

Measuring Geopolitical Risk*

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Abstract

We present an indicator of geopolitical risk based on a tally of newspaper articles covering geopolitical tensions, and examine its evolution and economic effects since 1985. The geopolitical risk (GPR) index spikes around the Gulf War, after 9/11, and in the 2003 Iraq invasion. High geopolitical risk reduces U.S. investment, employment, and the level of the stock market. When we decompose the index into threats and acts components, the adverse effects of geopolitical risk are mostly driven by the threat of adverse geopolitical events. We complement our aggregate measures with indicators of geopolitical risk at the level of individual firms. We show that investment drops more in industries that are positively exposed to aggregate geopolitical risk, and that firms reduce investment in response to higher idiosyncratic geopolitical risk.

KEYWORDS: Geopolitical Risk; Economic Uncertainty; Business Cycles; Firm-level investment; Textual Analysis; Earnings Calls.

JEL CLASSIFICATION: C1. D80. E32. H56.

Latest version at https://www2.bc.edu/matteo-iacoviello/gpr_files/GPR_PAPER.pdf

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1 Introduction

Entrepreneurs, market participants, and central bank officials view geopolitical risks as key determinants of investment decisions and stock market dynamics. The Bank of England includes geopolitical risk—together with economic and policy uncertainty—among an ‘uncertainty trinity’ that could have significant adverse economic effects (Carney, 2016). In recent years, the European Central Bank—in the *Economic Bulletin*—, the International Monetary Fund—in the *World Economic Outlook*—, and the World Bank—in the *Global Economic Prospects*—have routinely highlighted and monitored the risks to the outlook posed by geopolitical uncertainties.¹ In a recent Gallup survey of more than 1,000 investors, 75 percent of respondents expressed worries about the economic impact of the various military and diplomatic conflicts happening around the world, ranking concerns about geopolitical risk ahead of political and economic uncertainty.²

However, the importance of geopolitical risks in shaping macroeconomic outcomes has not been the subject of systematic empirical analysis. The main limitation has been the lack of an indicator of geopolitical risk that is consistent over time, and that measures in real time geopolitical risk as perceived by the press, the public, global investors, and policy-makers. This is the perspective we adopt here. We construct a monthly index of geopolitical risk from newspaper records and examine its evolution since 1985. Using aggregate data, we then show that higher geopolitical risk depresses investment and stock returns. Finally, using disaggregated data, we document that the effects are stronger in industries that are positively exposed to geopolitical risks, and that high idiosyncratic GPR—constructed from the text of listed firms’ earnings calls—predicts lower firm-level investment.³

In Section 2, we describe the construction of the GPR index, which involves definition, measurement, and audit. In the definition step, we follow one common usage of the term “geopolitics,” and refer to it as the practice of states and organizations to control and compete for territory. In particular, we identify geopolitical events in which power struggles over territories cannot be resolved peacefully. Accordingly, we define geopolitical risk as the risk associated with wars, ter-

¹ These institutions keep track of geopolitical risks using our GPR index introduced and described in this paper. The index is updated monthly and is available at daily and monthly frequencies at <https://www2.bc.edu/matteo-iacoviello/gpr.htm>. The webpage also presents additional indicators, including country-specific measures of geopolitical risk.

² See <http://www.businesswire.com/news/home/20170613005348/en/>.

³ Many companies publish various indicators of geopolitical uncertainty which suffer from various shortcomings that make them poorly suited for empirical analysis. First, it is unclear what these indexes measure, as they either do not define geopolitical risk or use a wide-ranging definition that includes very different events, ranging from wars to major economic crises to climate change. Second, these indexes are extremely hard to replicate, as they are not publicly available, are constructed subjectively, and come with a less-than-transparent methodology. Third, these indexes exhibit very little variability or are available only for a few years.

rorist acts, and tensions between states that affect the normal and peaceful course of international relations. Geopolitical risk captures both the risk that these events materialize, and the new risks associated with an escalation of existing events.

In the measurement step, we draw on [Saiz and Simonsohn \(2013\)](#) and [Baker, Bloom, and Davis \(2016\)](#), and construct the GPR index with an algorithm that computes the share of articles related to geopolitical risks in leading international newspapers published in the United States, the United Kingdom, and Canada. These newspapers—which include *The New York Times*, the *Financial Times*, and *The Wall Street Journal*—cover geopolitical events that are of global interest, thus often implying an involvement of the United States. Thus, the GPR index can be viewed either as a measure of global geopolitical risks that are relevant for major companies, investors, and policy-makers, or as a measure of risks that are mostly relevant from a North-American and British perspective.

We plot the benchmark index from 1985 through 2018 in [Figure 1](#). The three largest spikes are recorded during the Gulf War, after 9/11, and during the 2003 invasion of Iraq. More recently, the index spikes after the Paris terrorist attacks and during the 2017-2018 North Korea crisis. We also construct the daily GPR index—plotted in [Figure 2](#)—as well as the historical GPR index—dating back to 1899 and plotted in [Figure 3](#)—which reaches its highest values at the beginning of World War I and World War II, as well as at the onset of the U.S. involvement in them.

In the audit step, we assess whether the GPR index is an accurate measure of geopolitical risks. We develop a formal audit process based on a human reading of more than 16,000 newspaper articles. To quantify type I and type II errors, we audit both articles that comprise the GPR index, and articles that we sample from a broader set likely mentioning geopolitical events. Based on the audit, we conclude that the GPR index is a meaningful and accurate measure of geopolitical risks.

In [Section 3](#), we illustrate several properties of the GPR index that showcase its potential for economic analysis. We construct two subindexes that separate periods of elevated geopolitical risks due to realization of adverse events from periods of elevated risks without the realization of the underlying event. We also show that the GPR index correlates well with listed firms’ own perceptions of geopolitical risks, that we construct looking for mentions of geopolitical risks in 135,000 firms’ earnings calls, inspired by the work of [Hassan, Hollander, van Lent, and Tahoun \(2019\)](#).⁴ We then compute the exposure of industries to geopolitical risks using daily stock returns data. Precious metals, petroleum and defense industries have negative exposure to geopolitical

⁴[Hassan, Hollander, van Lent, and Tahoun \(2019\)](#) construct firm-level measures of political (not geopolitical) risk using text analysis of their earnings calls.

risk—their stock prices outperform the market in periods of elevated geopolitical tensions—while coal, transportation, and entertainment industries have positive exposure. Exposure is larger for industries that are more cyclically-sensitive, that are more open to trade, and where firms are more levered.

In Section 4, we study the relationship between geopolitical risk and the U.S. economy. We first show that the GPR index cannot be predicted by macroeconomic, financial, or other uncertainty indicators, supporting the idea that our measure of geopolitical risks is largely exogenous to the U.S. economy at business cycle frequency. Using forecasting regressions, we then show that higher geopolitical risks predict a decline in business fixed investment up to one year after the shock. Using vector autoregressive (VAR) models, we show that a shock to geopolitical risk induces persistent declines in investment, employment, consumer confidence, and in the level of the stock market. Next, we ask whether activity responds more to threats of adverse events or to their actual realization. For the U.S., we find that adverse geopolitical events lead to a short-lived increase in uncertainty and produce economically small effects, while heightened geopolitical threats lead to a protracted rise in uncertainty and produce a larger decline in real activity. These results lend support to theoretical models where agents form expectations using a worst-case probability—as in [Ilut and Schneider \(2014\)](#)—and to models where elevated levels of uncertainty cause a decline in employment and investment—as in [Dixit and Pindyck \(1994\)](#) and [Bloom, Bond, and Van Reenen \(2007\)](#).

In Section 5, we provide further evidence on the effects of geopolitical risk using industry and firm-level data. We do so by providing a full account of the dynamic, firm-level effects on investment of innovations in aggregate and firm-specific geopolitical risk. Using panel local projections, we show that the effects of geopolitical risk are not uniform: industries that are positively exposed to geopolitical risks suffer a larger decline in investment relative to the aggregate effect. In addition, we show that idiosyncratic geopolitical risk—constructed using earnings call transcripts, and purged of aggregate and industry-specific components—also reduces investment at the firm level, with effects that gradually build up and that persist over time.⁵

Our paper makes three distinct contributions to the empirical literature on measuring uncertainty and its economic implications. First, we provide a systematic attempt to measure a new source of risk—geopolitical risk—and its economic effects. In doing so, we show that the GPR

⁵ At the firm level, there are two differences between us and [Hassan, Hollander, van Lent, and Tahoun \(2019\)](#). First, we study a new source of risk. Second, we track the dynamic—instead of contemporaneous only—effects of idiosyncratic risk using a local projection approach. Our firm-level approach also differs from [Baker, Bloom, and Davis \(2016\)](#), who find that firms with more exposure to government purchases are more responsive to contemporaneous policy uncertainty movements.

index is an important force that can affect the economic outlook—and, accordingly, should be tracked by businesses and policy institutions—, and that existing uncertainty indicators do not fully encompass geopolitical risks. For instance, even if the GPR index is correlated with the economic policy uncertainty (EPU) index of [Baker, Bloom, and Davis \(2016\)](#), it also displays a notable amount of additional, independent variation that predicts lower economic activity. Second, we present new evidence on the causal role of uncertainty as an exogenous impulse to business fluctuations. Relative to existing uncertainty proxies that tend to rise during recessions, our index singles out episodes that, at least for the United States, are largely independent of the economy at business cycle frequency. In fact, our index does not systematically spike in recessions or during the Global Financial Crisis. Thus, we do not require strong identification assumptions to support the finding that geopolitical risk has recessionary effects. Third, we distinguish the threats of adverse events from their actual realization. We do so because the methodology can pinpoint the timing of different types—acts and threats—of geopolitical events, thus allowing to measure their distinct effects.⁶

2 Construction of the Geopolitical Risk Indexes

The construction of geopolitical risk indexes involves three main steps: definition, measurement, and audit. We first describe the definition of geopolitics and geopolitical risk that we adopt in our paper. We then discuss how we measure geopolitical risk and describe the key features of the resulting indexes. Finally, we explain the audit process. The audit section is self contained and can be skipped when reading the paper for the first time. All indexes described in this section are updated monthly and available at <https://www2.bc.edu/matteo-iacoviello/gpr.htm>.

2.1 Definition

We define geopolitical risk as the risk associated with wars, terrorism, and tensions among states that affect the normal course of international relations. Geopolitical risk captures both the risk that these events materialize, and the new risks associated with an escalation of existing events.

⁶ Several papers construct and use proxies for economic uncertainty. See [Bloom \(2009\)](#), [Bachmann, Elstner, and Sims \(2013\)](#), [Gilchrist, Sim, and Zakrajšek \(2014\)](#), [Jurado, Ludvigson, and Ng \(2015\)](#), and [Scotti \(2016\)](#). [Ludvigson, Ma, and Ng \(2019\)](#), [Caldara, Fuentes-Albero, Gilchrist, and Zakrajšek \(2016\)](#), and [Berger, Dew-Becker, and Giglio \(2019\)](#) use structural VAR models and find a two-way relationship between uncertainty and the business cycle. Our emphasis on geopolitical risk also links our paper to the literature on disaster risk, which often identifies consumption disasters during wars. See for instance [Barro \(2006\)](#), [Gourio \(2008\)](#), and [Berkman, Jacobsen, and Lee \(2011\)](#).

Our definition closely follows the historical usage of the term geopolitics—to describe the practice of states to control and compete for territory (Flint, 2016).⁷ However, in line with recent assessments of modern international relations among states, our definition includes terrorism. In recent decades, terrorist acts have generated political tensions among states, and, in some instances, have led to full-fledged wars. This practice is not confined to Al-Qaeda and ISIS, but dates back to every episode in which acts of violence were carried out by terrorist organizations and rebel groups to bolster religious, economic, or revolutionary objectives.

As discussed in the remainder of the section, our definition encompasses events that are most frequently described as being geopolitical. Thus, through our definition, we make clear that we exclude events that only occasionally are referred to as being geopolitical—climate change, major democratic political events (e.g. Brexit), and global economic events (e.g. the global financial crisis). This choice is dictated both by the methodology used to measure geopolitical risk—these events would receive a small weight in an index based on the frequency of newspaper articles containing the most common words associated with geopolitics—and by the choice of excluding events that have distinct causes and effects relative to wars and terrorism.

2.2 Measurement

We construct geopolitical risk indexes by counting the number of occurrences in leading English-language newspapers of articles discussing geopolitical events and associated risks. In particular, we construct the baseline geopolitical risk (GPR) index—starting in 1985—by running automated text-searches of the electronic archives available on ProQuest Newsstream of 11 newspapers: *The Boston Globe*, the *Chicago Tribune*, *The Daily Telegraph*, the *Financial Times*, *The Globe and Mail*, *The Guardian*, the *Los Angeles Times*, *The New York Times*, *The Times*, *The Wall Street Journal*, and the *Washington Post*. The index reflects, in each month, the number of articles discussing rising geopolitical risks, divided by the total number of published articles containing the stop words “and”, “of”, and “the”. We normalize the index to average a value of 100 in the 2000-2009 decade.⁸

Table 1 lists examples of words searched in the construction of the GPR indexes organized in six categories, while we report the exact search query in the Appendix (Figure A.2). We selected

⁷ The Austro-Hungarian historian Emil Reich is credited with first using the word “geopolitics” in the early 20th century (GoGwilt, 2000).

⁸ By searching for articles that include three of the most frequent words in English, we remove some measurement error, excluding from the searches one-line news, ads, and titles of articles that are sometimes erroneously classified as full articles. The Appendix shows that there is a very high correlation across GPR measures across all newspapers (see Figure A.1).

Table 1: Examples of Phrases Searched to Construct the GPR Indexes

| <i>Search Category</i> | <i>Examples of Search Terms</i> |
|-------------------------|--|
| 1. Geopolitical Threats | geopolitical AND (risk* OR concern* OR tension* OR uncertain*) AND “United States” AND (coup OR guerrilla OR warfare) AND (“Latin America” OR “Central America” OR “South America” OR Europe OR Africa OR “Middle East” OR “Far East” OR Asia) |
| 2. Nuclear Threats | (“nuclear war” OR “atomic war” OR “nuclear conflict”) AND (fear* OR threat* OR risk* OR peril* OR menace*) |
| 3. War Threats | “war risk*” OR “war fear*” OR “military threat*” |
| 4. Terrorist Threats | “terrorist threat*” OR “terrorism menace*” |
| 5. War Acts | ((beginning OR outbreak OR start OR escalation) “of the war”) |
| 6. Terrorist Acts | “terrorist act” OR “terrorist acts” |

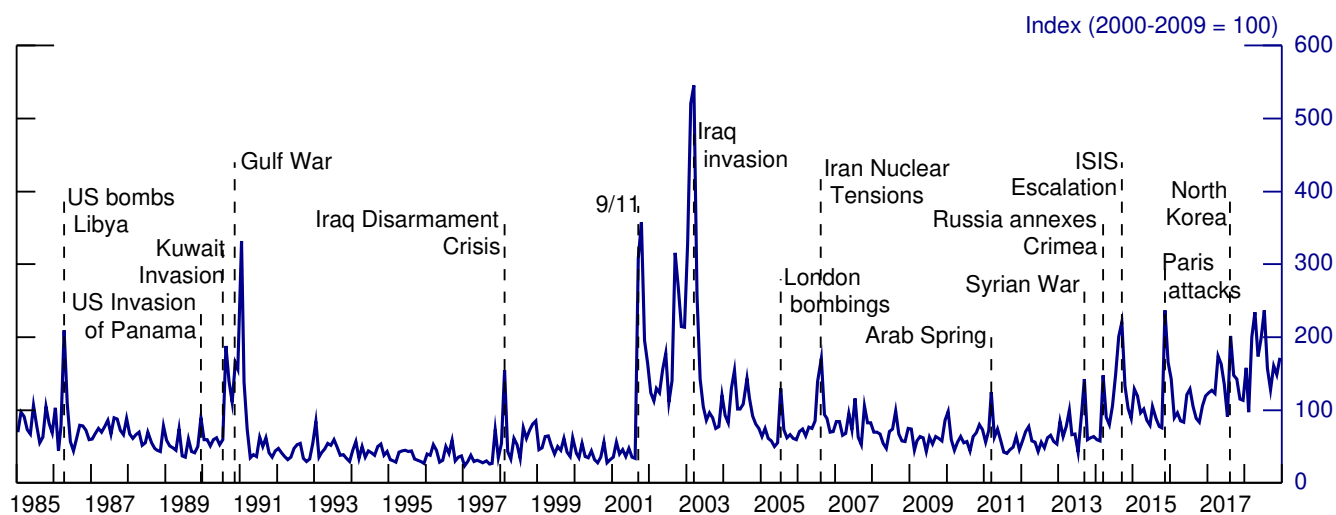
NOTE: This table lists a subset of phrases searched in the construction of the GPR indexes, organized by categories. We report the exact search query in the Appendix. The asterisk (*) symbol denotes a wild-card character.

words by conducting a pilot audit of newspaper articles likely mentioning geopolitical tensions—described in Section 2.3—and by isolating the most common uni-grams and bi-grams in geopolitics textbooks.⁹

The first four categories of words are related to geopolitical threats and tensions, while the last two categories are related to geopolitical events and acts. Category 1 includes words that explicitly mention geopolitical risk, as well as words describing military-related tensions involving large regions of the world and the United States. The associated articles describe geopolitical risks with a direct U.S. involvement (e.g. the Gulf War and the Iraq War), but also regional tensions among two or more countries with a U.S. diplomatic involvement. Category 2 includes words describing nuclear tensions. Categories 3 and 4 include words that describe war threats and terrorist threats, respectively. Lastly, categories 5 and 6 aim at capturing press coverage of actual

⁹ For instance, the *The Geopolitics Reader* (Dalby, Routledge, and Tuathail, 2003), a compendium of 39 essays on geopolitics, contains 91,210 bigrams, of which the most common ones are “unit[ed] states,” “cold war,” “foreign polic[y],” “nation secur[ity],” “world war,” “world order,” “nation[al] state,” “gulf war,” “war II,” and “nuclear weapon.” The most common word roots in Flint (2016)’s textbook *Introduction to Geopolitics* are “geopolit,” “war,” “nation,” “terror,” “polit,” and “countri,” and “global.” Similarly, the most common word roots in Samuel Huntington’s classic book on the “Clash of Civilizations” (Huntington, 1997) are “civil,” “war,” “cultur,” “polit,” “power,” “econom,” “societi,” and “conflict.”. We do not include in searches proper nouns (e.g., Adolf Hitler), or names of specific events (e.g., “Cuban Missile Crisis”) because they capture specific risks for a limited period of time, leading to false positives (e.g., the anniversary of the Cuban Missile Crisis) outside that window.

Figure 1: THE GEOPOLITICAL RISK INDEX (2000-2009=100)



NOTE: The line plots the benchmark GPR index from 1985 through 2018.

geopolitical events as opposed to just risks. Importantly, we use words that capture negative geopolitical events—for instance the start of a war—as opposed to positive ones—for instance the end of a war, or peace talks.

The Benchmark GPR Index

Figure 1 presents the benchmark GPR index. The index is characterized by several spikes corresponding to key geopolitical events. The first spike is recorded in April 1986 and corresponds to the terrorist escalation that led to the U.S. bombing of Libya. The second spike happens around the Iraq invasion of Kuwait and the subsequent Gulf War. The index spikes again at the beginning of 1998, during a period of escalating tensions between the United States and Iraq. It then stays low until 9/11. The index reaches its maximum during the 2003 invasion of Iraq. Since 2003, the index spikes in correspondence with major terrorist events in Europe, during the Russian annexation of the Crimea peninsula, and during the escalation of ISIS military operations in Iraq and Syria.

In the Appendix (Figure A.3), we elaborate on the contribution of each search category to the index. Nuclear threats are disproportionately more important prior to the end of the Cold War, and gradually subside after 1989. Terrorist threats trend higher over the sample period, spiking after 9/11, and remaining at elevated levels ever since. While war threats and war acts move in

sync throughout the sample, mentions of terrorist threats increase relative to mentions of terrorist acts since 9/11. The high values of geopolitical risk in the 2010s appear puzzling in absence of large-scale wars or big cross-border terrorist attacks. Yet such high values capture a multitude of risks, including the continuing threats from entities such as Al Qaida, ISIS, North Korea, and Iran. According to our index, the combination of these risks poses a threat to geopolitical order that is as high as during the Cold War. One explanation is that many of the entities posing such risks may not be deterred in conventional ways, and could inflict substantial damage to the U.S. economy (see for instance [Ferguson, 2008](#)).

The Daily GPR Index

Figure 2 shows the GPR index at daily frequency. The daily index is obviously noisier than its monthly counterpart, yet it nicely provides a more detailed view of a larger set of episodes, including some that may seem to have been ignored by the monthly index. For instance, in August 1991, the daily index captures the escalation of ethnic violence in former Yugoslavia, and the attempted coup in the Soviet Union. In March 1999, the index spikes at the beginning of the NATO air strikes in Kosovo. These events have a low bearing into the monthly index, as the associated news coverage was short-lived.

The daily index illustrates how the day-to-day unfolding of geopolitical tensions can cause elevated readings of the monthly GPR index. In a first scenario, a protracted build-up in tensions leads to a defining event causing a big spike in the index, as in the case of the Gulf War.¹⁰ In a second scenario, one climactic event causes a large spike in daily geopolitical risk and is followed by readings that are persistently higher than the average, as in the aftermath of the 9/11 terrorist attacks. In a third scenario, slow-moving geopolitical tensions persistently remain in the news cycle, averaging out to elevated values of the monthly GPR. Examples include the Syrian Civil War and the 2017-18 North Korea crisis. In all these scenarios, spikes in the daily index correctly point to when particular tensions materialized, thus providing robust evidence on the large informative content of the index at frequencies such as days or weeks. That said, it is possible that our index may not appropriately measure episodes that slowly unfold over multiple years—for instance the fall of the Communism in Soviet Union and Eastern Europe—and are recognized as geopolitical risks only with the benefit of hindsight.

¹⁰ In the Appendix (Figure A.4), we show the newspapers' front pages reporting on the news mentioned in this paragraph.

Figure 2: DAILY GEOPOLITICAL RISK

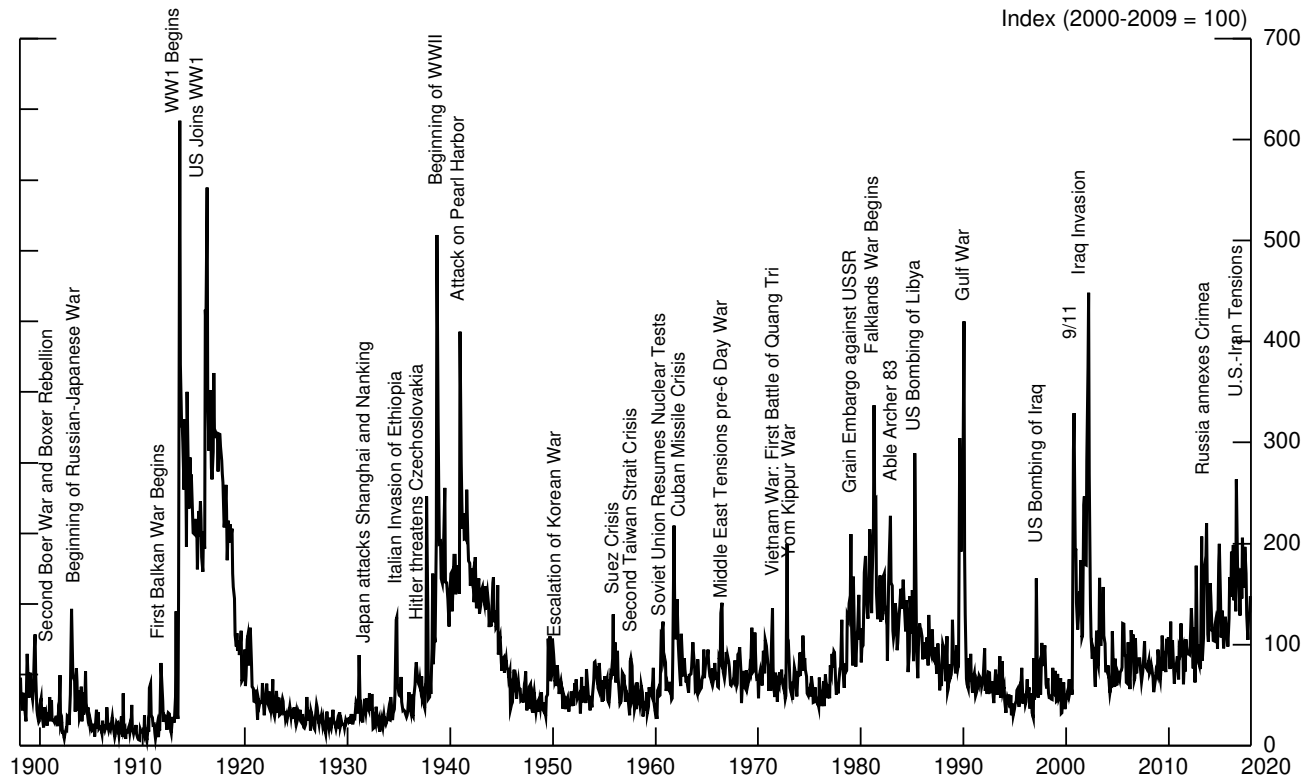


NOTE: Timeline of the daily GPR index. The solid blue line plots the monthly index. The dots show the daily observations, including description of the events reported by the newspapers on days featuring spikes in the index.

The Historical GPR Index

We construct an historical index (GPRH), dating back to 1900, searching the three newspapers for which we have electronic access to all articles from 1900 through ProQuest Historical Newspapers—

Figure 3: THE HISTORICAL GEOPOLITICAL RISK INDEX (2000-2009=100)



NOTE: The line plots the historical monthly GPR index from 1900 through 2018.

namely *The New York Times*, the *Chicago Tribune*, and the *Washington Post*. Figure 3 displays the historical GPR index. The long-span index closely mimics the benchmark index for the period in which the coverage overlaps, with a correlation of 0.95. As for the benchmark GPR index, every major spike in the index can be associated with episodes of rising geopolitical tensions. Early in the sample, the index rises and stays high during World War I and World War II, and peaks at the onset of both. The index stays at high levels between the 1950s and the 1980s—a time when the threat of a nuclear war and rising geopolitical tensions between countries were more prevalent than wars themselves. Since the 2000s, terrorist events have come to dominate the index, alongside rising bilateral tensions among countries. Indeed, the index reaches the highest values at the start of World War I and World War II, and around 9/11.

2.3 Audit

The construction of any index based on automated text-searches raises concerns about accuracy and bias. We explain how we address these concerns by describing our audit process.

The sample of newspaper articles used to construct the index—denoted by \mathcal{U} —contains about 70,000 news articles, on average, each month. The audit was conducted from a subset of \mathcal{U} —denoted by \mathcal{E} —consisting of articles that contain any of the following words: *geopolitics*, *war*, *military*, *terrorism/t*. This choice of words is supported by an analysis of the most common unigrams found in books on the subject of geopolitics. The sample \mathcal{E} contains about 8,000 articles per month, about 15 percent of the articles in \mathcal{U} .

Pilot Audit

We conducted the pilot audit as follows. We randomly selected 50 months in the period from 1985:M1 to 2016:M12, and for each month, we randomly selected 50 articles from the sample \mathcal{E} . Together with a team of research assistants, we read these 2,500 articles and assigned to the set \mathcal{E}^1 articles mentioning high geopolitical tensions or adverse geopolitical events, and to the set \mathcal{E}^0 articles not highlighting any recent risks or recent adverse events. For instance, articles in \mathcal{E}^0 are written at times of anniversaries, such as the centenary of World War I in 2014; upon death of historical figures; or at the time of books’ publication and movies’ releases.

We found that slightly less than half of the articles in \mathcal{E} discussed high or rising geopolitical risks. Additionally, the error rate $\mathcal{E}^0/\mathcal{E}$ was very volatile, with a monthly standard deviation of 17 percent, thus indicating that a very broad search would generate an index with a high noise-to-signal ratio.

We used text analytic techniques to identify bi-grams that appeared more frequently in articles belonging to either the set \mathcal{E}^1 or the set \mathcal{E}^0 . Then, using Bayes’ rule, we computed the odds ratio of an article belonging to \mathcal{E}^1 instead of \mathcal{E}^0 given that it contained each bi-gram. We used this list of bi-grams with the highest odds ratio as an input to choose the group of search words that are listed in Table 1. We also found the bi-grams with the highest odds ratio of belonging to the set \mathcal{E}^0 . We used this list of bi-grams to choose words that articles should not contain in order to be included in the index.¹¹ Finally, through the pilot audit, we also create a detailed audit guide to

¹¹ The phrases that are highly likely to signal false positives are “civil war,” “human rights,” “war” in close proximity of the word “end” (end N/2 war), “air force,” “movie,” “film,” “museum,” “anniversary,” “memorial,” and “art.”

be used during the full scale audits, discussed next.¹²

Full-Scale Audit

The full-scale audit involved the construction of a human-generated GPR index and the evaluation of the computer-generated GPR index. To construct a human-generated GPR index, we randomly sampled 6,125 articles from \mathcal{E} —on average about 50 articles per quarter. For each quarter, we calculated the fraction of articles assigned to \mathcal{E}^1 , multiplied this fraction by the quarterly rate \mathcal{E}/\mathcal{U} , and normalized the resulting index to 100 over the 2000-09 period. We show the human-generated GPR index in the Appendix (Figure A.5). Our computer index lines up well with an index that could be constructed by humans. The correlation between the two series is 0.84, a value that is remarkably high when one takes into account sampling uncertainty. The correlation becomes 0.86 when we repeat the same exercise using historical data from 1899 through 2018 and a random sample of 7,416 articles.

To evaluate the computer-generated GPR index, we randomly sampled 50 articles from 50 different months from the set of articles selected by the automated text-search algorithm, and classified them as either discussing high or rising geopolitical tensions or not. About 87 percent of the articles that constitute the computer-generated GPR mention high or rising geopolitical risks. Of the remaining articles, 4 percent mention low or decreasing geopolitical tensions, while other false positives fall under various categories, for instance discussions of past geopolitical events and related personal experiences (e.g trauma) without an immediate connection to current developments. The low incidence of articles discussing positive geopolitical developments supports our claim that our choice of words captures negative risks to the geopolitical outlook, as the discussion of positive events uses a different set of words (for instance “negotiations” or “peace talks”). For the 50 months that we sample, the correlation between the human-audited GPR index and the benchmark GPR index is 0.98. The error rate—the fraction of articles that do not discuss rising geopolitical risks—is essentially uncorrelated with the GPR index itself as well as with other macroeconomic variables.

¹²The audit guide is available at https://www2.bc.edu/matteo-iacoviello/gpr_files/audit_guidelines_GPR.pptx. To develop the audit guide and to identify coding difficulties, we assigned 40 percent of the articles in the pilot sample to multiple auditors. Following the lead of Baker, Bloom, and Davis (2016), we met with the auditors on a weekly basis over the course of more than six months, we discussed with them criteria that could lead to an improvement of the audit process, and we reviewed with them “hard calls” and coding discrepancies. We continued this process until coding discrepancies across auditors were reduced to 15 percent or less of the articles sampled, a threshold that we consider reasonable given the vast range of topics included in our index.

Additional Checks

In the Appendix, we present an extensive battery of additional checks and comparisons to alternative measures of geopolitical risk. First, we construct GPR indexes based on a broader and narrower set of articles, as well as on a very parsimonious choice of words, showing that they are very highly correlated. Second, we show that fluctuations in our GPR index cannot be explained by variation in media attention due to other events (e.g. sport events or natural disasters) or by political slant. Third, we show that a version of the GPR index that excludes economics and finance related words—constructed to avoid a mechanical correlation between GPR and outcomes of interest—is indistinguishable from our benchmark index. Fourth, we compare the GPR index to quantitative proxies constructed using other sources, such as the International Crisis Behavior (ICB) database, the Global Terrorism Database, and the International Country Risk Guide.

Finally, we link our audit process to the work of [Saiz and Simonsohn \(2013\)](#). These authors list a number of conditions—some of them discussed in the audit section above—that must hold to obtain useful document frequency-based proxies for variables and concepts that are otherwise elusive to measure, such as geopolitical risk. As described in the Appendix, our index satisfies these conditions with flying colors. Accordingly, we can reasonably argue that the GPR index is a robust and reliable measure of geopolitical risk.

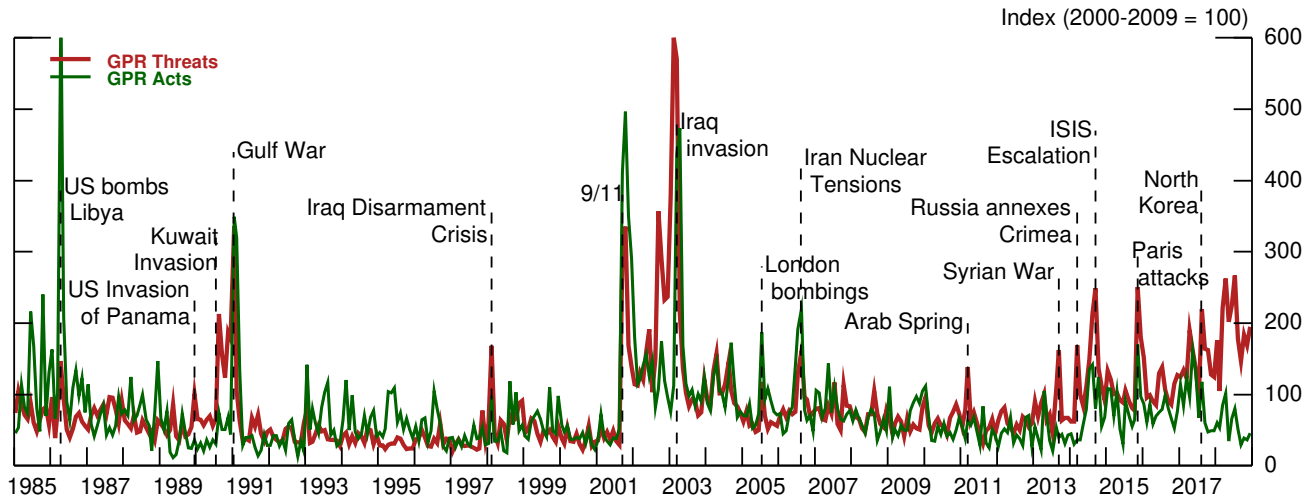
3 Understanding the GPR Index

In this section, we illustrate several features of the GPR index to show that it is a meaningful and accurate measure of geopolitical risks and that it can be useful for economic analysis. We organize the discussion around four questions: (1) Is the GPR index a measure of uncertainty and risks associated with geopolitical events, or does it mostly capture the realization of geopolitical acts? (2) Is the index a relevant measure of investors' perception of geopolitical risks? (3) Does exposure to geopolitical risks vary across industries of the U.S. economy? (4) What is the relationship between the GPR index and measures of economic uncertainty?

3.1 Geopolitical Acts and Geopolitical Threats

The realization of adverse geopolitical events often triggers an increase in geopolitical risk. For instance, a terrorist attack may increase the risk of future attacks. Thus, searching directly for articles discussing the realization of events—using words in categories 5 and 6 listed in [Table 1](#)—plays an important role in our analysis as it can deliver a more accurate timing of some

Figure 4: THE GEOPOLITICAL RISK INDEX: THE TWO SUBINDEXES



NOTE: This figure shows the geopolitical threats (GPT) and the geopolitical acts (GPA) indexes (data from 1985 until the end of 2018). The GPT is constructed by searching articles containing words included in groups 1 to 4 in Table 1. The GPA is constructed by searching articles containing words included in groups 5 and 6 in Table 1.

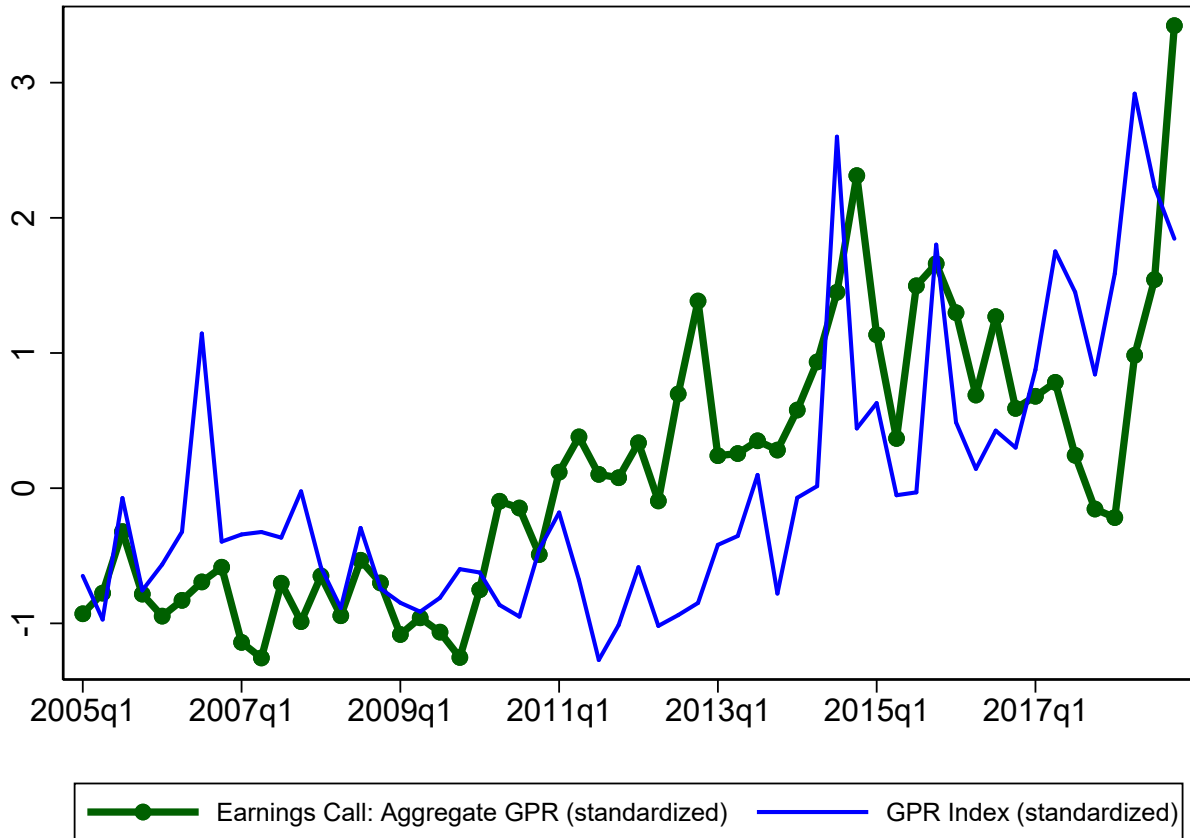
risk-inducing shocks. However, since spikes in risk can coincide with the realization of events, the overall GPR index—as well as many other uncertainty indexes used in the literature—likely captures a convolution of shocks to first- and higher-order moments. We address this measurement and identification problem as follows.

We isolate periods of elevated geopolitical risk due to the realization of events by constructing two indexes: the geopolitical threats index (GPT) and the geopolitical acts (GPA) index. The GPT index is constructed by searching articles that include words in categories 1 to 4—the groups directly mentioning risks—while the GPA index searches only for words included in categories 5 and 6—those referring to adverse events.

Figure 4 plots the two indexes. The GPT and GPA indexes have a correlation of 0.51. Nearly all spikes in the GPA index coincide with spikes in the GPT index. Nonetheless, there is also a non-trivial amount of independent variation. In particular, the GPT index rises in the months prior to major events—for instance the Gulf War and the Iraq War—suggesting that the index might capture risks and news about future events. In some cases, the GPT index is elevated when no event materializes—for instance, the two indexes diverge during the 2017-18 North Korea crisis.

Later in the empirical analysis, we exploit the independent variation between the GPA and GPT indexes—together with some additional identifying assumptions—to measure the macroeco-

Figure 5: GPR INDEX AND FIRMS' PERCEPTION OF GEOPOLITICAL RISK



NOTE: Each quarter, GPR from the Earnings Calls is the share of earnings calls mentioning geopolitical risks. Both measures have been transformed to have zero mean and unit standard deviation in the 2005-2018 period.

conomic effects of geopolitical threats that do not coincide with the realization of adverse events.¹³

3.2 GPR Index and Firms' Perception of Geopolitical Risks

Our index captures geopolitical risks as perceived through and chronicled by the press in English-speaking countries, particularly in the United States. At the same time, we search newspapers that have wide geographical coverage and routinely report on international events. Hence, a broader interpretation is that the index is also a good proxy for global geopolitical risks that are relevant

¹³ When using the GPT and GPA indexes, the definition of an event may depend on media coverage. For instance, at the onset of the Iraq invasion of Kuwait in August 1990, the GPT index spikes, but the GPA index does not. Most of the media coverage in August 1990 was about the possibility of the United States entering the conflict. Hence, through the lens of our indexes, August 1990 would be a month characterized by a large threat shock. The empirical analysis accounts for events that might not be fully captured by the GPA index by including various controls, such as oil prices.

for major financial investors, corporations, and policy-makers.

To validate the idea that the GPR index could be a useful gauge of investor sentiment, we use disaggregated data. In particular, we construct a firm-specific measure of GPR from their earnings calls. Following [Hassan, Hollander, van Lent, and Tahoun \(2019\)](#), we perform text analysis on 135,000 transcripts of quarterly earnings calls of firms listed in U.S. stock markets for the sample 2005-2018, and construct a firm-quarter variable that counts mentions of geopolitical risks in the earnings call. Specifically, we count the joint occurrences of “risk” words within ten words of “geopolitical” words, and normalize the number of occurrences by the total number of words in the transcript. For instance, if a firm’s earnings call reads like “We have been *worried* because of the *war*. Additionally, we have scaled back our investment plans because of **concerns** about **war-related** sanctions,” its firm-specific geopolitical risk index will equal $\frac{2}{22}$, where two are the instances of mentions, and 22 are the total words in the transcript.¹⁴

Figure 5 plots the GPR index alongside the index obtained by counting the number of earnings calls transcripts that discuss concerns about geopolitical risk. From 2005, the first year for which transcripts are available, the correlation between the two indexes is about 0.65. This high correlation bolsters our confidence that firms’ and newspapers concerns about geopolitical events are well aligned. We return to firm-specific geopolitical risk when assessing the impact of geopolitical risks for firm investment in Section 5.

3.3 Industry Exposure to Geopolitical Risk

It is plausible that some industries—because of the nature of their business, their supply chains, or their geographic location—are disproportionately affected by aggregate geopolitical risks. For instance, petroleum companies may be particularly affected by geopolitical tensions in the Middle East, while transportation or entertainment companies may be highly exposed to risks of terrorist attacks. Thus, calculating industry exposure can provide additional validation of the GPR index.

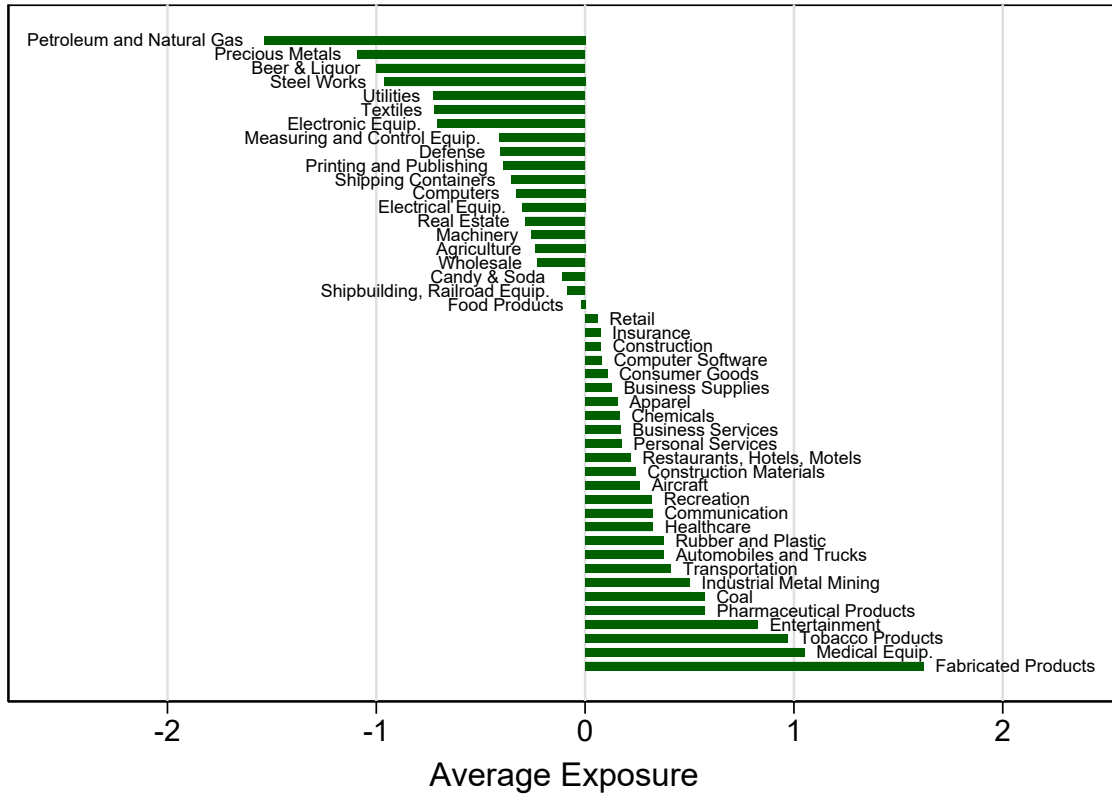
We measure industry exposure by regressing daily portfolio returns in the 49 industry groups of [Fama and French \(1997\)](#) on changes in the daily geopolitical threat index:

$$R_{k,s} = \alpha_k + \beta_k \Delta GPT_s + \gamma_k RM_s + \varepsilon_{k,s}, \quad (1)$$

where $R_{k,s}$ is the annualized daily excess return in industry k over the one-month T-bill rate,

¹⁴ See the Appendix for the complete details. The list of most common geopolitical words is: *war**, *military**, *terror**, *conflict**, *coup*, *embargo**. The list of uncertainty words is: *uncertain**, *risk**, *potential**, *danger**, *dubious*, *unclear*, *probl**, and *predict**.

Figure 6: EXPOSURE TO GPR BY INDUSTRY USING DAILY STOCK RETURNS



NOTE: Industry exposure to adverse geopolitical risk: average values from 1995 through 2018, standardized to have zero mean and unit standard deviation. Higher values indicate a larger decline in industry daily stock returns after an increase in geopolitical risk.

ΔGPT_s is the change in daily geopolitical threat index, and RM_s is the market excess return over the one-month T-bill rate. We estimate equation (1) on a 10-year estimation sample, which we roll forward one quarter at the time. We use data from 1985 through 2018; this, we run the first regression over the sample 1985-1994, and we estimate quarterly betas from 1995Q1 through 2018Q4. The exposure measure, which we define as $\Lambda_{k,t}$, consists of the estimated beta coefficients lagged by one quarter, demeaned and with the sign changed so that positive values of $\Lambda_{k,t}$ indicate high exposure.

The rationale underlying this measure is that stock returns in sectors with positive exposure drop in response to spikes in the GPR index relative to the aggregate market, thus signaling that these sectors stand to lose, in relative terms, from periods of heightened geopolitical tensions. By contrast, industries with negative exposure tend to gain from geopolitical risks relative to the market. For instance, the return in the precious metals sector was +7.4 percent on September

17, 2001, the first trading day on the U.S. stock market after 9/11. By contrast, on the same day, returns in the transportation industry were -13 percent. This example underscores also the importance of using daily data: stock prices—a fast-moving variable—react quickly to news. Daily data also allow for a more granular taxonomy of geopolitical risks that—for episodes that do not dominate the news cycle for a prolonged period of time—is in part lost by aggregating data to lower frequencies.

Figure 6 plots the average exposure by industry. Precious metals, petroleum, and defense are among the industries negatively exposed to increases in geopolitical risk. Coal, recreation, and entertainment are among the industries with positive exposure. We return to this measure when assessing the impact of geopolitical risks for industry investment in Section 5.

Why Do Some Industries Respond More to Geopolitical Risk?

What determines industry exposure to aggregate geopolitical risks? To shed some light on this question, we read a sample of one hundred transcripts of earnings calls between firms and investors that discuss how (aggregate) geopolitical risks might impact firms' operations. There are two topics that summarize many of the discussions reported in the transcripts:

1. **Macroeconomic industry exposure.** Firms operating in highly cyclical sectors may be more vulnerable than others to geopolitical uncertainties, to the extent that these uncertainties weigh on aggregate demand. For instance, according to [Cendant Corporation \(2005\)](#): *Hurricanes, higher fuel prices and terrorism including the London bombings have taken their toll in varying degrees on our consumer travel businesses. Whether it is simply declining consumer confidence or an actual slowdown in the travel economy, it is too soon to tell. But the impact is the same, slower growth across our segments of the markets.*
2. **Negative demand effects for industries exposed to international markets.** Geopolitical tensions can reduce foreign demand for foreign-oriented firms.¹⁵ For instance, [Deere Company \(2014\)](#) company describes the impact of geopolitical tensions resulting from the Russian annexation of Crimea and the imposition of economic sanctions on Russia: *In the [former Soviet Union], declining economic growth and further tightening of credit availability continue to weigh on equipment sales. Notably, Western equipment manufacturers are being heavily impacted by geopolitical uncertainties.*

¹⁵ [Boutchkova, Doshi, Durnev, and Molchanov \(2012\)](#) provide empirical evidence that industries that are more dependent on trade exhibit greater return volatility when local political risks are higher.

A third channel of transmission that is not discussed in transcripts, but that has been emphasized in the literature, comes through **negative financial effects for highly levered firms**. [Gourio \(2013\)](#) highlights how leverage may amplify “disaster” risk shocks through financial friction, and to the extent that geopolitical uncertainties expose firms to the probability of large disaster risks, more levered industries could be more exposed, all else equal, to geopolitical risk.

To complement this anecdotal discussion, we construct three industry indicators meant to capture the three channels. Our indicator of macro exposure is the slope coefficient of a regression of industry investment on consumer confidence (*Expomacro*).¹⁶ Our indicator of international exposure is the ratio of industry exports to industry gross value added (*Openness*). Finally, the indicator of financial vulnerability is the ratio of debt to assets at the industry level (*Leverage*). We then regress the industry-level exposure measure on these three exposure variables. Such regression gives (standard errors are in parentheses):¹⁷

$$\Lambda_{k,t} = \underset{(0.096)}{0.203} \text{Expomacro}_k + \underset{(0.091)}{0.177} \text{Openness}_{k,t-4} + \underset{(0.074)}{0.234} \text{Leverage}_{k,t-4} \quad (2)$$

Exposure to macroeconomic conditions, trade openness, and leverage significantly explain industry exposure to geopolitical risk with the correct sign. However, the explanatory power is relatively small, with an adjusted R^2 of only 0.11. Overall, this simple regression suggests that the transmission of geopolitical risk is related to easily measurable and intuitive industry characteristics, but our industry exposure measure contains additional information that helps characterizing empirically the heterogeneous effects of geopolitical risk.

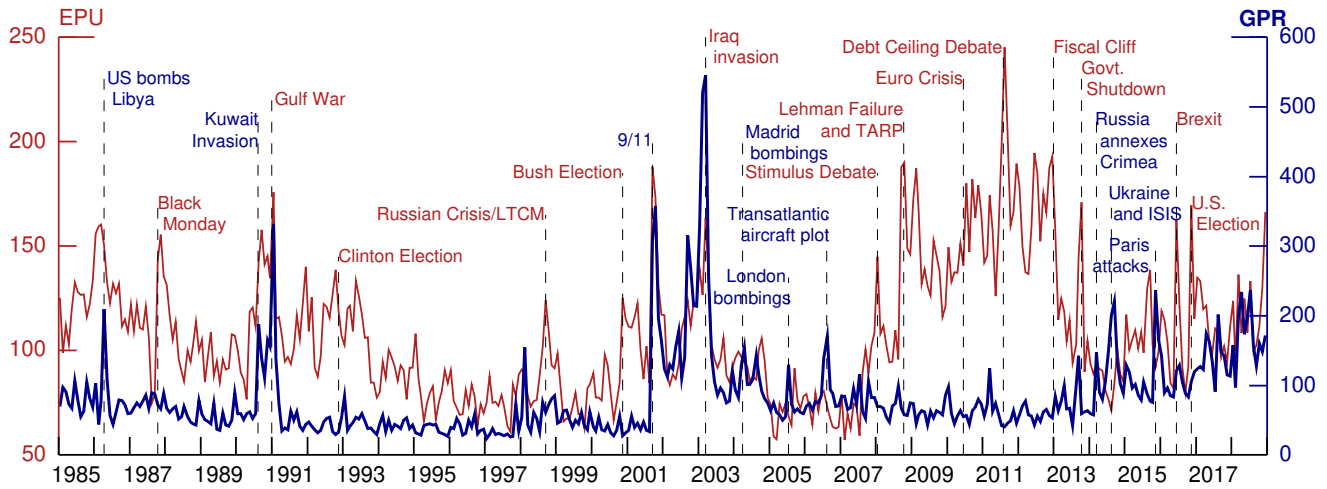
3.4 GPR Index and Economic Uncertainty

Figure 7 compares the benchmark GPR index with two popular measures of uncertainty: the VXO—a measure of stock market volatility—and the EPU index of [Baker, Bloom, and Davis \(2016\)](#). All indexes share two common spikes: in 1991, at the time of the Gulf War, and in 2001, after the 9/11 terrorist attacks. However, in both cases it seems plausible to argue that the correlation runs from geopolitical events to stock market volatility and policy uncertainty. Similarly, the 2003 U.S. invasion of Iraq seems to cause an increase in EPU, while it does not induce financial volatility.

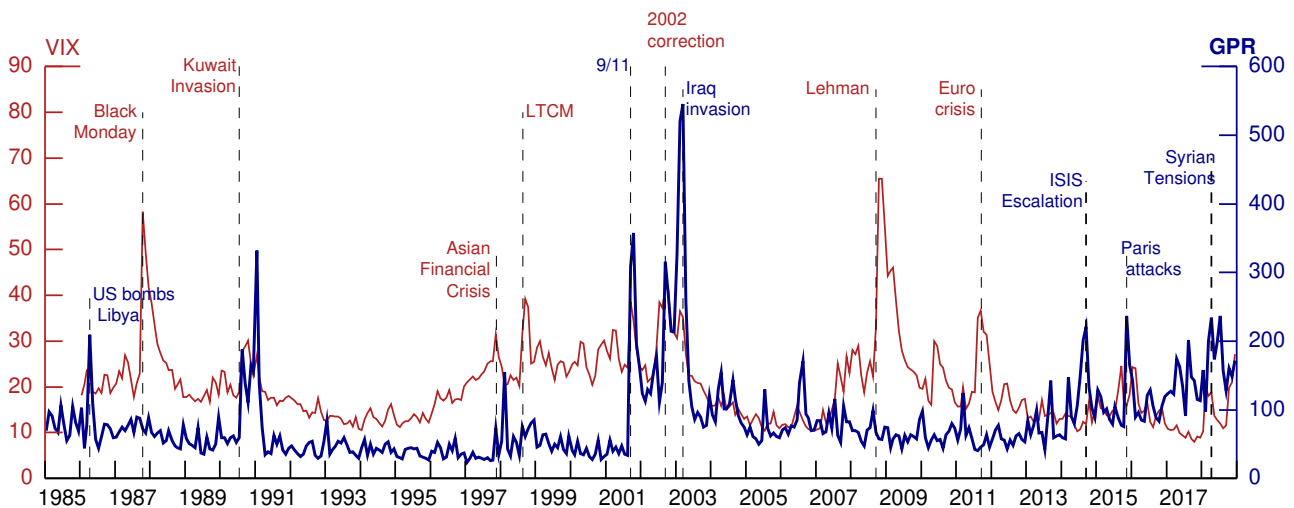
¹⁶ We use the Michigan survey 5-year ahead consumer confidence index, as used in [Barsky and Sims \(2012\)](#).

¹⁷ Macroeconomic exposure varies across industries but not over time, whereas trade openness and leverage vary both across industries and over time. The standard errors are clustered by industry and time. The Sample includes the Fama-French industries in the manufacturing sector (39 industries) and covers the period 2003Q4 through 2017Q4 due to limited data on trade openness. The number of observations is 2,089.

Figure 7: THE GEOPOLITICAL RISK INDEX AND OTHER MEASURES OF RISK



(a) Comparison to economic policy uncertainty



(b) Comparison to option-implied volatility

NOTE: This figure compares the GPR index with the economic policy uncertainty (EPU) constructed by [Baker, Bloom, and Davis \(2016\)](#) and with financial volatility as measured by the CBOE S&P 100 Volatility Index (VIX).

The three indexes also feature a large amount of independent variation. The GPR index does not move during periods of economic and financial distress, such as at the onset of the dot-com bubble and during the Global Financial Crisis, when both the VIX and the EPU index rise sharply and remain elevated. The GPR index also does not move around presidential elections, periods characterized by elevated policy uncertainty. By contrast, rises in the EPU index and VIX do not coincide with the Russian annexation of Crimea, the ISIS escalation in the Middle East, or

various terrorist events other than 9/11.

Summing up, compared to the VXO and the EPU index, the GPR index captures events that (i) are more likely to be exogenous to the business and financial cycles, and (ii) could give rise to heightened financial volatility and policy uncertainty. This comparison motivates the identification assumptions used in the structural VAR analysis described in the next section.

4 Geopolitical Risk and Aggregate Activity

In this section, we present our investigation of the relationship between geopolitical risk and aggregate economic activity in the United States. We first show the lack of association between the GPR index and lagged economic and financial indicators. We then explore the role of the GPR index in predicting near-term private investment. Finally, we estimate the broader effects of rising geopolitical risk on the U.S. economy using a structural VAR model.

4.1 Exogeneity of the GPR Index

We claim that the events captured by the GPR index have their roots in geopolitical dynamics that are unlikely to be caused by short-term economic developments in the United States. Thus, intuitively, the GPR index should be exogenous to the state of the U.S. economy. We provide statistical evidence of the exogeneity of the GPR index by running Granger-causality tests based on the following regression:

$$LGPR_t = \alpha + \sum_{i=1}^p \beta_i LGPR_{t-i} + \sum_{i=1}^p \Gamma'_{M,i} \mathbf{M}_{t-i} + \sum_{i=1}^p \Gamma'_{F,i} \mathbf{F}_{t-i} + \sum_{i=1}^p \Gamma'_{U,i} \mathbf{U}_{t-i} + \varepsilon_{LGPR,t}, \quad (3)$$

where $LGPR$ is the log benchmark GPR index; \mathbf{M} denotes a vector of macroeconomic variables; \mathbf{F} denotes a vector of financial variables; and \mathbf{U} denotes a vector of proxies for uncertainty. In our application, \mathbf{M} consists of the log-difference of U.S. industrial production, the log-difference of private employment, and the log of the WTI price of oil deflated by U.S. CPI; \mathbf{F} consists of the return on the S&P500 index and the 2-year Treasury yield; and \mathbf{U} includes the log the EPU index and the log of the VXO. We include in the regression a constant term and set $p = 3$.

Column (1) of Table 2 tabulates the results. The evidence is very clear. In line with the hypothesis that the geopolitical events captured by our index are not caused by economic developments, macroeconomic, financial and economic uncertainty developments do not Granger-cause

Table 2: Granger Causality Tests – Exogeneity of the GPR Indexes

| <i>Variables</i> | (1) | (2) | (3) |
|------------------|-----------------|-----------------|------------------|
| | LGPR | LGPA | LGPT |
| Macro | 1.18 [0.31] | 0.94 [0.49] | 1.38 [0.20] |
| Financial | 1.33 [0.24] | 0.82 [0.55] | 1.26 [0.28] |
| Uncertainty | 1.08 [0.38] | 0.72 [0.63] | 1.46 [0.19] |
| LGPR | 139.6 [0.00] | | |
| LGPA | | 27.67 [0.00] | 1.22 [0.30] |
| LGPT | | 3.21 [0.02] | 121.46 [0.00] |
| Adj. R^2 | 0.66 | 0.39 | 0.67 |

NOTE: The entries in the table are the test statistics and p-values (in parentheses) for the joint hypothesis that all lags of the variable included in a given group are equal to zero.

the GPR index. Columns (2) and (3) show the results of the Granger causality tests when we replace LGPR on the left-hand-side of equation (3) with the log of the geopolitical acts (LGPA) and geopolitical threats (LGPT) indexes, respectively. Both regressions include lags of both LGPA and LGPT as independent variables. As for the baseline GPR index, we do not find any significant impact of macroeconomic, financial, and uncertainty variables on the GPA and GPT indexes. However, we find that geopolitical threats predict geopolitical acts, suggesting that the threat index could contain signals about future geopolitical developments. By contrast, geopolitical acts do not Granger-cause geopolitical threats.

4.2 Forecasting Regressions: Effects on Private Investment

We start by exploring the role of geopolitical risk as predictor of near-term aggregate investment using simple univariate specifications. Specifically, we estimate the following forecasting regression:

$$\Delta BFI_{t+h} = \alpha + \beta_h \varepsilon_{t, LGPR}^Q + \sum_{i=1}^p \Gamma_{t-i} \mathbf{X}_{t-i} + \nu_{t+h}, \quad (4)$$

Table 3: Forecasting Regressions – Investment and Geopolitical Risk

| <i>Business Fixed Investment</i> (ΔBFI_{t+h}) | (1) $h = 1$ | (2) | (3) $h = 2$ | (4) | (5) $h = 4$ | (6) |
|---|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|
| $\varepsilon_{LGPR,t}^Q$ | -0.97 [2.84] | | -1.27 [2.86] | | -1.81 [2.89] | |
| $\varepsilon_{LGPA,t}^Q$ | | -0.48 [1.34] | | -0.46 [0.72] | | -0.02 [0.02] |
| $\varepsilon_{LGPT,t}^Q$ | | -0.79 [2.28] | | -0.99 [2.27] | | -1.64 [2.49] |

NOTE: The entries in the table are the regression coefficients and t-statistics (in parentheses) for the forecasting regressions described by Equation (4).

where ΔBFI_{t+h} denotes the log-difference of business fixed investment (BFI) between quarter t and $t + h$; $\varepsilon_{LGPR,t}^Q$ is the quarterly average of the residuals from the monthly regression described in equation (3); and \mathbf{X}_t denotes a set of controls that includes two lags of BFI, of the log EPU, and of the log-difference of private sector employment.¹⁸

The first row of Table 3 reports the response of BFI to a two-standard-deviations shock to the GPR index. The size of the shock reflects the average innovation in the index following the nine episodes of largest increases in the GPR index.¹⁹ The GPR index is informative about the near-term trajectory of investment, which drops by nearly 2 percent four quarters after the shock.

The second and third row of Table 3 break down the response of BFI between shocks to geopolitical acts and geopolitical threats. Geopolitical acts do not have statistically significant impact on investment; by contrast, geopolitical threats predict an economically and statistically significant decline in investment. Thus, the forecasting power of the GPR index is mostly driven by threats of adverse geopolitical events rather than their realization.

4.3 Structural VAR Analysis: Broader Economic Effects

We examine the broader macroeconomic consequences of innovations to geopolitical risk using a structural VAR model. Our main VAR specification—which we estimate using quarterly data from 1985 through 2018—consists of eight variables: (1) the log GPR index; (2) the log EPU index

¹⁸ We include controls to account for the different frequency of equation (1), run using monthly data, and equation (2), run using quarterly data. A regression that replaces $\bar{\varepsilon}_{t, LGPR}$ with $LGPR$ at quarterly frequency—which also avoids the use of generated regressor—delivers similar results.

¹⁹ These episodes are the U.S. bombing of Libya in 1986, the Kuwait Invasion, the Gulf War, the 1998 Iraq Disarmament Crisis, 9/11, the risk of Iraq invasion in September 2002, the 2005 London bombings, the Russian annexation of Crimea, and the 2015 Paris terrorist attacks.

of Baker, Bloom, and Davis (2016); (3) the log of the Standard and Poor’s 500 index; (4) the log consumer sentiment from the University of Michigan Survey of Consumers; (5) the log real business fixed investment; (6) the log of payroll employment (total private industries); (7) the log of the West Texas Intermediate price of oil; (8) the yield on two-year U.S. Treasuries.²⁰ All VAR models presented in the paper are estimated using Bayesian techniques. We impose a Normal-Wishart prior on the reduced-form VAR parameters. The resulting specification is estimated using a constant and one lag of the endogenous variables.²¹

We identify the structural shocks by using a Cholesky decomposition of the covariance matrix of the VAR reduced-form residuals, ordering the GPR index first. The ordering implies that any contemporaneous correlation between the macro variables and the GPR index reflects the effect of the GPR index on the macro variables, rather than the other way around. The characteristics of the GPR index discussed in Section 2—as well as the lack of predictability of the GPR index shown in Section 4.3—lend support to this assumption. Nonetheless, we also explore robustness to alternative identification assumptions and VAR specifications.

The solid lines in Figure 8 show the median impulse responses to an exogenous two-standard-deviations increase in the GPR index. As mentioned in the previous section, the size of the shock reflects the average innovation in the index following the nine episodes of largest increases in the GPR index. A shock to geopolitical risk leads to a persistent rise in the GPR index, which remains elevated for nearly two years. High geopolitical risk leads to a short-lived increase in the EPU index and a decline in consumer sentiment. Intuitively, geopolitical risk can induce some economic policy uncertainty on items such as national security and the fiscal budget and negatively weigh on consumer sentiment. The response of the stock market is economically and statistically significant, with stock prices dropping about 2.5 percent two quarters after the shock.

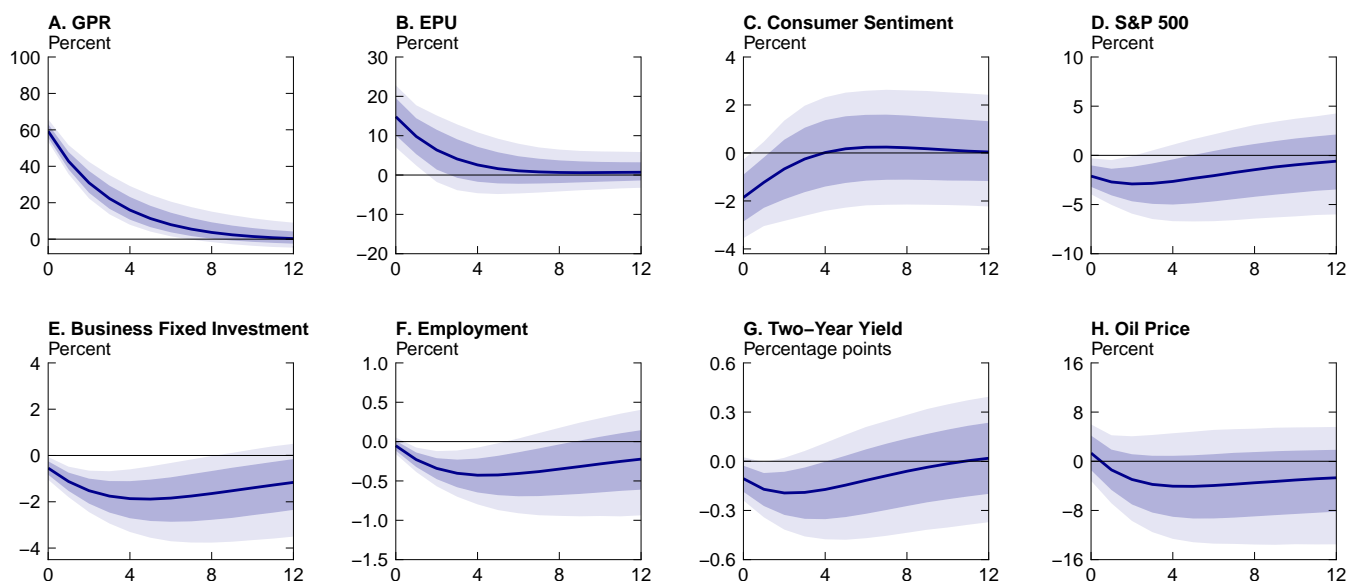
On the real side, private investment gradually declines, bottoming out at negative 1.7 percent after about a year, before reverting back to trend. The deterioration in labor market conditions is moderate, with payroll employment reaching a trough of negative 0.4 percent a year after the shock. The economically significant decline in investment and employment following a GPR shock is consistent with models of investment under uncertainty à la Dixit and Pindyck (1994). Of note, the decline in stock prices is slightly larger than that of investment, thus suggesting that risk premia rise, albeit only to a limited extent.²²

²⁰ The stock market index and the price of oil are expressed in real terms dividing by the U.S. Consumer Price Index for All Urban Consumers; the series for the stock market, investment, and employment are linearly detrended.

²¹ We use the weak prior in Uhlig (2005). All the results reported in the paper are based on 20,000 draws from the posterior distribution of the structural parameters, where the first 4,000 draws were used as a burn-in period.

²² Muir (2017) finds that risk premia only rise modestly in the aftermath of wars.

Figure 8: THE MACROECONOMIC IMPACT OF INCREASED GEOPOLITICAL RISK



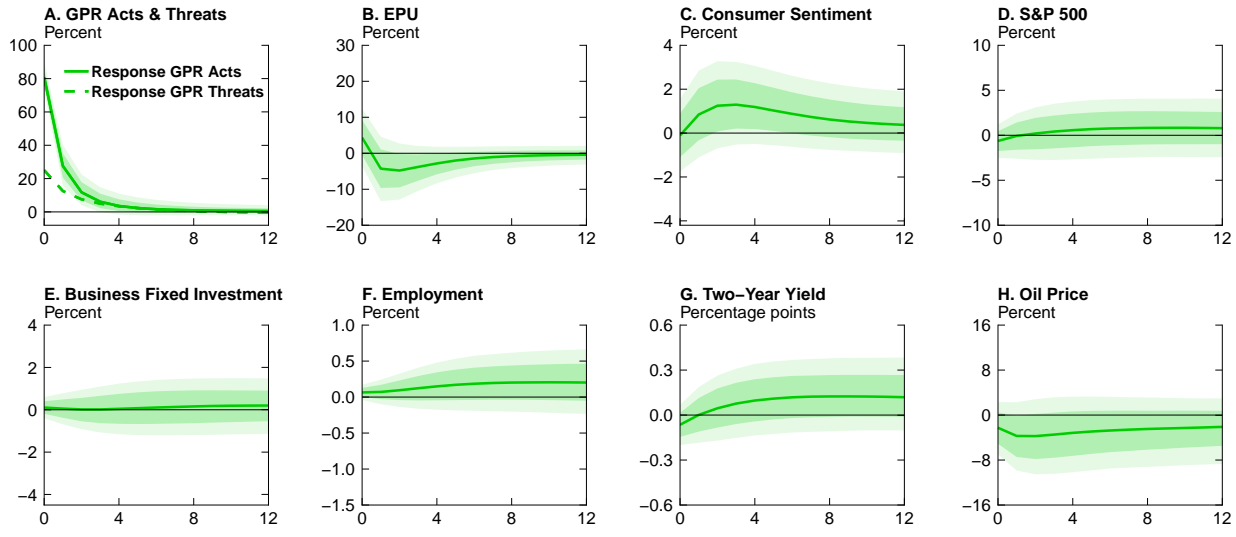
NOTE: The black solid line in each panel depicts the median impulse response of the specified variable to a two-standard-deviations increase in the GPR index. The dark and light shaded bands represent the 68 and 90 percent pointwise credible sets, respectively. The horizontal axis measures quarters since the shock.

The yield on two-year Treasuries declines by about 20 basis points, indicating both a worsening of the macroeconomic outlook and a loosening of the monetary policy stance. Finally, the increase in the GPR leads only to a modest, short-lived increase in oil prices. This result stands in contrast with the conventionally held view that higher geopolitical risk drives up oil prices persistently—a view that might reflect a selective memory that confounds all geopolitical tensions with oil supply shocks driven by geopolitical tensions in the Middle East.

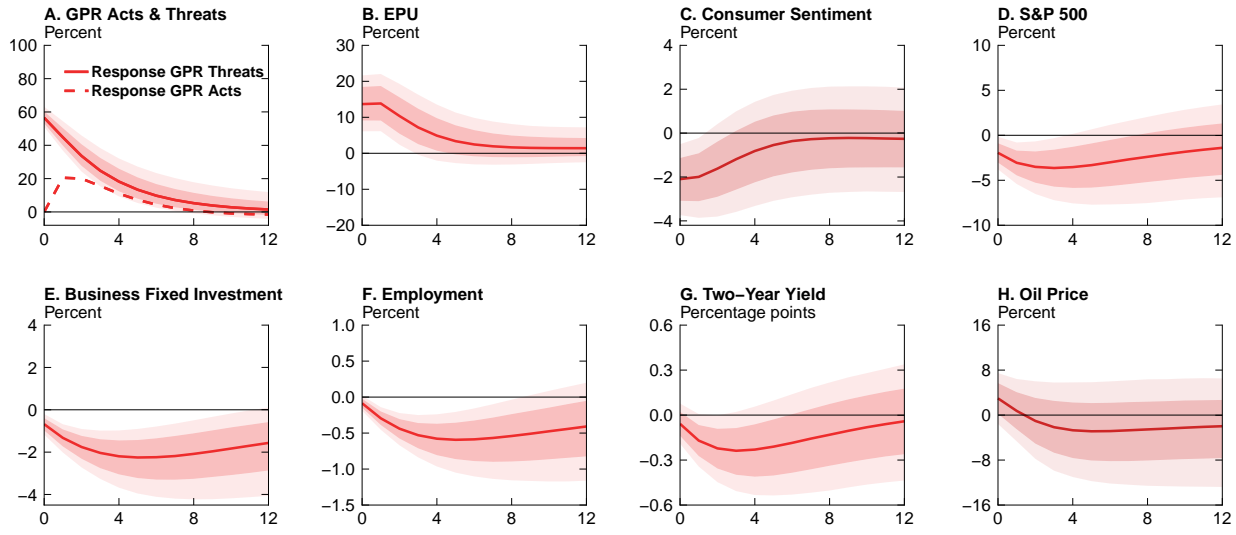
Threats versus Acts

Next, we evaluate the difference between innovations in the two broad components of the GPR index, the GPA—geopolitical acts—index and the GPT—geopolitical threats—index, by replacing the GPR index with the GPA and GPT indexes in the benchmark VAR. To achieve identification, we use a Cholesky ordering, with the GPA index ordered first and the GPT index ordered second. We interpret the first shock—the GPA shock—as the realization of some adverse geopolitical events that could induce a contemporaneous increase in geopolitical threats; we interpret the second shock—the GPT shock—as capturing geopolitical threats that are not contemporaneously associated with geopolitical acts, such as tensions building up before wars or after terrorist attacks.

Figure 9: THE IMPACT OF INCREASED GEOPOLITICAL RISK: ACTS VS. THREATS



(a) Impulse Responses to a GPA shock

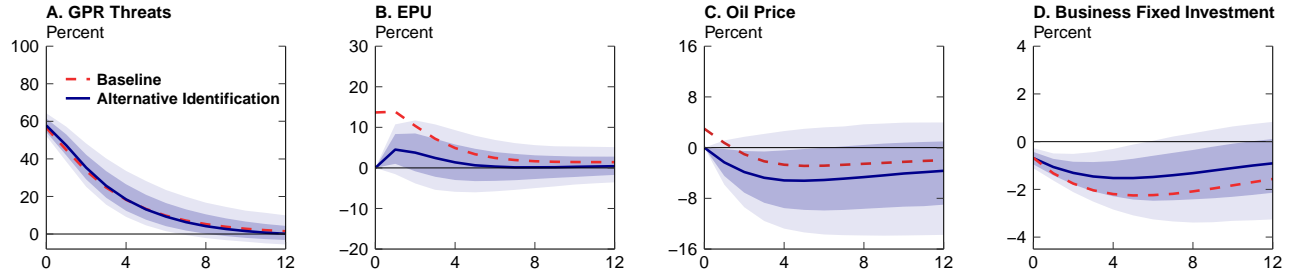


(b) Impulse Responses to a GPT shock

NOTE: The green (red) line in each panel depicts the median impulse response of the specified variable to a two-standard-deviations increase in the GPA (GPT) index. The dark and light shaded bands represent the 68 and 90 percent pointwise credible sets, respectively. The horizontal axis measures quarters since the shock.

The impulse responses to the GPA and GPT shocks are shown in Figure 9. The impulse responses clearly show that the GPA and GPT shocks produce different effects on the U.S. economy. A shock to GPA has small economic and financial consequences, with a positive median response of employment, the interest rate, and the level of the stock market. By contrast, a shock to the GPT index induces large and protracted recessionary effects, as well as a decline in stock

Figure 10: GEOPOLITICAL THREATS - ALTERNATIVE IDENTIFICATION



NOTE: The black solid line in each panel depicts the median impulse response of the specified variable to a two-standard-deviations increase in the GPR index. The dark and light shaded bands represent the 68 and 90 percent pointwise credible sets, respectively. The horizontal axis measures quarters since the shock.

prices. Incidentally, the response of the stock market lends support to the old idea, attributed to London financier Nathan Rothschild, that one should buy stocks “on cannons,” and sell them “on trumpets.”

The timing of the resolution of uncertainty and risk associated with these shocks could explain the different effects of GPA and GPT. GPA shocks induce an initial increase in the GPT and EPU indexes, followed by a period of below-average EPU and consumer sentiment that lasts for nearly two years. By contrast, threat shocks depress asset prices and economic activity because they lead to a protracted increase in uncertainty and send signals about future adverse events.²³ The finding that the threats of adverse events has large economic effects while their realization appears to have only modest economic consequences supports the findings of theoretical models where agents form expectations using a worst case probability, as in [Ilut and Schneider \(2014\)](#), or models where the threat of adverse events leads agents to reassess macroeconomic tail risks, as in [Kozlowski, Veldkamp, and Venkateswaran \(2018\)](#). Of course, it is important to note that this statement is confined to the time period and the country—the United States—that we analyze. With the notable exception of 9/11, the most adverse geopolitical events in our sample did not directly hit the U.S. soil. By contrast, it is well-known that countries experiencing adverse geopolitical events—wars in particular—on their soil experience large drops in economic activity, as documented for instance by [Barro \(2006\)](#) and [Glick and Taylor \(2010\)](#).

An important question is whether shocks to the GPR isolate novel sources of business cycle fluctuations or capture a convolution of shocks already studied in the literature. Two natural candidates are shocks to the EPU index and oil shocks. For instance, the EPU index and oil prices

²³ See [Pastor and Veronesi \(2013\)](#) for a model of political uncertainty and risk premia.

increase on impact following a shock to the threat component of the GPR. Accordingly, geopolitical shocks may capture the primitive impulse otherwise captured by EPU shocks—uncertainty about fiscal consequences of a conflict—and oil shocks—mostly oil price increases associated with tensions in the Middle East. Figure 10 plots the response of selected variables to a geopolitical threat shock under the baseline identification—that orders GPT second after GPA—and an alternative identification that orders GPT fourth after GPA, the EPU index, and oil prices. Absent an impact effect on EPU and on oil prices, shocks to geopolitical threats lead to an overall decline in investment of 1.7 percent, an effect that is about 0.5 percentage point smaller than under the baseline identification. Such result hints that higher EPU and higher oil prices explain part of the transmission of geopolitical risk to the real economy, and that GPR shocks are not simply a mix of EPU and oil shocks. Accordingly, the GPR contains independent, additional information for predicting economic activity.

5 Geopolitical Risk and Firm-Level Investment

The analysis in the previous section shows that elevated geopolitical risks weigh down on aggregate business investment. In this section, we provide additional evidence on the effects of geopolitical risk using disaggregated data at the firm and industry level. There are two questions that we are interested in. First, do firms in industries more exposed to aggregate geopolitical risks experience a larger decline in investment? Second, are there idiosyncratic geopolitical events that drive fluctuations in investment at the firm level?

5.1 Conceptual Framework

We decompose “firm-level” geopolitical risk into three components:

$$GPR_{i,t} = GPR_t + GPR_t \Lambda_{k,t} + Z_{i,t} \tag{5}$$

where the subscript i denotes a firm and the subscript k denotes an industry. The first component in equation (5) is aggregate GPR, and is by definition common across firms in each period. The second component interacts aggregate GPR with industry exposure $\Lambda_{k,t}$, capturing the idea discussed in Section 3.3 that some industries may be disproportionately affected by aggregate geopolitical risks. The third component, $Z_{i,t}$, is idiosyncratic, and isolates firm-level geopolitical risks that are not reflected at the aggregate and industry levels. For instance, a company might face elevated geopolitical risks because it operates in countries whose events are not reflected in the

aggregate measure and in industry exposure—for instance, an oil company operating in Gabon. Alternatively, a company could have unique and time-varying exposure—because of its location, political connections, trade exposure, or risk-management strategies—to aggregate geopolitical events.

In what follows, we quantify the effect on investment of geopolitical risk in the cross-section of industries and at the level of individual firms. The analysis relies on firm-level investment from Compustat, a panel of firms publicly listed in the United States. We measure investment as the ratio of capital expenditures to previous period property, plant, and equipment, and denote it by ik . We use Compustat data to construct firms’ cash flows and Tobin’s Q—two standard investment predictors.²⁴

5.2 Industry Effects of Geopolitical Risk

To measure the industry effect of geopolitical risk, we regress firm investment at various horizons against geopolitical risk interacted with the industry exposure measure constructed in Section 3.3. This strategy follows the local projection approach developed by Jorda (2005), with the difference that we exploit variation both in the time-series and in the cross-section of the dependent and independent variables. More precisely, we estimate the following specification:

$$\log ik_{i,t+h} - \log ik_{i,t-1} = \alpha_{i,h} + \alpha_{t,h} + \beta_h (GPR_t \Lambda_{k,t}) + \mathbf{d}_h \mathbf{X}_{i,t} + \varepsilon_{i,t+h} \quad (6)$$

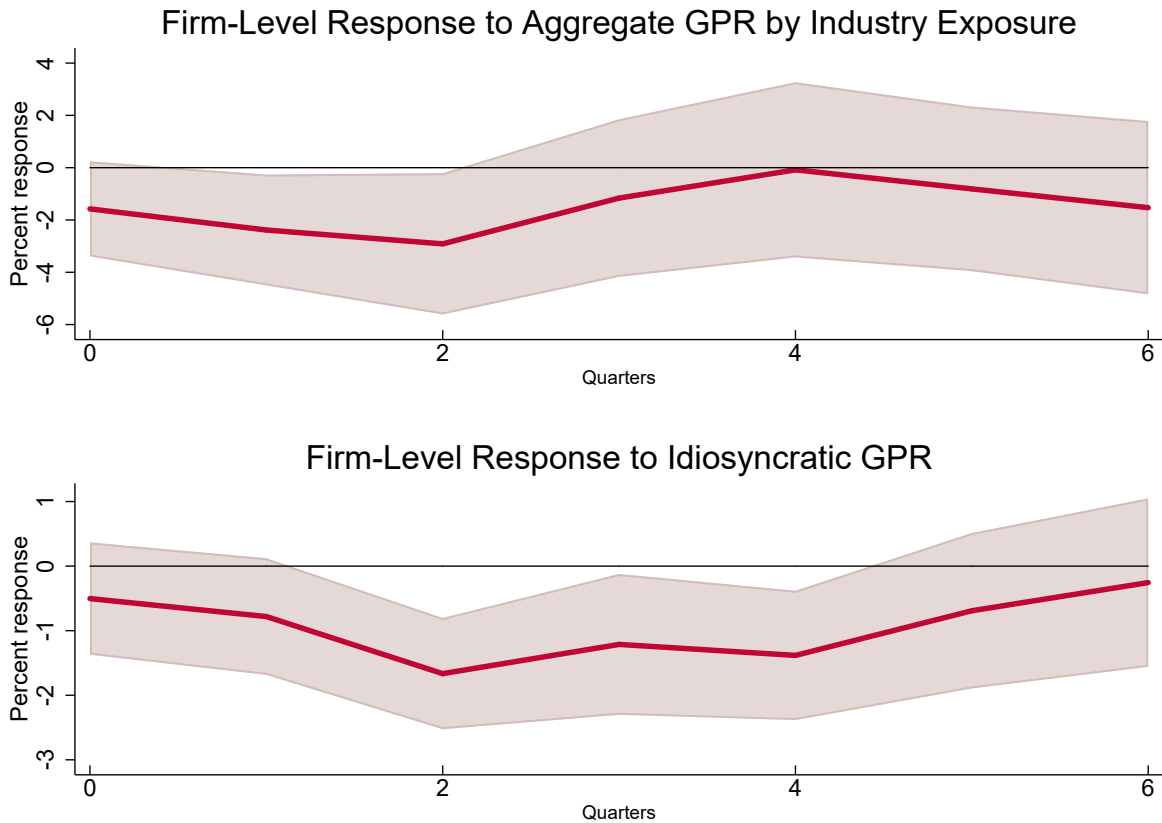
where $h \geq 0$ indexes current and future quarters. The goal is to estimate—equation-by-equation for each horizon h —the sequence of regression coefficients β_h associated with the interaction between aggregate geopolitical risk and industry exposure. In the equation above, α_i and α_t denote firm fixed effects and time effects, respectively, whereas $\mathbf{X}_{i,t}$ denotes control variables, namely firm-level cash flows, firm-level Tobin’s Q, $\log ik_{i,t-1}$, the industry exposure $\Lambda_{k,t}$, and the lagged value of $GPR_t \Lambda_{k,t}$.²⁵ The sample runs from 1995Q1 through 2018Q4 and is constrained by the availability of the exposure measure.

The top panel of Figure 11 shows the differential response of firm-level investment to a two-standard deviation aggregate GPR shock, for a firm belonging to an industry with high exposure to GPR—one standard deviation above average. In the four quarters after the shock, such a firm

²⁴ Following Gulen and Ion (2015), we measure Tobin’s Q as the market value of equity plus the book value of assets minus book value of equity plus deferred taxes, all divided by the book value of assets. We normalize cash flows by beginning of period assets.

²⁵ The lagged value of $GPR_t \Lambda_{k,t}$ is a convenient way to control for the past effects of changes in geopolitical risk when we construct the local projection.

Figure 11: RESPONSE OF FIRM-LEVEL INVESTMENT TO GEOPOLITICAL RISK



NOTE: The top panel plots the dynamic response of investment following a two-standard deviation increase in aggregate GPR for a firm in an industry with exposure one-standard deviation above the mean. The bottom panel plots the dynamic response of investment following a two-standard deviation increase in idiosyncratic GPR. The shaded areas denote 90 percent confidence intervals. Standard errors are two-way clustered by firm and quarter.

experiences a differential decline in investment that is about 2 percentage points larger than the average decline. Recall that in the estimated VAR shown in Figure 8 average investment drops 1.8 percent in the first year. Thus, in response to an aggregate GPR shock, a firm with high exposure to geopolitical risk reduces its investment by 3.8 percent, the sum of the 1.8 percent aggregate effect and the 2 percent differential effect. By contrast, a firm with low exposure to geopolitical risk—say, one standard deviation below mean—does not reduce its investment. All told, our results suggest that the negative effects of a typical spike in geopolitical risk on the investment rate vary significantly depending on the industry of operation.

5.3 Firm-Specific Geopolitical Risk and Investment Dynamics

To measure the effects of firm-specific geopolitical risk on firm-level investment, we estimate:

$$\log ik_{i,t+h} - \log ik_{i,t-1} = \alpha_{i,h} + \alpha_{k,t,h} + \gamma_h Z_{i,t} + \mathbf{d}_h \mathbf{X}_{i,t} + \varepsilon_{i,t+h}. \quad (7)$$

The goal is to estimate—equation-by-equation, at horizon $h \geq 0$ —the coefficient γ_h , which measures the dynamic effect on investment of changes in firm-level geopolitical risk. The regression includes firm fixed effects (α_i) and sector-by-quarter dummies ($\alpha_{k,t}$). The sector-by-quarter dummies control for industry-specific drivers of investment. Firm-control variables $\mathbf{X}_{i,t}$ include firm-level cash flows, firm-level Tobin’s Q, $\log ik_{i,t-1}$, and the lagged value of $Z_{i,t}$.

The sample runs from 2005Q1 through 2018Q4 and is dictated by the availability of the idiosyncratic GPR measure $Z_{i,t}$, which is constructed—as discussed in Section 3.2—by counting mentions of geopolitical risks in the text of the earnings calls. Mentions of geopolitical risks in the earnings represent a proxy for $GPR_{i,t}$, as the typical earnings call of a firm also contains references to aggregate and industry-specific geopolitical risks. We absorb the aggregate and industry-specific components by including in equation (7) sector-by-quarter dummies. Accordingly, the coefficient γ_h measures the response of investment to idiosyncratic geopolitical risks.

The bottom panel of Figure 11 plots the response of firm-level investment after an increase in firm-level GPR of two standard deviations. As shown in the figure, firms gradually reduce their investment over the next two quarters, with investment declining nearly 2 percent at the trough, and remaining significantly below the baseline for up to one year. These effects are as large—similar in magnitude, but more protracted over time—as the effects that one finds using a broad-based measure of political—not geopolitical—risk.²⁶

Overall, geopolitical risks have heterogeneous effects on firm investment, depending on the industry of operation and on firm-specific risks. These effects are significant, economically meaningful, and persistent over time.

²⁶ Hassan, Hollander, van Lent, and Tahoun (2019) study the *contemporaneous* response of firm-level investment to changes in firm-level political risk, a broad concept encompassing concerns for instance about the government budget, health care, trade, and national security. Figure A.14 in the Appendix shows the response of investment when we replace our idiosyncratic GPR variable with their firm-level political risk measure. On impact, the effect of geopolitical risks is smaller than that of political risk: investment drops about 0.5 percent following an increase in GPR, while it drops 1.5 percent following an increase in political risk. Yet the effects of geopolitical risks build up over time, and reduce investment persistently and by as much as political risk after about one year.

6 Conclusions

We construct an index of geopolitical risk and examine its evolution and its effects over time. This index captures an important dimension of uncertainty: the risk of events that disrupt the normal, democratic, and peaceful course of relations across states, populations, and territories. Compared to existing proxies for macroeconomic uncertainty, we argue that our index can be used to isolate risks—such as risks of wars and terrorist attacks—that are more likely to be exogenous to economic developments in the United States at business cycle frequency. A detailed audit and a comparison with existing proxies confirm that the GPR index accurately captures the timing and the intensity of heightened geopolitical risk. Moreover, spikes in the GPR—both at monthly and a daily frequency—correctly point to well-known historical episodes of rising tensions.

Our results indicate that exogenous changes in geopolitical risks depress economic activity and stock returns in the United States. In particular, we find that U.S. business fixed investment drops in response to aggregate geopolitical risks, a finding corroborated using firm-level investment data and an indicator of idiosyncratic geopolitical risk. Importantly, these adverse effects are sparked by heightened threats of adverse geopolitical events, rather than their realization. Thus, our findings provide support for theories where expectations about future negative events—such as models of ambiguity aversion or disaster risks—and changes in macroeconomic uncertainty can drive the business and financial cycles.

The GPR index captures a large and diverse set of events and weighs them by the intensity of the coverage they receive in English-speaking newspapers, thus reflecting the public perception about events as covered by the press, especially in the United States. We have shown in the paper that news-based and firm-based measures of geopolitical risks are closely aligned, and that increases in both measures exert a drag on investment, thus bolstering our confidence in using the news-based aggregate indicator.

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Appendix

A Details on the Construction of the GPR Index

A.1 Construction of the Index

The geopolitical risk (GPR) index is constructed by running a search query in the ProQuest *Boston Globe* (1/1/1985); *Chicago Tribune* (1/1/1985); *The Daily Telegraph* (4/1/1991); *Financial Times* (5/31/1996); *The Newsstand Database*. We search the archives of the following newspapers (start date availability in parentheses): *Globe and Mail* (1/1/1985); *The Guardian* (8/18/1992); *Los Angeles Times* (1/1/1985); *The New York Times* (1/1/1985); *The Times* (4/18/1992); *The Wall Street Journal* (1/1/1985); and the *Washington Post* (1/1/1985).

Newspaper-specific indexes are shown in Figure A.1, expressed as a share of news articles for each of the newspapers.²⁷ As the top left panel shows, coverage of geopolitical risks aligns with the benchmark GPR index for the three general interest newspapers that we use in the construction of the historical index. As the top right panel shows, coverage of geopolitical risks is slightly higher than the average for the two business newspapers in the sample, *The Wall Street Journal* and the *Financial Times*. Coverage also lines up with the average for the two U.S. newspapers not included in the historical index (bottom left panel). Coverage of geopolitical events by non-U.S. general interest newspapers lines up with the average, but is slightly more volatile (bottom right panel).

We report the exact search query in Figure A.2.

Figure A.3 elaborates on the contribution of each search category of the index. Nuclear threats are disproportionately more important prior to the end of the Cold War and gradually subside after 1989. By contrast, terror threats trend higher over the sample period, spiking after 9/11, and remaining at elevated levels ever since. While “war threats” and “war acts” appear to move somewhat in sync throughout the sample, mentions of “terrorist threats” seem to increase proportionally relative to mentions of actual terrorist acts since 9/11.

Figure A.4 provides the newspapers’ front pages reporting on the news mentioned in the discussion of the daily index in Section 2.

Finally, Figure A.5 compares the human-generated GPR index against the baseline computer-generated GPR index. The correlation between the two series is 0.837.

A.2 Comparison with Broader and Narrower Measures

To evaluate how the choice of search terms impacts the construction of the index, we discuss three alternative specifications of the search terms. We plot the three resulting indexes in Figure A.6.

²⁷ The actual indexes are a simple normalization of the articles’ share.

The **broad index** is constructed by combining the search words in Table 1 with the 10 bi-grams that have the highest odds of belonging to \mathcal{E}^1 instead of \mathcal{E}^0 . While the resulting search criteria double the number of articles mentioning geopolitical risks, the broad index is highly correlated (0.92) with the benchmark one, suggesting that the index is robust to the exclusion of expressions that are likely to be associated with rising geopolitical tensions. The broad index exhibits a slightly lower correlation with the human index than the benchmark index does (0.82) when the data are aggregated at a quarterly frequency.

The **narrow index** excludes articles containing search terms that—in the human audit of the set \mathcal{E} —were often correlated with false positives. As before, we identify bi-grams that are more likely than not to appear in \mathcal{E}^0 . We then exclude from the index all the articles containing any of these bi-grams.²⁸ The resulting search reduces the number of articles mentioning geopolitical risks by approximately 15 percent, but the resulting index is virtually indistinguishable from the benchmark one (correlation 0.997), suggesting that the index is sufficiently robust to the inclusion of words that are likely to be associated with false positives. Like the broad index, the narrow index also exhibits a slightly lower correlation with the human index than the benchmark index does (0.76) when the data are aggregated at quarterly frequency.

Finally, the **simple index** economizes on search words and is close in spirit to the methodology of Baker, Bloom, and Davis (2016). The simple index is based on articles that, instead of belonging to any of the six potential search categories, contain at least one word from each of two sets of terms: the set \mathcal{S}_1 , including {war OR military OR terrorism OR geopolitical}, and the set \mathcal{S}_2 , containing {risk* OR concern* OR tension* OR uncertain* OR threat*}. The correlation between the benchmark index and the simple GPR index is sizable, at 0.89. Although the principle of parsimony would make this index appealing (in particular, this index has the same quarterly correlation with the human index, at 0.84), we prefer the benchmark index because, among other things, it showed a lower error rate in pilot audits, and because it affords a natural decomposition into several search subcategories that is not afforded by the simple index.

A.3 Media Attention and Political Slant

The use of press coverage has the potential to induce fluctuations in the GPR index even if the underlying geopolitical risk factors remain constant, due to either changes in geopolitical-related risk aversion of the public or to state-dependent bias in news coverage. For example, the high levels of the index in the years following 9/11 may reflect public fear towards geopolitical tensions more than actual risk. Additionally, geopolitical issues may receive more or less coverage in the news depending on the attention of the press to other newsworthy events. Finally, the use of war

²⁸ Our benchmark index already excludes expressions that in our first audit were often associated with false positives, like “civil war” and “human rights”, as well as words like movie, museum, anniversary, memorial and art. The additional bigrams that exclude an article from the count in the narrow index are “air force,” “death penalty,” “national guard,” “supreme court,” “justice department,” “enemy combatant,” “military commission,” “military tribunal,” “military civilian,” “military loss,” “defense department,” “chief of staff,” “law enforcement,” and “war crime.” These bigrams were found to have odds of belonging to set \mathcal{E}^1 instead of set \mathcal{E}^0 of less than 40 percent.

and terrorism-related words may reflect the issues that a newspaper likes to report on, rather than objective geopolitical risks.

Figure A.7 allays some of these concerns about measurement error and bias in the construction of our index. In the top panel, we show that unpredictable newsworthy events do not crowd out media coverage of geopolitical risk. We do so by highlighting the time-series comovement between the GPR index and an alternative index constructed using media mentions of words related to natural disasters. The largest spikes in the “Natural Disasters Index” correspond to well-known events that are hard to predict and that attract significant media attention.²⁹ On average, one in 70 newspaper articles mentions words related to natural disasters, a ratio that is about three times higher than the ratio of articles mentioning geopolitical risks. If media coverage of geopolitical risk were to systematically vary in response to natural disasters, one could find a (negative) correlation between the GPR and the natural disasters indexes, and argue there is a quantitative difference between objective geopolitical risks on the one hand, and media attention towards geopolitical risks on the other. However, there appears to be virtually no relationship at monthly frequency between the natural disasters index and our GPR index—their correlation coefficient is negative 0.02, and is not significantly different from zero.

The top panel of Figure A.8 confirms that the irrelevance of other newsworthy events still applies when we look at an index capturing newspapers’ attention towards recurring and predictable sport events, such as the Olympics or the Super Bowl. The correlation between the GPR index and the “Sport Events Index” is modest (0.07), thus suggesting that not just unpredictable events (like most natural disasters), but also predictable ones (like most sports events) hardly have a significant bearing on fluctuations in the geopolitical risk index.³⁰

Finally, the bottom panel of Figure A.8 addresses the potential for political slant to skew newspaper coverage of geopolitical risks. We split our 11 newspapers into six left-leaning and five right-leaning newspapers.³¹ The “left” and “right” versions of our GPR index move together closely, with a correlation of 0.94, suggesting that while different media outlets may vary the intensity with which they cover geopolitical events, the broad time-series properties of the index are robust to the political slant of newspapers.

A.4 Excluding Economics-Related Words

Because our interest as economists is to look at the economic effects of higher geopolitical risk, we need to guard against the possibility that words related to geopolitical tensions are more likely to

²⁹ The natural disasters index counts the share of articles mentioning “earthquakes,” “hurricanes,” “tornadoes,” “tsunamis,” or “wildfires.”

³⁰ Predictable or unpredictable news could themselves cause geopolitical tensions if agents engaging in military or terrorist acts want more or less publicity in the media following their actions. Durante and Zhuravskaya (2018) argue that Israeli attacks on Palestinians are more likely to occur when U.S. news on the following day are dominated by important predictable events. Jetter (2017) uses data on terrorist attacks in 201 countries to argue that increased coverage of *The New York Times* encourages further attacks in the same country.

³¹ The left-leaning newspapers are the *Boston Globe*, *The Globe and Mail*, *The Guardian*, *Los Angeles Times*, *The New York Times*, and the *Washington Post*. The right-leaning newspapers are *The Daily Telegraph*, *Chicago Tribune*, the *Financial Times*, the *Times*, and *The Wall Street Journal*.

be mechanically used during, say, recessions, even if recessions are caused by geopolitical tensions. To address this concern, we construct a version of the GPR index that excludes the search terms “economy” OR “stock market*” OR “financial market*” OR “stock price*.” Figure A.9 plots the resulting index. Although 19 percent of articles in GPR are filtered out once this criterion is included, the resulting index is indistinguishable from the benchmark index (their correlation is 0.989). Additionally, the share of articles in the GPR index mentioning economic words is uncorrelated with real outcomes: for instance, the correlation between the GPR index and the monthly change in log industrial production is 0.03.

A.5 Relation to Alternative Proxies for Geopolitical Risks

Several studies have constructed quantitative proxies of war intensity or terrorism-related events. One widely used source is the International Crisis Behavior (ICB) database, which provides detailed information on 476 major international crises that occurred during the period from 1918 to 2015. This database has been used in the political science literature as well as in studies on war and economics. One example is the work by [Berkman, Jacobsen, and Lee \(2011\)](#), who use the ICB database to construct a proxy for time-varying rare disaster risk.³² The proxy, which counts the number of international crises per month, is plotted alongside the GPR index in the top panel of Figure A.10. The ICB crisis index and the GPR index display some degree of comovement in various historical periods, such as the aftermath of World War I, the Cold War in the early 1960s and late 1970s, the Gulf War, and the Iraq War. But there are also some remarkable differences, such as during World War II, when the ICB crisis index is remarkably low, or during the mid-1990s, when the ICB crisis index is higher than the GPR index. Some differences are due to the different nature of the indexes—the ICB index counts international crises, including those that might receive little press coverage. Moreover, the GPR index displays substantially more high-frequency variation—a feature that, as we show in Section 5, allows us to establish the importance of GPR for stock returns over relatively short samples.

The second panel of Figure A.10 compares our index to two alternative indicators that offer a different perspective on the threats coming from geopolitical risk. The two indicators are (1) deaths due to terrorism in the world, and (2) deaths due to terrorism in the United States and Europe combined. The latter are likely to receive more coverage in the English-speaking press.³³ Both series appear to be uninformative about overall movements in the GPR index. However, all indexes spike around 9/11, and the somewhat elevated level of the GPR index in 2015 and 2016 appear to reflect a rise in the worldwide number of deaths due to terrorism, alongside heightened media attention to conflicts in the Middle East.

The third panel of Figure A.10 compares the GPR index with the national security component

³² Measures of political or geopolitical risk offer an alternative to proxies of disaster risk based on economic indicators, such as those based on asset prices—[Watcher \(2013\)](#)—or consumption—[Barro and Ursúa \(2012\)](#).

³³ The data on terrorism-related deaths largely exclude wars, but the distinction appears mostly semantic as the dividing line between wars and terrorism has been blurred at least since 9/11. The data are from the Global Terrorism Database (GTD), which is an open-source database including information on terrorist events around the world.

of the economic policy uncertainty index (EPU) constructed by [Baker, Bloom, and Davis \(2016\)](#). Like our measure, the national security EPU spikes during the Gulf War, after 9/11, and during the Iraq War. However, the GPR index seems to better capture other spikes in geopolitical risk that are missed by the national security EPU. The correlation between the two measures is 0.69, a plausible value because the national security component of the EPU captures uncertainty about policy responses to events associated with national security (of which geopolitical events are a subset), which is not the same concept as the uncertainty generated by geopolitical events.³⁴

Finally, the bottom panel of [Figure A.10](#) compares the GPR index with an outside measure of political risk related to wars, the U.S. External Conflict Rating (ECR) constructed by the International Country Risk Guide (ICRG). The ratings constructed by the ICRG are largely subjective, as they are based on the insights of various analysts following developments in a particular country or region. The ECR measure moves only occasionally over the sample, changing on average once a year, with more pronounced movements and more frequent changes around 9/11, when both the GPR index and ICRG index spike. The correlation between the two series is 0.41.

A.6 [Saiz and Simonsohn \(2013\)](#) Checks

[Saiz and Simonsohn \(2013\)](#) state a number of conditions that must hold to obtain useful document-frequency based proxies for variables, such as geopolitical risk, that are otherwise difficult to measure. Our audit, among other things, makes sure that these conditions are indeed satisfied in our application. We provide a point-by-point discussion on how we perform these data checks below.

1. We verify that our search terms are more likely to be used when geopolitical risk is high than when it is low (*Data check 1: Do the different queries maintain the phenomenon and keyword constant?*, and *Data check 3: Is the keyword employed predominately to discuss the occurrence rather than non-occurrence of phenomenon?*). Across all the documents in our human audit, we found that 86 percent of articles measure high geopolitical risk, whereas only 4.3 percent of these articles measure declining tensions. We therefore conclude that increases in GPR are far more likely to lead to the use of our preferred search terms.
2. The GPR index is a frequency, thus satisfying data check 2 (*Data check 2. Is the variable being proxied a frequency?*).
3. We verify that the average number of documents found is large enough for variation to be driven by factors other than sampling error (*Data check 4: Is the average number of documents found large enough [...]?*). In particular, we verify that spikes in GPR are easily

³⁴ [Chadefaux \(2014\)](#) uses news-searches from *Google News Archive* to construct an annual indicator that detects early warning signals for wars dating back to the early 20th century. Unfortunately, neither the *Google News Archive* nor *Google Trends* seem amenable to systematic, quantitative news searches over long periods of time. The search algorithms are not transparent, and change continuously over time thus making replication difficult. In the case of *Google News Archive*, the searches seemed to yield a number of results that were two orders of magnitude smaller than the results we obtained using the ProQuest databases.

attributable to well-defined historical events at both a monthly and at a daily frequency. For instance, the monthly data show that our index spikes in April 1986, mostly following the events that culminated with U.S. air strikes against Libya on April 15. However, the index also spikes, within the month, on April 8, when the United States accused Muammar el-Qaddafi of sponsoring terrorist acts aimed at Americans (such as the Berlin discotheque bombing which occurred on April 5). It also spikes on April 18, when British police found a bomb in a bag that was taken onto an El Al aircraft.

4. We verify that measurement error is low enough (*Data check 3*, and *Data check 5: Is the expected variance in the occurrence-frequency of interest high enough to overcome the noise associated with document-frequency proxying?*), by choosing combinations of search terms that—unlike with a single keyword or a bi-gram—are unlikely to be used outside of the realm of rising geopolitical risk. For instance, a naïve geopolitical risk index that merely counts the share of articles containing *geopolitics*, *war*, *military*, or *terrorism/t* is nearly as high in March 1991 as in January 1991, whereas the benchmark GPR index is four times lower in March 1991 than in January 1991. This occurs because the naïve index fails to account for the fact that many articles comment on the aftermath of the Gulf War, but do not explicitly mention rising threats or risks, something that our index takes into account.
5. We construct and examine broad and narrow versions of the index around the benchmark index, thus satisfying data check number 5.
6. We construct a version of the GPR index that excludes articles containing economics and finance related words. (*Data check 6: [...] Does the chosen keyword have as its primary or only meaning the occurrence of the phenomenon of interest?*, and *Data check 7: [...] Does the chosen keyword also result in documents related to the covariates of the occurrence of interest?*).
7. In robustness checks, we use the naïve index as a placebo document-frequency variable in our vector autoregression (VAR) analysis. In particular, there is the possibility that it is not geopolitical risks per se that are bad, but that the overall tendency to discuss geopolitical events rises during recessions. We show that adding the naïve index to the VAR does not change the predictive power of GPR in the VAR. (*Data check 8: Are there plausible omitted variables that may be correlated both with the document-frequency and its covariates?*)

B Robustness of VAR Results

The effects of the GPR shock uncovered in the Structural VAR analysis are robust to a number of robustness checks. First, in Figure A.12 we explore the robustness to an alternative Cholesky ordering where we order the GPR index oil prices and consumer sentiment. We do so to address the concern that—in our baseline VAR specification—a shock to GPR could be contaminated by shocks to oil prices or by exogenous changes in consumer sentiment that could lead to a higher-than-normal discussion of geopolitical risks. These exclusion restrictions have a very modest

impact on the adverse effects of the GPR shock. For instance, the drop in investment is 1.5 percent compared to 1.7 percent in the baseline model. In Figure A.13 we show that the results are robust to replacing the EPU with the VIX as a proxy for economic uncertainty.

Results are robust to a variety of additional robustness checks, which we do not include in the Appendix but can be found in the working paper version. In particular, we included in the model a dummy for 9/11, the episode that induced the largest increase in the index (the index rose to its highest level with the Iraq War two years later, but from already elevated levels). We also estimated a VAR model that uses a censored version of the GPR index, constructed by setting to zero all observations on the GPR where the residuals from an AR(1) regression of the GPR index increase by less than 1.68 standard deviations.

C Description of Firm-Level and Industry Data

C.1 Details on Industry Exposure Regressions

To compute industry exposure, we collect daily stock market returns data for the 49 Industry Portfolios from the Kenneth French data library, which group NYSE, AMEX, and NASDAQ stocks based on four-digit SIC codes. We also incorporate the daily excess return of the market over the risk-free rate, defined as the one-month T-bill rate (Fama and French, 1997).

Stock market-based exposure is measured using the estimated coefficient on GPR from rolling regressions of daily industry portfolio returns on GPR and the excess market return. Since the index is a newspaper-based measure of risk, we assume that daily stock market returns react contemporaneously to given geopolitical events, which are first reported in print news media on the following morning.

C.2 Firm-Level Variables from Compustat

Our firm-level data source is the Compustat North America database. Our firm-level variables are investment rate, cash flows, and Tobin's Q.

1. We construct the investment rate as the ratio of quarterly capital expenditures (DCAPXY, defined as the first difference of CAPXY with a firm's fiscal year) to the beginning-of-period stock of property, plants, and equipment (lag of PPENTQ). We consider only firms with headquarters located in the United States (Compustat variable LOC is "USA"). We drop the observations where DCAPXY is negative and all observations where PPENTQ is less than \$5 million in chained 2009 dollars. We drop observations where the capital stock (PPENTQ) decreases and then increases (or viceversa) more than fifty percent between two successive quarters. We only include a firm if it has at least twenty quarters of data. We winsorize the variable at the 1st and 99th percentile.
2. We construct Tobin's Q, defined as the ratio of a firm's total market value to its total asset value, using the quarterly Compustat items PRCCQ (share price at close), CSHOQ

(common shares), ATQ (total assets), and CEQQ (common equity). The measure is equal to $\frac{(PRCCQ*CSHOQ)+ATQ-CEQQ}{ATQ}$. We winsorize the variable at the 1st and 99th percentile.

3. We construct cash flows using the ratio of Compustat item CHEQ (cash and short-term investments) to beginning-of-period PPE, which is the first lag of PPENTQ in our sample. The variable is winsorized at the 1st and 99th percentile.

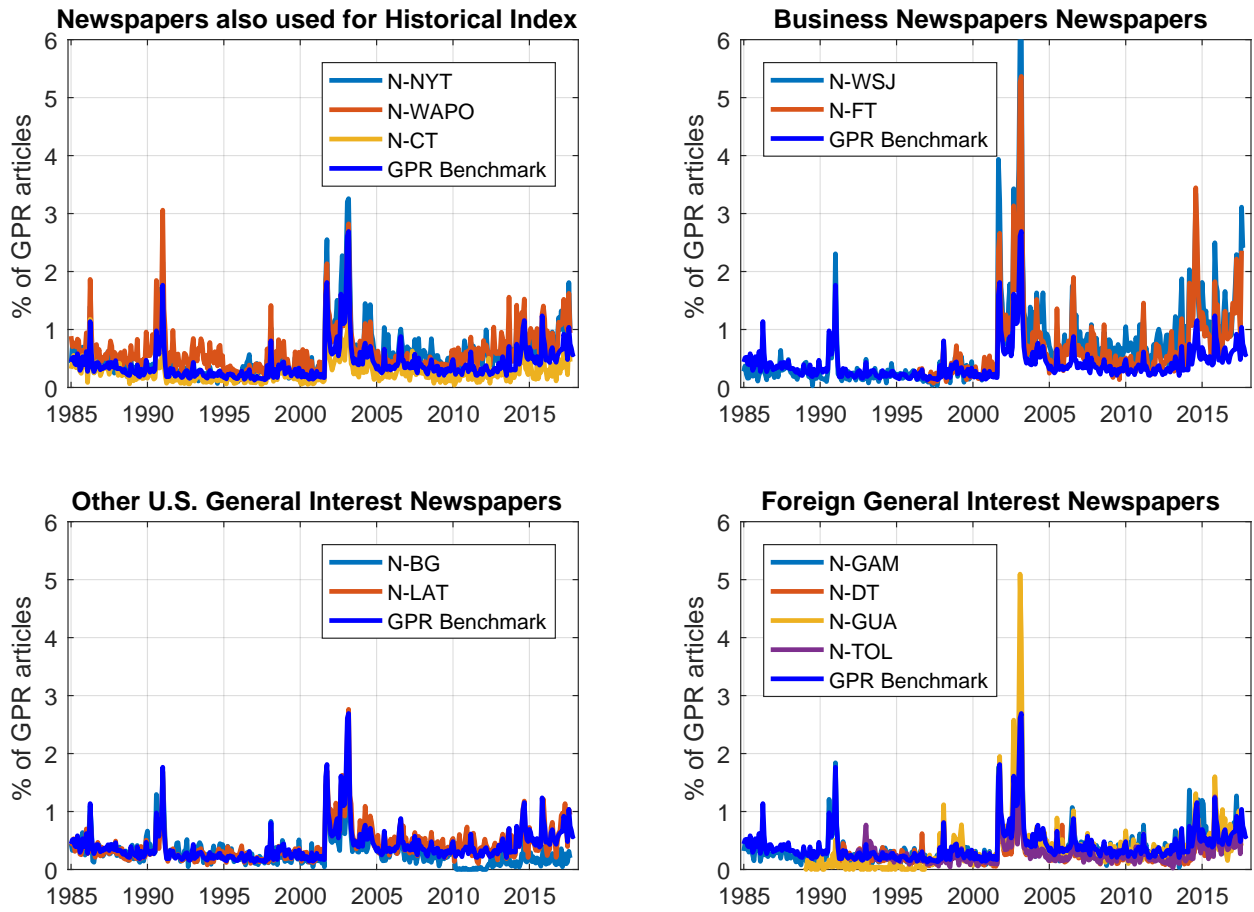
C.3 Search Terms for Firm-Level Geopolitical Risk

We perform text analysis on 134,990 transcripts of quarterly earnings calls of firms listed in U.S. stock markets for the sample 2005-2018 that we are able to match with the corresponding quarterly firm-level Compustat data. We obtain the conference call transcripts from the Fair Disclosure Wire. We construct a firm-quarter variable that counts the occurrence of mentions of geopolitical risks in the earnings call. Specifically, we count the joint occurrences of “risk” words within ten words of “geopolitical” words, and normalize the number of joint occurrences by the total number of words in the transcript. The number of joint occurrences is zero for 80.7 percent of the firm-quarter observations, one for 12.7 percent of observations, two for 3.9 percent of observations, and greater than two for 2.7 percent of observations. Figure A.11 plots average mentions of geopolitical risk terms by industry. Firms in the aircraft industry mention geopolitical risk most frequently. Firms in agriculture mention geopolitical risk less frequently.

The list of geopolitical terms in the earnings calls is: *war, military, terror*, geopolitical, conflict, "Middle East", Iraq, Afghanistan, Iran, Syria, Libya, China, Chinese, Ukrain*, Russia*, "North Korea", Venezuela, coup, expropriation, confiscation, nationalism, security, protest*, country, countries, political, retaliation, unrest, geograph*, troop*, sanction, sanctions, embargo, wars, warfare, Army, Navy, weapon*, combat, missile*, immigration, diplomacy.*

We require the uncertainty-related words to be within ten words of one, more of the trade policy-related terms. The list of uncertainty terms is: *risk*, uncertain*, variab*, chance*, possib*, pending, doubt*, prospect*, bet, bets, betting, exposed, likel*, threat*, probab*, unknown*, potential, concern*, tension*, issue*, instability, cautio*, fear*, volatil*, varying, unclear, speculative, hesitant, headwind*, backlog*, dispute, disrupt*, worry*, worries, hurdle*, obstacle*, disturbance*, hostile*.*

Figure A.1: SHARE OF GPR ARTICLES BY INDIVIDUAL NEWSPAPER



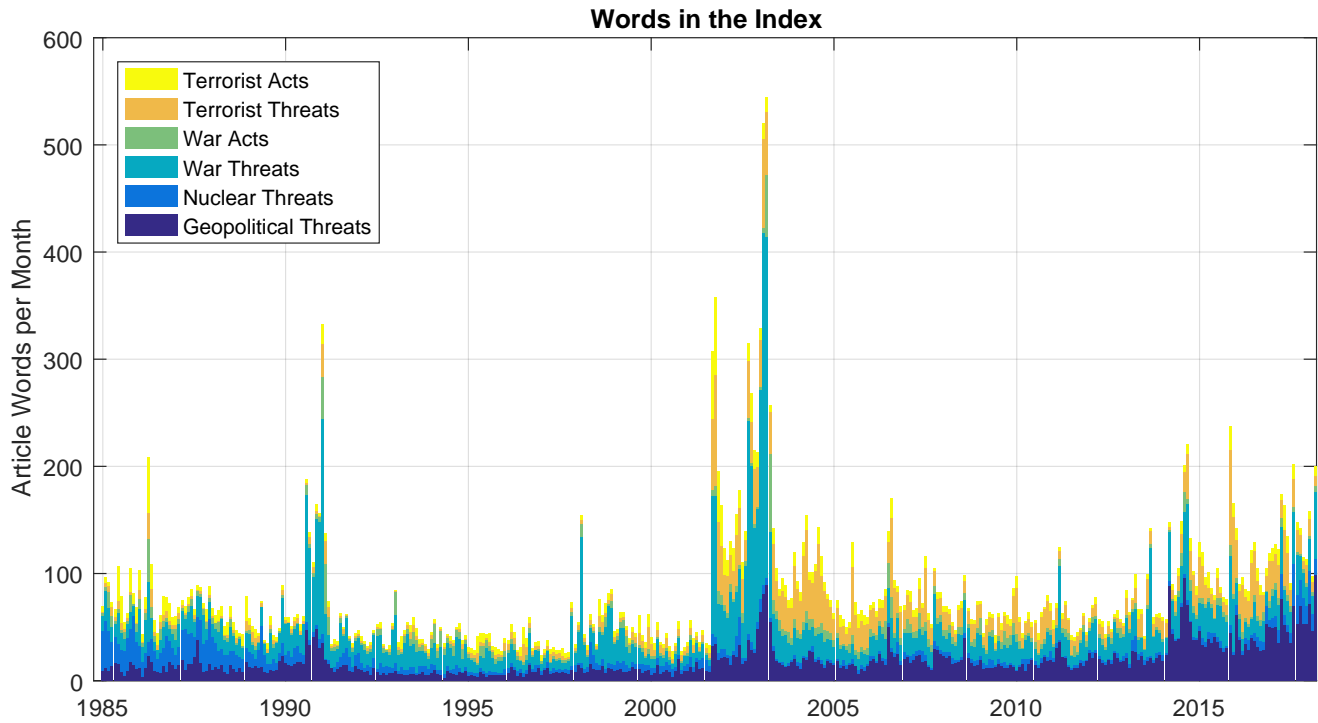
NOTE: Each panel plots the share of articles containing words related to geopolitical risk for each of the 11 newspapers used to construct the baseline GPR index.

Figure A.2: SEARCH QUERY FOR THE BENCHMARK GPR INDEX

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pub.Exact("Boston Globe" OR "Chicago Tribune" OR "The Daily Telegraph" OR "Financial Times" OR "The Globe and Mail" OR "The Guardian" OR "Los Angeles Times" OR "New York Times" OR "The Times" OR "Wall Street Journal" OR "The Washington Post") AND DTYPE(article OR commentary OR editorial OR feature OR front page article OR front page/cover story OR news OR report OR review) AND (("United States" AND tensions AND (military OR war OR geopolitical OR coup OR guerrilla OR warfare) AND ("Latin America" OR "Central America" OR "South America" OR Europe OR (Africa NOT "South Africa") OR "Middle East" OR "Far East" OR Asia)) OR (geopolitical AND (risk* OR concern* OR tension* OR uncertaint*)) OR (("nuclear war" OR "atomic war" OR "nuclear conflict" OR "atomic conflict" OR "nuclear missile*") AND (fear* OR threat* OR risk* OR peril* OR menace*)) OR ("war risk*" OR "risk* of war" OR "fear of war" OR "war fear*" OR "military threat*" OR "war threat*" OR "threat of war" OR ("military action" OR "military operation" OR "military force") AND (risk* OR threat*)) OR ("terrorist threat" OR "terrorist threats" OR "menace of terrorism" OR "terrorism menace" OR "threat of terrorism" OR "terrorist risk" OR "terror risk" OR "risk of terrorism" OR "terror threat" OR "terror threats") OR ("beginning of the war" OR "outbreak of the war" OR "onset of the war" OR "escalation of the war" OR "start of the war" OR ((war OR military) AND "air strike") OR (war AND "heavy casualties") OR (battle AND "heavy casualties")) OR ("terrorist act" OR "terrorist acts") NOT ("civil war" OR "human rights" OR (end N/2 war) OR "air force" OR movie OR film OR museum OR anniversary OR memorial OR art))
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NOTE: This figure shows the exact search query we run on the web interface of ProQuest Newsstream to count articles discussing geopolitical risks.

Figure A.3: THE GEOPOLITICAL RISK INDEX:
CONTRIBUTION OF THE SIX SEARCH CATEGORIES



NOTE: The chart plots the monthly cumulative contribution to the GPR index of the articles associated with the six search groups described in Table 1. Higher geopolitical risk since the 2000s reflects increased mentions of both terrorist acts and terrorist threats, as well as an increased use of words directly mentioning geopolitical uncertainties.

Figure A.4: SELECTED FRONT PAGES ON DAYS OF HEIGHTENED GEOPOLITICAL RISK



(a) January 7, 1991



(b) January 17, 1991



(c) September 12, 2001



(d) October 3, 2001

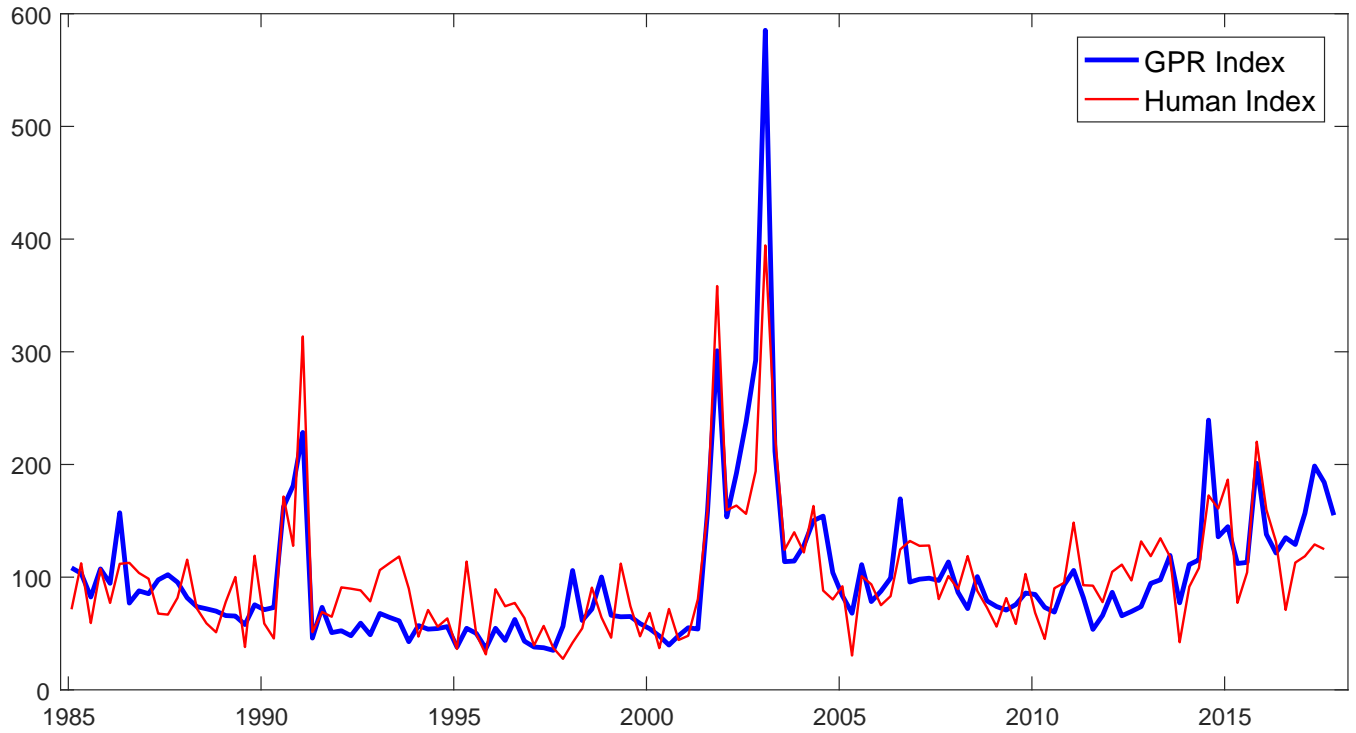


(e) August 10, 2017



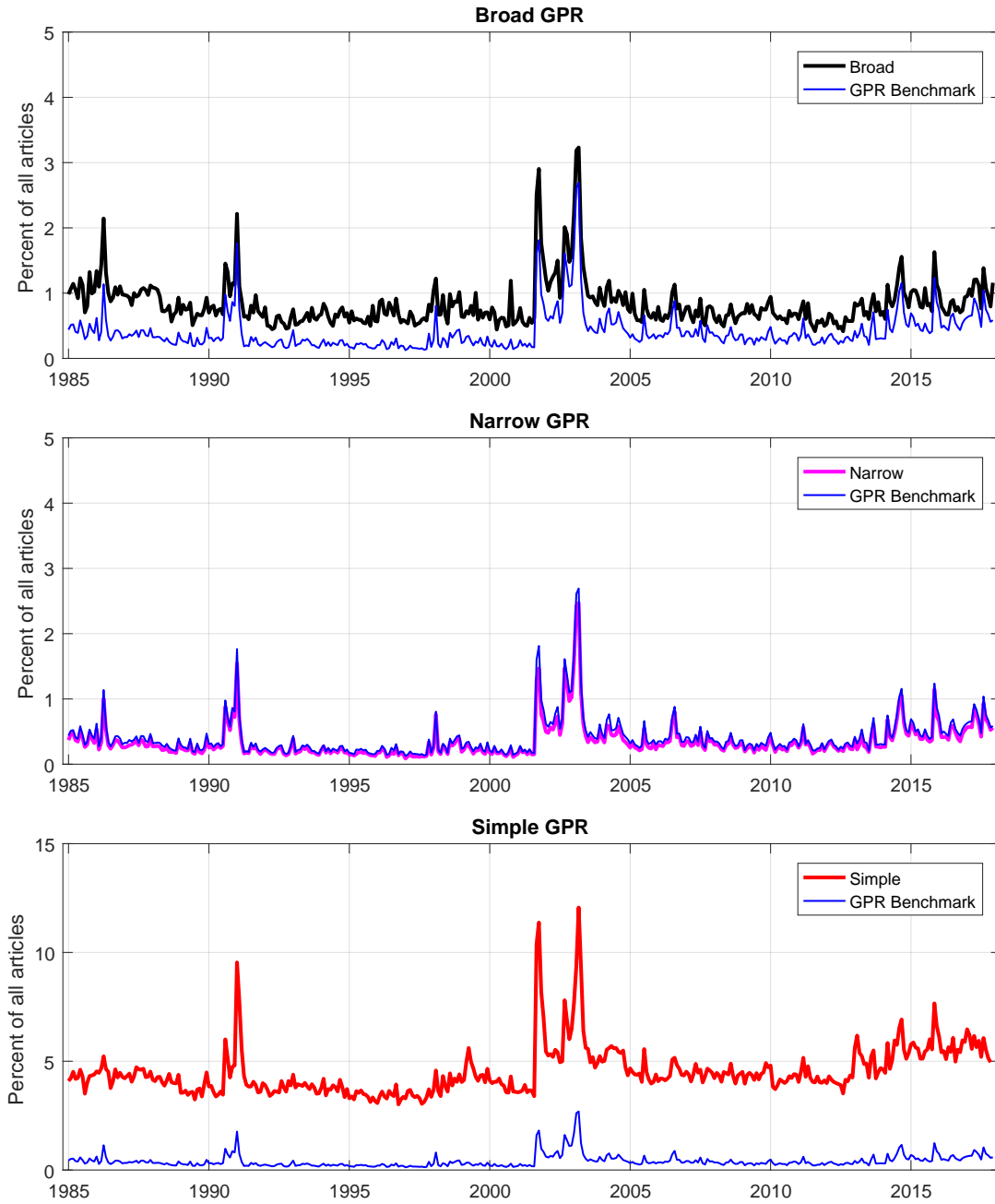
(f) August 23, 2017

Figure A.5: HUMAN AND COMPUTER-GENERATED GPR INDEXES



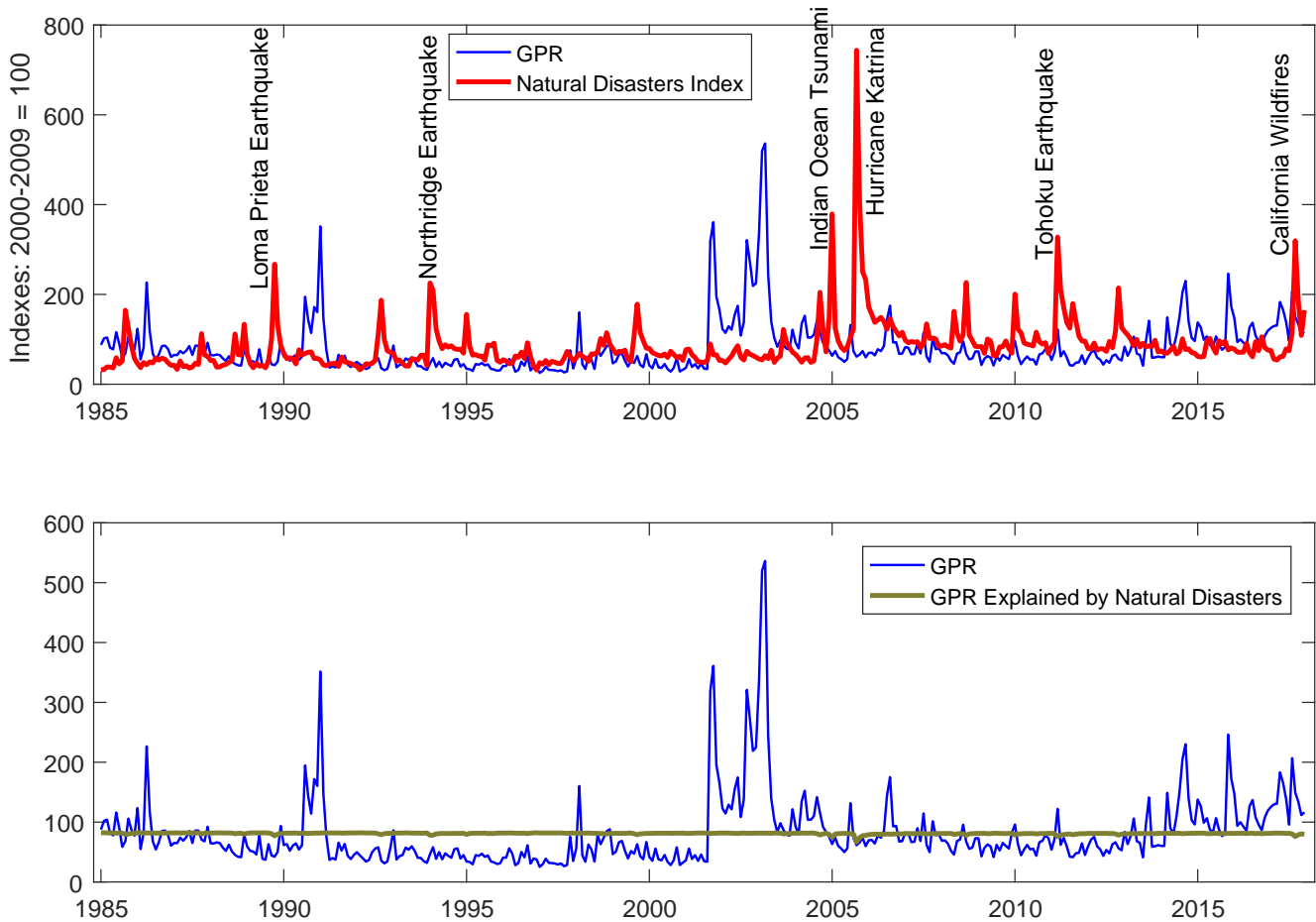
NOTE: Comparison of the benchmark GPR index (blue thick line) and the human index constructed by reading 6,125 articles (red thin line). Both series are plotted at quarterly frequency to reduce sampling variability and indexed to equal 100, on average, in the 1985–2016 period.

Figure A.6: THE GPR INDEX AND THREE ALTERNATIVES



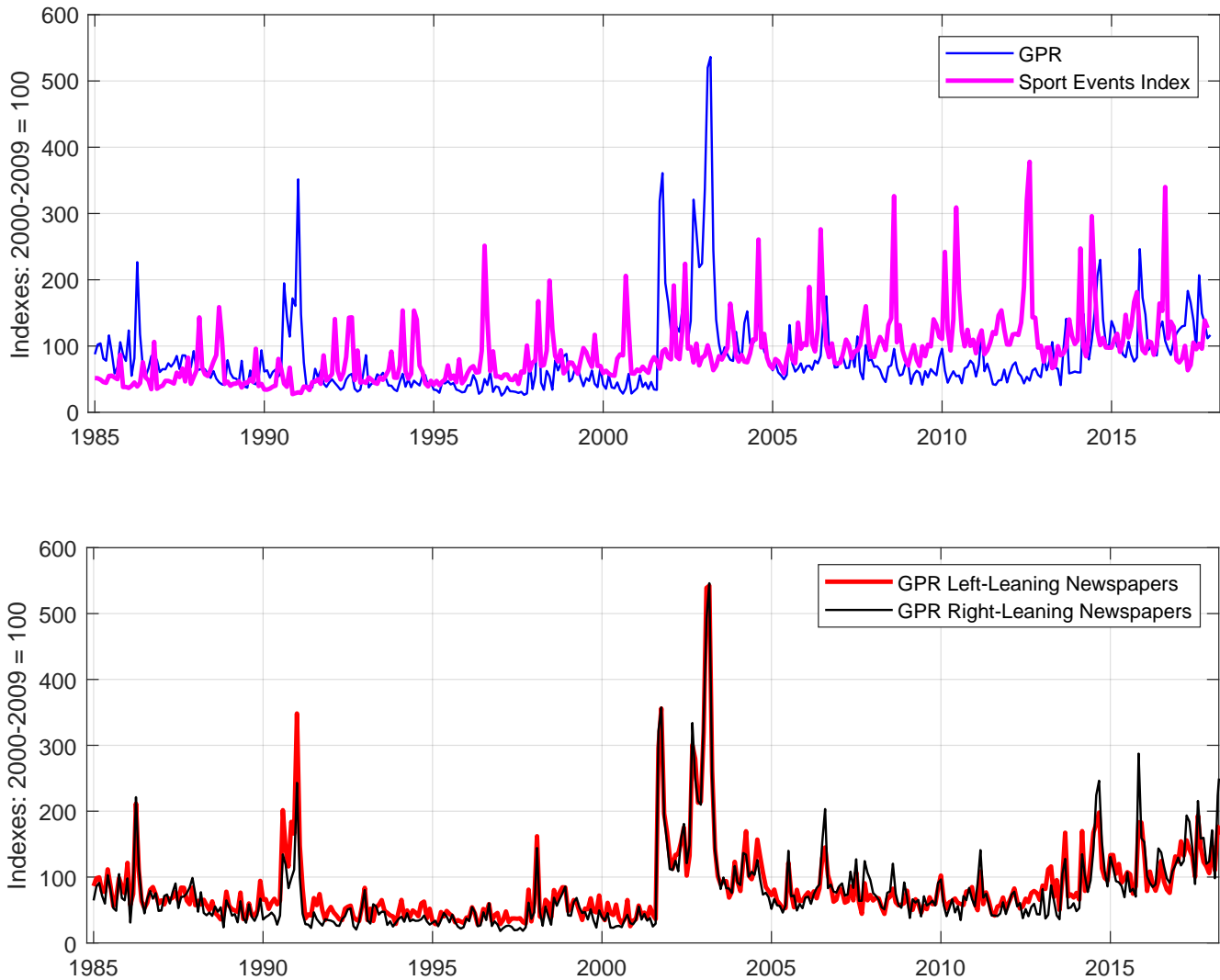
NOTE: The broad GPR combines the search terms in Table 1 with bigrams that an algorithm—based on Bayes’ rule—signals as very likely indicators of rising geopolitical tensions. The narrow GPR excludes articles containing narrow search terms which, in the human audit, were most likely associated with false positives. The simple GPR is based on articles that contain at least one word from each of two sets of terms: the set \mathcal{S}_1 , including {war OR military OR terrorism OR geopolitical}, and the set \mathcal{S}_2 , containing {risk* OR concern* OR tension* OR uncertain* OR threat*}. The indexes are shown as shares of total articles by month, rather than normalized to 100.

Figure A.7: GPR AND NATURAL DISASTERS



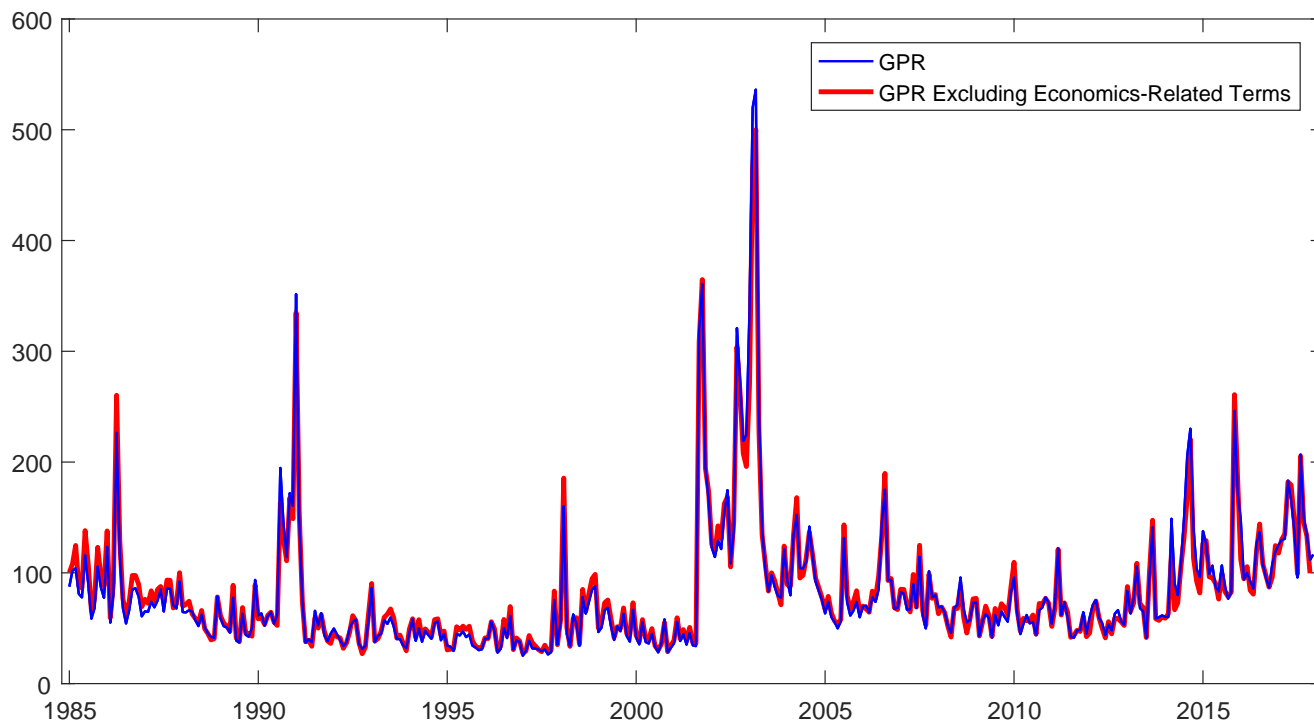
NOTE: The top panel of the figure compares the benchmark GPR index with a news-based index of natural disasters, constructed by counting the share of newspapers articles mentioning any of the following words: earthquake(s), hurricane(s), tornado(es), tsunami(s), or wildfire(s). The bottom panel of the figure shows the GPR together with the fitted value of a regression of the GPR index against a constant and the natural disasters index. As shown by this figure, the GPR hardly moves in response to news coverage of natural disasters. Thus, shifting media attention towards geopolitical events does not move the GPR index, which corroborates the view that the index captures movements in underlying geopolitical tensions.

Figure A.8: THE GPR INDEX, MEDIA ATTENTION, AND MEDIA BIAS



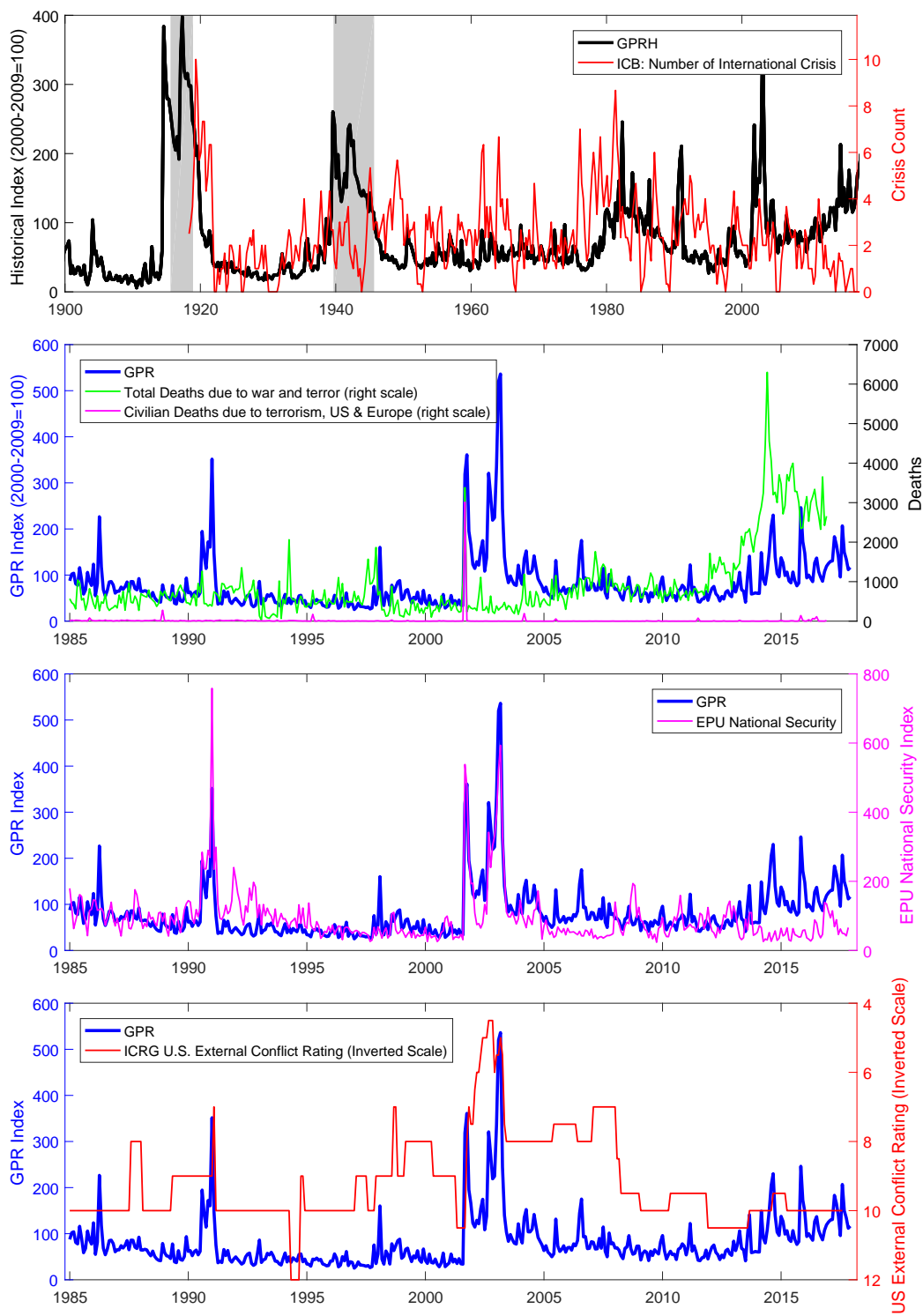
NOTE: The top panel compares the GPR index with a news-based index of sport popularity, constructed by counting the share of articles mentioning: “Olympics” OR “Olympic Games” OR “World Cup” OR “Super Bowl” OR “World Series.” The bottom panel compares the GPR index using left-leaning newspapers with the GPR index using right-leaning newspapers.

Figure A.9: THE GPR INDEX EXCLUDING ECONOMICS-RELATED TERMS



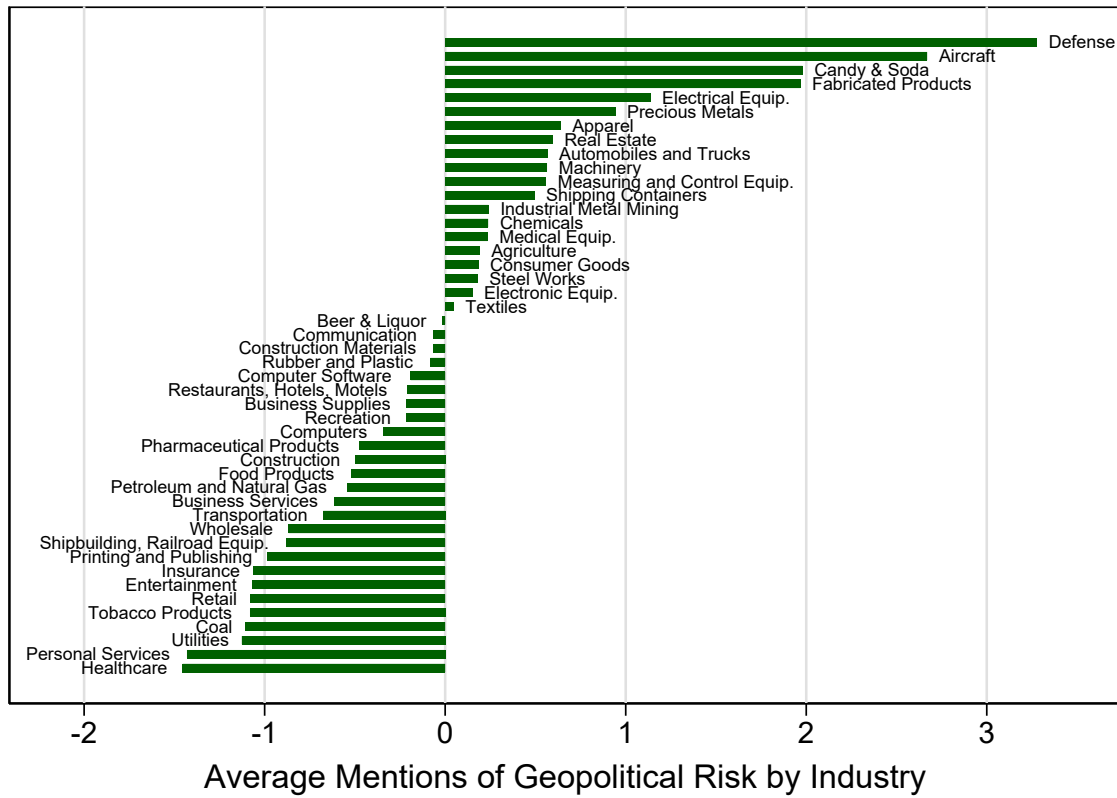
NOTE: The figure compares the benchmark GPR index with a version of the index constructed excluding the search terms “economy” OR “stock market*” OR “financial market*” OR “stock price*.” The correlation between the resulting index and the benchmark index is 0.989.

Figure A.10: THE GEOPOLITICAL RISK INDEX AND OTHER PROXIES FOR GEOPOLITICAL RISK



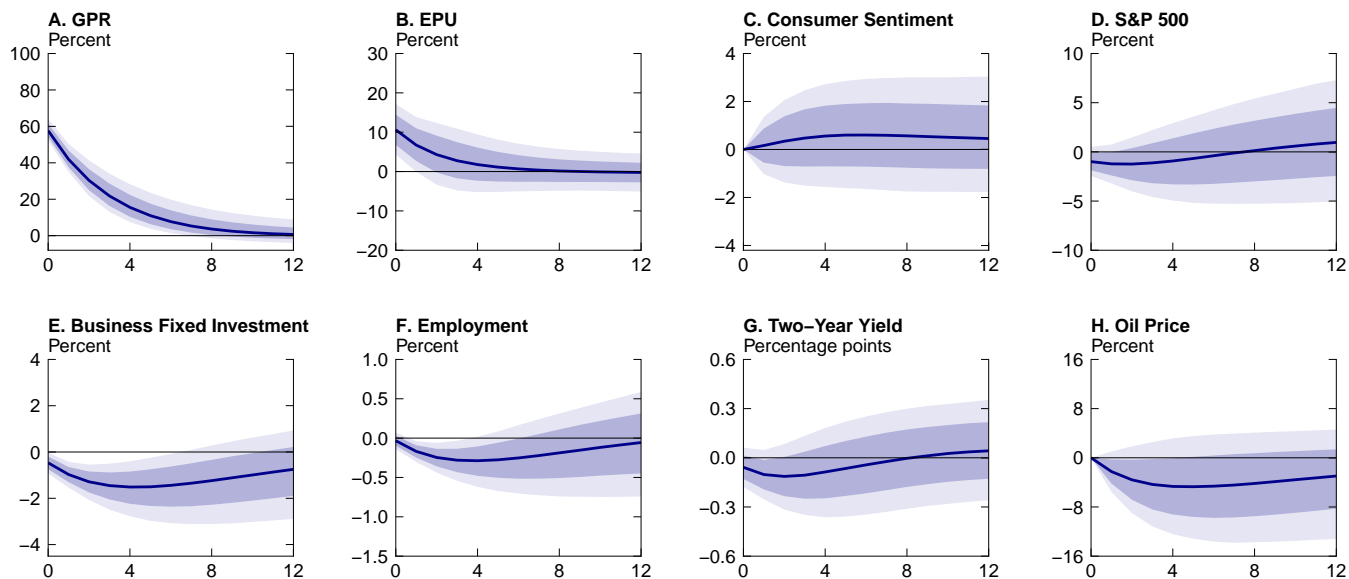
NOTE: In the first panel, the shaded areas represent the two World Wars, and the historical GPR and the ICB index are plotted at quarterly frequency.

Figure A.11: MENTIONS OF GEOPOLITICAL RISK IN THE EARNINGS CALLS BY INDUSTRY



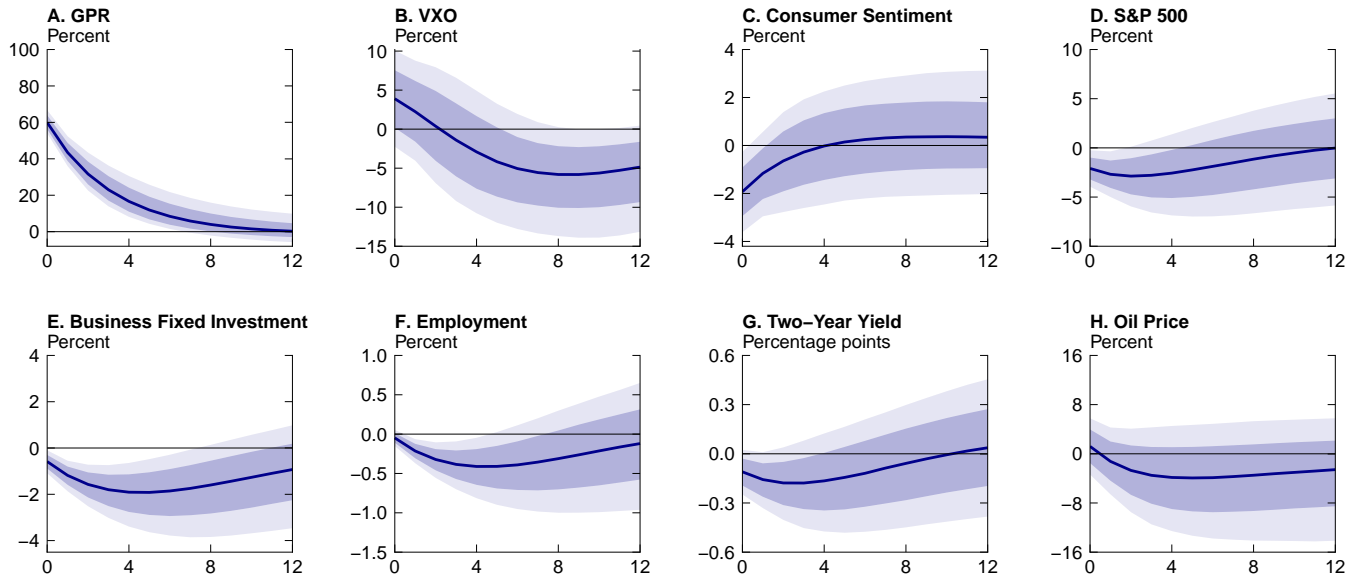
NOTE: Mentions of geopolitical risk by industry: average values from 2005 through 2018. The measure is standardized to have zero mean and unit standard deviation.

Figure A.12: THE MACROECONOMIC IMPACT OF INCREASED GEOPOLITICAL RISK
ALTERNATIVE CHOLESKY ORDERING



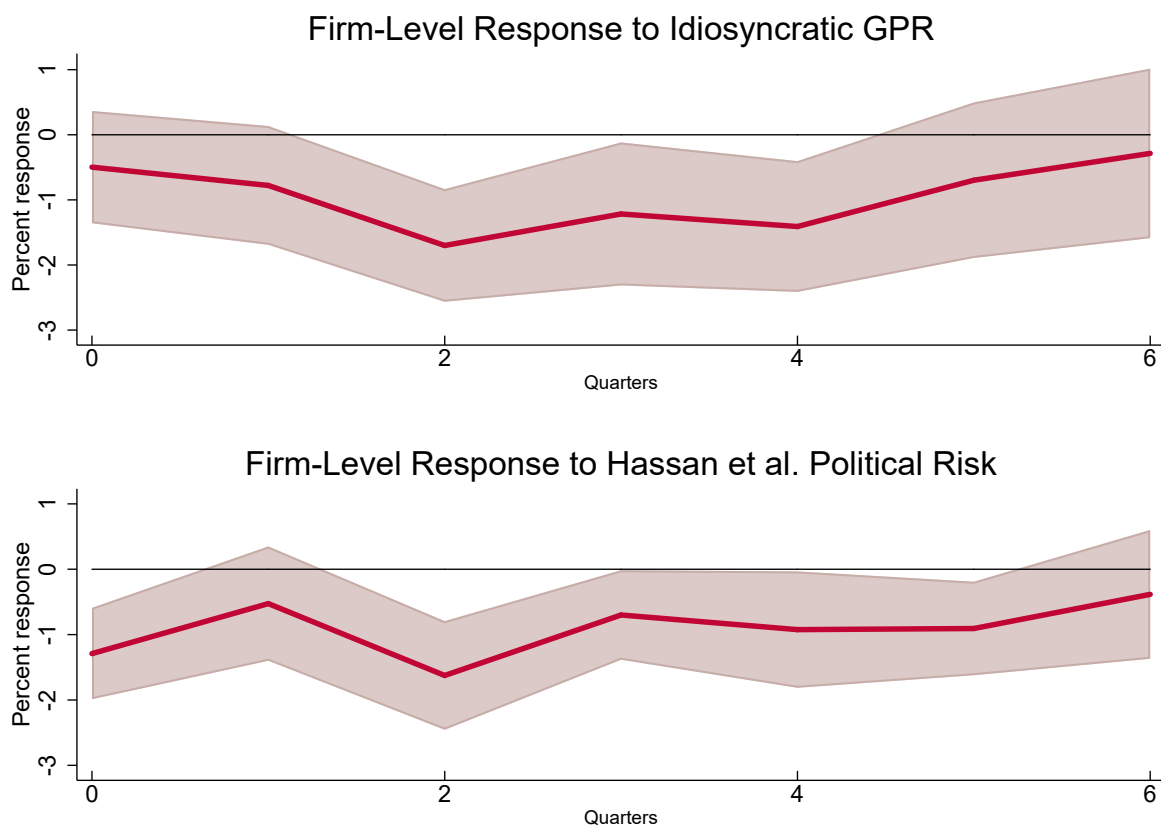
NOTE: The black solid line in each panel depicts the median impulse response of the specified variable to a two-standard-deviations increase in the GPR index. Compared to the baseline model, we identify a GPR shock by ordering the GPR index after oil prices and consumer sentiment in a Cholesky ordering. The dark and light shaded bands represent the 68 and 90 percent pointwise credible sets, respectively. The horizontal axis measures quarters since the shock.

Figure A.13: THE MACROECONOMIC IMPACT OF INCREASED GEOPOLITICAL RISK
REPLACING THE EPU INDEX WITH THE VXO



NOTE: The black solid line in each panel depicts the median impulse response of the specified variable to a two-standard-deviations increase in the GPR index. Compared to the baseline model, we replace the EPU index with the VXO. The dark and light shaded bands represent the 68 and 90 percent pointwise credible sets, respectively. The horizontal axis measures quarters since the shock.

Figure A.14: RESPONSE OF FIRM-LEVEL INVESTMENT TO GEOPOLITICAL RISK:
COMPARISON WITH HASSAN ET AL.(2019) POLITICAL RISK MEASURE



NOTE: The top panel reproduces the dynamic response of investment following a two-standard deviation increase in idiosyncratic GPR, as shown in the bottom panel of Figure 11. The bottom panel plots the dynamic response of investment following a two-standard deviation increase in the firm-level political risk measure constructed by Hassan, Hollander, van Lent, and Tahoun (2019). The shaded areas denote 90 percent confidence intervals. Standard errors are two-way clustered by firm and quarter.