the efficient-market perspective. The idea here is that U.S. firms with stronger ties with China would exhibit closer co-movement in their idiosyncratic stock

returns with China's economic conditions and hence its stock market.[22] For each firm, we estimate its "China beta" as the co-movement of its idiosyncratic stock returns with the returns of the Xtrackers Harvest China A-Shares (ASHR) ETF, a commonly-used proxy for the Chinese stock market which is comprised of the 300 largest and most liquid stocks listed on the Shanghai and Shenzhen Stock Exchanges.

For each security i, the China beta is estimated by regressing its residuals from the CAPM model on the returns of the ASHR China A-Shares ETF. As with the UCT betas, we include all securities from CRSP listed on the NYSE, AMEX, and NASDAQ stock exchanges in our sample.[23] In Appendix H, we report the distributional properties of China betas and show correlations with other firm attributes. Firms with high China betas have low UCT betas and more frequent mentions of China in their earnings call transcripts. That is, firms whose shares do well when China does well do poorly when U.S.-China tension rises. These firms also tend to discuss China more in their earnings calls. These relationships offer reassurance that the UCT beta and China beta measures are in agreement and conform to economic logic.

The results are presented in Table 5. Columns (1)—(5) correspond to specifications of Equation 1 where dummies indicating whether a firm's China beta is above the 50^{th}, 60^{th}, 70^{th}, 80^{th}, and 90^{th} percentile respectively are included in the regression along with their interactions with the UCT index. Firms with relatively high exposure to China—proxied by having a China beta above the 70^{th} percentile—exhibit an amplified investment response to heightened tension.

In sum, we see consistent patterns: heightened UCT depresses firm investment, a response that is stronger among firms that are *a priori* likely to be impacted by U.S.-China tension. Firms with more exposure—those in trade-exposed industries, with deeper links to the Chinese market, and experiencing stronger re-pricing when UCT fluctuates—

[22] We also constructed a third measure: each firm's share of revenue from China, using the geographic segment data from Compustat Historical Segments. Unfortunately, this cut the sample of firms to one-quarter of the original so we leave out these results.

[23] Since the ASHR ETF only dates back to December 2013, we only include a stock if it is trading for the entire 72-month period between January 2014 and December 2019. Following convention, and as with the UCT betas, we remove a stock from the sample if its share price ever exceeds $1000 or drops below $5 for any month within the 72-month period. These steps result in a sample of 1,723 stocks.

Table 5: UCT and Investment Effects of China Beta

Dependent Variable:	Investment				
	50th	60th	70th	80th	90th
Model:	(1)	(2)	(3)	(4)	(5)
Variables					
UCT Index	-0.086***	-0.083***	-0.082***	-0.081***	-0.080***
	(0.012)	(0.012)	(0.012)	(0.012)	(0.011)
China Beta	0.061***	0.073***	0.064***	0.089***	0.060***
	(0.004)	(0.005)	(0.006)	(0.007)	(0.010)
EPU	-0.051***	-0.051***	-0.051***	-0.051***	-0.051***
	(0.011)	(0.011)	(0.011)	(0.011)	(0.011)
GPR	-0.045***	-0.045***	-0.045***	-0.044***	-0.044***
	(0.013)	(0.013)	(0.013)	(0.013)	(0.013)
GDP Growth	0.012	0.012	0.012	0.012	0.012
	(0.012)	(0.012)	(0.011)	(0.011)	(0.011)
UCT Index × China Beta	0.001	-0.007	-0.011**	-0.022***	-0.054***
	(0.004)	(0.005)	(0.005)	(0.006)	(0.011)
Fit Statistics					
Observations	86,643	86,643	86,643	86,643	86,643
R^2	0.032	0.033	0.032	0.033	0.032

This table reports the regression results after incorporating the China beta dummy and its interaction with UCT into Equation 1. Columns (1)-(5) correspond to specifications where the China beta dummy equals 1 for firms whose China betas are above the 50th to 90th percentiles, and zero otherwise. The lag between investment and the independent variables is 1 quarter. All other variables are standardized by Z-score. The sample period is 1993 Q1–2019 Q4.
Clustered (Year-Quarter) standard-errors in parentheses
*Signif. Codes: ***: 0.01, **: 0.05, *: 0.1*

scale back more aggressively during periods when our UCT index registers heightened tensions. The confluence of these results sheds light on the economic transmission of elevated tensions, and it is also consistent with the notion that our index correlates with firm real decisions in ways that are indicative of rising bilateral tensions,

4.2 Supply chain relationships with China

We next investigate the effects of U.S.-China tension on supply chain relationships between U.S. and Chinese firms. Our analysis differs from the literature on the trade war in that (i) we examine a longer period of time and (ii) the UCT index captures the realization and uncertainty about escalation of many types of barriers, in addition to trade,

that disrupt transactions between the countries. We use relationship-level data from the FactSet Revere Supply Chain Relationships Database, available beginning in 2003 Q1. Factset Revere gathers firm-to-firm relationships using primary sources such as annual reports, investor filings, and company press releases, covering over 450,000 relationships.

For each U.S. firm, we count the number of customer and supplier relationships with Chinese entities that were initiated or terminated every month. A relationship is considered an initiation if it did not exist in the preceding month and a termination if it ceases to exist in the following month. For a given firm i in month t, we quantify whether firms are expanding or reducing their supplier dependencies on China by computing $D_{i,t}^{\text{SUP}}$, the difference between the number of Chinese supplier initiations and terminations, scaled by the total number of Chinese suppliers for that firm:

$$D_{i,t}^{SUP} = \frac{\text{\# of CN Supplier Initiations}_{i,t}}{\text{\# of CN Suppliers}_{i,t}} - \frac{\text{\# of CN Supplier Terminations}_{i,t}}{\text{\# of CN Suppliers}_{i,t}}$$

A value of 100% indicates that a firm has formed relations with Chinese suppliers where none existed previously, and a value of -100% suggests that a firm has ceased all dependency on Chinese suppliers. We define $D_{i,t}^{CUS}$ analogously for customer relationships. $D_{i,t}^{SUP}$ and $D_{i,t}^{CUS}$ are aggregated up to the firm-quarter level by taking the monthly average over a given quarter, and then merged to COMPUSTAT using 8 digit CUSIP codes. Financial and utilities firms are excluded.

We examine the association between UCT and the change in U.S. firm relationships with China by estimating the following panel model:

$$D_{i,t+\ell} = \alpha_i + \beta_1 UCT_t + \beta_2 \frac{CF_{i,t}}{TA_{i,t-1}} + \beta_3 TA_{i,t} + \beta_4 SG_{i,t} + \beta_5 \mathcal{M}_{i,t} + \epsilon_{i,t} \tag{3}$$

where i indexes firm, t indexes quarter, leads are denoted with $\ell \in \{1, 2, 3, 4\}$, and the dependent variable is either the change in U.S. firm supplier relationships with China ($D_{i,t}^{SUP}$), or the change in customer relationships ($D_{i,t}^{CUS}$). To control for other factors that may affect U.S. supply-chain connections with China, we include the same set of macroeconomic, public expectations, and uncertainty controls, ($\mathcal{M}_{i,t}$), used in the firm investment model. These are quarterly GDP growth, forecasted 6-month ahead GDP growth, consumer sentiment, expected business conditions in the following year, and

the U.S. EPU and GPR indices. We also include a firm fixed effect (α_i), total assets, ($TA_{i,t}$), scaled cash flows ($\frac{CF_{i,t}}{TA_{i,t-1}}$), and sales growth ($SG_{i,t}$) to control for firm-specific characteristics potentially correlated with a firm's decision to expand its current set of suppliers or customers. In general, U.S. firms with Chinese relations tend to be larger and have a greater sales volume than those without any connections to China, as can be seen from the summary statistics shown in the final six columns of Table 1.

Columns (1)-(4) of Table 6 report estimates of Equation 3 for suppliers while column (5)-(8) show results for customers. All regressors are normalized to zero mean and unit standard deviation while the dependent variables are expressed in percentage points. Rising UCT is strongly correlated with a persistent decrease in U.S. firms' supply-chain reliance on China. A one-standard-deviation increase in UCT is associated with a 6.2 percentage point decrease in net initiation of Chinese supplier relationships next quarter. A standard deviation increase in UCT is also associated with a 4.5 percentage point decrease in the net initiation of Chinese customer relationships in the next quarter. These coefficients are significant at the 1% significance level.

4.3 UCT and U.S. stock returns

The intertemporal capital asset pricing theory of Merton (1973), Campbell (1993), and Campbell (1996) indicates that investors are incentivized to hedge against future stochastic shifts in their consumption and investment opportunity sets. This implies that economic variables that are correlated with changes in consumption and investment opportunities are priced in capital markets. In this section, we discuss evidence that UCT is indeed that type of economic variable. First, our firm-level regressions above showed that heightened tensions lead to lower investment spending. Second, in Appendix I, we demonstrate that there are significant contractionary effects of UCT in the aggregate. There we estimate (i) standard vector auto-regression models which show that positive shocks to UCT lead to a decline in industrial production (IP), a rise in the excess bond premium (Gilchrist & Zakrajšek (2012)), and sizable declines in bilateral (U.S.-China) imports and exports; (ii) quantile regressions relating UCT to the distribution of growth

Table 6: UCT and U.S. Firm Linkages with China

Dependent Variable:	Scaled Initiations Minus Terminations							
	Suppliers				Customers			
	$\ell = 1$	$\ell = 2$	$\ell = 3$	$\ell = 4$	$\ell = 1$	$\ell = 2$	$\ell = 3$	$\ell = 4$
Model:	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Variables								
UCT Index	-6.206***	-4.071***	-4.403***	-4.958***	-4.525***	-2.704**	-3.477***	-3.810***
	(1.227)	(1.168)	(1.521)	(1.603)	(1.050)	(1.029)	(0.944)	(0.936)
Total Assets	0.092	0.113	-0.034	0.149	0.273	0.181	0.185	0.229
	(0.429)	(0.452)	(0.556)	(0.484)	(0.323)	(0.260)	(0.244)	(0.259)
Cash Flows	1.411**	1.973***	0.090	-1.219	1.713***	0.292	-0.140	-1.254***
	(0.678)	(0.506)	(0.292)	(0.790)	(0.401)	(0.273)	(0.264)	(0.429)
Sales Growth	0.061	-0.951	0.575	0.251	0.748**	0.315	1.019**	-0.423
	(0.656)	(0.723)	(1.022)	(0.885)	(0.310)	(0.320)	(0.428)	(0.328)
EPU	0.195	-0.499	-0.103	0.592	1.967**	0.684	0.953	1.149
	(1.066)	(1.142)	(1.133)	(1.211)	(0.848)	(0.852)	(0.724)	(0.875)
GPR	0.012	1.776	4.068**	2.250	4.009***	2.740**	2.419**	3.181***
	(1.841)	(1.762)	(1.678)	(1.960)	(1.491)	(1.150)	(0.938)	(0.987)
GDP Growth	-0.443	-0.970	-0.299	-0.157	-0.346	-0.000	-0.094	0.021
	(0.914)	(0.880)	(0.907)	(0.760)	(0.542)	(0.626)	(0.647)	(0.545)
Fixed-effects								
Firm	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Fit statistics								
Observations	3,663	3,645	3611	3,579	11,513	11,436	11,358	11,262
R^2	0.089	0.084	0.081	0.087	0.064	0.055	0.059	0.062
Within R2	0.033	0.025	0.023	0.023	0.020	0.009	0.012	0.015

This table reports the regression results for Equation 3. Columns (1)-(4) report the results where the dependent variable is the scaled difference between supplier initiations and terminations whereas columns (5)-(8) correspond to customer initiations net terminations. The dependent variables are expressed in percentage points while all right-hand side variables are standardized by Z-score. The sample period is 2003 Q1–2019 Q4.
Clustered (Year-Quarter & Firm) standard-errors in parentheses
*Signif. Codes: ***: 0.01, **: 0.05, *: 0.1*

in IP; and (iii) recession probability regressions with UCT as an explanatory variable.

With this backdrop, we now examine whether UCT is being priced in the cross section of stock returns. To hedge against a decline in economic prospects during periods of heightened tensions, investors would prefer holding stocks whose returns exhibit positive covariance with UCT. Therefore, we expect investors to be willing to pay higher prices and accept lower returns for stocks with higher UCT betas.

We follow the existing asset-pricing literature and construct a set of time-varying UCT betas for each firm from a rolling-window specification of Eq. 2. For each security i and month t, we estimate its rolling beta ($\beta_{i,t}^{ROLL}$) on the window from month $t-119$ to month t, provided that there exists at least 24 stock returns observations within this window. Decile portfolios are then constructed for each month on the basis of firm rolling betas in the previous month, where decile 1 (10) is formed from firms with the lowest (highest) betas. We compute equally-weighted excess returns for each decile portfolio as well as its abnormal returns with respect to three factor models: (α_5) is the alpha from regressing the equally-weighted excess returns on the market, size, book-to-market, investment, and profitability factors, (α_4) is the abnormal return relative to the market, size, investment, and profitability factors, and (α_7) is the abnormal return relative to the market, size, investment, and profitability factor, book-to-market, momentum, and liquidity factors.

The results are reported in Table 7. Column (1) reports the average rolling beta while columns (2)-(5) report the average excess and abnormal returns for each decile portfolio. As we move towards the higher deciles, both the average excess and abnormal returns tend to decrease. The differences in the alphas and excess returns between the highest and lowest deciles are shown in the bottom-most row, and are statistically significant. These results are consistent with our hypothesis that investors are willing pay a greater price for high decile securities that are less vulnerable to U.S.-China tension.

To further explore the cross-sectional relationship between the UCT betas and stock returns, we complement the portfolio-level results with Fama-Macbeth regressions. For each month t, we estimate a regression of one-month ahead stock returns on current

Table 7: Portfolios of Stocks Sorted by UCT Beta

Decile	β^{UCT} (1)	RET-RF (2)	α_5 (3)	α_4 (4)	α_7 (5)
Low	-2.312	1.388	0.617	0.573	0.507
		(0.348)	(0.177)	(0.165)	(0.114)
2	-1.210	1.094	0.280	0.247	0.225
		(0.332)	(0.079)	(0.085)	(0.072)
3	-0.769	1.097	0.377	0.334	0.290
		(0.276)	(0.123)	(0.114)	(0.086)
4	-0.434	1.065	0.281	0.249	0.254
		(0.299)	(0.091)	(0.095)	(0.089)
5	-0.146	1.103	0.332	0.304	0.331
		(0.296)	(0.092)	(0.097)	(0.086)
6	0.126	1.044	0.271	0.249	0.265
		(0.292)	(0.068)	(0.076)	(0.065)
7	0.406	1.008	0.240	0.226	0.220
		(0.279)	(0.064)	(0.067)	(0.072)
8	0.730	1.048	0.265	0.253	0.267
		(0.284)	(0.074)	(0.077)	(0.076)
9	1.164	1.064	0.271	0.259	0.272
		(0.270)	(0.084)	(0.088)	(0.089)
High	2.187	1.007	0.154	0.157	0.195
		(0.329)	(0.097)	(0.094)	(0.100)
High-Low		-0.381**	-0.463**	-0.416**	-0.313**
		(0.178)	(0.213)	(0.188)	(0.154)

Decile 1 (10) contains the stocks with the lowest (highest) rolling UCT betas each month. Column (1) shows the average UCT beta for each portfolio while column (2) reports the average excess returns. Column (3) shows the alphas relative to the market, size, book-to-market, investment and profitability factors. Column (4) shows the alphas relative to the market, size, investment and profitability factors while column (5) reports to the alphas relative to the market, size, investment, profitability, book-to-market, momentum, and liquidity factors. Differences in the average excess and abnormal returns between the highest and lowest deciles are reported in the bottom panel, along with significance levels. The sample period is Dec. 2002–Dec. 2019.
Newey-West standard-errors with six lags in parentheses
*Signif. codes for decile differences: ***: 0.01, **: 0.05, *: 0.1*

month UCT betas across all firms in the sample:

$$R_{i,t+1} = \lambda_{0,t} + \lambda_{1,t}\beta_{i,t}^{UCT} + \epsilon_{i,t+1}.$$

The estimated averages of $\lambda_{0,t}$ and $\lambda_{1,t}$ across all months are negative, -0.038, and

statistically significant at the 10% level, which provides corroborative evidence for the negative relationship between a stock's UCT beta and its returns.

4.4 Time variation in UCT effects

Our analysis thus far encompasses the trade war period between the United States and China starting in 2018 and earlier years tracing back decades. A question remains: did adverse economic consequences of heightened tension between the U.S. and China begin only with the trade policy conflicts, or were they present earlier? We assess this by re-estimating the effects of UCT in the pre-2018 subsample.

The results in Table 8, Table 9, and Table 10 reveal that the economic effects of elevated U.S.-China tension were present prior to the trade war years. Across our various exercises, we find statistically and economically significant effects of UCT fluctuations operational before the eruption of trade hostilities. Specifically, during the pre-2018 period, we document that U.S. firms curtailed investment and, on net, shifted their production networks away from China following increases in our UCT index. Moreover, firm-level stock returns are priced in exposure to U.S.-China tension risk prior to 2018, in line with diminishing economic conditions amid escalating tension.

5 Transmission channels: action vs. uncertainty

Tensions between the U.S. and China can be considered a factor influencing economic decisions because it can be accompanied by increased barriers that disrupt existing ties, and it could also trigger uncertainty about future escalation in such barriers. To that end, we interpret U.S.-China tension, as measured by our index, as reflecting both the *realization* of new concrete barriers that obstruct economic interactions between the two countries as well as *uncertainty* surrounding prospective barriers. We emphasize that while the introduction of tangible barriers often increases uncertainty over additional actions, uncertainty can also arise without the materialization of new barriers.

Cognizant of the inherent challenge of untangling the realization of actions from uncertainty, we make an effort to do so by constructing two subindices each designed to be

Table 8: UCT and U.S. Firm Investment (Pre-2018 Sample)

Dependent Variable:	Investment							
	$\ell = 1$	$\ell = 2$	$\ell = 3$	$\ell = 4$	$\ell = 1$	$\ell = 2$	$\ell = 3$	$\ell = 4$
Model:	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Variables								
UCT Index	-0.112***	-0.125***	-0.137***	-0.130***	-0.104***	-0.117***	-0.128***	-0.124***
	(0.022)	(0.018)	(0.020)	(0.020)	(0.022)	(0.018)	(0.020)	(0.020)
EPU	-0.045***	-0.035***	-0.028***	-0.020**	-0.035**	-0.029**	-0.020	-0.023
	(0.011)	(0.010)	(0.009)	(0.010)	(0.015)	(0.014)	(0.015)	(0.016)
GPR	-0.043***	-0.040***	-0.037***	-0.032***	-0.039***	-0.034**	-0.030**	-0.024**
	(0.010)	(0.011)	(0.010)	(0.008)	(0.012)	(0.013)	(0.012)	(0.011)
GDP Growth	0.004	0.016*	0.011	0.028***	-0.002	0.010	0.004	0.023**
	(0.010)	(0.010)	(0.009)	(0.009)	(0.010)	(0.010)	(0.009)	(0.010)
Expected GDP Growth					0.013	0.010	0.007	0.005
					(0.011)	(0.011)	(0.010)	(0.009)
Consumer Sentiment					-0.033	-0.048	-0.045	-0.072
					(0.051)	(0.049)	(0.051)	(0.048)
Expected Bus Cond					0.050	0.060	0.063	0.072
					(0.048)	(0.048)	(0.046)	(0.044)
Fixed-effects								
Firm	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Fit statistics								
Observations	378,960	364,985	353,503	342,587	378,960	364,985	353,503	342,587
R^2	0.434	0.439	0.440	0.442	0.435	0.440	0.440	0.442
Within R^2	0.034	0.034	0.031	0.028	0.034	0.035	0.031	0.029

This table reports the regression results for Equation 1 where the sample period is restricted to before the trade war. All variables are standardized by Z-score. The sample period is 1993 Q1–2017 Q4.
Clustered (Year-Quarter & Firm) standard-errors in parentheses
*Signif. Codes: ***: 0.01, **: 0.05, *: 0.1*

Table 9: UCT and U.S. Firm Linkages with China (Pre-2018 Sample)

Dependent Variable:	Scaled Initiations Minus Terminations							
	Suppliers				Customers			
	$\ell = 1$	$\ell = 2$	$\ell = 3$	$\ell = 4$	$\ell = 1$	$\ell = 2$	$\ell = 3$	$\ell = 4$
Model:	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Variables								
UCT Index	-6.866***	-3.882**	-2.769*	-2.051	-3.443***	-2.027	-3.641***	-3.195**
	(2.040)	(1.825)	(1.650)	(1.768)	(1.116)	(1.621)	(1.242)	(1.293)
Total Assets	-0.049	0.105	0.116	0.006	0.195	0.074	0.253	0.327
	(0.751)	(0.743)	(0.743)	(0.783)	(0.299)	(0.240)	(0.259)	(0.311)
Cash Flows	1.276*	1.880***	0.048	-1.537*	2.049***	0.521	-0.190	-1.592***
	(0.705)	(0.661)	(0.437)	(0.796)	(0.475)	(0.336)	(0.355)	(0.517)
Sales Growth	0.778	-0.622	1.693	0.064	0.947**	0.540	0.985**	-0.032
	(0.830)	(0.840)	(1.213)	(1.185)	(0.442)	(0.444)	(0.450)	(0.429)
EPU	0.539	-0.214	0.225	0.603	2.071**	0.816	1.167	0.836
	(1.178)	(1.220)	(1.262)	(1.267)	(0.964)	(0.926)	(0.867)	(0.957)
GPR	-1.765	-0.846	3.624*	2.282	3.891**	1.980*	1.773*	3.479***
	(2.137)	(1.541)	(1.904)	(2.385)	(1.781)	(1.048)	(0.902)	(1.090)
GDP Growth	2.772**	3.250**	3.331**	4.888***	1.979**	1.622	1.502	1.203
	(1.250)	(1.584)	(1.529)	(1.705)	(0.957)	(1.033)	(0.914)	(0.823)
Fixed-effects								
Firm	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Fit statistics								
Observations	2,664	2,651	2,630	2,605	9,003	8,952	8,885	8,809
R^2	0.094	0.088	0.089	0.099	0.070	0.061	0.067	0.071
Within R^2	0.028	0.022	0.022	0.024	0.018	0.008	0.013	0.016

This table reports the regression results for Equation 3 where the sample period is restricted to before the trade war. Columns (1)-(4) show the results where the dependent variable is supplier initiations minus terminations while columns (5)-(8) correspond to customer initiations minus terminations. The dependent variables are in percentage points while all right-hand side variables are standardized by Z-score. The sample period is 2003 Q1–2017 Q4.

Clustered (Year-Quarter & Firm) standard-errors in parentheses

*Signif. Codes: ***: 0.01, **: 0.05, *: 0.1*

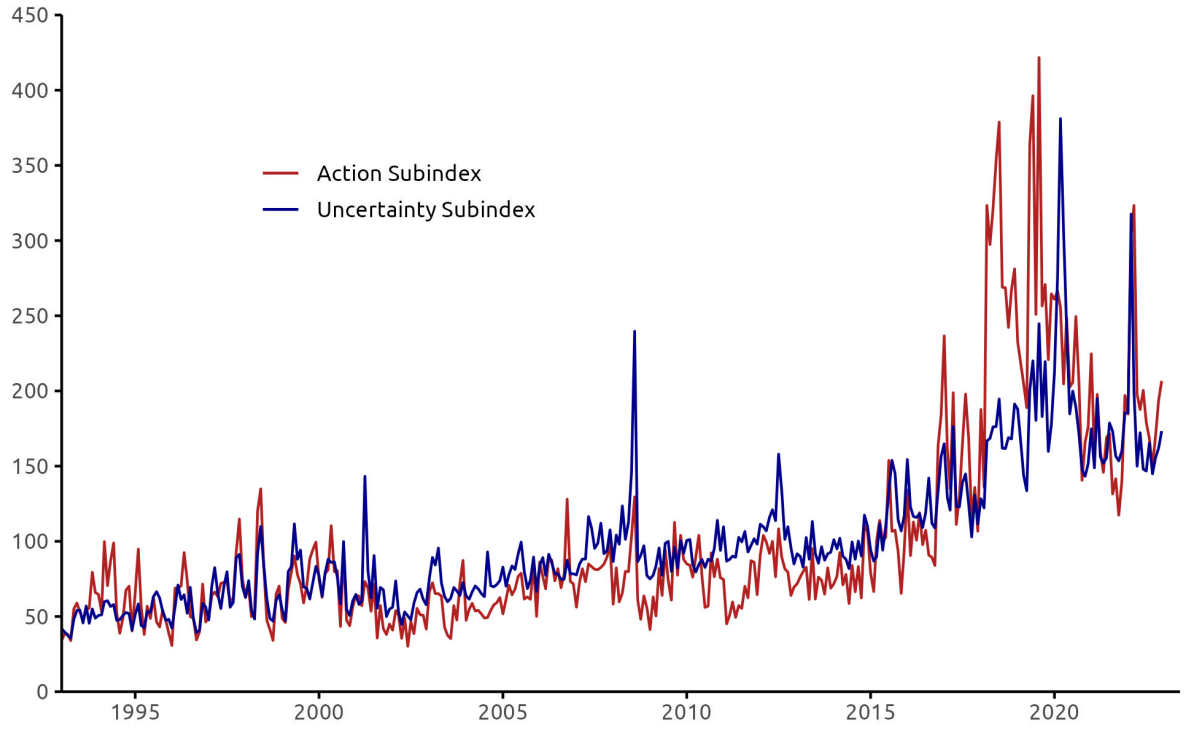
Table 10: Portfolios of Stocks Sorted by UCT Beta (Pre-2018 Sample)

Decile	β^{UCT} (1)	RET-RF (2)	α_5 (3)	α_4 (4)	α_7 (5)
Low	-2.421	1.433	0.617	0.599	0.482
		(0.385)	(0.189)	(0.172)	(0.120)
2	-1.264	1.150	0.294	0.279	0.230
		(0.364)	(0.095)	(0.105)	(0.084)
3	-0.801	1.148	0.392	0.374	0.278
		(0.303)	(0.115)	(0.106)	(0.081)
4	-0.450	1.133	0.296	0.282	0.261
		(0.333)	(0.093)	(0.099)	(0.089)
5	-0.147	1.101	0.287	0.277	0.275
		(0.333)	(0.093)	(0.097)	(0.085)
6	0.136	1.163	0.349	0.340	0.330
		(0.318)	(0.077)	(0.088)	(0.080)
7	0.429	1.024	0.215	0.210	0.193
		(0.310)	(0.074)	(0.074)	(0.087)
8	0.772	1.130	0.326	0.322	0.324
		(0.315)	(0.076)	(0.078)	(0.080)
9	1.235	1.158	0.330	0.326	0.326
		(0.293)	(0.091)	(0.093)	(0.098)
High	2.312	1.136	0.240	0.241	0.285
		(0.358)	(0.097)	(0.095)	(0.099)
High-Low		-0.298	-0.377*	-0.358*	-0.197
		(0.197)	(0.227)	(0.201)	(0.154)

This table reports the average excess and abnormal returns for UCT beta decile portfolios during the period before the trade war. Column (1) shows the average UCT beta for each portfolio while column (2) reports the average excess returns. Column (3) shows the alphas relative to the market, size, book-to-market, investment and profitability factors. Column (4) shows the alphas relative to the market, size, investment and profitability factors while column (5) reports to the alphas relative to the market, size, investment, profitability, book-to-market, momentum, and liquidity factors. Differences in returns between the highest and lowest deciles are reported in the bottom panel, along with significance levels. The sample period is Dec. 2002–Dec. 2017.
Newey-West standard-errors with six lags in parentheses
*Signif. codes for decile differences: ***: 0.01, **: 0.05, *: 0.1*

more responsive to a specific component. We divide our category (iii) search terms into those that are suggestive of the materialization of new barriers (e.g., barrier, friction, sanction, forbid, and blacklist) and those that are not (e.g., risk, uncertainty, pressure,

Figure 7: Actions vs. Uncertainty Subindices



Note: The monthly UCT action and uncertainty subindices from Jan. 1993 to Dec. 2022. Both subindices are normalized to a mean of 100 over the plotted period.

disappoint, and accuse). The sets of *action* and *uncertainty* category (iii) terms are reported in Table A1. The two subindices are therefore constructed as the share of news articles that mention at least one phrase from the corresponding subset of category (iii) terms, as well as at least one phrase from both the category (i) and (ii) search terms. They are then normalized in the same manner as the baseline index.

The subindices are plotted in Figure 7. Although the measures are correlated in ways in line with the notion that actions tend to produce uncertainty, they also exhibit large independent variation. The action subindex stays particularly elevated throughout the trade war period (2018-2019), while the uncertainty subindex spikes in August 2008 and March 2020 when intensified disputes did not immediately result in tangible barriers.

5.1 Firm investment

To examine the effects of the action and uncertainty components in driving firm real decisions, we re-estimate Equation 1 and replace the baseline index by the two subindices one at a time. As shown in Table 11, both the realization of and uncertainty over barri-

ers significantly reduce firm investment, with the effect notably stronger for uncertainty. The importance of this finding can be well understood from the real options theory of investment under uncertainty. This theory implies that it is not merely the level of frictions, but also the uncertainty surrounding those frictions, that weighs heavily on firms' investment decisions. Our results indicate that while higher bilateral tensions decrease investment on average, it is the uncertainty element that acts as a stronger deterrent compared to concrete actions. Firms optimally delay investment when faced with uncertainty over future frictions. However, if the tensions were to stabilize at an elevated but predictable level, economic decision-makers could adjust. Our findings suggest that, should uncertainty surrounding the bilateral tension subside, even a high-tension steady state between the U.S. and China may see more contained economic effects, relative to an environment of persisting instability.

Investment irreversibility

To further assess the role of uncertainty in UCT transmission, we examine how firm investment irreversibility influences the negative investment response to UCT. The real options theory postulates that increased uncertainty creates an incentive for firms to delay investment when the option to delay is available, as noted above. Moreover, investment irreversibility increases the incentive to delay. Our first measure of investment irreversibility is a proxy for asset tangibility, measured as the ratio of Property, Plant, and Equipment (PPE) to total assets. The rationale is that firms with higher ratios of fixed to total assets tend to rely heavily on physical capital, and would find it costly to divest as they would have to do so in large discrete amounts (Gulen & Ion (2016)). We also use four additional proxies for sunk costs: sale of PPE, sale of investment, rent expenses, and depreciation expenses (Kessides (1990); Farinas & Ruano (2005); and Gulen & Ion (2016)).[24] All proxies are normalized by the beginning-of-quarter PPE. As the metrics are inevitably rough, for each investment irreversibility measure, we follow the literature and construct an categorical variable that ranges between 0 to 9, with the value

[24]Intuitively, sunk costs (and hence investment irreversibility) are lower for firms that can sell their investments or PPE in a more liquid market, for firms that rent a higher proportion of their physical assets, and for firms with rapidly depreciating capital.

Table 11: UCT Action vs. Uncertainty and U.S. Firm Investment

Dependent Variable:	Investment							
	Uncertainty Subindex				Action Subindex			
	$\ell = 1$	$\ell = 2$	$\ell = 3$	$\ell = 4$	$\ell = 1$	$\ell = 2$	$\ell = 3$	$\ell = 4$
Model:	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Variables								
UCT Uncertainty	-0.093***	-0.105***	-0.119***	-0.112***				
	(0.0144)	(0.0130)	(0.0144)	(0.0142)				
UCT Action					-0.059***	-0.060***	-0.076***	-0.070***
					(0.011)	(0.012)	(0.014)	(0.013)
EPU	-0.029**	-0.025*	-0.015	-0.019	-0.037***	-0.034***	-0.024*	-0.027*
	(0.014)	(0.013)	(0.014)	(0.015)	(0.012)	(0.012)	(0.014)	(0.015)
GPR	-0.038***	-0.032**	-0.029**	-0.023**	-0.030**	-0.022	-0.018	-0.013
	(0.012)	(0.013)	(0.012)	(0.011)	(0.013)	(0.015)	(0.013)	(0.011)
GDP Growth	-0.001	0.011	0.005	0.024**	0.002	0.015	0.010	0.029**
	(0.009)	(0.010)	(0.009)	(0.010)	(0.010)	(0.012)	(0.010)	(0.011)
Expected GDP Growth	0.016	0.013	0.010	0.008	0.026**	0.025**	0.023**	0.020*
	(0.011)	(0.010)	(0.010)	(0.009)	(0.012)	(0.012)	(0.011)	(0.011)
Consumer Sentiment	-0.025	-0.038	-0.030	-0.058	-0.065	-0.088*	-0.078	-0.102**
	(0.049)	(0.048)	(0.049)	(0.047)	(0.049)	(0.048)	(0.049)	(0.044)
Expected Bus Cond	0.049	0.058	0.056	0.067	0.094**	0.113**	0.112**	0.119***
	(0.046)	(0.047)	(0.045)	(0.044)	(0.045)	(0.046)	(0.046)	(0.040)
Fixed-effects								
Firm	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Fit statistics								
Observations	399,123	384,713	372,948	361,752	399,123	384,713	372,948	361,752
R^2	0.435	0.440	0.441	0.442	0.433	0.437	0.438	0.439
Within R^2	0.035	0.035	0.032	0.029	0.032	0.031	0.027	0.024

This table reports the regression results for Equation 1 where the UCT index regressor is replaced with the uncertainty subindex (columns 1-4) and the action subindex (columns 5-8). All variables are standardized by Z-score. The sample period is 1993 Q1–2019 Q4.

Clustered (Year-Quarter & Firm) standard-errors in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

representing the decile rank relative to all firms in a given quarter. A larger value thus represents a higher levels of investment irreversibility.

We introduce each proxy and its interaction with UCT into our baseline specification (Equation 1) one at a time:

$$\frac{CAPX_{i,t+1}}{TA_{i,t}} = \alpha_i + \beta_2 UCT_t + \beta_3 II_t + \beta_4 UCT_t \times II_t + \beta_5 Q_{i,t} + \beta_6 \frac{CF_{i,t}}{TA_{i,t-1}} + \beta_7 SG_{i,t} + \beta_8 \mathcal{M}_{i,t} + \epsilon_{i,t} \quad (4)$$

where $II_{i,t}$ represents the firm's investment irreversibility decile rank in the cross section at time t. As seen in Table 12, higher levels of investment irreversibility are associated with a significantly more negative relationship between UCT and firm investment. Our results are robust to using the *levels* of the irreversibility measures as well.

Table 12: UCT and Investment Effects of Investment Irreversibility

Dependent Variable:	Investment				
	PPE	Rent Expenses	Depreciation	PPE Sales	Investment Sales
II Proxy:	(1)	(2)	(3)	(4)	(5)
Variables					
UCT Index	0.010	-0.073***	-0.070***	-0.080***	-0.068***
	(0.010)	(0.013)	(0.012)	(0.014)	(0.013)
UCT Index × II	-0.021***	-0.004**	-0.006***	-0.001	-0.004***
	(0.003)	(0.002)	(0.002)	(0.001)	(0.001)
Fixed-effects					
Firm	Yes	Yes	Yes	Yes	Yes
Fit statistics					
Observations	398,260	352,763	373,183	330,760	387,458
R^2	0.442	0.449	0.443	0.438	0.436
Within R^2	0.047	0.037	0.034	0.035	0.035

This table reports the results of Equation 4 where each column corresponds to a different measure of investment irreversibility. The dependent variable and the UCT index are standard by Z-score, while II ranges between 0–9 depending on the decile rank of each firm's irreversibility measure. The lag between investment and the independent variables is 1 quarter. The sample period is 1993 Q1–2019 Q4.
Clustered (Year-Quarter & Firm) standard-errors in parentheses
*Signif. Codes: ***: 0.01, **: 0.05, *: 0.1*

5.2 Supply chain reconfiguration

To examine the distinct roles of UCT actions and UCT uncertainty in driving firm supply chain decisions, we re-estimate Equation 3 but replace the main index with the action and uncertainty subindices one at a time. The results are displayed in Table 6, with the

top panel showing results with the action subindex and the bottom panel for uncertainty. Increases in both subindices are associated with significant decreases in net initiations of U.S. firm relationships with Chinese entities. The uncertainty effect is consistently stronger, particularly for relationships with Chinese suppliers.

Our analysis reveals that elevated uncertainty exhibits a more pronounced correlation with firms repositioning their supply chains away from China, relative to the impacts of concrete policy actions that directly impede bilateral economic transactions. Facing uncertainty over the severity and longevity of economic frictions with China, firms pause initiating supply chain relationships with China against unpredictable policy shifts or tension escalations. Our findings therefore highlight that uncertainty over future frictions alone can incentivize diversification of economic engagement away from China.

5.3 UCT equity premium

Finally, we investigate the different roles of action and uncertainty in the UCT premium associated with U.S. equity returns. As shown in Table 14, for portfolios formed on the basis of both action and uncertainty betas, the differences in alphas and excess returns between the highest and lowest deciles are negative and significant, with the results for the uncertainty betas generally larger.[25] The larger UCT premium for the uncertainty component, relative to the action component, is consistent with models of compounded uncertainty over economic fundamentals and cash flow processes. When uncertainty arises over prospective barriers impeding economic transactions, it translates into uncertainty over firms' future growth prospects and profitability. This compounded uncertainty commands a higher risk premium in market valuations relative to concrete policy actions whose impacts can be more readily quantified. Moreover, uncertainty over the future state incentivizes firms to delay undertaking investments, contracting their capital stock and dampening expected profitability and valuations. To the extent that the uncertainty

[25]Consistent with this, we show in Appendix I that a one-standard-deviation positive shock to the uncertainty component has a large and persistent contractionary effect that depresses output and bilateral trade, as well raising unemployment and EBP. In contrast, a one-standard-deviation positive shock to the action component generates significantly larger and more protracted reductions to bilateral trade, while having relatively muted effects on output and borrowing costs. It appears that the adverse aggregate output effect of UCT is primarily driven by its uncertainty component.

Table 13: UCT Action vs. Uncertainty and U.S. Firm Linkages with China

	Suppliers				Customers			
	$\ell = 1$	$\ell = 2$	$\ell = 3$	$\ell = 4$	$\ell = 1$	$\ell = 2$	$\ell = 3$	$\ell = 4$
Model:	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Action								
UCT Action	-3.505***	-2.409***	-3.238***	-4.066***	-3.491***	-2.394***	-2.149***	-2.576***
	(0.937)	(0.831)	(1.043)	(1.077)	(0.821)	(0.672)	(0.804)	(0.731)
Fixed-effects								
Firm	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Fit statistics								
Observations	3,663	3,645	3,611	3,579	11,513	11,436	11,358	11,262
R^2	0.085	0.083	0.082	0.091	0.066	0.057	0.058	0.062
Within R^2	0.029	0.024	0.024	0.027	0.023	0.011	0.011	0.014
Uncertainty								
UCT Uncertainty	-6.266***	-4.330***	-4.957***	-5.512***	-4.685***	-2.988***	-3.704***	-4.247***
	(1.155)	(1.152)	(1.494)	(1.539)	(1.009)	(0.987)	(0.969)	(0.910)
Fixed-effects								
Firm	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Fit statistics								
Observations	3,663	3,645	3,611	3,579	11,513	11,436	11,358	11,262
R^2	0.090	0.085	0.082	0.089	0.064	0.055	0.059	0.063
Within R^2	0.034	0.026	0.024	0.024	0.021	0.010	0.012	0.016

This table reports the regression results for Equation 3 where the UCT index regressor is replaced with the action subindex (top panel) and the uncertainty index (bottom panel). Columns (1)-(4) show the results where the dependent variable is supplier initiations minus terminations while columns (5)-(8) correspond to customer initiations minus terminations. The dependent variables are in percentage points while all right-hand side variables are standardized by Z-score. The sample period is 2003 Q1–2019 Q4.

Standard errors in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 14: Portfolios of Stocks Sorted by Action vs. Uncertainty Betas

	Action Beta Decile Portfolios					Uncertainty Beta Decile Portfolios				
Decile	β^{ACT}	RET-RF	α_5	α_4	α_7	β^{UNC}	RET-RF	α_5	α_4	α_7
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Low	-4.199	1.333	0.485	0.449	0.461	-2.424	1.406	0.621	0.577	0.517
		(0.355)	(0.162)	(0.151)	(0.117)		(0.345)	(0.171)	(0.158)	(0.111)
2	-2.341	1.239	0.448	0.411	0.393	-1.275	1.111	0.336	0.291	0.239
		(0.299)	(0.101)	(0.102)	(0.088)		(0.319)	(0.104)	(0.109)	(0.085)
3	-1.524	1.185	0.418	0.381	0.365	-0.804	1.004	0.254	0.213	0.224
		(0.282)	(0.089)	(0.093)	(0.081)		(0.294)	(0.090)	(0.089)	(0.077)
4	-0.917	1.063	0.278	0.245	0.248	-0.441	1.139	0.378	0.351	0.324
		(0.280)	(0.078)	(0.089)	(0.070)		(0.284)	(0.103)	(0.100)	(0.092)
5	-0.411	1.179	0.456	0.420	0.410	-0.134	1.045	0.267	0.240	0.257
		(0.278)	(0.091)	(0.093)	(0.082)		(0.294)	(0.079)	(0.085)	(0.077)
6	0.059	1.034	0.291	0.268	0.289	0.149	1.076	0.318	0.301	0.324
		(0.277)	(0.070)	(0.073)	(0.074)		(0.294)	(0.065)	(0.068)	(0.075)
7	0.544	0.860	0.062	0.039	0.053	0.437	1.035	0.265	0.247	0.259
		(0.300)	(0.072)	(0.081)	(0.077)		(0.284)	(0.072)	(0.078)	(0.078)
8	1.099	0.994	0.246	0.241	0.206	0.775	1.034	0.239	0.229	0.226
		(0.277)	(0.083)	(0.085)	(0.073)		(0.283)	(0.080)	(0.081)	(0.082)
9	1.825	1.043	0.252	0.242	0.292	1.237	1.063	0.278	0.264	0.289
		(0.293)	(0.069)	(0.075)	(0.075)		(0.267)	(0.089)	(0.095)	(0.095)
High	3.557	0.986	0.149	0.152	0.107	2.308	1.005	0.132	0.138	0.166
		(0.346)	(0.099)	(0.099)	(0.090)		(0.343)	(0.107)	(0.104)	(0.106)
High-Low		-0.348***	-0.336**	-0.297**	-0.354**		-0.401**	-0.489**	-0.439**	-0.351**
		(0.123)	(0.160)	(0.141)	(0.146)		(0.175)	(0.214)	(0.188)	(0.166)

This table reports the average excess and abnormal returns for decile portfolios formed on the basis of action betas (columns 1-5) and uncertainty betas (columns 6-10). Columns (1) and (6) show the average action and uncertainty betas for each decile while the RET-RF columns report the average excess returns. The α_5 columns show the alphas relative to the market, size, book-to-market, investment and profitability factors. The α_4 columns show the alphas relative to the market, size, investment and profitability factors while the α_7 columns report the alphas relative to the market, size, investment, profitability, book-to-market, momentum, and liquidity factors. Differences in returns between the highest and lowest deciles are reported in the bottom panel, along with significance levels. The sample period is Dec. 2002–Dec. 2019.
Newey-West standard-errors with six lags in parentheses
*Signif. codes for decile differences: ***: 0.01, **: 0.05, *: 0.1*

component of UCT prompts more pervasive delays in firms' investment and growth plans, as we documented above, this effect also contributes to the stock premium being larger in size for the uncertainty component than the action component.

6 UCT viewed from outside the U.S.

Given the economic sizes of both the U.S. and China and their corresponding global influence, newspapers from other countries also report and reflect heightened U.S.-China tension. To examine perceptions of U.S.-China tension from outside the United States, we apply the same methodology and compute foreign UCT indices that replace the set of U.S. newspapers with (i) the People's Daily from Beijing, (ii) three newspapers from the UK (Daily Telegraph, Financial Times, and Guardian), (iii) four newspapers from Canada (Globe & Mail, Ottawa Citizen, Toronto Star, Vancouver Sun), and (iv) the South China Morning Post from Hong Kong.

To construct the U.S.-China tension index from mainland China's perspective (UCT-CN), we use the online database of People's Daily, China's longest running continuous newspaper since 1949.[26] Due to nuanced subtlety in Chinese when expressing tension, the (supervised) machine learning algorithms do not produce as reliable results. Therefore, we base our initial selection of search terms on our judgment, informed by extensive review of newspaper articles on escalating U.S.-China tension. We then refine these terms through human audits of the indices generated from different permutations of search terms.

Our search terms are presented in Appendix A. In order for an article to be included, it must contain at least one word from each of three categories in the list presented. We display the words in traditional Chinese, the language of the news articles themselves, as well as translations into pinyin and English. The first category contains proper nouns such as Obama, Trump, and Washington. In contrast to English, the leadership surnames in Chinese do not result in any false positives. The second category includes terms describing confrontational issues such as trade war, Taiwan Strait Crisis, and COVID-19. The final category includes words that directly represent the comments of the Chinese government on the United States, including threat, pressure and tension. These words

[26] We also used the CNKI China Core Newspapers Full-text Database (www.CNKI.net), a continuously updated full-text newspaper database. It collects more than 500 newspapers affiliated with either the Communist Party of China, industry, or "comprehensive" newspapers. We found sufficient availability in CNKI for four newspapers: Economics Daily (JJ), Guangming Daily (GM), People's Daily(PD). We use the fact that PD is also included in the CNKI database as a cross-check on our index construction. As a result of these cross-checks, we began the sample for the CNKI newspapers in 2012. Indices constructed from the CNKI newspapers are available on request.

are all emotionally negative, consistent with the goals of our index construction.

The UCT-CN index shares fluctuations akin to those in the U.S.-based index yet reveals distinct disparities, reflecting contrasting views of the two nations. Figure A10 in Appendix J depicts the monthly UCT-CN index from People's Daily from Jan. 1993 to Feb. 2022. Notably, there were two periods when over 10% of articles referenced escalating U.S.-China tension. The first instance, in May 1999, followed the bombing of the Chinese embassy in Belgrade during the Kosovo War, an act China perceived as a declaration of war, despite the U.S. government's apology for misidentifying the target, as noted in our analysis of U.S. Congressional legislation. The second surge aligns with the trade disputes between the U.S. and China, with a notable peak in August 2019 when the Chinese government formally articulated its stance on the trade conflict.

Finally, we employ the same procedure used for U.S. newspapers for several English language newspapers in other locations—three in the UK, four in Canada, and one in Hong Kong: Daily Telegraph, Financial Times, and Guardian; Globe & Mail, Ottawa Citizen, Toronto Star, Vancouver Sun; and South China Morning Post. The keyword search is the same as with the U.S. newspapers. As seen in Figure A11 in Appendix J, these "third-party" indices line up closely and mirror the US-based index, indicating not only a shared perspective in the Western world but also highlighting the global attention focused on the US-China relationship.

7 Conclusion

The tempestuous relationship between the U.S. and China looms large over the global economic landscape. While trade war effects have been examined and the political ramifications of U.S.-China tension are readily acknowledged, the longer-term general economic impact of such tension remains opaque, posing a significant challenge for policymakers, investors, and businesses. We contribute to understanding that impact by constructing an index of general public concerns over U.S.-China tension. We validate our index by demonstrating its close alignment with those of business and policy decision-makers.

Utilizing extensive data on firm investment, granular supply-chain relationships, id-

iosyncratic stock returns, and macro aggregates, we find that heightened U.S.-China tension has negative economic consequences. The contractionary effects predominantly operate through uncertainty channels. Our results suggest that even absent tension-inducing actions, the threat of such actions alone elicits adverse economic responses. Stated differently, the economic impacts of U.S.-China tension can be moderated going forward, provided that economic decision-makers perceive limited uncertainty regarding a new norm in the bilateral relationship, irrespective of the intensity of tension that characterizes the new norm.

Our analysis underscores the significance of understanding the economic ramifications of bilateral relationships in the interconnected global economy, with U.S.-China being a salient example. We hope that our UCT index—along with our proxies for firm exposure to tension, foreign-news measures of U.S.-China tension, and measures of tension between the U.S. and several other countries including Russia and Japan—will enhance research designed to deepen our understanding of related questions spanning different areas.

References

Abadie, A. & Gardeazabal, J. (2003), 'The economic costs of conflict: A case study of the basque country', *American economic review* **93**(1), 113–132.

Alesina, A., Özler, S., Roubini, N. & Swagel, P. (1996), 'Political instability and economic growth', *Journal of Economic growth* **1**, 189–211.

Alfaro, L. & Chor, D. (2023), Global supply chains: the looming 'Great Reallocation', Technical report, Jackson Hole Conference, Federal Reserve Bank of Kansas City.

Baker, S. R., Bloom, N. & Davis, S. J. (2016), 'Measuring economic policy uncertainty', *Quarterly Journal of Economics* **131**(4), 1593–1636.

Baker, S. R., Davis, S. J. & Levy, J. A. (2022), 'State-level economic policy uncertainty', *Journal of Monetary Economics* **132**, 81–99.

Bloom, N., Bond, S. & Reenen, J. V. (2007), 'Uncertainty and investment dynamics', *The review of economic studies* **74**(2), 391–415.

Caldara, D. & Iacoviello, M. (2022), 'Measuring geopolitical risk', *American Economic Review* **112**(4), 1194–1225.

Calomiris, C. W. & Mamaysky, H. (2019), 'How news and its context drive risk and returns around the world', *Journal of Financial Economics* **133**(2), 299–336.

Campbell, J. (1993), 'Intertemporal asset pricing without consumption data', *The American Economic Review* **83**(3), 487–512.

Campbell, J. (1996), 'Understanding risk and return', *The Journal of Political Economy* **104**(2), 298–345.

Cerra, V. & Saxena, S. C. (2008), 'Growth dynamics: the myth of economic recovery', *American Economic Review* **98**(1), 439–457.

Chen, K., Ren, J. & Zha, T. (2018), 'The nexus of monetary policy and shadow banking in China', *American Economic Review* **108**(12), 3891–3936.

Davis, S. J. (2019), Rising policy uncertainty, Technical report, National Bureau of Economic Research.

Eckstein, Z. & Tsiddon, D. (2004), 'Macroeconomic consequences of terror: theory and the case of Israel', *Journal of monetary economics* **51**(5), 971–1002.

Fajgelbaum, P., Goldberg, P. K., Kennedy, P. J., Khandelwal, A. & Taglioni, D. (2021), The US-China trade war and global reallocations, Technical report, National Bureau of Economic Research.

Farinas, J. C. & Ruano, S. (2005), 'Firm productivity, heterogeneity, sunk costs and market selection', *International Journal of Industrial Organization* **23**(7-8), 505–534.

Farre-Mensa, J. & Ljungqvist, A. (2016), 'Do measures of financial constraints measure financial constraints?', *The review of financial studies* **29**(2), 271–308.

Flaaen, A., Hortacsu, A. & Tintelnot, F. (2020), 'The production relocation and price effects of US trade policy: The case of washing machines', *American Economic Review* **110**(7), 2103–27.

Freund, C., Mattoo, A., Mulabdic, A. & Ruta, M. (2023), 'Is US trade policy reshaping global supply chains?'.

Garfinkel, M. R. (1990), 'Arming as a strategic investment in a cooperative equilibrium', *The American Economic Review* pp. 50–68.

Garfinkel, M. R., Syropoulos, C. & Yotov, Y. V. (2020), 'Arming in the global economy: The importance of trade with enemies and friends', *Journal of International Economics* **123**, 103295.

Gilchrist, S. & Zakrajšek, E. (2012), 'Credit spreads and business cycle fluctuations', *American economic review* **102**(4), 1692–1720.

Guidolin, M. & La Ferrara, E. (2007), 'Diamonds are forever, wars are not: Is conflict bad for private firms?', *American Economic Review* **97**(5), 1978–1993.

Gulen, H. & Ion, M. (2016), 'Policy uncertainty and corporate investment', *The Review of Financial Studies* **29**(3), 523–564.

Hansen, S., McMahon, M. & Tong, M. (2019), 'The long-run information effect of central bank communication', *Journal of Monetary Economics* **108**, 185–202.

Hassan, T., Hollander, S., van Lent, L. & Tahoun, A. (2019), 'Firm-level political risk: Measurement and effects', *The Quarterly Journal of Economics* **134**(4), 2135–2202.

Hou, K., Xue, C. & Lu, Z. (2015), 'Digesting anomalies: An investment approach', *The Review of Financial Studies* **28**(3), 650–705.

Isaacs, H. R. (2015), *Scratches on our minds: American images of China and India*, Routledge.

Jain, A. K. (2010), 'Data clustering: 50 years beyond k-means', *Pattern recognition letters* **31**(8), 651–666.

Jordà, Ò. (2005), 'Estimation and inference of impulse responses by local projections', *American Economic Review* **95**(1), 161–182.

Kessides, I. N. (1990), 'Market concentration, contestability, and sunk costs', *The Review of Economics and Statistics* pp. 614–622.

Loughran, T. & McDonald, B. (2016), 'Textual analysis in accounting and finance: A survey', *Journal of Accounting Research* **54**(4), 1187–1230.

Merton, R. C. (1973), 'An intertemporal capital asset pricing model', *Econometrica* **41**(5), 867–887.

Pindyck, R. S. (1988), 'Irreversible investment, capacity choice, and the value of the firm', *American Economic Review* **78**(5), 969–985.

Sahm, C. (2019), Direct stimulus payments to individuals, *in* H. Boushey, R. Nunn & J. Shambaugh, eds, 'Recession ready: Fiscal policies to stabilize the American economy', Brookings Washington, DC.

Shiller, R. J. (2002), 'Bubbles, human judgment, and expert opinion', *Financial Analysts Journal* **58**(3), 18–26.

Watanabe, K. (2018), 'Newsmap: A semi-supervised approach to geographical news classification', *Digital Journalism* **6**(3), 294–309.

Internet Appendix
(Intended for online publication only)

U.S.-China Tension

by J. Rogers, B. Sun, T. Sun

April 2024

Appendix A: Newspaper Search Terms

We list our search terms for the action and uncertainty subindexes in Table A1. Consolidating them, we list our search terms for the English language newspapers in Table A2. Chinese language search terms for the UCT-CN index are listed in Table A3.

Table A1: Action and Uncertainty Subindex Category (iii) Search Terms

Action Words (1)	Uncertainty Words (2)
sanction*, infring*, ban, prosecute*, forbid*, friction*, blacklist*, barrier*, tariff*	risk*, uncertain*, threat*, pressure*, stress*, accus*, intimidat*, rival*, disappoint*, warn*, theft, undermin*, aggressi*, enem*, disput*, strain*, intensif*, alleg*, deteriat*, challeng*, tension*, hostil*, tense, intimidat*, repress*, abus*, suppress*, rival*, disappoint*, manipulat*, sour*, authoritarian*, tension*, conflict*, fight*

This table lists the *action* and *uncertainty* category (iii) terms used in the construction of the subindices. * denotes the truncation operator.

Table A2: UCT Index Search Terms

U.S. & China Words (i)	Topic Words (ii)	Tension Words (iii)
United States, U.S., Washington, China, Chinese, Beijing	trade*, econom*, tariff*, currenc*, WTO, world trade organization, invest*, manufactur*, cheap, treasury, factory, factories, surplus*, tax*, debt*, barrier*, market*, loan*, deficit*, bank*, yuan, sector*, plant*, stock*, industr*, commerce, subsid*, dollar*, export*, competitor*, profit*, corporat*, product*, customer*, theft, import*, telecommunication*, piracy, business*, climate, energy, dumping, copyright*, patent*, property right*, hack*, protectionalism, exchange rate*, Huawei, environment*, information security, pollut*, financ*, IPO, transaction*, securit*, stock exchange*, Renminbi, supply chain*, pharmaceutical, agriculture, technology, unilateral*, cyber*, pandemic*, COVID*, coronavirus, pneumonia, embass*, consulate*, immigration, visa*, green card*, Hong Kong, human right*, detention*, democra*, protest*, police, autonom*, ethnic, arrest*, dissent*, unrest, detain*, elect*, rally, dissident*, prison*, crackdown, authoritarian, repress*, crush*, suppress*, demonstrat*, movement*, opposition, abuse*, activist*, religio*, Muslim*, nationalism, environement*, Tiananmen, minorit*, interfer*, violat*, freedom, exile*, Tibet, criminal*, law*, terror*, jail*, rule, revolution*, dalai, rule of law, communis*, Uyghur*, Uighur*, Uygur*, Uigur*, military, security, defens*, aircraft, ballistic, buildup*, naval, deploy*, warhead*, missile*, pentagon, rocket*, carrier*, warship*, sink, sank, North Korea*, patrol*, navy, jet*, emergency, arsenal, intelligence, destroyer*, provocation, nuclear, domina*, reconnaissance, weapon*, vessel*, surveil*, fleet*, incident*, alliance*, adversar*, U.N., secure*, espionage, radar, submarine*, flight*, NATO, pilot*, treaty, pacific, territory, satellite*, maritime, army, Taiwan, bomb*, Taipei, violen*, virus*, South China Sea, island*	threat*, war, hostil*, tense, violat*, lawsuit*, punish*, pressure*, stress*, terror*, infring*, break*, harm*, hurt*, ban*, restrict*, fals*, accus*, manipulat*, prosecut*, forbid*, conspirac*, intimidat*, repress*, abus*, suppress*, oppose*, opposition, collision*, deter*, destroy*, provoc*, rival*, barrier*, stall*, friction*, disappoint*, warn*, theft, undermin*, aggressi*, enem*, defen*, fight*, sour*, disput*, strain*, intensif*, retaliat*, alleg*, deteriorat*, challeng*, crisis*, tension*, worse*, combat*, adversarial*, scrutin*, oversight, block*, disrupt*, issue*, headwind*, conflict*, decoupl*, preacious, sanction*, blacklist*, obstacle*, hurdle*, disturb*, tariff*

This table lists the category (i), (ii), and (iii) terms used in the construction of the baseline UCT index. * denotes the truncation operator. For example, "hostil*" includes both "hostile" and "hostility."

Table A3: People's Daily UCT Index Search Terms

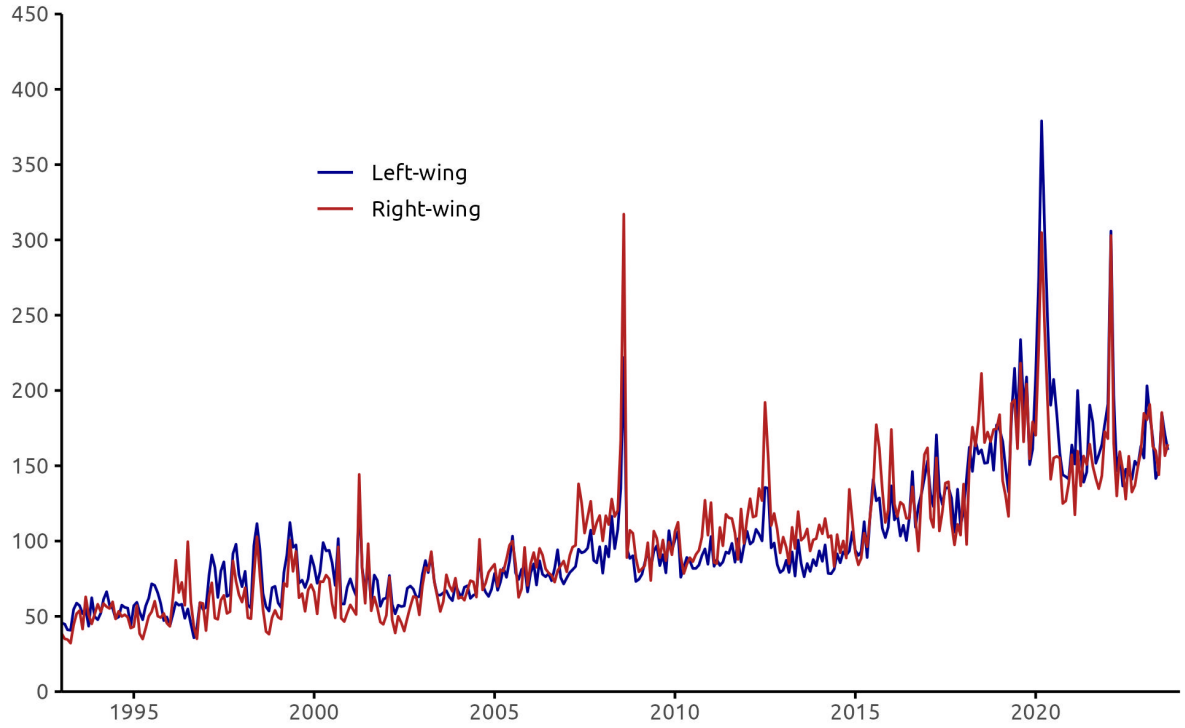
A			B			C		
Word	Pinyin	English	Words	Pinyin	English	Words	Pinyin	English
奥巴马	Ào Bā Mǎ	Obama	安全	Ān Quán	Safety	霸凌	Bà Líng	Bullying
白宫	Bái Gōng	White House	版权	Bǎn Quán	Copyright	霸权	Bà Quán	Hegemony
布什	Bù Shí	Bush	保护主义	Bǎo Hù Zhǔ Yì	Protectionism	报复	Bào Fù	Revenge
华盛顿	Huá Shèng Dùn	Washington	暴力	Bào Lì	Violence	别有用心	Bié Yǒu Yòng Xīn	Ulterior Motives
克林顿	Kè Lín Dùn	Clinton	病毒	Bìng Dú	Virus	捕风捉影	Bǔ Fēng Zhuō Yǐng	Catch The Wind
美国	Měi Guó	United States	部队	Bù Duì	Army	操弄	Cāo Nòng	Manipulate
蓬佩奥	Péng Pèi Ào	Pompeo	补贴	Bǔ Tiē	Subsidy	操纵	Cāo Zòng	Manipulate
特朗普	Tè Lǎng Pǔ	Trump	产权	Chǎn Quán	Property	惩罚	Chéng Fá	Punishment
世界警察	Shì Jiè Jǐng Chá	World Police	朝核	Cháo Hé	North Korean Nuclear	丑化	Chǒu Huà	Vilify
			朝鲜	Cháo Xiǎn	Korea	仇视	Chóu Shì	Hatred
			出口	Chū Kǒu	Export	打击	Dǎ Jī	Suppress
			大使馆	Dà Shǐ Guǎn	Embassy	打压	Dǎ Yā	Suppress
			贷款	Dài Kuǎn	loan	敌对	Dí Duì	Hostility
			单边主义	Dān Biān Zhǔ Yì	Unilateralism	敌视	Dí Shì	Hostility
			帝国主义	Dì Guó Zhǔ Yì	Imperialism	扼杀	È Shā	Strangle
			钓鱼岛	Diào Yú Dǎo	Diaoyu Islands	遏制	È Zhì	contain
			东海	Dōng Hǎi	East China Sea	反美	Fǎn Měi	Anti-America
			肺炎	Fèi Yán	Pneumonia	愤慨	Fèn Kǎi	Indignation
			工业	Gōng Yè	industry	干涉	Gān Shè	Put One'S Oar In
			供应链	Gòng Yìng Liàn	supply chain	勾连	Gōu Lián	Link
			股票	Gǔ Piào	stock	践踏	Jiàn Tà	Trample
			关税	Guān Shuì	Tariff	紧张	Jǐn Zhāng	Tension
			核武器	Hé Wǔ Qì	Nuclear weapons	禁止	Jìn Zhǐ	Forbid
			黑客	Hēi Kè	Hacking	恐吓	Kǒng Xià	Intimidate
			华为	Huá Wéi	Huawei	滥用	Làn Yòng	abuse
			环保	Huán Bǎo	Environmental Protection	抹黑	Mò Hēi	Smear
			环境	Huán Jìng	surroundings	捏造	Niē Zào	Made Up
			汇率	Huì L Ǜ	Exchange Rate	歧视	Qí Shì	Discrimination
			货币	Huò Bì	currency	起诉	Qǐ Sù	Prosecute
			技术	Jì Shù	technology	企图	Qǐ Tú	attempt
			间谍	Jiān Dié	Espionage	谴责	Qiǎn Zé	Condemn
			交易	Jiāo Yì	transaction	强权	Qiáng Quán	Power
			进口	Jìn Kǒu	Import	伤害	Shāng Hài	Hurt
			金融	Jīn Róng	financial	施压	Shī Yā	Pressure
			经济	Jīng Jì	economic	双重标准	Shuāng Zhòng Biāo Zhǔn	Double Standard
			竞争	Jìng Zhēng	competition	图谋	Tú Móu	Plot
			军队	Jūn Duì	Army	歪曲	Wāi Qū	Distort
			领事馆	Lǐng Shì Guǎn	Consulate	违反	Wéi Fǎn	Violation
			流行病	Liú Háng Bìng	Pandemic	伪善	Wěi Shàn	Hypocritical
			绿卡	L Ǜ Kǎ	Green card	威胁	Wēi Xié	Threaten
			贸易	Mào Yì	Trading	无理	Wú Lǐ	unreasonable
			美元	Měi Yuán	USD	污名化	Wū Míng Huà	Stigmatization
			南海	Nán Hǎi	South China Sea	虚伪	Xū Wěi	Hypocritical
			能源	Néng Yuán	energy	压力	Yā Lì	Pressure
			农业	Nóng Yè	agriculture	战争	Zhàn Zhēng	War
			企业	Qǐ Yè	enterprise	政治操弄	Zhèng Zhì Cāo Nòng	Political Manipulation
			签证	Qiān Zhèng	Visa	指责	Zhǐ Zé	Accuse
			枪支	Qiāng Zhī	Gun	拙劣	Zhuō Liè	Poor
			情报	Qíng Bào	Intelligence	嘴脸	Zuǐ Liǎn	Mouth
			倾销	Qīng Xiāo	Dumping			
			人民币	Rén Mín Bì	RMB			
			人权	Rén Quán	Human Rights			
			萨德	Sà Dé	THAAD			
			上市	Shàng Shì	Listed			
			生物	Shēng Wù	biological			
			世贸	Shì Mào	World Trade Center			
			食品业	Shí Pǐn Yè	Food industry			
			收购	Shōu Gòu	Acquisition			
			税	Shuì	tax			
			台湾	Tái Wān	Taiwan			
			投资	Tóu Zī	investment			
			网络	Wǎng Luò	Internet			
			网络战	Wǎng Luò Zhàn	Cyber Warfare			
			西藏	Xī Cáng	Tibet			
			新冠	Xīn Guàn	Abbr. of COVID-19			
			新疆	Xīn Jiāng	Xinjiang			
			新冷战	Xīn Lěng Zhàn	New Cold War			
			信息安全	Xìn Xī Ān Quán	information security			
			新型冠状	Xīn Xíng Guàn Zhuàng	Full name of COVID-19			
			移民	Yí Mín	Immigration			
			医药	Yī Yào	medicine			
			证券	Zhèng Quàn	Securities			
			制药	Zhì Yào	Pharmaceutical			
			制造业	Zhì Zào Yè	manufacturing			
			种族	Zhǒng Zú	Race			
			专利	Zhuān Lì	Patent			

This table lists Chinese search terms used in the construction of the UCT-CN index, along with the corresponding Pinyin romanization and English translation.

Appendix B: Left- vs. Right-wing U.S. Newspapers

News reporting may be biased due to political leanings. To address concerns related to media slant, we compare UCT indices constructed using right-wing vs. left-wing newspapers. We group our sample of U.S. newspapers into left-wing vs. right-wing based on the categorization provided on *mondotimes.com*. The left-wing papers are: New York Times, Washington Post, Los Angeles Times, and Boston Globe while the right-wing papers are: Wall Street Journal, Chicago Tribune and USA Today. Figure A1 shows that the two series track each other very closely, indicating that U.S.-China tension cuts across partisan lines.

Figure A1: Left-wing vs. right-wing newspapers



Note: The monthly UCT indices constructed from left-wing and right-wing newspapers from Jan. 1993 to Sep. 2023. Left-wing newspapers include the New York Times, Washington Post, Los Angeles Times, and Boston Globe. Right-wing newspapers include the Wall Street Journal, Chicago Tribune, and USA Today.

Appendix C: Rescaled UCT and Intensive Margin UCT

The baseline UCT index measures public perceptions of U.S.-China tension through analysis of newspaper discussion. The search-based methodology essentially measures the intensity of news discussion along the extensive margin, by capturing the frequency of news articles that mention the U.S., China, and an economic, security-related, or ideological issue, scaled by the total number of articles. There are two potential concerns with this approach. First, the frequency of news articles discussing China may be increasing over time to reflect the growing importance of China on the world stage. Second, raw frequency counts do not capture the tone of the articles. A small number of highly critical articles may have a disproportionate effect on public opinion, while conversely, the rise of China upon the world stage could lead to increased news coverage of the country that is not necessarily more negative. In this appendix, we complement the baseline index by (1) showing a version that is rescaled by the count of articles mentioning "China," "Chinese," or "Beijing" instead of by total article counts and (2) constructing an additional index designed to capture news discussion of tensions along the intensive margin.

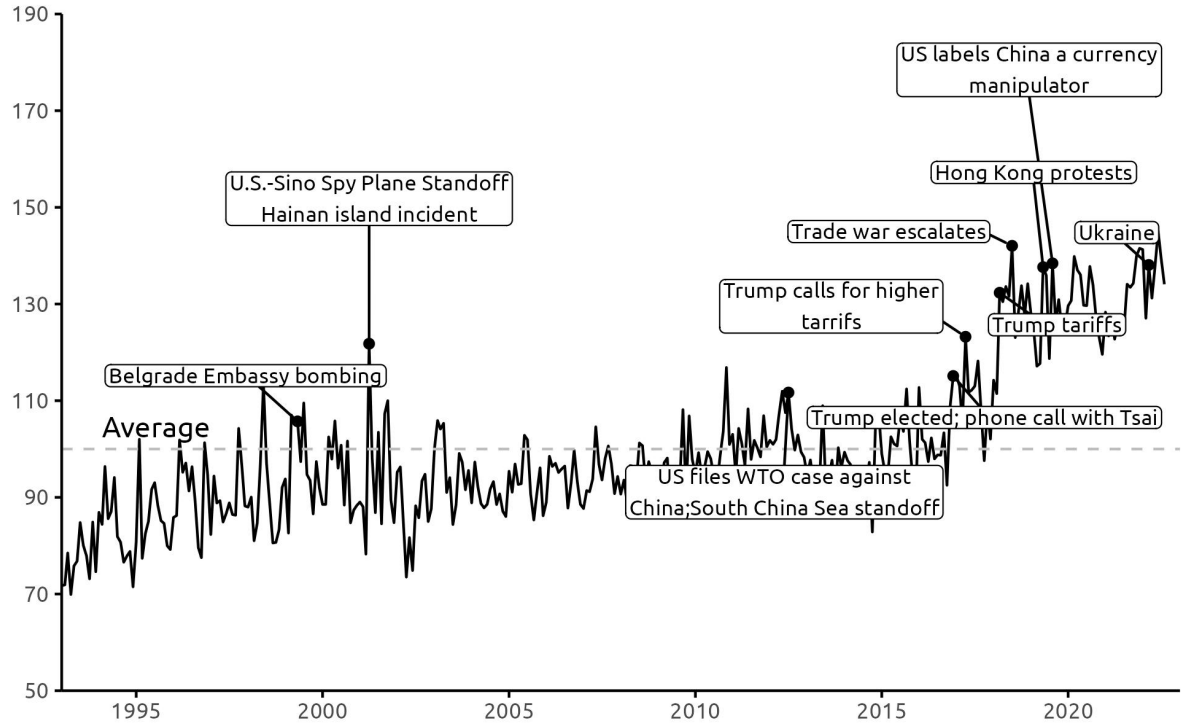
Figure A2 plots the "China-scaled" UCT index while Figure A3 shows the intensive margin index, both with major events labelled. Both indices spike around many of the same crises as the baseline UCT index. These include the embassy bombing in Belgrade, the 2001 Hainan Island incident, the U.S.-China trade war under the Trump administration, and the Russian Invasion of Ukraine. Moreover, both the main UCT and intensive margin indices exhibit an upward trend and are consistently elevated post-2016. The correlation between the baseline UCT index and the "China-scaled" index is 0.860 while the correlation between the baseline index and the intensive margin index is 0.522. These similarities lend additional credence to our baseline index and indicate that its important properties, such as the upward trend, reflect U.S.-China relations and are not an artifact of the news-based methodology.

To construct the intensive margin index, we begin with the corpus of all articles from the Boston Globe, Chicago Tribune, Los Angeles Times, New York Times, USA Today, and Washington Post that satisfy the search criteria of the baseline UCT index.[27] These include all articles containing the sets of keywords listed in Table A2.[28] This procedure results in a corpus of 68,512 articles. We count the number of occurrences of category (iii) tension words within each article and then compute the average by month and newspaper. These paper-month series are normalized to have a standard deviation of 1, summed together, and the resulting index is rescaled to a mean of 100. This index measures the hawkishness of articles picked up by the keyword search for the primary index, to the extent that the frequency of tension keywords proxies for tone.

[27]The Wall Street Journal is omitted due to data limitations. We currently do not have the ability to perform large-scale textual analysis on WSJ articles within ProQuest.

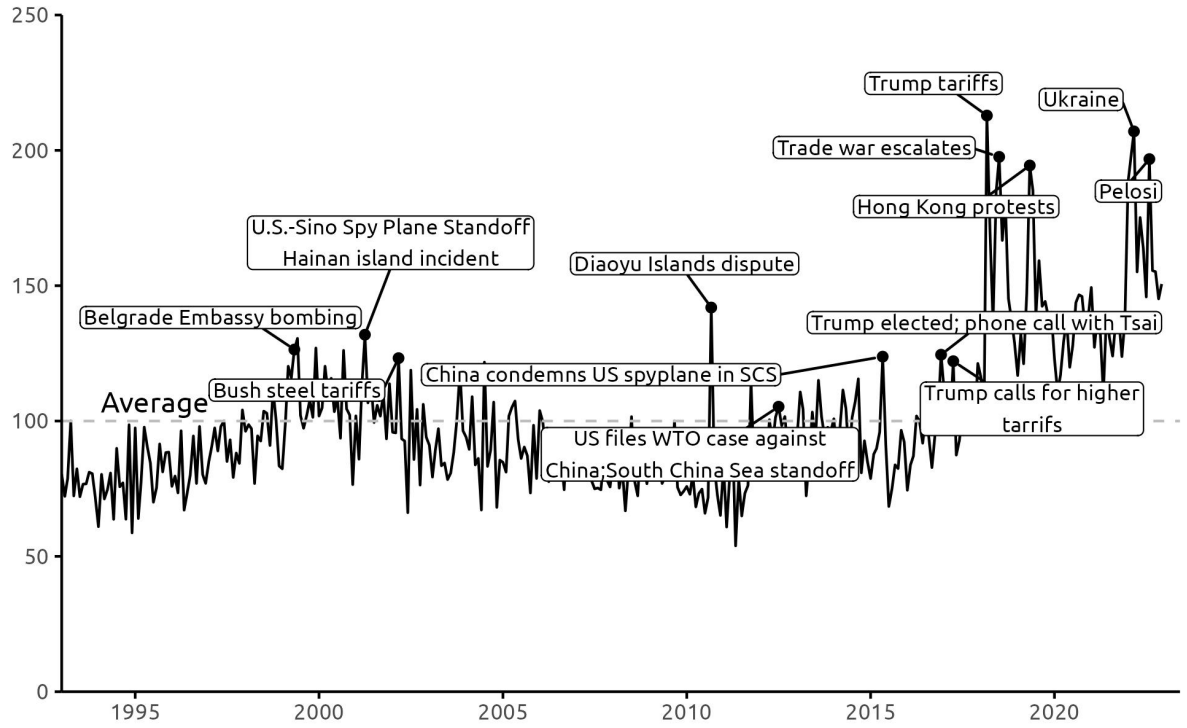
[28]To reduce error from false positives, we remove any articles containing the set of excluded terms from Table A4 in Appendix D as well as the terms "crime watch", "crime report", "unsolved crime", "India", "New Delhi", "Pakistan" and "Islamabad".

Figure A2: The China-scaled UCT Index



Note: The monthly China-scaled UCT index from Jan. 1993 to Aug. 2022, normalized to have a mean of 100 over the plotted period.

Figure A3: The Intensive Margin UCT Index



Note: The monthly intensive margin UCT index from Jan. 1993 to Dec. 2022, normalized to have a mean of 100 over the plotted period.

Appendix D: Placebo Indices

We create news-based indices measuring U.S. tensions with Japan, Canada, UK and Russia using the same methodology as for the baseline UCT index. The purpose of this is twofold. First, these indices serve as a placebo for the UCT index. To the extent that the UCT index captures China-specific tensions and is not merely a reflection of general economic uncertainty or geopolitical risk, then there should exist substantial independent variation between UCT and indices measuring U.S. relations with other countries. Second, we aim to show that our index construction methodology is generalizeable beyond the realm of U.S.-China relations.

For each country, we search for articles in our baseline set of U.S. newspapers that mention its name (or demonym or capital), the United States (or U.S. or Washington), and a category (iii) tension keyword. Since U.S. relations with Japan, Canada, and the UK have generally been less turbulent than relations with China or Russia, we expect fewer hits overall for these three countries, along with a greater risk of bias from false positives. All newspaper articles containing the terms listed in Table A4 are therefore excluded from the Japan, Canada, and UK searches to minimize bias. These excluded terms include words associated with athletic competitions (Column 1), unrelated geopolitical crises (Column 2), and with book reviews, obituaries, and other likely sources of false positives (Column 3). This list of terms is inspired by the set of exclusion terms used in Caldara & Iacoviello (2022).

Table A4: Excluded Terms for the Canada, U.K. and Japan Placebo Indices

Sports Terms (1)	Geopolitical Terms (2)	Other Terms (3)
sport*, game*, Olympic*	movie*, film*, museum*, obituar*, memorial*, art, arts, book*, memoir*, price war*, veteran*, tribute*, music, racing, cancer, mafia, blackout*, earthquake*, tsunami*, natural disaster*,	Afghan*, Kabul, Iraq*, Baghdad, bin Laden, al-Qaeda, ISIS, Islamic State, Saddam, China, Chinese, Beijing, Russia*, Moscow, North Korea*, Pyongyang

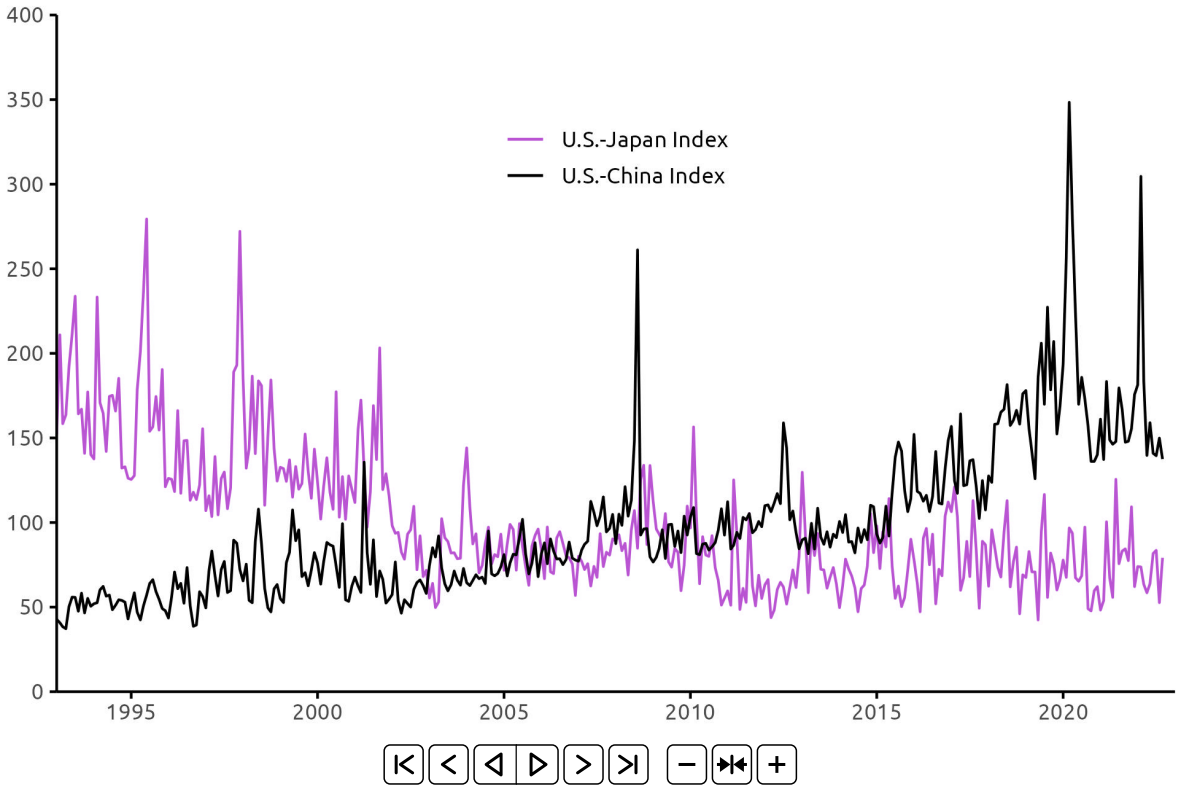
This table lists the exclusion terms used in the construction of the Canada, U.K., and Japan placebo indices. * denotes the truncation operator.

Figure A4 plots the Japan, Canada, United Kingdom and Russia placebo indices separately against the UCT index (click the figure to forward to the next country). In contrast to the UCT index, the long-term trajectories of the UK and Canada indices are flat while the Japan index is downward trending. Pairwise correlations are reported in Table A5 and they are not strong. The correlation coefficient between the UCT and U.S.-Japan indices is negative, while the UCT and U.S.-Russia indices are the most closely correlated with a coefficient of 0.553. However, the UCT and the U.S.-Russia indices exhibit substantial independent variation, with the latter spiking in 2014 with takeover of Crimea and in 2017 and 2018 with the allegations of meddling in U.S. elections.

Having demonstrated the dissimilarity between the UCT and placebo indices, we next examine whether these differences are meaningful. We add the four placebo indices one at a time to the baseline firm investment model (Equation 1) and estimate:

$$\frac{CAPX_{i,t+\ell}}{TA_{i,t+\ell-1}} = \alpha_i + \beta_1 UCT_t + \beta_2 Placebo_t + \beta_3 Q_{i,t} + \beta_4 \frac{CF_{i,t}}{TA_{i,t-1}} + \beta_5 SG_{i,t} + \beta_6 \mathcal{M}_{i,t} + \epsilon_{i,t} \quad (-1)$$

Figure A4: UCT and Placebo Indices



Note: The monthly UCT index with the Japan, Canada, U.K., and Russia placebo indices from Jan. 1993 to Sep. 2022, normalized to have a mean of 100 over the plotted period. Use the arrow buttons to scroll between the placebo indices.

Table A5: Correlation Matrix of UCT and Placebo Indices

	UCT	Japan	Canada	U.K.	Russia
UCT	1.000	–	–	–	–
Japan	-0.452	1.000	–	–	–
Canada	0.255	0.174	1.000	–	–
U.K.	0.342	0.083	0.384	1.000	–
Russia	0.553	-0.203	0.308	0.225	1.000

This table lists the correlations between the UCT and placebo indices. The sample period is Jan. 1993–Sep. 2022.

with ℓ, the lag length, ranging from 1 to 4 quarters. The results with the Japan, Canada, U.K., and Russia placebo indices are shown in Table A6. As with Table 2, columns 1 – 4 report the results with cash flows, sales growth, Tobin's Q, quarterly GDP growth, and the EPU and GPR indices as controls, while columns 5 – 8 also control for consumer sentiment, expected business conditions and the 6-month ahead GDP forecast.

The negative relationship between the UCT index and firm investment remains significant after controlling for U.S. tensions with Japan, Canada, the U.K. and Russia. This robustness provides quantitative evidence that the UCT index captures China-specific information not reflected in the other country indices.

Table A6: UCT with Placebo Indices and U.S. Firm Investment

Dependent Variable:	Investment							
	$\ell = 1$	$\ell = 2$	$\ell = 3$	$\ell = 4$	$\ell = 1$	$\ell = 2$	$\ell = 3$	$\ell = 4$
Model:	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Japan								
UCT Index	-0.052***	-0.072***	-0.092***	-0.097***	-0.039***	-0.076***	-0.103***	-0.105***
	(0.015)	(0.016)	(0.016)	(0.016)	(0.017)	(0.017)	(0.017)	(0.016)
US-Japan Index	0.087***	0.075***	0.067***	0.067***	0.089***	0.068***	0.057***	0.058***
	(0.011)	(0.012)	(0.012)	(0.011)	(0.013)	(0.013)	(0.014)	(0.011)
Canada								
UCT Index	-0.098***	-0.114***	-0.131***	-0.134***	-0.106***	-0.129***	-0.148***	-0.145***
	(0.020)	(0.020)	(0.019)	(0.018)	(0.019)	(0.019)	(0.016)	(0.015)
US-Canada Index	-0.004	-0.004	0.000	0.005	0.001	0.008	0.017	0.021
	(0.012)	(0.012)	(0.012)	(0.013)	(0.013)	(0.014)	(0.013)	(0.013)
United Kingdom								
UCT Index	-0.104***	-0.115***	-0.132***	-0.134***	-0.106***	-0.128***	-0.146***	-0.146***
	(0.020)	(0.019)	(0.019)	(0.018)	(0.019)	(0.018)	(0.017)	(0.016)
US-UK Index	0.021	0.005	0.004	0.000	0.017	0.000	0.003	0.007
	(0.014)	(0.017)	(0.015)	(0.015)	(0.015)	(0.018)	(0.016)	(0.014)
Russia								
UCT Index	-0.090***	-0.099***	-0.125***	-0.125***	-0.096***	-0.114***	-0.142***	-0.136***
	(0.025)	(0.025)	(0.024)	(0.022)	(0.023)	(0.024)	(0.021)	(0.019)
US-Russia Index	-0.014	-0.023	-0.010	-0.014	-0.020	-0.022	-0.006	-0.015
	(0.017)	(0.017)	(0.016)	(0.015)	(0.019)	(0.019)	(0.017)	(0.018)
Specification								
Firm & Macro Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Expectations Controls	No	No	No	No	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

This table reports the regression results for specifications of Equation 1 with the Japan, Canada, U.K., and Russia placebo indices added, one at a time, as additional controls. All variables are standardized by Z-score. The sample period is 1993 Q1–2019 Q4.
Clustered (Year-Quarter & Firm) standard-errors in parentheses
*Signif. Codes: ***: 0.01, **: 0.05, *: 0.1*

Appendix E: Robustness to False-Positive Article Hits

One concern regarding our news-based methodology is potential effect of false positive search results. It is possible for articles not discussing US-China tension to contain the relevant keywords and thus be included in our search. These articles will add idiosyncratic noise to our index, and if the false positives are non-randomly scattered, may lead to bias as well. In this section, we examine robustness to false positives

Table A7: Excluded Terms for the False-Positive Robust Indices

General Exclusion Terms (1)	Sports Exclusion Terms I (2)	Sports Exclusion Terms II (3)
movie*, film*, museum*, obituar*, memorial*, art, arts, book*, memoir*, price war*, veteran*, tribute*, music, racing, cancer, mafia, blackout*, earthquake*, tsunami*, natural disaster*, Afghan*, Kabul, Iraq*, Baghdad, bin Laden, al-Qaeda, ISIS, Islamic State, Saddam	sport*, game*, Olympic*	basketball*, soccer*, football*, diving*, swimming*, gymnastic*, ping pong, tennis*, badminton*, figure skate*, skiing, snowboard*, hockey*, gold medal*, silver medal*, bronze medal*

This table lists the exclusion terms used in the construction of the false-positive robust indices. * denotes the truncation operator.

We begin by constructing false positive robust UCT indices where the keyword search does not count any article that contains specific exclusion terms. These terms are displayed in Table A7. The general exclusion terms are selected from Caldara & Iacoviello (2022) and are chosen to discard articles discussing a wide range of irrelevant topics from arts and entertainment to natural disasters to obituaries. We also add to this list terms associated with conflicts in the Middle East, as news coverage of US participation in the Afghanistan and Iraq Wars may be another source of false positives.

Filtering out the irrelevant sports-related articles is a more complicated task. Since sporting events such as the 2022 Beijing Olympics are at a conduit of significant tensions between the U.S. and China, the outright exclusion of terms like "sport" or "Olympic" may lead to the removal of legitimate tension-related articles. Given this nuance, we report three separate of false-positive robust indices constructed using different sets exclusion terms.

The first index, (UCT *exclude general*), does not filter out any sports-related articles and excludes only the general exclusion terms. The second index (UCT *exclude sports I*) excludes both the general exclusion terms as well as the terms "sport", "game", and "Olympic". The third index, (UCT *exclude sports II*) replaces "sport", "game", and "Olympic" with the expanded set of sports-related terms shown in Column 3 of Table **??**. The reasoning behind this third index is that by excluding only the articles mentioning specific sports and awards, we are more likely to filter out genuine sports reporting while keeping the articles discussing geopolitical tensions around sporting events.

Finally, we construct a robust index that uses ProQuest Newstand's subject indexing system to filter irrelevant articles. This UCT *subjects* index is constructed by searching for all articles whose text mentions the United States (or U.S. or Washington), China (or

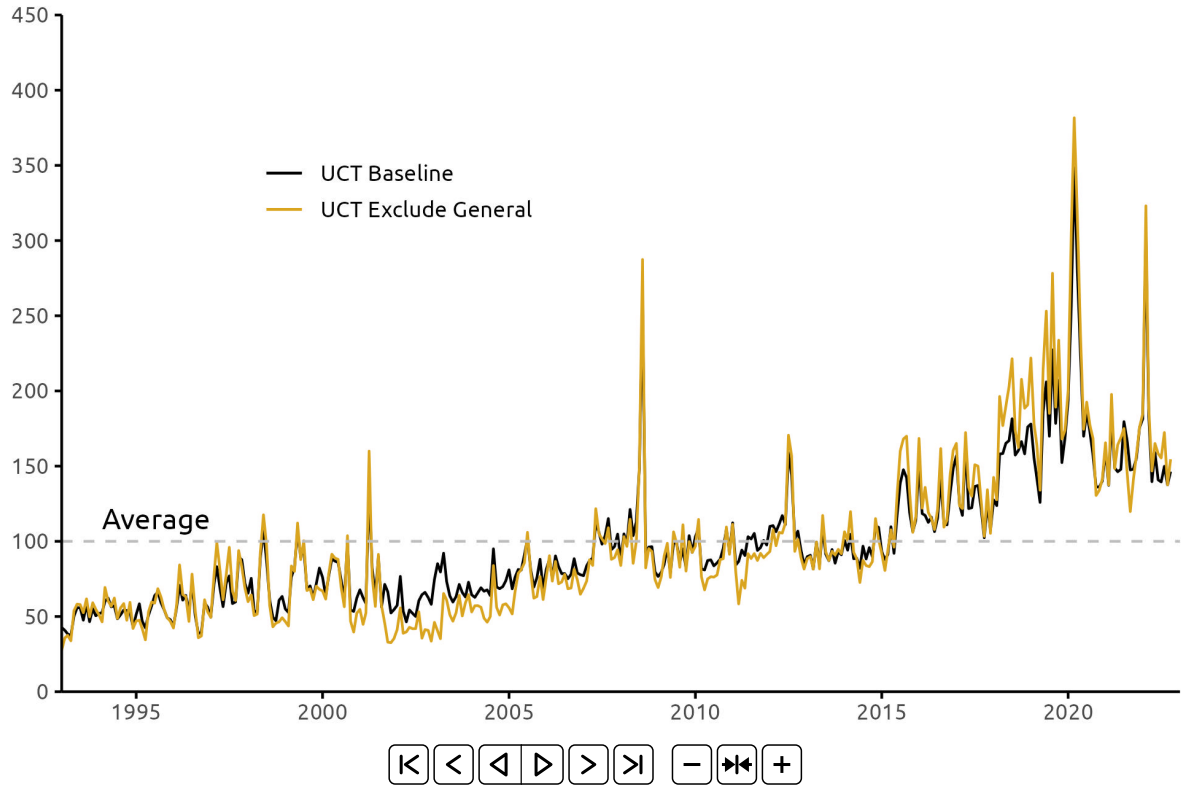
Table A8: Correlation Matrix of False-Positive Robust UCT Indices

Index	UCT Baseline	Exclude General	Exclude Sports I	Exclude Sports II	Subjects
UCT Baseline	1.000	–	–	–	–
Exclude General	0.981	1.000	–	–	–
Exclude Sports I	0.899	0.930	1.000	–	–
Exclude Sports II	0.919	0.951	0.995	1.000	–
Subjects	0.942	0.931	0.949	0.952	1.000

This table lists the correlations between the UCT and the false-positive robust indices. The sample period is Jan. 1997–Oct. 2022.

Chinese or Beijing) as well as a category (iii) tension term, and which is indexed with a subject tag that matches one of the category (ii) topic terms listed in Table A2. Due to data limitations, the UCT*subjects* index extends back to only 1997.

Figure A5: Robust UCT Indices with Baseline UCT



Note: The monthly baseline UCT index with the *exclude general*, *exclude sports I*, *exclude sports II*, and *subjects* robust indices from Jan. 1993 to Oct. 2022, normalized to have a mean of 100 over the plotted period. Use the arrow buttons to scroll between the robust indices.

Figure A5 displays the four false positive robust indices plotted separately against the baseline UCT index. Each false positive robust index is highly similar to UCT. However,

these indices do diverge during the 2008 and 2022 Beijing Olympics. In particular, the baseline index and the *exclude general* index spike in August 2008 and February 2022 while the *exclude sports I* index experienced declines in those months. The *exclude sports II* index is relatively flat for the 2008 and 2022 Olympics whereas the *subjects* index exhibits a small spike only for February 2022. We believe that the large spikes in the main index during the Olympics are more plausible than the flat values or dips in the *exclude sports I*, *exclude sports II* and *subjects* robust indices. US-China tensions have been significantly exacerbated by events related to the Olympics, such as the pro-Tibet protests surrounding the 2008 Olympics or the Xi-Putin meeting during and the U.S. diplomatic boycott of the 2022 Winter Olympics.

The correlations between each index are reported in Table A8. Notwithstanding the differences in behavior around the Olympics, each false positive robust index is highly correlated with the baseline UCT index, which affirms the robustness of our methodology to the presence of false positives.

Appendix F: Firm Investment and Other UCT Indices

We re-estimate the firm investment model (Equation 1) but replace the baseline UCT index with the earnings-call index created in Section 3.1 (Table A9), with the "China-scaled" UCT index (Table A10), and with the intensive margin index (Table A11), both created in Appendix C. We find a strong negative association between firm investment and the earnings-call, the "China-scaled," and the intensive margin UCT indices.

Table A9: Earnings-call UCT and Firm Investment

Dependent Variable:	Investment							
	$\ell = 1$	$\ell = 2$	$\ell = 3$	$\ell = 4$	$\ell = 1$	$\ell = 2$	$\ell = 3$	$\ell = 4$
Model:	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Variables								
Earnings-call UCT	-0.027***	-0.034***	-0.030***	-0.031***	-0.005	-0.032***	-0.038***	-0.028***
	(0.008)	(0.008)	(0.008)	(0.006)	(0.007)	(0.008)	(0.008)	(0.008)
EPU	0.001	0.007	0.031**	0.044***	-0.009	0.006	0.034***	0.039***
	(0.015)	(0.014)	(0.013)	(0.009)	(0.008)	(0.009)	(0.011)	(0.009)
GPR	-0.035	-0.062**	-0.025	-0.020	-0.007	-0.050***	-0.021	-0.008
	(0.037)	(0.026)	(0.025)	(0.022)	(0.027)	(0.015)	(0.017)	(0.019)
GDP Growth	0.003	0.017	0.014	0.027***	-0.007	-0.001	-0.004	0.017**
	(0.013)	(0.012)	(0.012)	(0.007)	(0.006)	(0.007)	(0.008)	(0.007)
Expected GDP Growth					0.075***	0.074***	0.061***	0.020***
					(0.008)	(0.009)	(0.009)	(0.007)
Consumer Sentiment					-0.004	-0.008	-0.018	-0.060**
					(0.031)	(0.034)	(0.028)	(0.028)
Expected Bus Cond					-0.079**	-0.039	-0.006	0.049
					(0.033)	(0.038)	(0.031)	(0.030)
Fixed-effects								
Firm	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Fit statistics								
Observations	133,878	127,776	122,652	117,682	133,878	127,776	122,652	117,682
R^2	0.525	0.532	0.536	0.540	0.529	0.535	0.538	0.540
Within R^2	0.009	0.011	0.009	0.011	0.018	0.017	0.013	0.012

This table reports the regression results for Equation 1 with the earnings call UCT index replacing the news-based index. All variables are standardized by Z-score. The sample period is 2008 Q1–2019 Q4.
Clustered (Year-Quarter & Firm) standard-errors in parentheses
*Signif. Codes: ***: 0.01, **: 0.05, *: 0.1*

Table A10: China-scaled UCT and Firm Investment

Dependent Variable:	Investment							
	$\ell = 1$	$\ell = 2$	$\ell = 3$	$\ell = 4$	$\ell = 1$	$\ell = 2$	$\ell = 3$	$\ell = 4$
Model:	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Variables								
China-scaled UCT	-0.072***	-0.076***	-0.083***	-0.081***	-0.075***	-0.077***	-0.087***	-0.080***
	(0.011)	(0.012)	(0.013)	(0.013)	(0.012)	(0.013)	(0.015)	(0.014)
EPU	-0.048***	-0.040***	-0.033***	-0.025**	-0.027**	-0.023*	-0.012	-0.017
	(0.010)	(0.010)	(0.009)	(0.010)	(0.013)	(0.013)	(0.014)	(0.016)
GPR	-0.032***	-0.027**	-0.022**	-0.018**	-0.024*	-0.017	-0.011	-0.006
	(0.011)	(0.012)	(0.011)	(0.009)	(0.012)	(0.014)	(0.012)	(0.011)
GDP Growth	0.015	0.028***	0.024***	0.040***	0.001	0.014	0.009	0.028***
	(0.009)	(0.009)	(0.008)	(0.009)	(0.010)	(0.011)	(0.009)	(0.010)
Expected GDP Growth					0.018	0.017	0.014	0.011
					(0.011)	(0.011)	(0.010)	(0.010)
Consumer Sentiment					-0.061	-0.082*	-0.078*	-0.103**
					(0.046)	(0.045)	(0.044)	(0.042)
Expected Bus Cond					0.096**	0.114***	0.118***	0.125***
					(0.043)	(0.043)	(0.041)	(0.039)
Fixed-effects								
Firm	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Fit statistics								
Observations	399,123	384,713	372,948	361,752	399,123	384,713	372,948	361,752
R^2	0.433	0.437	0.438	0.439	0.434	0.438	0.439	0.440
Within R^2	0.032	0.031	0.027	0.025	0.033	0.033	0.029	0.026

This table reports the regression results for Equation 1 with the China-scaled UCT index replacing the news-based index. All variables are standardized by Z-score. The sample period is 2008 Q1–2019 Q4.
Clustered (Year-Quarter & Firm) standard-errors in parentheses
*Signif. Codes: ***: 0.01, **: 0.05, *: 0.1*

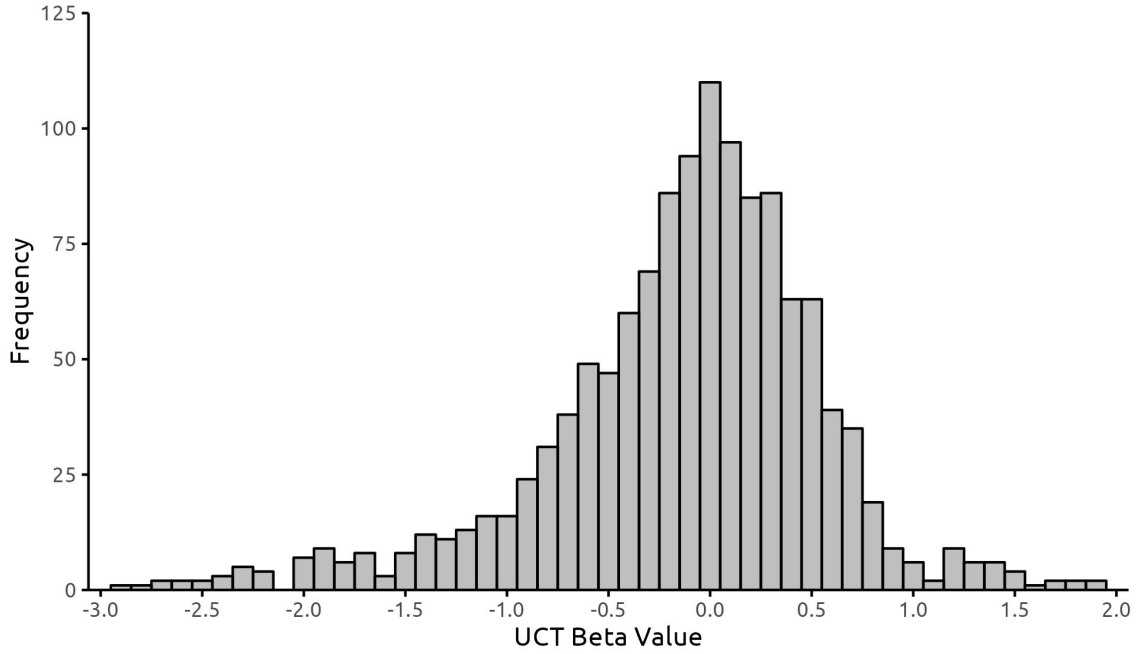
Table A11: Intensive Margin UCT and Firm Investment

Dependent Variable:	Investment							
	$\ell = 1$	$\ell = 2$	$\ell = 3$	$\ell = 4$	$\ell = 1$	$\ell = 2$	$\ell = 3$	$\ell = 4$
Model:	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Variables								
Intensive UCT	-0.043***	-0.049***	-0.055***	-0.057***	-0.055***	-0.059***	-0.071***	-0.064***
	(0.009)	(0.010)	(0.011)	(0.010)	(0.012)	(0.013)	(0.014)	(0.013)
EPU	-0.065***	-0.057***	-0.052***	-0.043***	-0.037***	-0.032**	-0.022	-0.024
	(0.010)	(0.010)	(0.009)	(0.010)	(0.012)	(0.013)	(0.013)	(0.015)
GPR	-0.030***	-0.025*	-0.021*	-0.017*	-0.024*	-0.017	-0.011	-0.007
	(0.011)	(0.013)	(0.011)	(0.009)	(0.014)	(0.016)	(0.013)	(0.012)
GDP Growth	0.014	0.028***	0.024***	0.040***	-0.001	0.012	0.006	0.025**
	(0.009)	(0.009)	(0.008)	(0.009)	(0.010)	(0.011)	(0.010)	(0.011)
Expected GDP Growth					0.024*	0.022*	0.020*	0.017
					(0.012)	(0.013)	(0.012)	(0.012)
Consumer Sentiment					-0.050	-0.066	-0.055	-0.079*
					(0.050)	(0.049)	(0.048)	(0.047)
Expected Bus Cond					0.093**	0.108**	0.108**	0.113***
					(0.044)	(0.044)	(0.043)	(0.040)
Fixed-effects								
Firm	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Fit statistics								
Observations	399,123	384,713	372,948	361,752	399,123	384,713	372,948	361,752
R^2	0.431	0.436	0.436	0.438	0.433	0.437	0.438	0.439
Within R^2	0.029	0.029	0.024	0.022	0.031	0.031	0.027	0.024

This table reports the regression results for Equation 1 with the intensive margin UCT index replacing the news-based index. All variables are standardized by Z-score. The sample period is 2008 Q1–2019 Q4.
Clustered (Year-Quarter & Firm) standard-errors in parentheses
*Signif. Codes: ***: 0.01, **: 0.05, *: 0.1*

Appendix G: Properties of UCT Betas

Figure A6: UCT Betas Frequency



Note: Distribution of the UCT betas, with 1% outliers removed.

We examine how the UCT betas displayed above are correlated with various firm and stock characteristics. We regress the UCT beta on the market beta, market volatility beta, log market capitalization, mentions of "China" in earnings calls, and asset growth rates. The market beta and market volatility betas are computed by regressing monthly stock excess returns on market excess returns and the CBOE volatility index (VIX) from January 1993 to December 2019. Market capitalization is measured each month by taking product of shares outstanding and stock price, both obtained from CRSP. "China" mentions is the count of "China" or "Chinese" in each firm's quarterly earnings call transcripts, scaled by the total number of words. Asset growth rates is the quarterly change in firm total assets, obtained from COMPUSTAT. For market capitalization, "China" mentions, and asset growth, we take the average of the period-specific values for each firm from 1993 to 2019. All variables are standardized by Z-score.

The results are shown in Table A12. Recall that more negative UCT betas are indicative of greater exposure to U.S.-China tension. Firms with greater exposure therefore have higher market betas and lower market volatility betas, as well as larger market capitalizations (columns 1 – 3). Firms more vulnerable to U.S.-China tension also mention "China" more in their earnings call transcripts (Column 4). More vulnerable firms also exhibit marginally higher asset growth rates (Column 5), although this result is not statistically significant.

Finally, we investigate how the UCT betas vary by industry. UCT betas are ranked by decile. For each 3-digit SIC code, we compute the average decile across all firms belonging to that industry. The industry classes belonging, on average, to the highest and lowest deciles are reported in Table A13.[29]

[29]For clarity, Table A13 omits SIC codes with less than 5 firms. Otherwise, the highest and lowest

Table A12: UCT Betas Firm & Stock Characteristics

Dependent Variable:	UCT Beta				
	Mkt. Beta	VIX Beta	Mkt. Cap.	China Mentions	Asset Growth
Model:	(1)	(2)	(3)	(4)	(5)
Variables					
Market Beta	−0.263***				
	(0.039)				
VIX Beta		0.264***			
		(0.067)			
Log Market Cap.			−0.127***		
			(0.021)		
China Mentions				−0.178**	
				(0.075)	
Asset Growth					−0.016
					(0.038)
Fit Statistics					
Observations	1,299	1,299	1,299	294	1,267
R^2	0.069	0.070	0.016	0.021	0.0002

This table reports the regression results of the UCT betas on firm characteristics. All variables are standardized by Z-score.
Heteroskedasticity-robust standard-errors in parentheses
*Signif. Codes: ***: 0.01, **: 0.05, *: 0.1*

Table A13: Industries with the Highest and Lowest UCT Betas

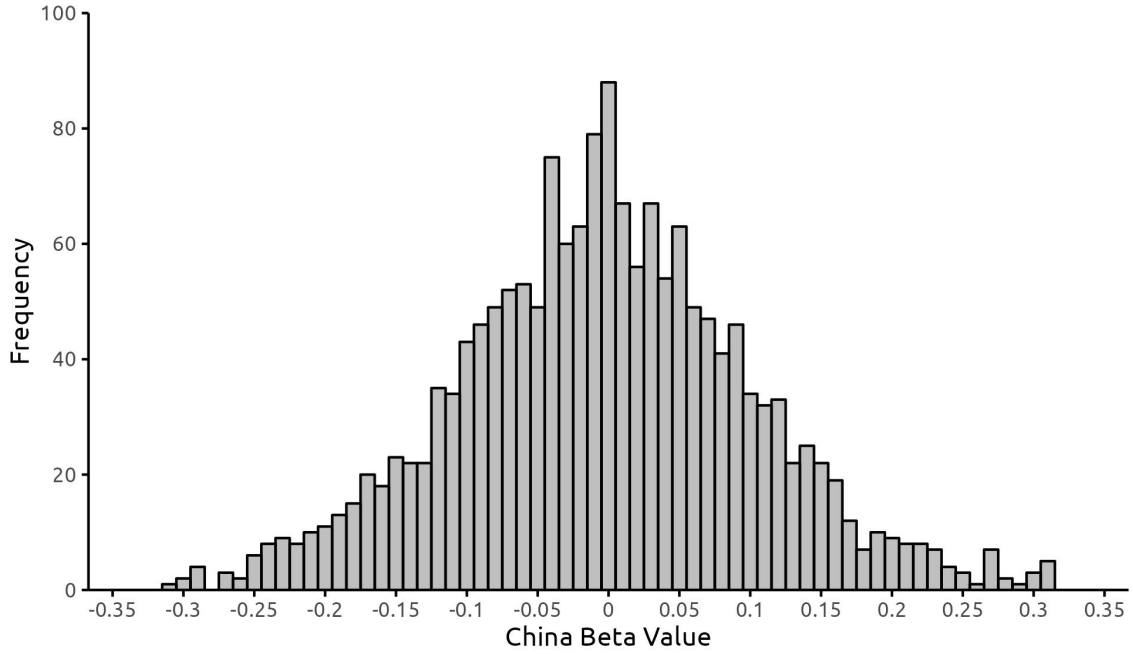
Industry	SIC Code	Avg. Decile	No. of Firms
Most Vulnerable			
Computer and Office Equipment	357	2.375	8
Oil and Gas Field Services	138	2.813	16
Plastic Materials and Synthetics	282	3.200	5
Miscellaneous Business Services	738	3.385	13
Electronics Components and Accessories	367	3.670	27
Motor Vehicles and Equipment	371	3.636	11
Computer and Data Processing Services	737	3.864	59
Least Vulnerable			
Water Supply	494	8.625	8
Electric Services	491	8.481	27
Personal Credit Institutions	614	8.400	5
Management and Public Relations	874	7.625	8
Gas Production and Distribution	492	7.500	12
Operative Builders	153	7.250	8
Combination Utility Services	493	7.214	14

This table lists the top and bottom-most SIC 3-digit industry classes, ranked by average firm UCT beta decile. Industries with less than 5 firms in sample are excluded.

ranked industries would be exclusively those that contain a single firm with a top or bottom decile beta.

Appendix H: Properties of China Betas

Figure A7: China Betas Frequency



Note: Distribution of the China betas, with 1% outliers removed.

As with the UCT betas, we regress the China betas on firm and stock characteristics: market beta, market volatility beta, log market capitalization, "China" mentions in earnings call transcripts, and asset growth rates. These characteristics are constructed as outlined in Appendix H.[30] Finally, we also regress the China beta on the UCT beta to directly gauge the correlation between these two measures of China exposure.

The results are reported in Table A14. Higher China betas suggest greater firm exposure to China. More exposed firms thus tend to have larger higher market betas, lower market volatility betas, and larger market capitalizations (columns 1 – 3). They also mention "China" more in their earnings calls and exhibit marginally higher asset growth rates (columns 4 – 5), although this relationship is not statistically significant. These properties align with the characteristics of low UCT beta firms, as identified in Appendix H. High China beta firms also tend to have low UCT betas (Column 6), which provides additional evidence that the UCT betas and China betas are in agreement.

[30]There is one difference between the characteristics constructed for the UCT betas and the characteristics for the China betas. Variables for the latter are constructed using data from 2014 to 2019 instead of from 1993 to 2019 to match the availability of the ASHR ETF used to create the China betas.

Table A14: China Betas Firm & Stock Characteristics

Dependent Variable:	China Beta					
	Mkt. Beta	VIX Beta	Mkt. Cap	China Mentions	Asset Growth	UCT Beta
Model:	(1)	(2)	(3)	(4)	(5)	(6)
Variables						
Market Beta	0.300***					
	(0.022)					
Vix Beta		-0.281***				
		(0.022)				
Log Market Cap.			0.087***			
			(0.029)			
China Mentions				0.089**		
				(0.041)		
Asset Growth					0.020	
					(0.020)	
UCT Beta						-0.142***
						(0.028)
Fit Statistics						
Observations	1,723	1,723	1,723	486	1,682	1,186
R^2	0.090	0.079	0.008	0.012	0.000	0.017

This table reports the regression results of the China betas on firm characteristics. All variables are standardized by Z-score.
Heteroskedasticity-robust standard-errors in parentheses
*Signif. Codes: ***: 0.01, **: 0.05, *: 0.1*

Appendix I: UCT and Aggregate Economic Effects

VAR Impulse Responses to UCT Shocks

We begin by identifying shocks to UCT in a standard Cholesky VAR model. As is well-known, identification is achieved through imposing the restrictions implied by a recursive ordering on the $\mathbf{B_0}$ matrix in the structural model:

$$\mathbf{A_0 Y_t} = \sum_{j=1}^{p} \mathbf{A_j Y_{t-j}} + \varepsilon_t$$

or

$$\mathbf{Y_t} = \sum_{j=1}^{p} \mathbf{B_j Y_{t-j}} + \mathbf{B_0}\varepsilon_t$$

where $\mathbf{B_0} = \mathbf{A_0}^{-1}$, $\mathbf{B_j} = \mathbf{A_0}^{-1}\mathbf{A_j}$ for $j \in [1, p]$, and ε_t is the vector of structural shocks. Specifically, in a Cholesky identification, $\mathbf{B_0}$ is assumed to be the lower-triangular matrix resulting from the Cholesky decomposition of the variance-covariance matrix of the reduced-form innovations Σ.[31]

In our baseline VAR, we include the logs of U.S. and Chinese industrial production (IP), U.S. consumer price index (CPI) and China's producer price index (PPI), bilateral U.S.-China imports and exports, our UCT index, the one-year U.S. Treasury bill rate, Chinese M2, the Gilchrist & Zakrajšek (2012) excess bond premium (EBP), and the log RMB-to-USD nominal exchange rate.[32] In addition, we include a measure of effective U.S. bilateral tariffs: the ratio of import duties to total imports. Series are monthly from December 1999 to December 2019, with the end date chosen to side-step Covid-related effects in the data. Lag length is six. The slow-moving output and price components are ordered first, followed by bilateral trade and U.S. tariffs. Since both monetary policy as well as the financial and currency markets move much more quickly, those components are placed after the UCT index. We report impulse response functions with respect to a one-standard-deviation shock to the UCT index along with 68 percent confidence intervals bootstrapped by 100 draws.[33] The US Treasury rate, excess bond premium, and

[31] That is, $\mathbf{B_0}$ is chosen suct that it satisfies:

$$E(u_t u_t') = \Sigma = \mathbf{B_0 B_0}'$$

Then, the series of Cholesky shocks can be recovered by using the relationship between reduced-form and structural residuals implied by the structural model:

$$u_t = \mathbf{B_0}\varepsilon_t$$

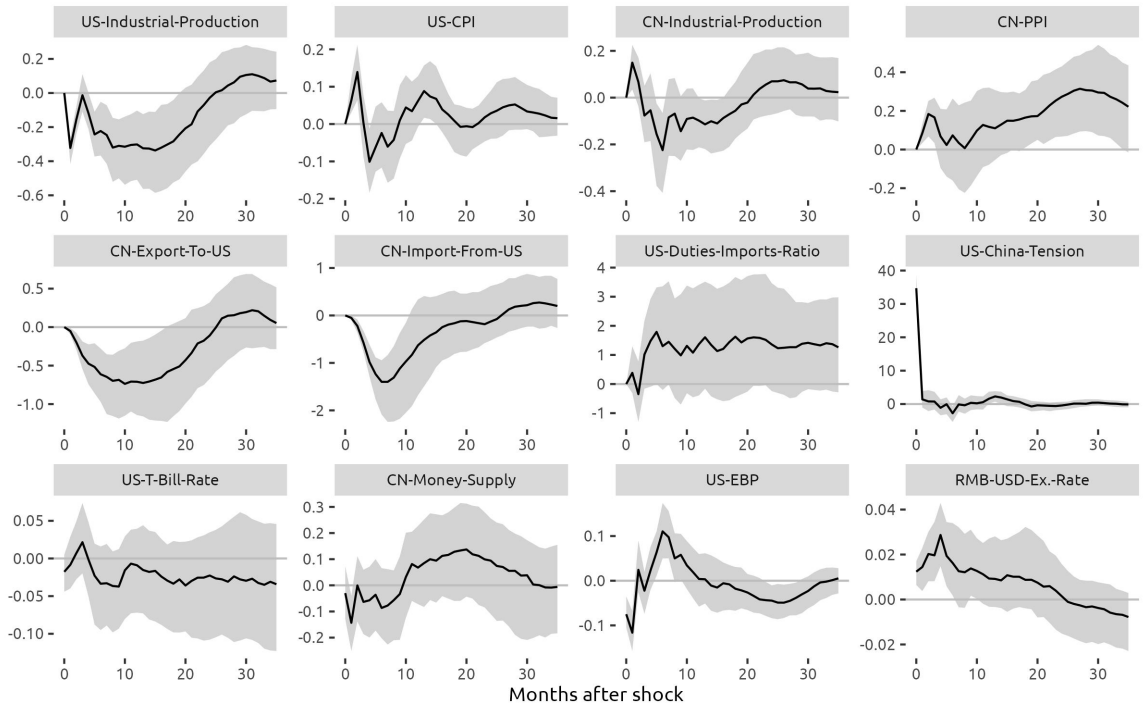
or equivalently:

$$\varepsilon_t = \mathbf{B_0}^{-1} u_t = \mathbf{A_0} u_t$$

[32] It is conventional to use China's PPI and M2 to reflect price conditions and monetary policy stance; see Chen, Ren & Zha (2018). EBP is the component of the remaining spread between an index of rates of return on corporate securities and the rate on a government bond of a similar maturity, after the default risk component is removed. This reflects investors' willingness or ability to bear risk and thus serves as a proxy for credit spreads and provides a convenient summary of the other financial indicators left out of the VAR.

[33] Recognizing the arbitrariness of Cholesky orderings in VARs that involve multiple financial variables, we also check and confirm robustness to alternative orderings.

Figure A8: VAR IRFs for a UCT Index Shock



Note: The black lines denote the impulse response functions following a one standard deviation positive shock to UCT. The upper and lower bounds show 68% confidence intervals, boot-strapped with 100 draws. Responses are expressed as percentage changes, except for the T-Bill rate, EBP, and the RMB-USD exchange rate, which are measured in percentage points.

currency exchange rate components are in levels while all other components are in logs.

Results are displayed in Figure A8. Both U.S. and Chinese industrial production decrease in response to a rise in tension. After 8 to 10 months, U.S. and Chinese IP have reached their troughs, with the former shrinking by 0.3% while the latter shrinks by 0.1%. The effect on Chinese IP is less persistent. In addition, tension affects both components of trade negatively. Exports to the U.S. from China decrease by 0.7%, while imports into China from the United States decline by 1.5%, both with a trough of approximately 8-12 months after the shock. We also see a persistent 1.5% increase in the U.S. imports-to-duties ratio, suggesting a long-lasting hike in tariffs on bilateral trade. Finally, the U.S. EBP increases by 0.1 percentage points eight months after the shock, suggesting an increase in borrowing costs, while the dollar appreciates against the yuan, which is indicative of the "safe haven" role for the dollar in times of heightened global strife.[34]

[34]For robustness, we estimates specifications that add one at a time to the baseline VAR measures of EPU, trade policy uncertainty (TPU), and geopolitical risk (GPR). Results are highly robust, suggesting that UCT shocks transmit to financial and macroeconomic outcome variables even when controlling for these related measures. We also find that impulse responses using Jordà (2005) local projections produce similar results, as we show more precisely in our trade diversion findings below.

UCT and the distribution of U.S. aggregate activity

We explore the impact of elevated U.S.-China tension on the distribution of future economic outcomes by estimating the following quantile regression:

$$Q(\Delta y_{t+1}) = \alpha + \beta_1 UCT_t + \epsilon_t \tag{-2}$$

where Δy_{t+1} is the one-period ahead growth in U.S. industrial production in percentage points and UCT is normalized to have unit standard deviation. Model -2 is estimated at the median, 10th and 90th percentiles. The results are shown in Table A15, along with estimates from an OLS counterpart. The OLS and 50th percentile coefficient estimates are negative and the extreme ends of the growth distributions behave differently following a UCT shock. The 10th percentile effects are approximately double the size of their OLS counterparts, whereas the 90th percentile effects are close to zero. Elevated US-China tension is therefore associated with greater dispersion of future growth.

Table A15: UCT and IP Growth

Dependent Variable:	ΔIP
Model:	(1)
OLS	-0.288
	(0.208)
Quantile	
Median	-0.127***
	(0.045)
10th Qtile	-0.427***
	(0.142)
90th Qtile	0.031
	(0.081)
Observations	360

This table reports the OLS, as well as the 10th, 50th, and 90th quantile regression results of Equation (-2). The dependent variable, the one-month ahead IP growth, is expressed in percentage points, while UCT, the right-hand side variable, is standardized by Z-score. The sample period is Jan. 1993–Dec. 2022.
Heteroskedasticity robust standard-errors in parentheses
*Signif. Codes: ***: 0.01, **: 0.05, *: 0.1*

UCT and U.S. recession risk

Having shown that a spike in the UCT index corresponds to increased variance in future economic outcomes, we next examine the relationship between UCT and recession risk directly. To measure U.S. recession probability, we use the Sahm (2019) rule recession indicator, which is the difference between the three-month moving average of unemployment and the minimum unemployment in the preceding 12 months. We estimate:

$$P_t = \alpha + \beta_1 UCT_t + \beta_2 \Delta GDP_{t-1} + \epsilon_t \tag{-3}$$

where P_t is the Sahm recession probability in percentage points, ΔGDP_{t-1} is lagged monthly US real GDP growth, and UCT is normalized to unit standard deviation.[35] The results of Model -3 are shown in Table A16 and they indicate a positive relationship between elevated U.S.-China tension and greater recession risk. A one-standard-deviation increase in UCT is associated with a 0.23 percentage point increase in the Sahm rule indicator without controls, and a 0.17 p.p. increase when controlling for the lagged US real GDP growth rate.

Table A16: UCT and Recession Probability

Dependent Variable:	Sahm Recession Indicator	
Model:	(1)	(2)
Variables		
UCT Index	0.225**	0.165*
	(0.099)	(0.093)
Controls		
ΔGDP	No	Yes
Fit Statistics		
Observations	360	360
R^2	0.036	0.131

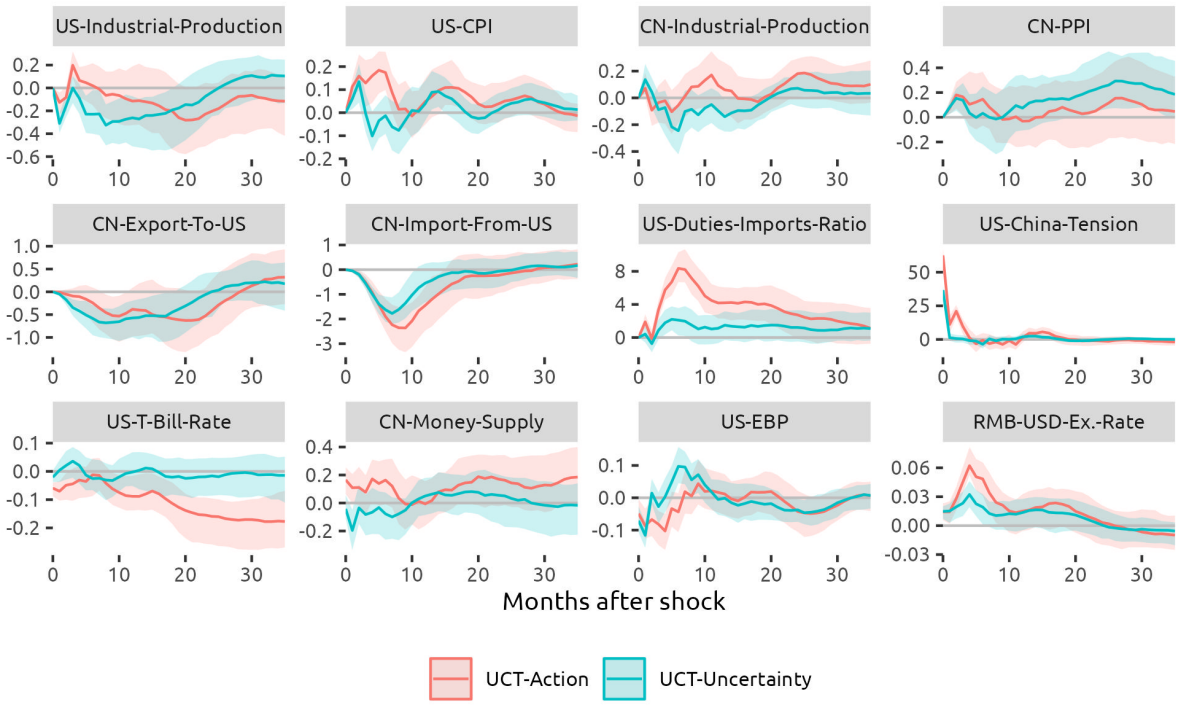
This table reports the results of Equation (-3). The dependent variable, the Sahm recession probability, is in percentage points, while the UCT variable is standardized by Z-score. The sample period is Jan. 1993–Dec. 2022.
Heteroskedasticity robust standard-errors in parentheses
*Signif. Codes: ***: 0.01, **: 0.05, *: 0.1*

Action vs. uncertainty

We next investigate the different roles of action vs. uncertainty in the aggregate transmission of U.S.-China tension. To that end, we use the same VAR model as with the baseline index and estimate impulse responses to innovations in the action and uncertainty components separately. As shown in Figure A9, a one-standard-deviation positive shock to the uncertainty component has a large and persistent effect of depressing output and bilateral trade as well as increasing unemployment and EBP. A one-standard-deviation positive shock to the action component generates significantly larger and more protracted adverse effects on bilateral trade, while having relatively muted effects on output and borrowing costs. It appears that the adverse aggregate output effect of UCT is primarily driven by its uncertainty component, despite a milder trade response. This also implies that the negative transmission of UCT operates through channels other than trade.

[35] We interpolate quarterly real GDP figures to monthly frequency, and then compute the monthly growth rate.

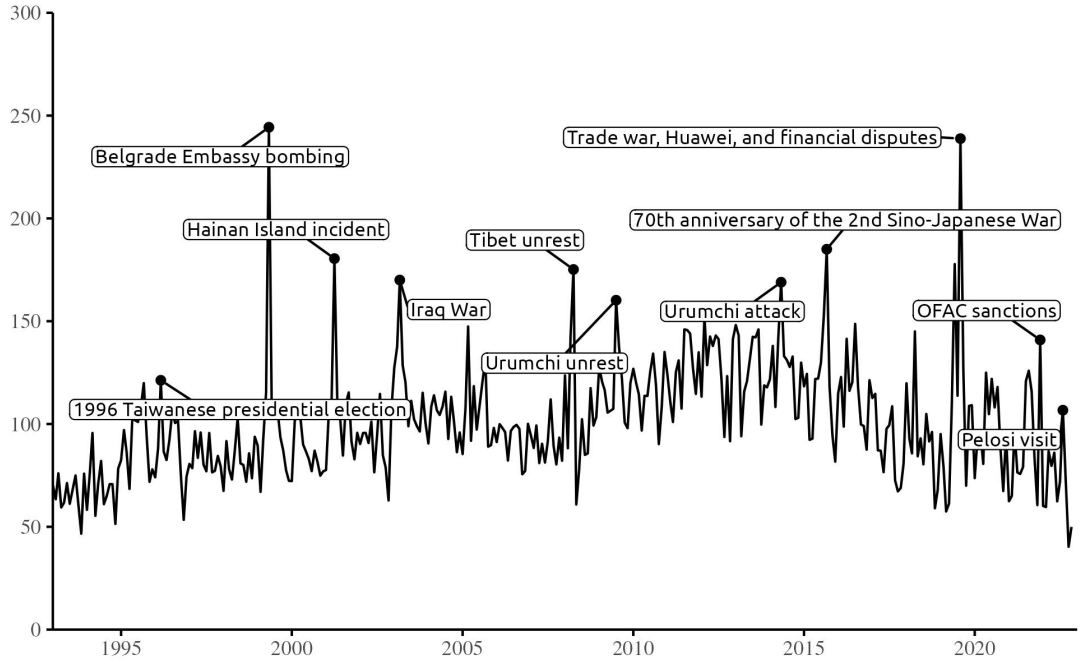
Figure A9: VAR IRFs for Action and Uncertainty Subindex Shocks



Note: The red (blue) lines denote the impulse response functions following a one standard deviation positive shock to the UCT action (uncertainty) subindex. The upper and lower bounds show 68% confidence intervals, boot-strapped with 100 draws. Responses are expressed as percentage changes, except for the T-Bill rate, EBP, and the RMB-USD exchange rate, which are measured in percentage points.

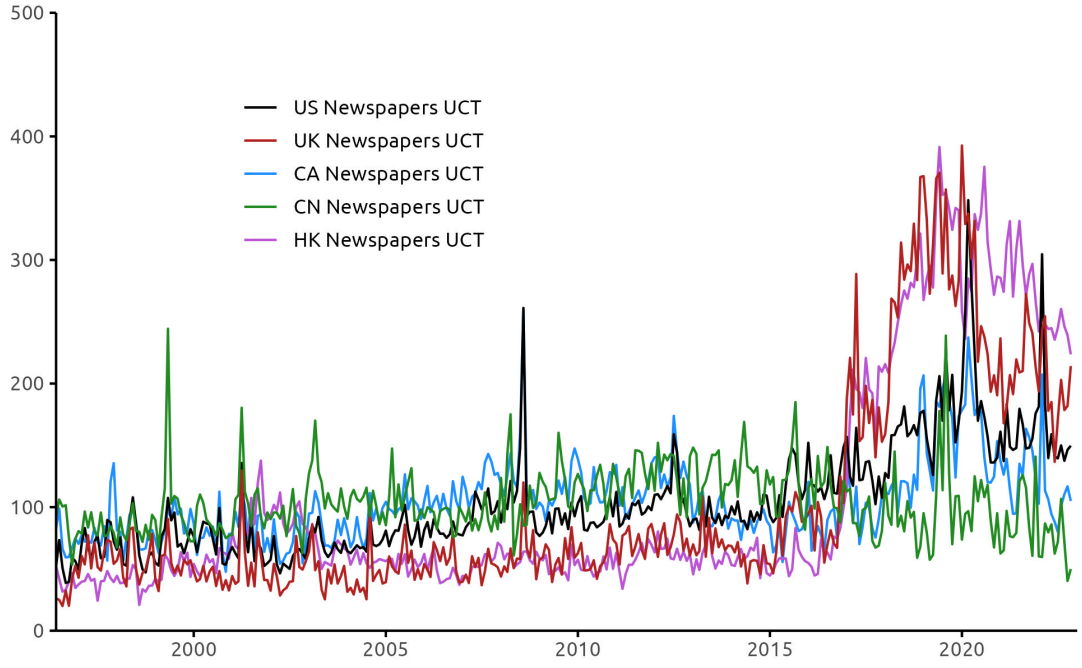
Appendix J: UCT Viewed from Outside the U.S.

Figure A10: UCT-CN Index (People's Daily)



Note: The monthly UCT-CN index from Jan. 1993 to Nov. 2022 normalized to a mean of 100 over the plotted period.

Figure A11: UCT indices by Newspaper Origin



Note: The monthly UCT indices constructed from U.S., U.K., Canadian, Chinese, and Hong Kong newspapers from Jun. 1996 to Nov. 2022 normalized to a mean of 100 over the plotted period. U.K. newspapers include the Daily Telegraph, Financial Times, and the Guardian. Canadian newspapers include the Globe & Mail, Ottawa Citizen, Toronto Star, and the Vancouver Sun. Chinese newspapers include the People's Daily. Hong Kong newspapers include the South China Morning Post.

Table A17: UCT Correlations by Newspaper Origin

	US	UK	CA	CN	HK
US	1.00	–	–	–	–
UK	0.84	1.00	–	–	–
CA	0.78	0.63	1.00	–	–
CN	0.05	-0.08	0.12	1.00	–
HK	0.76	0.92	0.54	-0.14	1.00

This table reports the correlations between the baseline UCT, and the indices constructed from other countries' newspapers. The sample period is Jun. 1996–Nov. 2022.

Figure A10 plots the U.S.-China tension index constructed from mainland China's People's Daily newspaper, with notable fluctuations labelled. Figure A11 plots the baseline U.S. newspaper UCT index along with the People's Daily index and UCT indices constructed from newspapers from the Canada, Hong Kong, and the U.K. Correlations across the indices are reported in Table A17.

What can we learn from differences in the indices? The largest discrepancy between them occurs from 2016 onwards, when the U.K. and Hong Kong indices reports notably higher tension levels than the others. This could be due to Brexit, as the U.K. experienced a changing relationship with other world powers, including the U.S. and China, or to domestic upheaval in Hong Kong. This, compounded with the heightening economic tensions between the U.S. and China and the trade war, may have led the other economies to be particularly sensitive to U.S.-China relations. Moreover, the substantial differences between the English language-based indices and those from China are indicative of a trend toward increased international polarization, which has become the subject of intense media scrutiny. We leave for further investigation the sources and implications of these differences.