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Caldara, Dario and Matteo Iacoviello

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Measuring Geopolitical Risk*

Dario Caldara[†] Matteo Iacoviello[‡]

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Abstract

We present a monthly indicator of geopolitical risk based on a tally of newspaper articles covering geopolitical tensions, and examine its evolution and effects since 1985. The geopolitical risk (GPR) index spikes around the Gulf War, after 9/11, during the 2003 Iraq invasion, during the 2014 Russia-Ukraine crisis, and after the Paris terrorist attacks. High geopolitical risk leads to a decline in real activity, lower stock returns, and movements in capital flows away from emerging economies and towards advanced economies. 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. Extending our index back to 1900, geopolitical risk rose dramatically during the World War I and World War II, was elevated in the early 1980s, and has drifted upward since the beginning of the 21st century.

KEYWORDS: Geopolitical Risk; Economic Uncertainty; War; Terrorism; Business Cycles.

JEL CLASSIFICATION: C1. D80. E32. H56.

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

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[†]FEDERAL RESERVE BOARD OF GOVERNORS. Email: dario.caldara@frb.gov

[‡]FEDERAL RESERVE BOARD OF GOVERNORS. Email: matteo.iacoviello@frb.gov

1 Introduction

Entrepreneurs, market participants, and central bank officials view geopolitical risks as key determinants of investment decisions and stock market dynamics. In a Gallup 2017 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 geopolitical risk ahead of political and economic uncertainty.¹ Carney (2016) includes geopolitical risk—together with economic and policy uncertainty—among an ‘uncertainty trinity’ that could have significant adverse economic effects. More recently, the European Central Bank, in its April 2017 Economic Bulletin, and the International Monetary Fund, in the October 2017 WEO, highlight geopolitical uncertainties as a salient risk to the economic outlook.

However, the importance of geopolitical risks in shaping the macroeconomic and financial cycles 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. Using newspaper records, we construct a monthly index of geopolitical risk (GPR) and examine its evolution and determinants since 1985. We then study the economic effects of geopolitical risks, and find that higher geopolitical risk depresses economic activity, lowers stock returns, and leads to flows of capital from emerging economies towards advanced economies.

The construction of the GPR index involves three main steps: definition, measurement, and audit.² 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 want to identify geopolitical events in which power struggles over territories cannot be resolved peacefully. Accordingly, we define geopolitical risk as the risk associated with wars, terrorist 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 the methodology pioneered by Saiz and Simonsohn (2013) and Baker, Bloom, and Davis (2016), and construct the GPR index with an algorithm that counts the frequency 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

¹ See <http://www.businesswire.com/news/home/20170613005348/en/>.

² The index is updated monthly and is available at <https://www2.bc.edu/matteo-iacoviello/gpr.htm>.

are of global interest, which often implies U.S. involvement. 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.³

We plot the resulting benchmark index from 1985 to 2016 in Figure 1. The three largest spikes are recorded during the Gulf War, after 9/11, and during the 2003 invasion of Iraq.⁴ More recently, the index spikes during the Ukraine/Russia crisis and after the Paris terrorist attacks. We also construct an historical version of the index—dating back to 1899 and plotted in Figure 2—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 underlying geopolitical risks. First, 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. The audit provides an important input to refine the search terms used by our algorithm, and allows us to construct a human-generated GPR index, which correlates remarkably well with the benchmark index. Second, we compare our index to various metrics of wars and terrorism intensity and to popular measures of economic uncertainty and financial volatility. Finally, we show that potential media bias in the coverage of geopolitical events is not a driver of fluctuations in our index.

We then turn our analysis to the role that geopolitical risks play for the macroeconomy. Using vector autoregressive (VAR) models estimated on U.S. data, we find that an increase in geopolitical risk induces persistent declines in industrial production, employment, and international trade, and that both economic policy uncertainty and consumer confidence enhance the transmission of geopolitical risk shocks. We also document that stock returns experience a short-lived but significant drop in response to higher geopolitical risk. The stock market response varies substantially across industries, with the defense sector experiencing positive excess returns, and with sectors exposed to the broader economy—for instance steelworks and mining—experiencing negative returns.

An important question is whether the economic effects of higher geopolitical risk are due to heightened threats of adverse events or to their realization. To answer this question, we construct two subindexes that, together with some exclusion restrictions discussed in the paper, allow us to

³ Hassan, Hollander, Tahoun, and van Lent (2016) construct a measure of firm-specific political risk using transcripts from quarterly earnings conference calls.

⁴ Throughout the paper, we refer to historical events by adopting the naming convention followed by the [Wikipedia](#) entry for that event.

separate shocks to geopolitical acts from shocks to geopolitical threats. We find that the realization of adverse geopolitical events leads to the resolution of uncertainty and produces economically small effects, while shocks to geopolitical threats lead to a protracted rise in uncertainty and induce a persistent decline in real activity. These findings lend support to theoretical models where agents form expectations using a worst-case probability—as, for instance, 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 \(2007\)](#).⁵

When we expand the analysis to international variables, we find that higher geopolitical risks lead to a decline in activity among advanced economies. Moreover, using monthly stock market data for a panel of 17 countries, we document that geopolitical risks depress stock prices. Last, we show that geopolitical tensions determine significant movements in international capital flows: following higher geopolitical risk, investors pull capital out of emerging economies and move towards safe havens, including the United States.

We are not the first to attempt to measure geopolitical risk. Indeed, many companies publish or market various indicators of political and geopolitical uncertainty.⁶ However, the construction of our GPR index overcomes the various shortcomings of existing indicators that make them poorly suited for empirical analysis. First, many indexes 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. Accordingly, it is unclear what these indexes measure. Second, existing indexes are extremely hard to replicate. Indexes constructed by private companies are often not publicly available, are constructed subjectively, and come with a less-than-transparent methodology. By contrast, our index can be both replicated and audited, as both our algorithm and audit guide are publicly available. Third, many indexes exhibit very little variability and are available only for a few years. Many of them are qualitative indicators of whether countries are politically stable, and are reported using color-coded maps or integer numbers ranging from one to five.⁷

This paper complements the literature that studies the measurement and effects of macroeconomic uncertainty in two ways. First, many proxies for macroeconomic uncertainty increase during

⁵ [Drautzburg, Fernández-Villaverde, and Guerrón-Quintana \(2017\)](#) document significant changes in the capital share after large political events, and argue—using a modified version of the neoclassical growth model—that bargaining shocks account for one third of aggregate fluctuations.

⁶ For example, the first 20 entries of a Google search of the terms “Geopolitical Risk” link to the following companies providing businesses with geopolitical-related intelligence: Marsh-McLennan, Control Risks Online, Zurich Insurance, Cambridge Econometrics, U.S. Energy Stream, Aon plc, Verisk Maplecroft, CSO Online, Euler Hermes, Risk Advisory, and Strategic Risk.

⁷ A notable example, the Doomsday Clock, measures the countdown to a possible global catastrophe, with fewer minutes to midnight measuring higher risk, but the value of this index has changed only six times in the past 20 years. The Bulletin of the Atomic Scientists [webpage](#) has more details about the Doomsday Clock.

recessions and financial crises.⁸ Whether this empirical regularity implies that uncertainty is an endogenous response to adverse macroeconomic and financial conditions or one of their drivers remains an open question.⁹ An advantage of our index relative to the existing uncertainty proxies is that it singles out episodes of geopolitical tensions that, for most countries and in particular for the United States, are largely independent of business fluctuations within a short period of time, such as one month. In fact, our index does not systematically spike in recessions or during the Global Financial Crisis, but rises—as many uncertainty proxies do—during the two Gulf wars and 9/11. Thus, we do not require strong identification assumptions to support the finding that geopolitical risk has recessionary effects. Second, we provide a first attempt within this literature to isolate pure movements in risk—that is, movements in our GPR index during periods when the underlying threat does not materialize. We are able to do so because we can accurately time actual geopolitical events and control for their direct effect.

Our work is also related to the literature that studies the implications of disaster risks (Barro, 2006, and Gourio, 2008). In particular, Berkman, Jacobsen, and Lee (2011) measure disaster risk by counting the number of international political crises. Using data starting in 1919, they find that disaster risk depresses stock returns. Compared to this study, we find a larger effect of disaster risk on stock returns. The effect is especially large after 1985 and is associated with threats of geopolitical events rather than their realization. Our analysis is also complementary to several papers that measure the economic consequences of wars, terrorist attacks, and other forms of collective violence, such as Blomberg, Hess, and Orphanides (2004), Tavares (2004), Glick and Taylor (2010), and, more recently, Moretti, Steinwender, and Van Reenen (2014) and Aghion, Jaravel, Persson, and Rouzet (2017).

Section 2 describes the construction of the GPR index. Section 3 discusses what our index measures, presents a daily version of the index, and compares the GPR index to alternative proxies for geopolitical risk and macroeconomic uncertainty. Section 4 studies the effects of changes in geopolitical risk on the U.S. economy. Section 5 estimates the international propagation of GPR shocks—on economic activity, capital flows and stock returns—. Section 6 concludes.

⁸ See the proxies used and constructed by, among many, Bloom (2009), Bachmann, Elstner, and Sims (2013), Gilchrist, Sim, and Zakrajek (2014), Jurado, Ludvigson, and Ng (2015) and Scotti (2016).

⁹ Ludvigson, Ma, and Ng (2015) use a structural VAR model identified with external information and find a two-way relationship between uncertainty and the business cycle. Caldara, Fuentes-Albero, Gilchrist, and Zakrajek (2016) also use a structural VAR and document that macroeconomic uncertainty does endogenously respond to tightening in financial conditions.

2 Construction of the Geopolitical Risk Index

The construction of the GPR index 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 construct the index and describe its key features. Finally, we provide a detailed review of the audit process.

2.1 Definition: Geopolitics and Geopolitical Risk

Geopolitics is a term that encompasses multiple definitions, and historically has been used to describe the practice of states to control and compete for territory.¹⁰ However, in recent decades, power struggles and other events involving a diverse set of agents—including corporations, non-governmental organizations, rebel groups, and political parties—have also been classified as part of geopolitics. For this reason, the current usage of the word “geopolitics” covers a diverse set of events with a wide range of causes and consequences, from terrorist attacks to climate change, from Brexit to the Global Financial Crisis.

In defining geopolitical risk, we want to identify situations in which the power struggles of agents over territories cannot be resolved peacefully and democratically. Accordingly, we define geopolitical risk as the risk associated with wars, terrorist 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.

Our definition closely follows the historical use of the term geopolitics and—in line with recent assessments of modern international relations among states—includes terrorism. At least since 9/11, terrorism has come to dominate the practice and the language of geopolitics. Even before 9/11, 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 political organizations to bolster religious, economic, or revolutionary objectives.

It is worth stressing that this definition of geopolitical risk is not exhaustive. That is, we cannot uniquely rely on this definition to classify events and risks as being geopolitical or not, and some judgment both in the construction of the index and in the auditing process is required. As an example, political tensions that are initially confined within nations’ borders and not aimed at af-

¹⁰ See for instance [Flint \(2016\)](#). The Austro-Hungarian historian Emil Reich was one of the earliest scholars to propose a similar definition and is credited with first using the word “geopolitics” in the early 20th century ([GoGwilt, 2000](#)).

fecting the normal course of international relations could potentially escalate and create geopolitical instability. Occasionally, the classification of these events is not clear-cut. For instance, we view the coup attempted in Turkey in July 2016 as falling within our definition. While the coup ended up having mostly domestic consequences, there were significant spillovers to the Middle East and to the fight against ISIS in Syria and Iraq. By contrast, we do not view Brexit as falling within our definition, as it was the outcome of a democratic referendum. We match the need for judgment with high standards of replicability, robustness, and transparency in the construction of the index and in the audit process.

2.2 Measurement

We construct the GPR index by counting the number of occurrences in leading English-language newspapers of articles discussing the geopolitical events and risks described by our definition. In particular, we construct a monthly index—starting in 1985—by running automated text-searches of the electronic archives 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*. We also construct a long-span historical index (GPRH) dating back to 1900. For the historical index, we restrict the newspapers’ coverage to the only three journals for which we have electronic access to all articles from 1900—namely *The New York Times*, the *Chicago Tribune*, 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.¹¹ The index is normalized to average a value of 100 in the 2000-09 decade, so that a reading of 200, for instance, indicates that newspaper mentions of rising geopolitical risk in that month were twice as frequent as they were during the 2000s.¹²

We search for articles containing references to any of the six categories of words reported in Table 1. As described in the next section, we arrive at this set of words after a pilot audit of newspaper articles mentioning geopolitical tensions and after isolating the most common unigrams and

¹¹ Our databases are ProQuest Historical Newspapers and ProQuest Newsstream.

¹² A monthly reading of 100 corresponds to about 350 articles per month containing terms related to geopolitical risk. The companion dataset reports the total number of articles each month. The average number of articles is around 70,000 over the sample. For one representative newspaper, this corresponds to about 200 articles per day. About one in 250 articles mentions, on average, terms related to geopolitical risk. As a comparison benchmark, one in 500 articles mentions the Beatles, and one in 300 articles mentions the Federal Reserve.

bigrams in geopolitics textbooks.¹³ In doing so, we verify that the defining elements of geopolitics concern territory, countries, nations, and leadership, and that defining elements of geopolitical risk center around the risk of wars and terrorism. Building on this characterization, we construct a set of search terms that give us an index that is robust, sensible, and easily interpretable.

As shown in Table 1, 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.¹⁴ Group 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 tend to describe geopolitical risks with a direct intervention of the United States (e.g. the Gulf War and the Iraq War), but also regional tensions among two or more countries with a U.S. diplomatic involvement. Group 2 includes words describing nuclear tensions. Groups 3 and 4 include words that describe war threats and terrorist threats, respectively. Lastly, groups 5 and 6 aim at capturing press coverage of actual geopolitical events as opposed to just risks. Importantly, the words included in these groups are meant to 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.

Searching directly for geopolitical events in groups 5 and 6 plays an important role in our analysis, for two reasons. First, adverse geopolitical events often trigger an increase in geopolitical risk. For instance, a terrorist attack may increase the risk of future attacks. Hence, searching directly for events rather than risk can help obtain a more precise identification of the timing of some risk-inducing shocks. Second, in assessing the impact of geopolitical risk, we want to control for the direct impact that the event itself might have. For this reason, as described below, we create two subindexes that measure geopolitical threats and acts separately.

Figure 1 presents the 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

¹³ For instance, the book *Introduction to Geopolitics* (Flint, 2016) contains 48,759 bigrams, of which the most common ones are “geopolit code,” “world leader,” “unit[ed] states,” “world leadership,” “war [on] terror,” “modelski model,” “geopolit agent,” “cold war,” “soviet union,” “world war,” and “foreign polic[y].” The book *The Geopolitics Reader* (Dalby, Routledge, and Tuathail, 2003), which is a compendium of 39 geopolitics essays written by different authors, 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.”

¹⁴ We refrain from including proper nouns in the search words, except for “United States” and the names of the four largest continents. We do so because we want to guard our search against the possibility that terms related to geopolitical risks may cease to be such for a limited period of time. For instance, although the name “Adolf Hitler” may have correctly identified geopolitical risks in the 1930s, it is far more often associated today with books, movies and historical accounts of World War II, and it is best left out of the searches. The same is often true of many political leaders or figures once they die, or are jailed, or retire from office.

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 rises in correspondence with major terrorist events in Europe, like the March 2004 Madrid bombing, the July 2005 London bombing, and the November 2015 Paris terror attacks. The index also rises in 2014, during the Russian annexation of the Crimea peninsula and the escalation of ISIS military operations in Iraq and Syria.

Figure A.1 in the Appendix elaborates further on the contribution of each of components of the index, one topic at a time. 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. Additionally, Figure A.2 in the Appendix shows the search results using one newspaper at a time, highlighting a high degree of correlation across the newspaper-specific indexes.

Since spikes in risk often coincide with the realization of big events, the GPR index—as well as many other uncertainty indexes—captures a convolution of shocks to first- and higher-order moments. We attempt to isolate the effects of pure geopolitical risk 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 groups 1 to 4—the groups directly mentioning risks—while the GPA index searches only for groups 5 and 6—the groups directly mentioning adverse events. Figure 3 plots the two indexes. The GPT and GPA indexes display a high degree of comovement, with a correlation of about 0.6. In particular, 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—and in some cases remains elevated after the event has ended. We will exploit this independent variation between the GPA and GPT indexes to disentangle the effects of geopolitical acts and threats in the VAR analysis presented in Section 4.

Lastly, Figure 2 displays GPRH, the monthly long-span index. The long-span index closely mimics the benchmark index for the period in which the coverage overlaps, with a monthly correlation since 1985 of 0.95.¹⁵ As for the baseline GPR index, every major spike in the index can be

¹⁵ To capture shifts in the usage of particular words over time, we add to the search category “War Threats”: {(war OR military) N/3 (crisis OR uncertain*)}, and {(“war effort*” OR “military effort*”) AND (risk* OR threat* OR fear*)}. We add to the search category “War Acts”: {“state of war”}, and {“declaration of war”}.

associated with episodes of rising geopolitical tensions. The index stays elevated during World War I and World War II and peaks at the onset of both. Figure A.3 in the Appendix further illustrates how the subcomponents of historical geopolitical risk have evolved over the past 115 years. Early in the sample, the index rises and stays high during World War I and World War II, and phrases directly related to the conflict itself dominate the index. 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. To preview the results, human reading of 16,000 newspaper articles as well as comparison to external proxies confirms that the index accurately captures movements in geopolitical risk.

The sample of newspaper articles used to construct the index—denoted by \mathcal{U} —contains about 70,000 news articles, on average, each month. After an initial reading of a few hundred articles selected at random from \mathcal{U} , we concluded that the largest payoff to an audit study involved selecting and evaluating articles that directly mentioned words such as geopolitics, war, or terrorism. In fact, articles that mention these words cover a diverse set of events, from rising geopolitical risks, to obituaries of famous generals, to war anniversaries and war movies, to declining geopolitical risks. Accordingly, 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 reflects our definition of geopolitics and geopolitical risks, and is also supported by an analysis of the most common unigrams found in books on the subject of geopolitics.¹⁶ 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} .

¹⁶ For instance, the most common word roots in Flint (2016) 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.”

Together with a team of research assistants, we read these $50 \times 50 = 2,500$ articles. We assigned to the set \mathcal{E}^1 the articles mentioning high geopolitical tensions or adverse geopolitical events, and assigned to the set \mathcal{E}^0 articles not highlighting any recent risks or recent adverse events. We found that slightly less than half of the articles in \mathcal{E} discussed high or rising geopolitical risks. Additionally, the error rate—the number of articles in the set \mathcal{E}^0 divided by the number of articles in the set \mathcal{E} —was very volatile, with a monthly standard deviation of 17 percent, thus indicating that a very broad search is likely to be contaminated by a high noise-to-signal ratio. For instance, the error rate averages around 80 percent in the months after the end of the Gulf War, when newspaper coverage of the Gulf War is very extensive, but a substantial majority of articles cite declining tensions, peace initiatives after Saddam Hussein’s withdrawal from Kuwait, and the importance of the UN mandate to maintain peace and stability in the region.

The pilot audit served two purposes. The first purpose was to identify words that would allow an automated search algorithm to differentiate between articles belonging to \mathcal{E}^1 and those belonging to \mathcal{E}^0 . In particular, we used text analytics techniques on the articles belonging to either set in order to identify the bi-grams that appeared more frequently in articles belonging to the set \mathcal{E}^1 and \mathcal{E}^0 . Although our index includes words and phrases of various length as well as proximity searches, uni-grams were not very informative, and tri-grams were too uncommon to derive or to guide our search criteria.¹⁷ Using Bayes’ rule, we computed the odds ratio of an article belonging to \mathcal{E}^1 instead of \mathcal{E}^0 given that it contains each bi-gram. We used the 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 . Most articles in this set are written at times of anniversaries, such as the centenary of World War I in 2014; upon death of historical figures; at the time of books’ publication and movies’ releases; and other art events that are connected to wars, terrorism, and other episodes of important historical relevance. We used this list of bi-grams to choose words that articles should not contain in order to be included in the index.¹⁸

The second purpose of the pilot audit was to create a detailed audit guide to be used during the full scale audits, discussed next.¹⁹ 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

¹⁷ Prior to selecting bi-grams, we filter out stop words and proper names, including names of countries, cities, and political organizations. For each bi-gram, we can calculate the probability that the bi-gram signals an article belonging to \mathcal{E}^1 using Bayes’ rule.

¹⁸ The set of words 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.”

¹⁹ The audit guide is available at https://www2.bc.edu/matteo-iacoviello/gpr_files/audit_guidelines_GPR.pptx.

of Baker, Bloom, and Davis (2016), we met with the auditors on a weekly basis over the course of more than two years, 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 articles and topics included in our index.

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. Figure 4 shows that our computer index lines up well with an index that could be constructed by humans. The correlation between the two series is 0.837, a value that is remarkably high when one takes into account sampling uncertainty. Figure A.4 shows a high correlation—0.86 when we aggregate the data at an annual frequency, and 0.78 at a quarterly frequency—when we repeat the same exercise using historical data, and a random sample of 7,416 articles, from 1899 through 2017.

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. 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.

Finally, we construct three variants of the GPR index based on a broader and narrower set of articles, as well as on a very parsimonious choice of search words. These indexes, which we name broad, narrow, and simple, are discussed in Appendix A.2 and plotted in Figure A.5. As the figure shows, the index is robust to the inclusion and exclusion of specific phrases and synonyms. In addition, because we study the economic effects of higher geopolitical risk, we need to guard against the possibility that words related to geopolitical tensions are more likely to be mechanically used during recessions, even if recessions are caused by geopolitical tensions. Figure A.6 shows

a version of the GPR index that excludes the search terms “economy” OR “stock market*” OR “financial market*” OR “stock price*.” Although 19 percent of articles in GPR are filtered out, this alternative index is virtually indistinguishable from the benchmark index, with a correlation of 0.989.

One way of summarizing the outcome of our audit process is to link it to the work of [Saiz and Simonsohn \(2013\)](#). These authors list a number of conditions 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 [Appendix A.3](#), 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 first discuss the nature of the risks captured by the GPR index, and whether biases in media coverage of some events can distort our measure. We then compare the GPR index to alternative proxies for geopolitical risks. Finally, we relate the GPR index to popular measures of economic uncertainty.

3.1 Risks Captured by the Index

Exposure to geopolitical risk varies both geographically and by sector of the economy. Our index captures geopolitical risks as perceived and chronicled by the press in English-speaking countries, particularly in the United States: to construct the index, we use six U.S., four British, and one Canadian newspaper. Moreover, one of the search categories measures regional tensions with some form of U.S. involvement. Thus, a narrow interpretation of the index is that it captures geopolitical risks as perceived in the United States, the United Kingdom, and Canada. At the same time, we search newspapers that have wide geographical coverage and routinely report on international events. Furthermore, geopolitical events that involve these countries and their interests abroad—in particular those of the United States—have global implications. Hence, a broader interpretation is that the index is also a good proxy for global geopolitical risks that are relevant for major financial investors, corporations, and policy-makers.

[Figure 5](#) provides a window into the type of events captured by our index by presenting the daily GPR—available at <https://www2.bc.edu/matteo-iacoviello/gpr.htm>—alongside the main geopolitical risks covered by the press on days where the index either reached high levels, or

rose significantly. The daily GPR is obviously noisier than its monthly counterpart. Even so, it nicely illustrates three frequent scenarios in which the daily unfolding of geopolitical tensions causes elevated levels of the GPR at a monthly level. Figure A.12 in the Appendix provides additional detail, using screenshots of the newspapers’ front pages.

In the first recurring 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—see panels (a) and (b) of Figure A.12. In the 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—see panels (c) and (d) of Figure A.12. In the 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, the 2014 tensions between Ukraine and Russia, and the 2017 tensions involving North Korea—see panels (e) and (f) of Figure A.12—featuring several days where the GPR is high, but no single instance where the index reaches extraordinarily large values.

In all these instances, spikes in the daily index correctly point to when particular events happened or reached a climax, thus providing robust evidence on the large informative content of the index even at frequencies such as days or weeks. Such frequencies can be useful to researchers wishing to study the financial market effects of geopolitical tensions.

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

Figure 6 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.²⁰ 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 middle panel confirms that the irrelevance of other newsworthy events still applies when we replace the natural disaster index with 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 neither unpredictable (like most natural disasters) nor predictable (like most sports events) news have a significant bearing on fluctuations in the geopolitical risk index.²¹

Finally, in the bottom panel we address the potential for political slant to skew newspaper coverage of geopolitical risks. Following the approach in [Baker, Bloom, and Davis \(2016\)](#), we split our 11 newspapers into seven left-leaning and four right-leaning newspapers.²² The “left” and “right” versions of our GPR index move together closely, with a correlation of 0.94, again 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 remarkably robust to the political slant of newspapers.

3.3 Relationship 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.

²⁰ The natural disasters index counts the share of articles mentioning “earthquakes,” “hurricanes,” “tornadoes,” “tsunamis,” or “wildfires.”

²¹ 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 \(2016\)](#) 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.

²² The left-leaning newspapers are the *Boston Globe*, *Chicago Tribune*, *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*, the *Financial Times*, the *Times*, and *The Wall Street Journal*

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.²³ The proxy, which counts the number of international crises per month, is plotted alongside the GPR index in the top panel of [Figure 7](#). 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 7](#) 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 press coverage in the English-speaking press.²⁴ 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 7](#) compares the GPR index with the national security component 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 about events associated to national security (of which geopolitical events are a

²³ 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 \(2012\)](#).

²⁴ 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.

subset), which is not the same concept as the uncertainty generated by geopolitical events.²⁵

Finally, the bottom panel of Figure 7 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.

3.4 Relation to Popular Measures of Economic Uncertainty

Figure 8 compares the benchmark index with two other popular measures of uncertainty: the VIX—a measure of stock market volatility—and the EPU index of Baker, Bloom, and Davis (2016).²⁶ 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.

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, and various terrorist attacks other than 9/11.

Summing up, compared to the VIX 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.

²⁵ Chadeaux (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 ready for 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.

²⁶ Throughout the paper, our VIX measure is the “old” VIX (VXO) from the Chicago Board Options Exchange. We use the VXO that starts in 1986 instead of “new” VIX—that only starts in 1990—since it grants us more data and since the two indexes have 0.99 correlation at monthly frequency.

4 Geopolitical Risk and the U.S. Economy

In this section we estimate the effects of rising geopolitical risk on the U.S. economy using structural VAR models. We first track the macroeconomic and financial implications of an exogenous rise in geopolitical risk. We then estimate the heterogeneous effects of geopolitical risk on industry-level stock returns. Finally, we assess the separate role of shocks to geopolitical threats and shocks to geopolitical acts.

4.1 Main Results

Our main VAR specification—which we estimate using data from 1985:M1 through 2016:M12—aims to characterize the economic effects of high geopolitical risk on the U.S. economy. The model consists of nine variables: (1) the GPR index; (2) the EPU index of [Baker, Bloom, and Davis \(2016\)](#); (3) consumer sentiment from the University of Michigan Survey of Consumers; (4) the log of U.S. industrial production; (5) the log of nonfarm payroll employment; (6) a measure of U.S. gross trade—namely, the log of the sum of U.S. imports and exports in goods; (7) the Standard and Poor’s 500 index; (8) the log of the West Texas Intermediate price of oil; (9) the yield on two-year U.S. Treasuries.²⁷ All VAR models presented in the paper are estimated using Bayesian techniques. We impose a Minnesota prior on the reduced-form VAR parameters by using dummy observations as in [Del Negro and Schorfheide \(2011\)](#). The resulting specification is estimated using a constant and 12 lags of the endogenous variables.²⁸

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 the GPR index reacts contemporaneously only to its own shock. Hence, any contemporaneous correlation between the macro variables and the GPR index reflects the effect of the GPR index on the macro variables. The characteristics of the GPR index discussed in Section 2—as well as the comparison to the EPU index in Section 3—lend support to this assumption. For instance, [Jackson and Morelli \(2011\)](#) list religion, revenge, ethnic cleansing, and bargaining failure over resources as the main reasons for armed conflicts. Although recessions, lower commodity prices, or dismal economic

²⁷ The U.S. trade series are from the OECD Monthly International Merchandise Trade database. The U.S. trade series, 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.

²⁸ Following the notation in [Del Negro and Schorfheide \(2011\)](#), the vector of hyperparameters of the Minnesota prior is $\lambda = [1, 3, 1, 1, 1]$. We use the first year of the sample as a training sample for the Minnesota prior. All the results reported in the paper are based on 10,000 draws from the posterior distribution of the structural parameters, where the first 2,000 draws were used as a burn-in period.

performance might in some cases have exacerbated existing geopolitical tensions, it seems reasonable to assume that movements in economic variables within a month have little bearing on geopolitical risks. Nonetheless, in Section A.4 in the Appendix we explore robustness to an alternative Cholesky ordering, as well as to alternative specifications of the baseline VAR model.

The solid lines in Figure 9 show the median impulse responses to an exogenous increase in the GPR index of 167 points, while the light- and dark-shaded areas represent the corresponding 68 percent and 90 percent pointwise credible bands, respectively. The size of the shock equals the average change in the index following the nine episodes of largest increases in the GPR index.²⁹ The rise in the GPR index induces a small and 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. On the real side, IP declines quickly, bottoming out at negative 0.9 percent after about 6 months, before reverting back to trend. The deterioration in labor market conditions is substantial but more gradual, with payroll employment reaching a trough of negative 0.4 percent a year after the shock. Gross trade also drops, with U.S. imports and exports falling nearly 2 percent relative to the baseline. Figure A.7 in the Appendix plots the response of private investment to a GPR shock, based on an extension of the baseline model estimated on quarterly data. The economically significant decline in investment following a GPR shock, together with the decline in employment, is consistent with models of investment under uncertainty à la Dixit and Pindyck (1994).³⁰

On the financial side, the response of the stock market is economically and statistically significant. Stock prices drop by almost 3 percent on impact and remain below baseline for a little over three months. The increase in the GPR leads to a decrease in oil prices, which bottom out at 7 percent below baseline after three months. This result stands in contrast with much of 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. Finally, 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

²⁹ 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.

³⁰ The quarterly VAR consists of the following variables: (1) the GPR index; (2) the EPU index; (3) consumer sentiment; (4) the log of U.S. GDP; (5) the log of nonfarm payroll employment; (6) the Standard and Poor's 500 index; (7) the log of the West Texas Intermediate price of oil; (8) the yield on two-year U.S. treasuries; and (9) the log of private investment, defined as the sum of private nonresidential investment and consumption of durable goods. 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, while the GDP and investment series dividing by the GDP deflator.

monetary policy stance.

One useful way to assess the exposure to GPR of various sectors of the U.S. economy is depicted in Figure 10. We add to the VAR model the cumulative excess return of firms in given industries relative to the S&P 500.³¹ The solid lines show the excess return for 6 industries. The defense industry, which is perhaps directly exposed to geopolitical risk, records a positive but short-lived excess return; by contrast, industries that are exposed to the overall U.S. economy—such as aircraft, steelworks, and mining—display somewhat persistent negative returns. The oil industry, which some commentators argued could benefit from wars, especially in the Middle East, displays an initial positive excess return followed by a persistent decline, a response that mimics the path of oil prices. Finally, the insurance industry moves in sync with the overall U.S. stock market.

4.2 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 an 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.

The impulse responses to the GPA and GPT shocks are shown for selected variables in Figure 11. In presenting the results, we adopt the following exposition scheme, which is best viewed in color. Specifically, the responses to the GPA shock are plotted using a green-based color motif, while the responses to the GPT shock are plotted using a red-based color motif.

Starting from the responses of the three uncertainty proxies, a GPA shock of size 288—a shock sized to be equal to the 7 largest spikes in GPA, shown in panel (a)—induces an initial increase in the GPT and EPU indexes, followed by a period of below-average GPT and EPU that lasts for about a year. Thus, these responses are consistent with the realization of acts leading to the resolution of threats and uncertainty. By contrast, a GPT shock—shown in panel (b)—leads to a persistent increase in GPT—which remains elevated for over a year—and in EPU. The GPA index, which by assumption does not move on impact, increases for about one year, as in our sample many

³¹ We use data on 6 industry portfolios from the 48 Fama-French value-weighted industry portfolios available in Kenneth French's data library.

geopolitical threats precede geopolitical acts.

The responses of activity, trade, and the stock market show that the GPA and GPT shocks have asymmetric effects on the U.S. economy. A shock to the GPA leads to a small but short-lived decline in economic activity and trade, whereas the stock market rises sharply one month after the shock. By contrast, a shock to the GPT induces large and protracted recessionary effects, as well as a decline in stock 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.”

Figure 12 further elaborates on the asymmetric response of the stock market by depicting the response of cumulative excess returns in six industries to GPA and GPT shocks. Excess returns in all industries feature an asymmetric response, albeit to a various degree. The defense industry features the largest asymmetry: defense companies, on average, earn an excess return of about 5 percent for more than two years following a GPA shock, while they earn only a modest and short-lived excess return following a GPT shock. Excess returns in the steel and mining industries are also asymmetric—positive when geopolitical acts materialize and negative when threats are high. By contrast, the asymmetry in excess returns for insurance companies is economically modest.

One possible interpretation of the asymmetric effects of shocks to acts and threats is that the act component of GPR leads to a resolution of the uncertainty around a particular set of events, as well as to a coordinated policy response that ends up giving protection on the worst possible outcomes. By contrast, threat shocks depress asset prices and economic activity because they increase uncertainty and send signals about future adverse events.³² The finding that the realization of the event has only modest economic consequences compared to the threat echoes the findings of theoretical models where agents form expectations using a worst case probability, as for instance in [Ilut and Schneider \(2014\)](#).

5 International Effects of Higher Geopolitical Risk

This section characterizes the international effects of rising geopolitical tensions. We first estimate a battery of structural VAR models, which we use to track the macroeconomic implications of an exogenous rise in geopolitical risk on real activity. We then test whether global stock market returns depend on geopolitical risk. Finally, we estimate panel regressions to unveil whether geopolitical risk affects international capital flows.

³² See [Pastor and Veronesi \(2013\)](#) for a model of political uncertainty and risk premia.

5.1 Geopolitical Risk and Real Activity

We first study whether GPR shocks have adverse consequences on the real economy outside the United States. We start by looking at the response of world IP and IP in advanced and emerging economies. Importantly, the emerging economies' IP index includes mostly Asian, European, and Latin American countries. Reliable data on IP in major oil producing countries—which are likely to be highly exposed to the geopolitical risks captured by our index—are not available.³³ We then estimate the response of real activity in three countries: Canada and the United Kingdom—as we used newspapers from these two countries in the construction of the index—and Mexico, an emerging economy selected for its large exposure to the U.S. economy.

We estimate a battery of VAR models consisting of the GPR index, the EPU index for the United States, and IP.³⁴ As for the U.S. model, we identify a GPR shock ordering the GPR index first in a Cholesky decomposition of the covariance matrix of the VAR residuals. The black lines in Figure 13 depict the median responses of IP for the six countries and regions listed above. These impulse responses suggest that a GPR shock has global consequences—world IP declines by about 0.5 percent one year after the shock—but its effects are mostly concentrated in advanced economies. By contrast, the emerging economies included in our index, on average, do not respond to geopolitical risks. Yet, Mexico—possibly through its large exposure to U.S. trade—experiences a modest but persistent decline in real activity.

5.2 Geopolitical Risk and Stock Returns

We now turn to examining the reaction of stock market returns to changes in geopolitical risk. We do so both for the sample covered by the historical GPR index and for the sample covered by the benchmark GPR index.

The baseline econometric specification echoes the work of [Berkman, Jacobsen, and Lee \(2011\)](#). These authors find that disaster risk depresses stock returns. They measure disaster risk by counting the number of active crises recorded in the International Crisis Database discussed in Section 3 and plotted in Figure 7. Since their measure of disaster risk is tightly linked to geopolitical events, in this section we ask if our proxy, which displays only a weak correlation with their crisis index, can

³³ These indexes aggregate IP across countries using GDP weights. [Caldara, Cavallo, and Iacoviello \(2016\)](#) provide details on the construction of the IP indexes for advanced and emerging economies.

³⁴ We estimate three-equation models as opposed to larger models, as the IP responses reported next are robust to the inclusion of various variables employed in the U.S. model. The lack of availability of long time series data for some advanced and emerging economies made us opt for a simple specification. In addition, similar impulse responses can be estimated by running simple local projections.

help us uncover a significant relationship between geopolitical risk and stock returns.

We obtain data on monthly stock returns based on general market price indexes from Global Financial Data. Our sample ranges from 1900 to 2016, although data availability varies by country, and the world stock price index is available starting in 1919. We select 17 countries—all countries that are currently classified as advanced economies, with the exception of India, Peru, and South Africa—for which data before World War II are available. The world stock price index is the Morgan Stanley Capital International (MSCI) index from 1970. Prior to 1970, world returns are calculated using the weighted average of country-specific returns.³⁵ Nine countries have data starting before World War I. Many countries included in our regressions have gaps in the coverage that range from one month to over a year. Since these gaps partly coincide with World War II—as some stock markets did not operate in those years—we follow [Berkman, Jacobsen, and Lee \(2011\)](#) and use all available information.

We start by estimating the following regression:

$$r_{wld,t} = \mu_i + \alpha_{wld}GPRSHOCK_t + \beta_{wld}CRISES_t + \varepsilon_{wld,t}, \quad (1)$$

where $r_{wld,t}$ is the world stock market return in month t , $GPRSHOCK_t$ is the residual of an autoregressive process of order one estimated for the GPR index, and $CRISES_t$ is the crisis index constructed by [Berkman, Jacobsen, and Lee \(2011\)](#). In columns (1) and (3) of [Table 2](#) we report results for two samples, starting in 1919 and 1985, respectively. To compare the impact on the GPR and on the crisis index, the coefficients measure the impact on stock returns of a one standard deviation shock in the GPR, and of having 2.41 active crises per month, the average number of crises over our sample.

For the historical sample, we find that a 1 standard deviation increase in the GPR induces a statistically significant decline in monthly stock returns of 0.5 percent. The sensitivity of world stock returns to geopolitical risk is larger after 1985, with an estimated drop of 0.75 percent. Interestingly, the coefficient on the crisis variable is negative for the historical sample—albeit not statistically significant—and becomes positive and not significant in the post-1985 sample. Thus, the GPR index correlates with negative stock returns controlling for the realizations of international

³⁵ The indexes were weighted in January 1919 as follows: North America 44 percent (USA 41 percent, Canada 3 percent), Europe 44 percent (United Kingdom 12 percent, Germany 8 percent, France 8 percent, Italy 4 percent, Switzerland 2.5 percent, Netherlands 2.5 percent, Belgium 2 percent, Spain 2 percent, Denmark 1 percent, Norway 1 percent and Sweden 1 percent), Asia and the Far East 12 percent (Japan 6 percent, India 2 percent, Australia 2 percent, South Africa Gold 1 percent, South Africa Industrials 1 percent). Country weights do not change until 1970. Capitalization weightings are used beginning in 1970 using the same countries that are included in the MSCI indexes.

crises. Moreover, the result over the post-1985 sample suggests that an advantage of the GPR index over the crisis index is that, having substantially more time variation, allows for the estimation of the impact of geopolitical events on stock returns over relatively short samples.

World stock returns react more to threats about geopolitical events than their realizations. This result is based on a modified version of equation (1), where we replace $GPRSHOCK_t$ with the residuals of AR(1) processes estimated for the GPR acts and threats indexes. As tabulated in column (2) of Table 2, for the historical sample, world stock returns decline in response to both GPA and GPT shocks, but the response to the former is small and not statistically significant. By contrast, in the post-1985 sample, stock returns rise in response to a positive GPA shock, while they experience a large and statistically significant decline in response to a GPT shock. Thus, as in the United States, world stock returns respond asymmetrically to the threats and realizations of geopolitical events.

We also estimate the following regression on country stock returns data:

$$r_{i,t} = \mu_i + \alpha_{wld}GPRSHOCK_t + \varepsilon_{i,t}, \quad (2)$$

where $r_{i,t}$ is the stock market return in country i and month t . We exclude the crisis index from the country regressions because for the 11 countries we have stock returns data starting prior to 1919, the first year the crisis index is available. Table 3 tabulates the results for the historical and the post-1985 samples.

Three results emerge from this exercise. First, both in the historical and post-1985 sample, geopolitical risk depresses stock returns in all but one of the countries included in our regressions—the only positive coefficient is estimated for Japan and is close to zero. Second, on average, the sensitivity of stock returns to geopolitical risk is larger in the post-1985 sample relative to the historical sample, with countries like the Netherlands, Portugal, and Spain having a coefficient about 3 times larger in the short sample. Third, the response of stock returns varies substantially across countries. For the historical sample, the response ranges from about negative 0.9 for Italy and South Africa, to 0 for countries like Japan and Germany. Similarly, for the post-1985 sample, coefficients range from negative 1.50 for Italy and Germany, to negative 0.3 for Australia and Japan. Furthermore, while stock returns in some countries have remained particularly responsive (such as Italy or South Africa) or unresponsive (such as Japan) over time, stock returns have become more sensitive in others—most notably in Germany.

5.3 Geopolitical Risk and Capital Flows

Finally, we present additional evidence on the global economic consequences of changes in geopolitical risk by showing how geopolitical risk affects capital inflows in a sample of advanced and emerging economies. The procyclical and volatile nature of capital flows makes them a leading policy concern, especially in economies that rely heavily on foreign sources of financing. We use country-level, quarterly data on capital inflows from the IMF’s Balance of Payments Statistics database. Our sample consists of 22 advanced economies, 23 emerging economies, and the United States, and covers the period from 1986:Q1 through 2015:Q4.³⁶

Our baseline specification tests whether movements in geopolitical risk have explanatory power for gross capital inflows. We choose gross inflows—net purchases of domestic assets by foreign residents excluding official reserves—in line with a large and growing body of empirical evidence that shows that gross capital flows respond systematically to changes in global conditions, and in line with the notion that our measure of geopolitical risk is more likely to matter for the economic decisions of global investors on where to allocate capital across countries.³⁷ Our regression takes the form:

$$y_{i,t} = \alpha_i + \rho y_{i,t-1} + \beta GPR_t + \Gamma X_t + u_{i,t}, \quad (3)$$

where $y_{i,t} = inflows_{i,t}/GDP_{i,t}$ are gross capital inflows divided by annualized GDP, α_i are country fixed effects, GPR_t is our geopolitical risk index, and X_t is a vector of control variables. We estimate equation (3) separately for emerging economies, for advanced economies excluding the United States, and for the United States. Throughout, we assume that the effect of the GPR index on capital inflows is equal within each group of countries. Following the work of [Ahmed and Zlate \(2014\)](#), our model specification includes the VIX to control for global economic risk, lagged capital flows to control for persistence in capital flows, as well as country-specific GDP growth to capture

³⁶ The sample of advanced economies includes Japan, Germany, France, UK, Italy, Canada, Spain, Australia, Netherlands, Switzerland, Sweden, Belgium, Norway, Austria, Denmark, Greece, Finland, Portugal, New Zealand, Slovakia, Slovenia, and Estonia. The sample of emerging economies includes China, Brazil, India, Korea, Mexico, Indonesia, Turkey, Argentina, Venezuela, South Africa, Thailand, Colombia, Malaysia, Israel, Chile, Philippines, Peru, Ecuador, Jordan, El Salvador, Russia, Saudi Arabia, and Latvia. We drop from the sample countries with a standard deviation of inflows to GDP larger than 50 percent (Hong Kong, Ireland, Singapore, Luxembourg and Iceland). The average number of observations per country is 106 for the advanced economies, and 93 for the emerging economies.

³⁷ See [Forbes and Warnock \(2012\)](#) and [Ahmed and Zlate \(2014\)](#) for recent discussions of the focus on gross versus net capital flows. As discussed in [Ahmed and Zlate \(2014\)](#), whether to look at net capital inflows or gross capital inflows is an open question. Conceptually, global geopolitical risk should be more directly relevant for the investment decisions of foreign investors. For this reason, we focus on gross capital inflows.

demand-side factors that could drive capital flows towards one country.

Table 4 reports regressions coefficients scaled to denote the impact of a 1 standard deviation increase in the GPR index and the VIX. Comparing columns (1) and (2) of the table, an increase in GPR produces different effects on capital inflows in emerging versus advanced economies. In emerging economies, high GPR reduces capital inflows by 0.23 percentage points, while an equally sized increase in the VIX reduces capital inflows by more than one percentage point. By contrast, in advanced economies, increases in GPR lead to a sizable increase in capital inflows—about one percentage point—whereas increases in the VIX reduces capital inflows by 1.5 percentage points. GPR and VIX also have opposite effects on inflows for the United States: as tabulated in column (3), the effect of an increase in geopolitical risk is negative (albeit the coefficient is not statistically different from zero) while the effect of an increase in the VIX is positive and statistically significant. In all specifications, the coefficient on lagged GDP growth is positive, confirming the findings in Broner, Didier, Erce, and Schmukler (2013) that a better investment climate (as proxied by GDP growth) leads to larger inflows in both advanced and emerging economies.

In additional regressions results, we have verified that the asymmetric effect of geopolitical risk on capital inflows for emerging and advanced economies is present for all three subcomponents of capital inflows: portfolio flows, foreign direct investment, and other investments.³⁸ However, such effects are especially pronounced for portfolio flows and other investments compared to foreign direct investment.

All told, the results suggest a marked difference between the effects on capital flows of global economic risk (as measured by the VIX) and geopolitical risk. While higher economic uncertainty leads to a repatriation of foreign capital across the board, increases in geopolitical risk appear to shift purchases of foreign capital away from emerging and toward advanced economies, consistent with a flight-to-safety hypothesis.³⁹ However, the relatively small estimate of the effect of GPR on emerging economies' inflows suggests that adverse geopolitical events fall short of causing full-blown sudden stops in these economies. This finding mirrors our international VAR evidence showing little effects of higher geopolitical risk on activity in emerging economies.

³⁸ Other investments include liabilities to official creditors, foreign bank loans, and other financial transactions not covered in direct investment, portfolio investment, or reserve assets.

³⁹ Fratzscher (2012) finds evidence of dynamics of capital flows driven by safe-haven flows during the crisis. Our results suggest that flight-to-safety flows can materialize also during periods of high geopolitical tensions.

6 Conclusions

We construct an index of geopolitical risk and examine its evolution and its effects over the past 120 years. 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 and other advanced economies.

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 advanced economies, most notably in the United States. 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.

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Table 1: Search Groups — Benchmark GPR Index

Search Category	Search Terms
1. Geopolitical Threats	Geopolitical AND (risk* OR concern* OR tension* OR uncertain*) “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 OR “Middle East” OR “Far East” OR Asia)
2. Nuclear Threats	(“nuclear war” OR “atomic war” OR “nuclear conflict” OR “atomic conflict” OR “nuclear missile*”) AND (fear* OR threat* OR risk* OR peril* OR menace*)
3. War Threats	“war risk*” OR “risk* of war” OR “fear of war” OR “war fear*” OR “military threat*” OR “war threat*” OR “threat of war” (“military action” OR “military operation” OR “military force”) AND (risk* OR threat*)
4. Terrorist Threats	“terrorist threat*” OR “threat of terrorism” OR “terrorism menace” OR “menace of terrorism” OR “terrorist risk” OR “terror risk” OR “risk of terrorism” OR “terror threat*”
5. War Acts	“beginning of the war” OR “outbreak of the war ” OR “onset of the war” OR “escalation of the war” OR “start of the war” (war OR military) AND “air strike” (war OR battle) AND “heavy casualties”
6. Terrorist Acts	“terrorist act” OR “terrorist acts”

NOTE: This table lists the combination words searched in the construction of the GPR index. The exact search query, inclusive of words that are excluded from the search, is in the Appendix. The asterisk (*) symbol denotes a wild-card character.

Table 2: GPR and World Stock Market Returns

Country	GPR Historical		GPR Benchmark	
	(1)	(2)	(3)	(4)
GPR	-0.45 (0.27)		-0.74 (0.35)	0.31
Crisis Index	-0.16 (0.15)	-0.16 (0.15)	0.24 (0.34)	0.23 (0.34)
GPA		-0.10 (0.30)		0.35 (0.23)
GPT		-0.31 (0.22)		-0.99 (0.36)

NOTE: Estimation of the effect of geopolitical risk on world stock market returns between 1919 and 2016. We standardize the GPR, GPA and GPT indexes so that the coefficient measures the percent change in stock returns to a 1 standard deviation innovation in a given index. The variable crisis is the total number of crises in a month, normalized by 2.41, the average number of active crisis in our sample. Standard errors reported in parentheses are corrected for autocorrelation using the Newey-West method. See Section 5.2 for additional details. Source: Global Financial Data and International Crisis Database.

Table 3: GPR and Country Stock Market Returns

Country	GPR Historical			GPR Benchmark	
	(1) Coefficient	(2) Std. Errors	(3) Sample Start	(4) Coefficient	(5) Std. Errors
Australia	-0.30	(0.22)	1900	-0.25	(0.30)
Belgium	-0.70	(0.31)	1900	-1.32	(0.42)
Canada	-0.62	(0.23)	1914	-0.64	(0.25)
Finland	-0.20	(0.36)	1923	-0.45	(0.58)
France	-0.59	(0.33)	1900	-1.18	(0.53)
Germany	-0.09	(0.62)	1918	-1.44	(0.64)
India	-0.49	(0.50)	1922	-0.67	(0.58)
Italy	-0.90	(0.38)	1905	-1.50	(0.55)
Japan	0.07	(0.32)	1914	-0.34	(0.35)
Netherlands	-0.30	(0.37)	1919	-1.28	(0.50)
Peru	-0.59	(0.71)	1933	-1.05	(0.96)
Portugal	-0.27	(0.52)	1934	-0.95	(0.43)
Spain	-0.27	(0.32)	1915	-0.83	(0.49)
South Africa	-0.84	(0.23)	1910	-1.33	(0.32)
Sweden	-0.40	(0.28)	1906	-0.83	(0.53)
United Kingdom	-0.56	(0.23)	1900	-0.96	(0.37)
United States	-0.43	(0.29)	1900	-0.78	(0.35)

NOTE: Estimation of the effect of geopolitical risk on individual countries' stock market returns. We standardize the GPR index so that the coefficient measures the percent change in stock returns to a 1 standard deviation innovation in a given index. Column (3) reports the year in which the monthly data on stock returns are available for each country, while the sample ends in 2016 for all countries. Standard errors reported in parenthesis are corrected for autocorrelation using the Newey-West method. See Section 5.2 for additional details. Source: Global Financial Data.

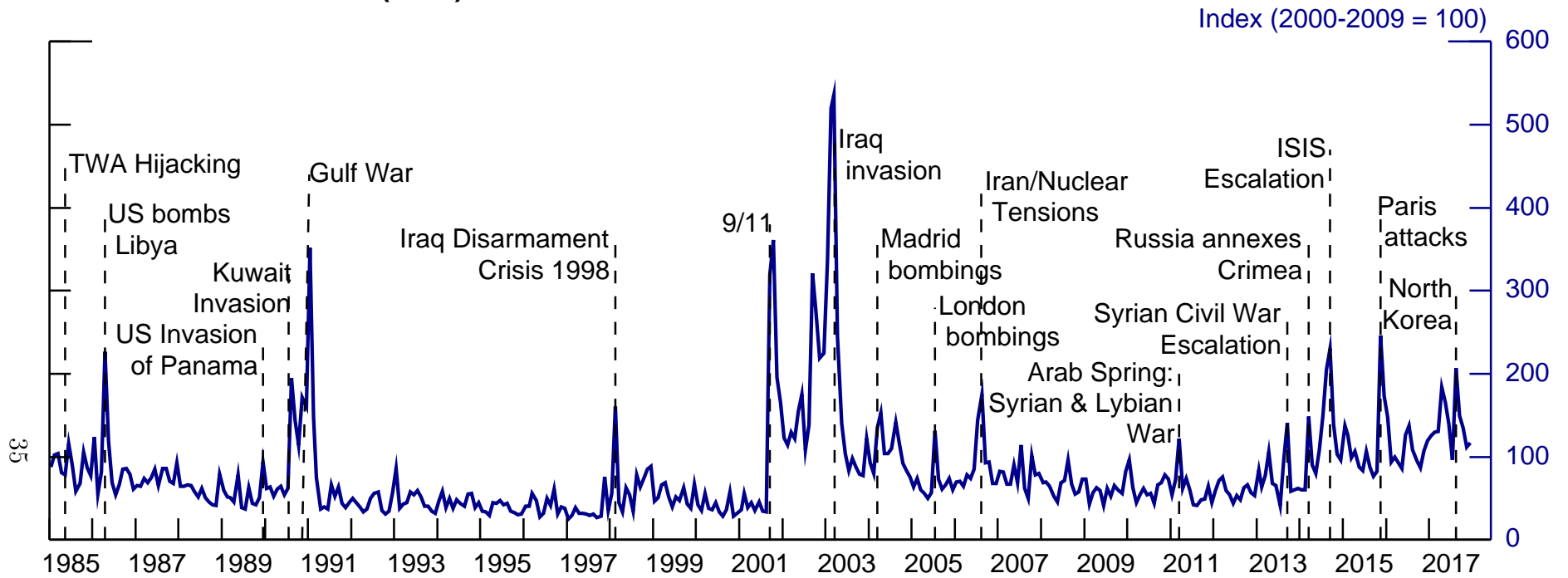
Table 4: GPR and Capital Flows

Variables	(1) Inflows/GDP Emerging Economies	(2) Inflows/GDP Advanced Economies	(3) Inflows/GDP United States
Lagged Inflows	0.30 (0.06)	0.16 (0.06)	0.51 (0.08)
GPR Index, standardized	-0.23 (0.12)	1.00 (0.32)	0.44 (0.36)
VIX, standardized	-1.09 (0.18)	-1.54 (0.59)	-0.88 (0.37)
Lagged GDP Growth	0.29 (0.09)	1.61 (0.36)	0.01 (0.62)
Observations	1,932	2,305	119
R-squared	0.170	0.047	0.329
Number of countries	23	22	1
Country Fixed Effects	YES	YES	—
Clustered Standard Errors	YES	YES	—

NOTE: Estimation of effects of geopolitical risk on gross capital inflows. We standardize both the GPR index and the VIX, so that the coefficients report the response of the ratio of inflows to gdp (in percentage points) to a 1 standard deviation innovation in GPR and the VIX. Robust standard errors reported in parenthesis. See Section 5.3 for additional details. Source: IMF's Balance of Payments Statistics database.

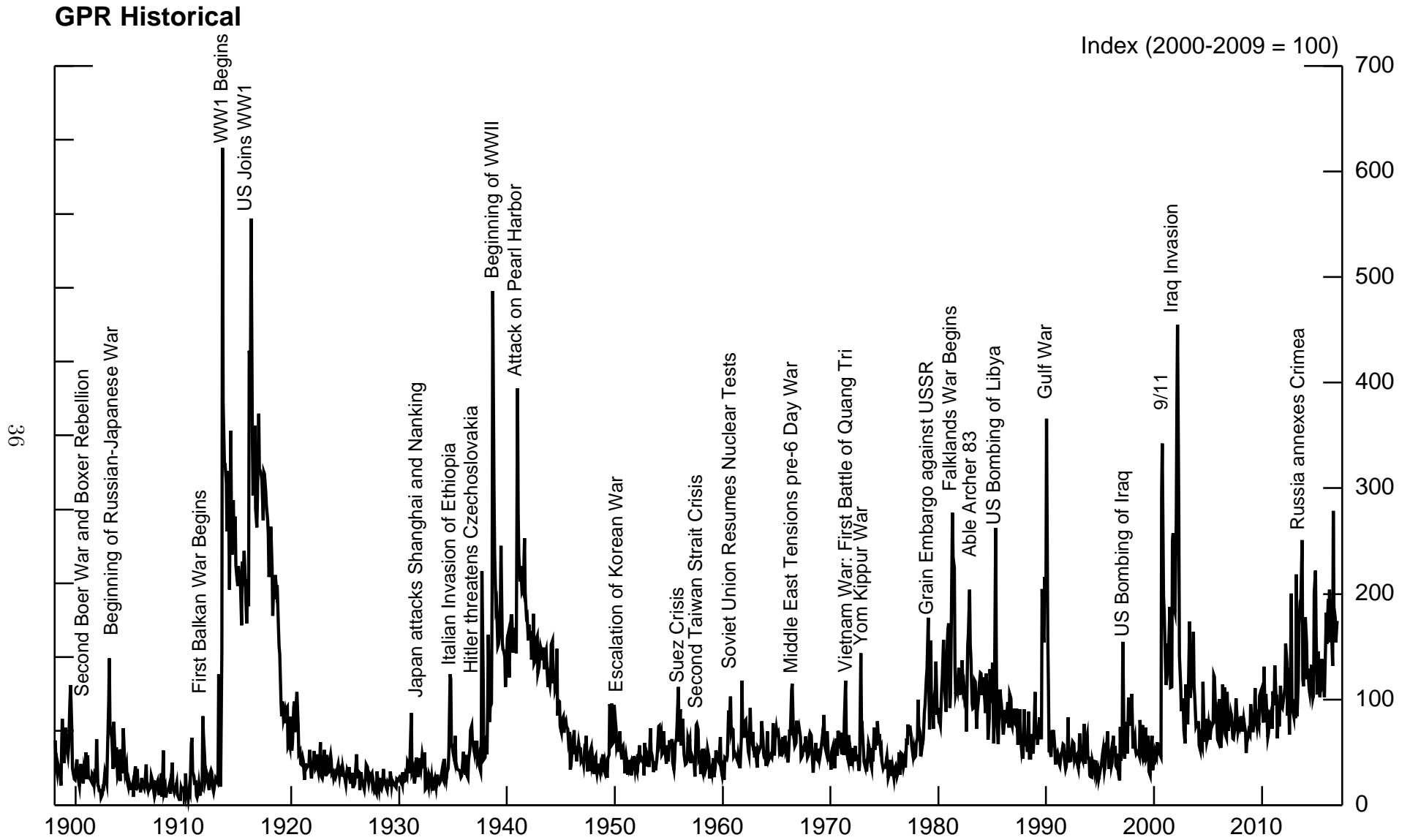
Figure 1: THE GEOPOLITICAL RISK INDEX

GPR Benchmark Index (GPR)



NOTE: The line plots the benchmark GPR index (data from 1985 until the end of 2017).

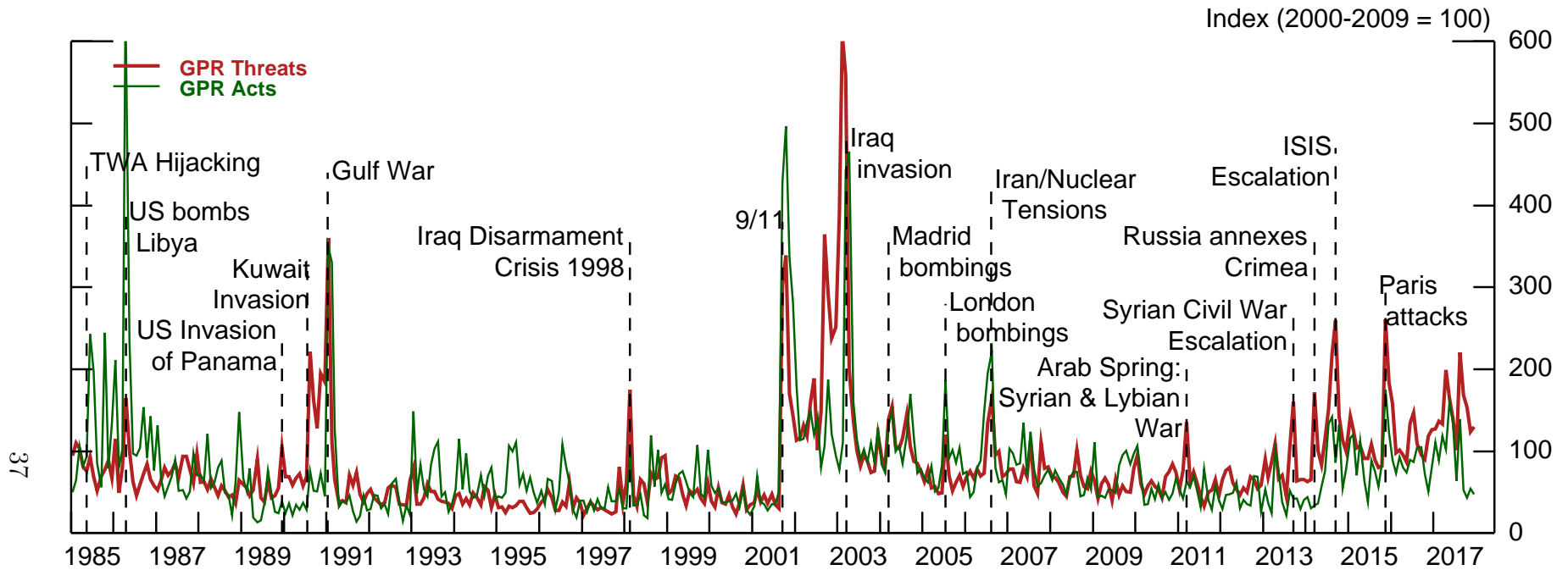
Figure 2: THE HISTORICAL GEOPOLITICAL RISK INDEX



NOTE: The line plots the monthly GPR index since 1900 (data until the end of 2017). The index is normalized to average a value of 100 in the 2000-2009 decade.

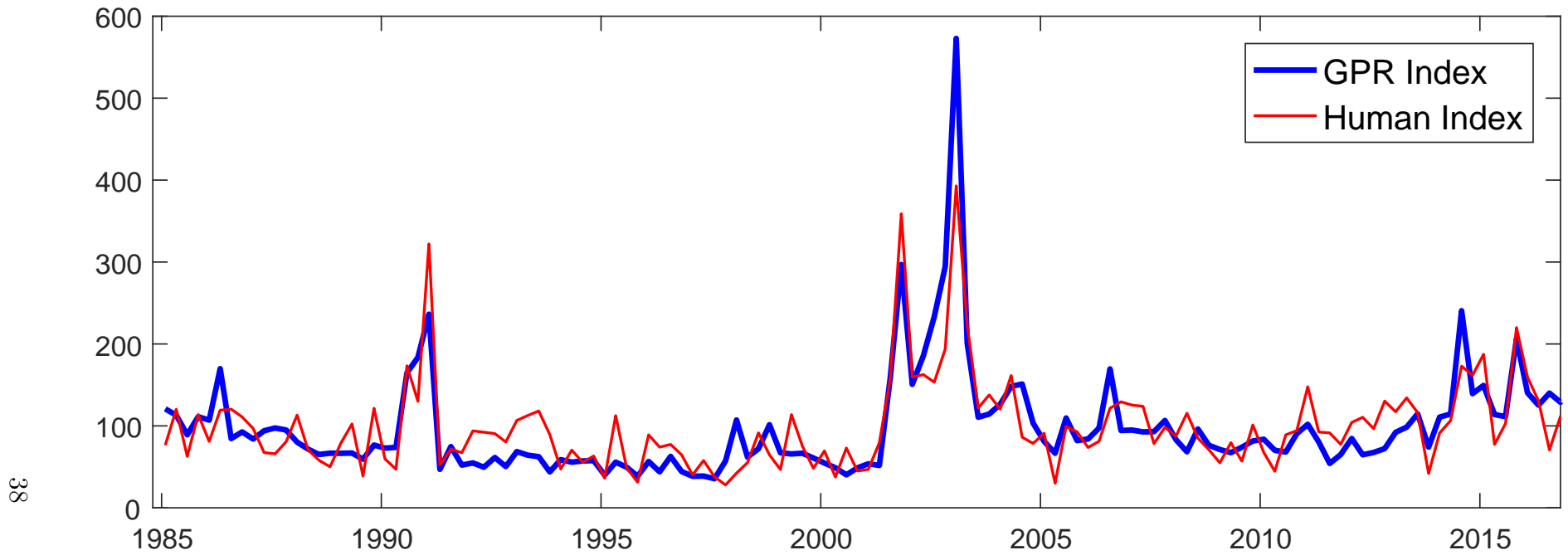
Figure 3: THE GEOPOLITICAL RISK INDEX: THE TWO SUBINDEXES

GPR THREATS AND ACTS



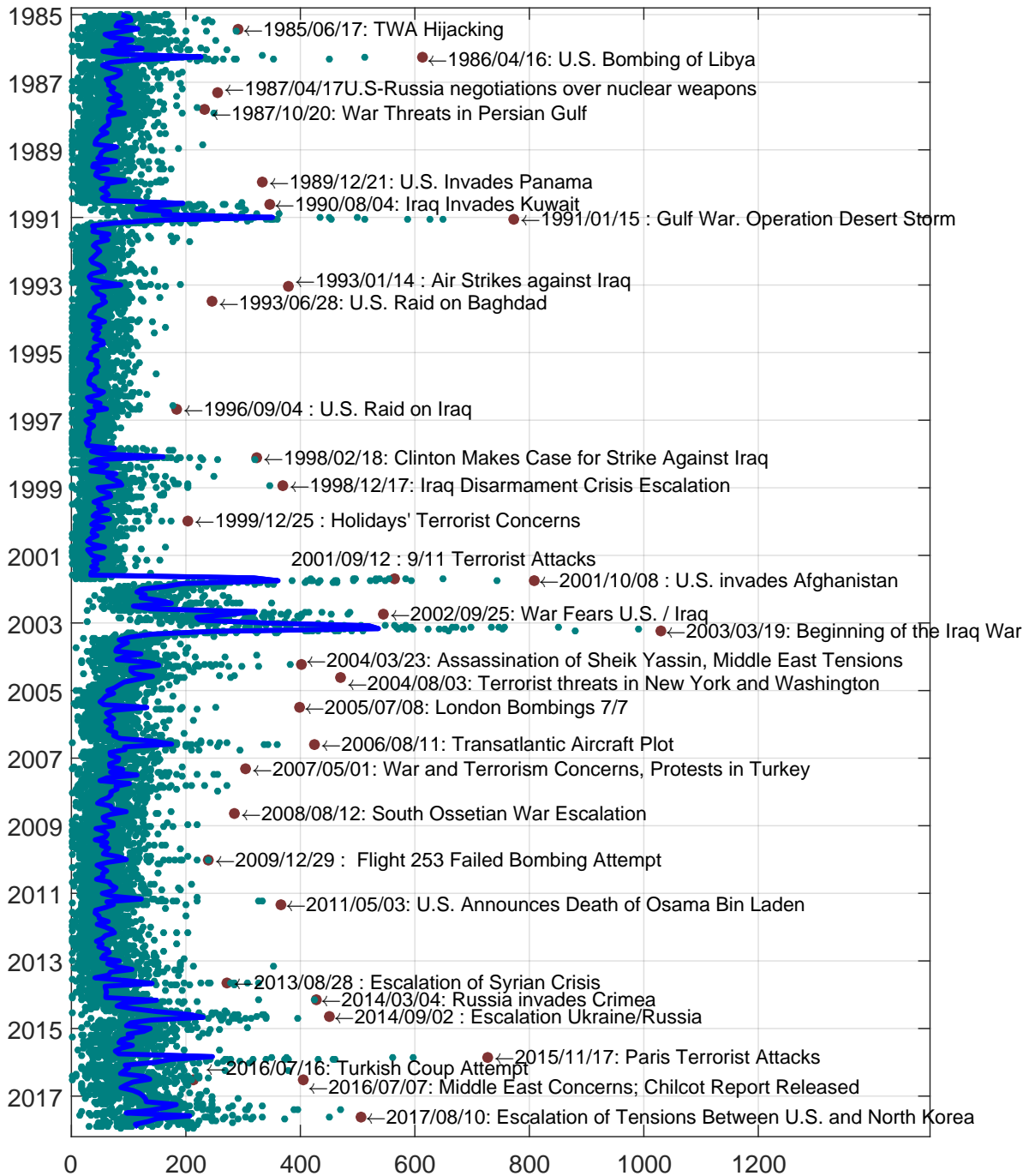
NOTE: This figure shows the GPR Threat (GPT) and the GPR Acts (GPA) indexes (data from 1985 until the end of 2017). The GPT is constructed by searching only articles containing words included in groups 1 to 4 in Table 1. The GPA is constructed by searching only articles containing words included in groups 5 and 6 in Table 1.

Figure 4: HUMAN AND COMPUTER-GENERATED GPR INDEXES



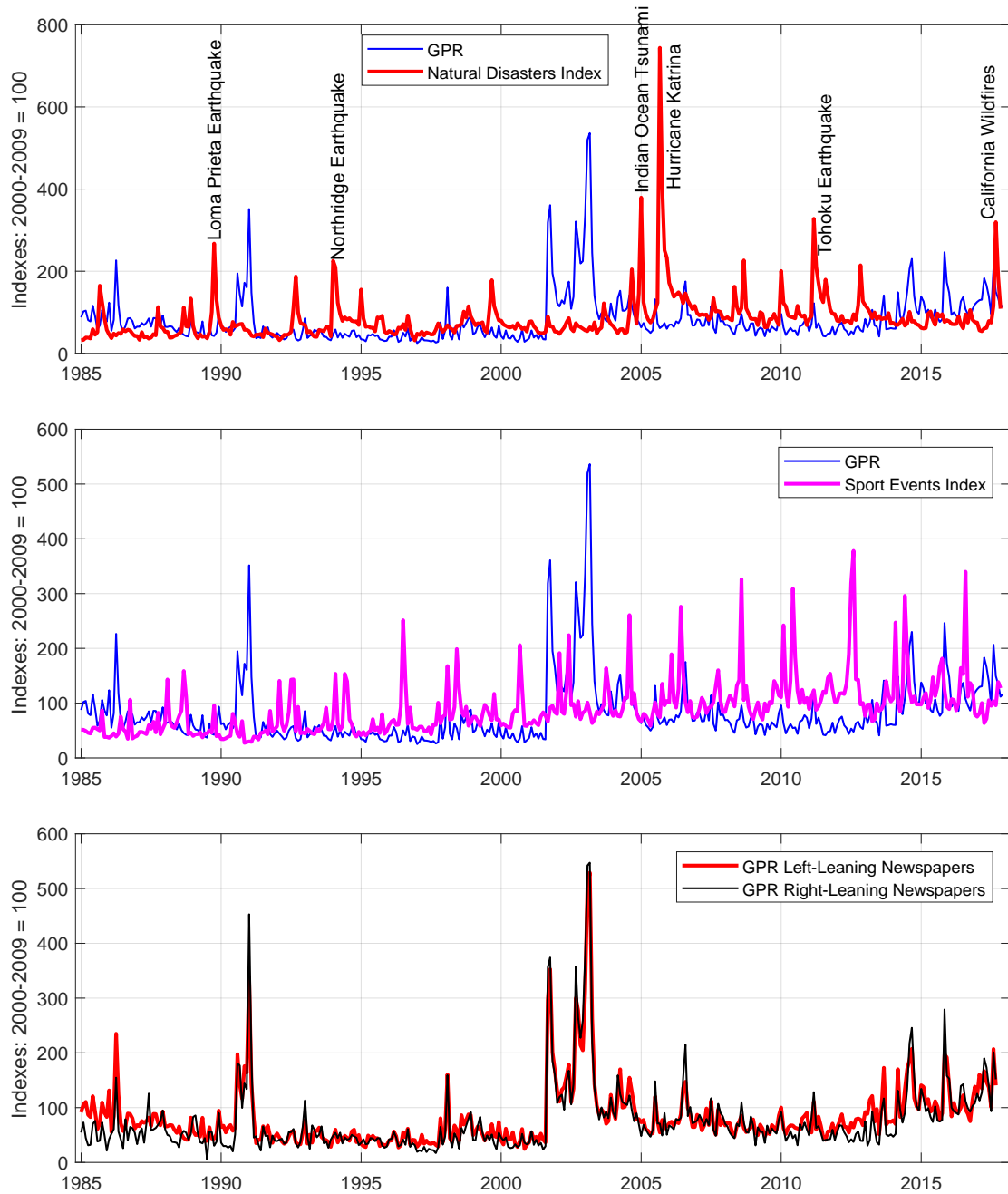
NOTE: Time-series comparison from 1985Q1 to 2016Q4 based on 6,125 articles. The series are plotted quarterly to reduce sampling variability. Both series are normalized to 100 from 1985 to 2016.

Figure 5: DAILY GEOPOLITICAL RISK AND KEY EVENTS



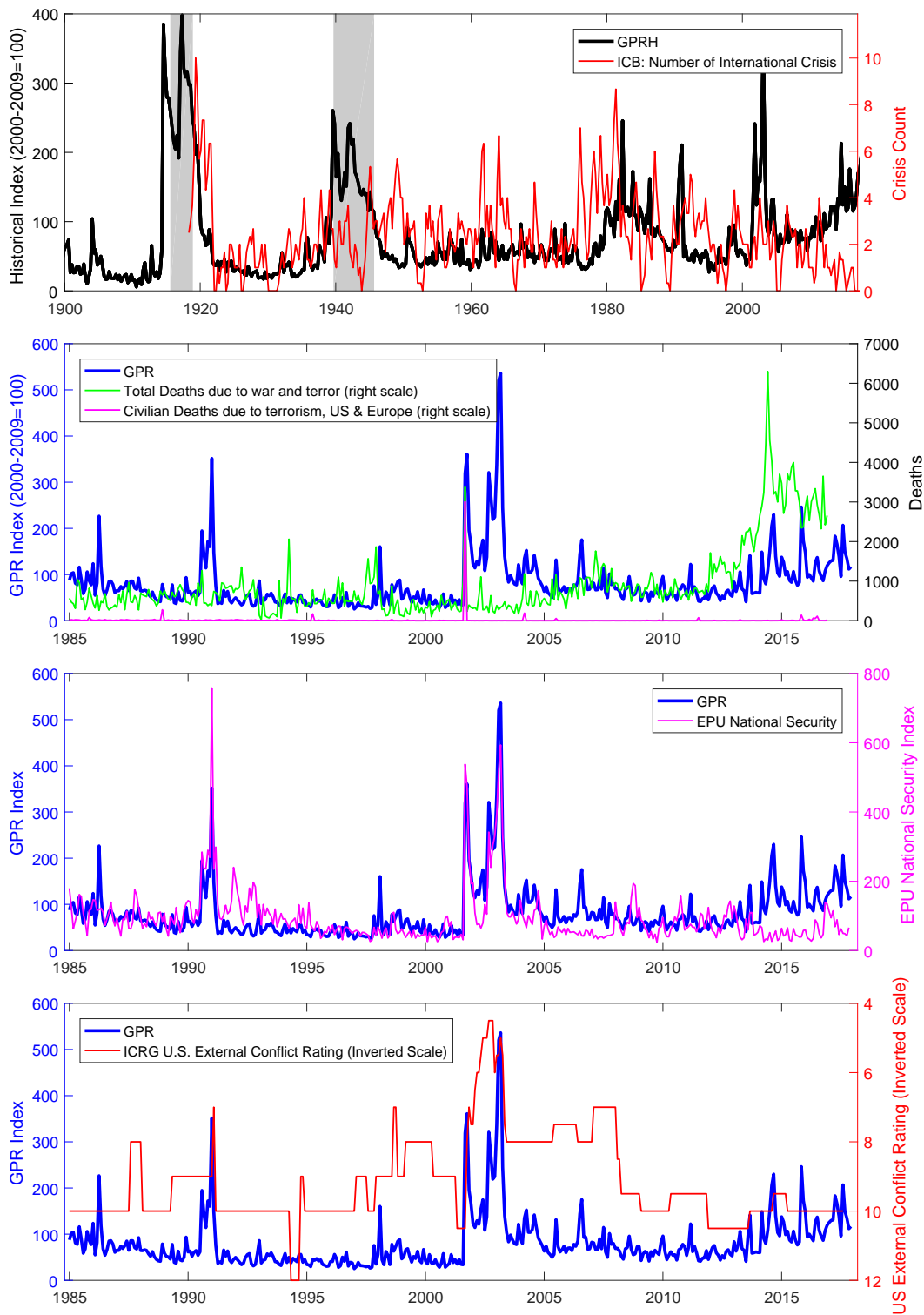
NOTE: Timeline of the daily GPR index. The solid blue line plots the monthly index (rotated 90 degrees). The dots show the daily observations, including description of the main events reported by the newspapers on days featuring spikes in the index.

Figure 6: THE GPR INDEX AND MEDIA BIASES



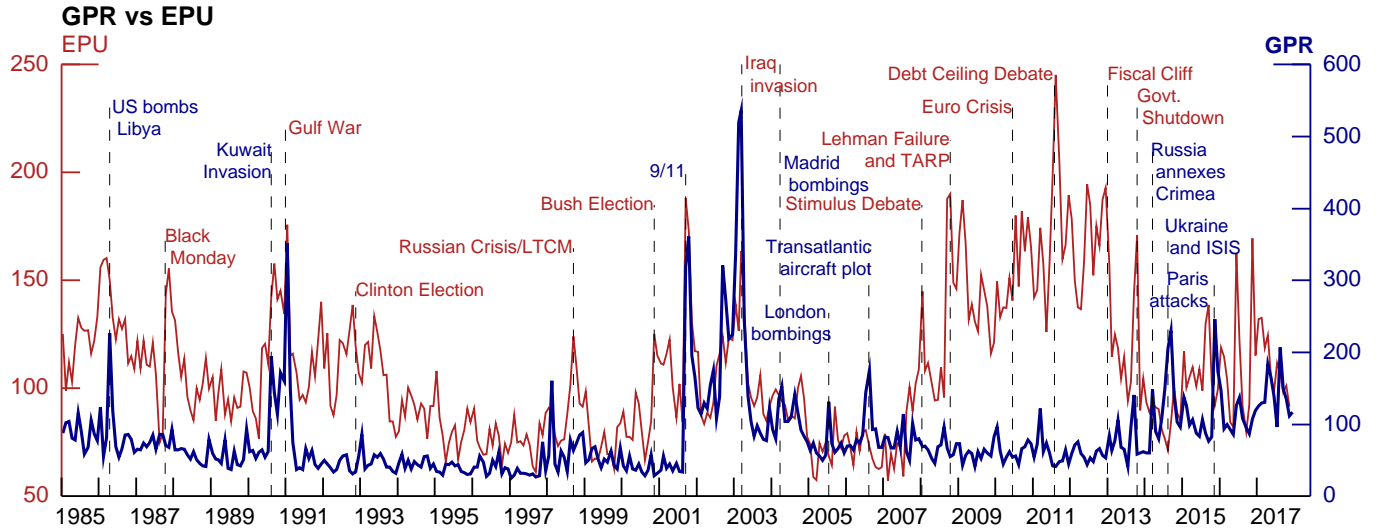
NOTE: The top panel compares the GPR index with a news-based index of natural disasters, constructed by counting the share of newspapers articles mentioning any of the following words: earthquake(s), hurricane(s), tornado(es), tsunami(s), or wildfire(s). The middle panel compares the GPR index with a news-bases 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 7: THE GEOPOLITICAL RISK INDEX AND OTHER PROXIES FOR GEOPOLITICAL RISK

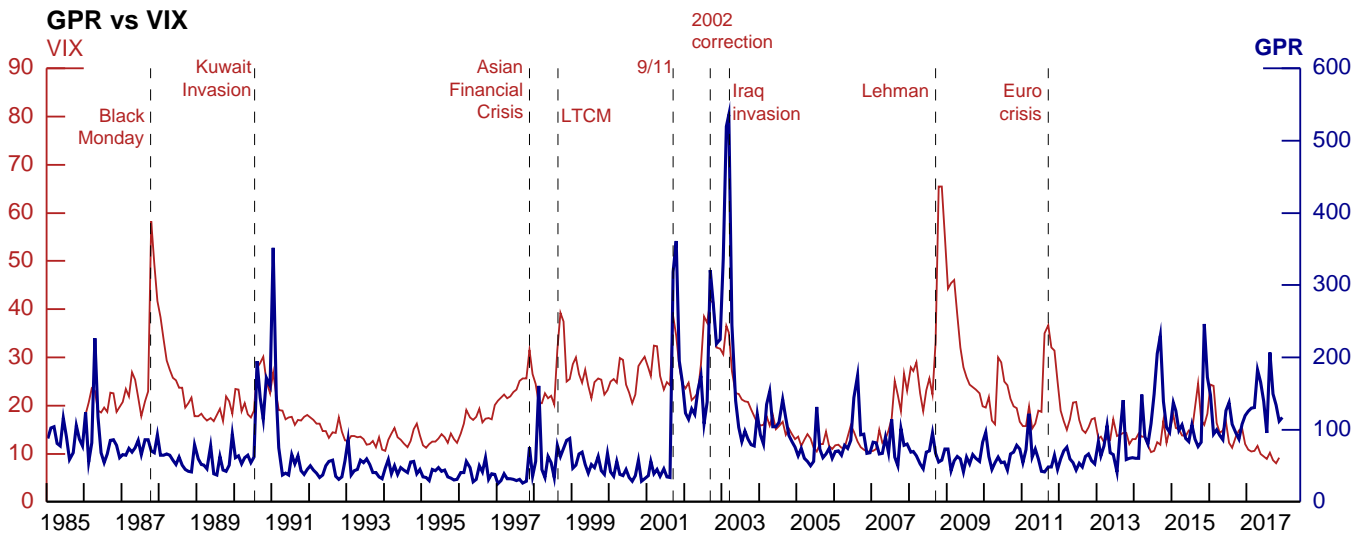


NOTE: See Section 3 for details. In the first panel, shaded areas represent the two World Wars and the historical GPR and the ICB index are plotted at quarterly frequency.

Figure 8: THE GEOPOLITICAL RISK INDEX AND OTHER MEASURES OF RISK



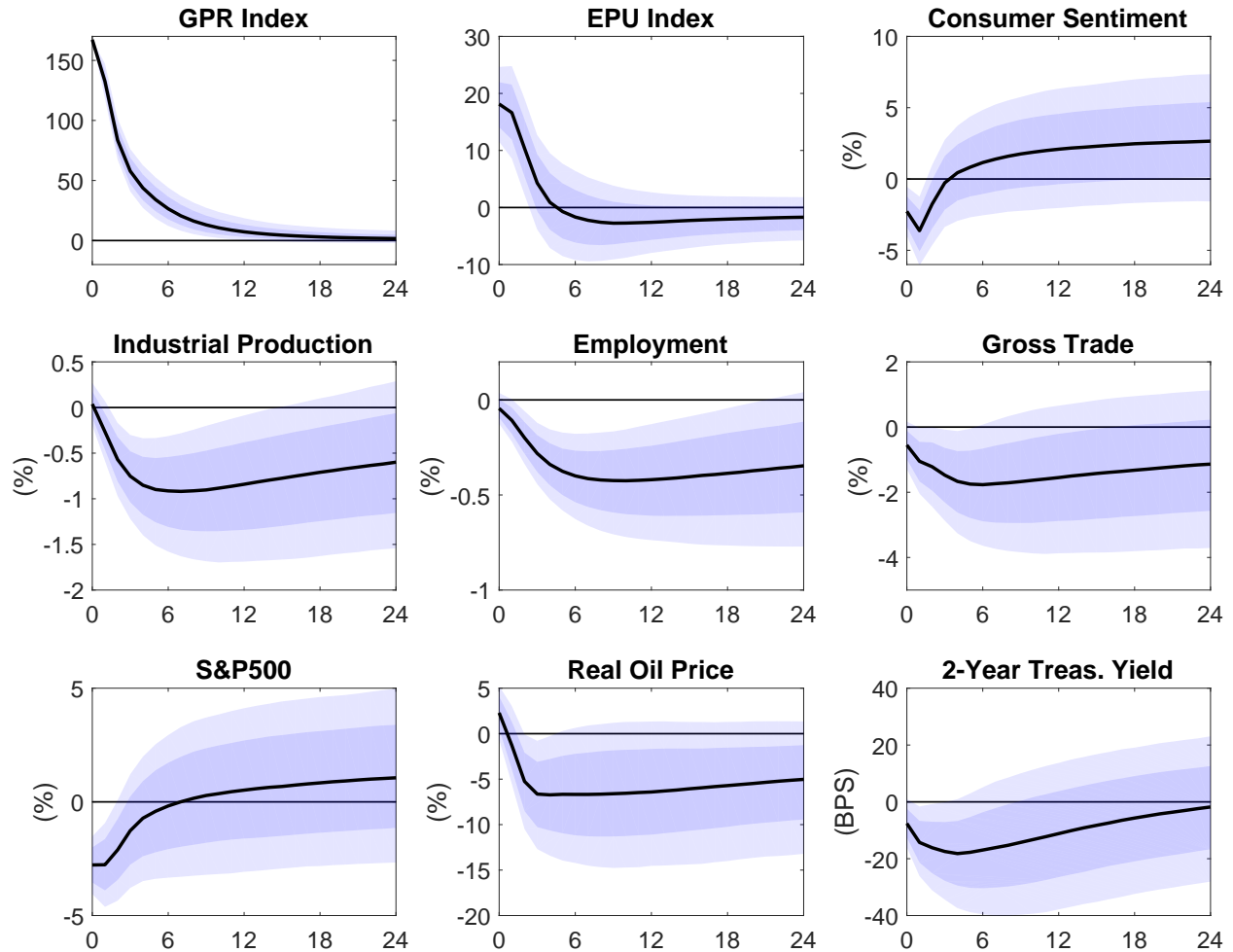
(a) Comparison to economic policy uncertainty



(b) Comparison to option-implied volatility

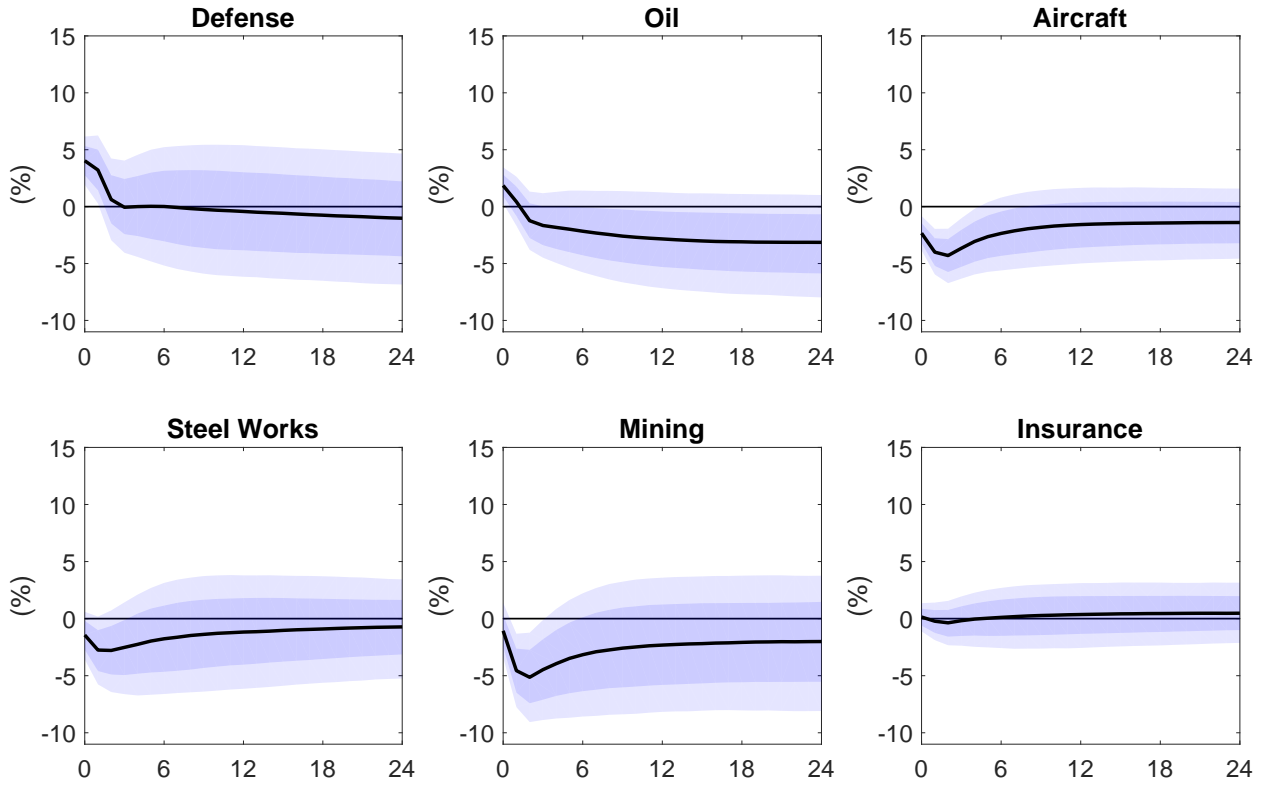
NOTE: This figure compares the GPR index with the economic policy uncertainty (EPU) constructed by Baker, Bloom, and Davis (2016) and with financial volatility as measured by the VIX.

Figure 9: THE MACROECONOMIC IMPACT OF INCREASED GEOPOLITICAL RISK



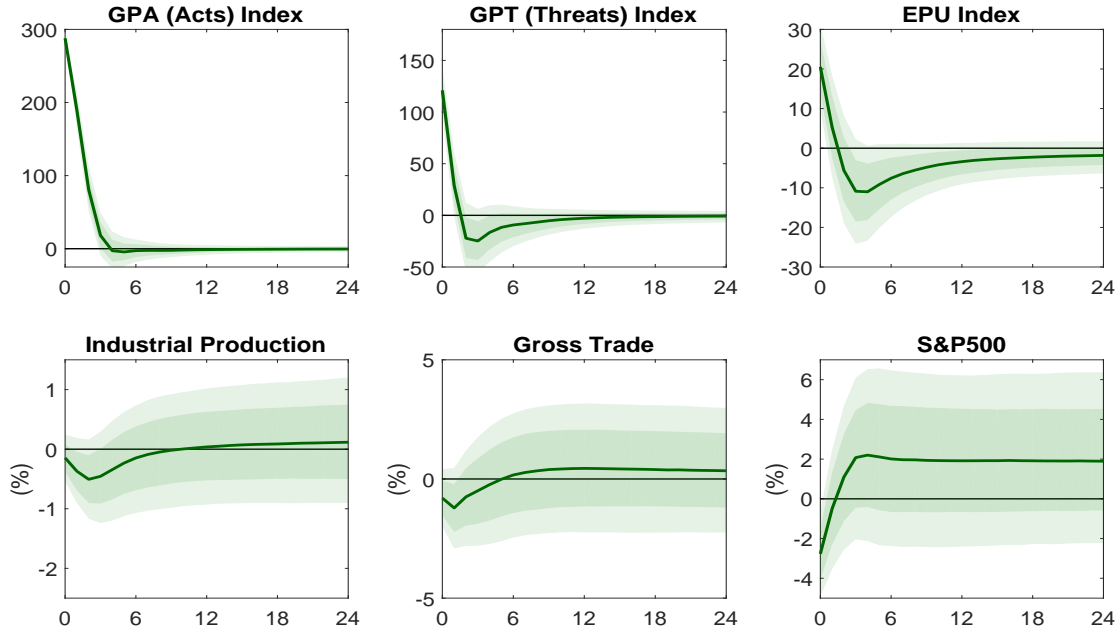
NOTE: The black solid line in each panel depicts the median impulse response of the specified variable to a rise of 167 points in the GPR index. The size of the shock equals the average change in the index following the nine episodes of largest increases in the GPR index. The dark and light shaded bands represent the 68 and 90 percent pointwise credible sets, respectively. The responses of the GPR index and of the Baker, Bloom, and Davis (2016) EPU index are reported in levels. The horizontal axis measures months since the shock.

Figure 10: INCREASED GEOPOLITICAL RISK AND STOCK RETURNS
(EXCESS RETURNS OF SELECTED INDUSTRIES)

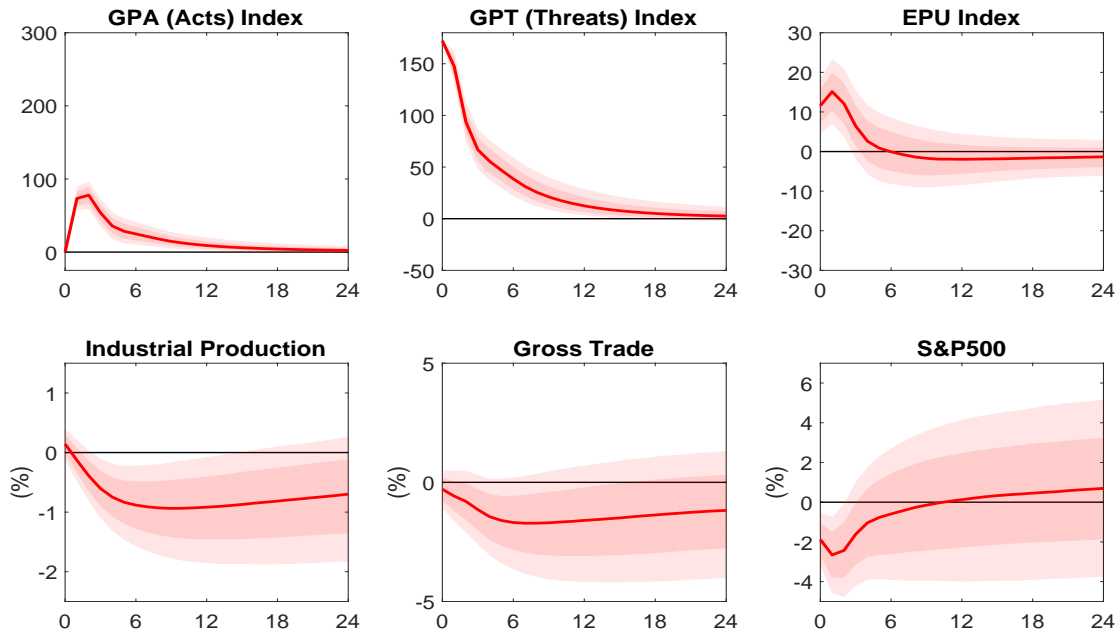


NOTE: The black solid line in each panel depicts the median impulse response of cumulative excess return of selected industries over the S&P 500 to a rise of 167 points in the GPR index. The size of the shock equals the average change in the index following the nine episodes of largest increases in the GPR index. The dark and light shaded bands represent the 68 and 90 percent pointwise credible sets, respectively. The horizontal axis measures months since the shock.

Figure 11: THE IMPACT OF INCREASED GEOPOLITICAL RISK: ACTS VS. THREATS



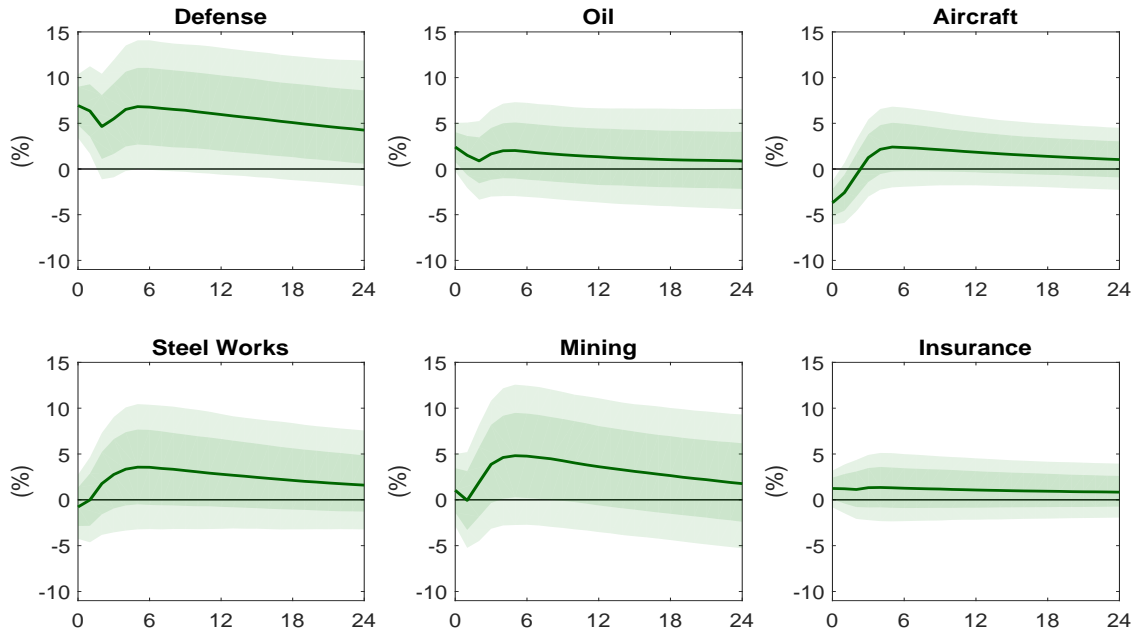
(a) Response of selected variables to a GPA shock



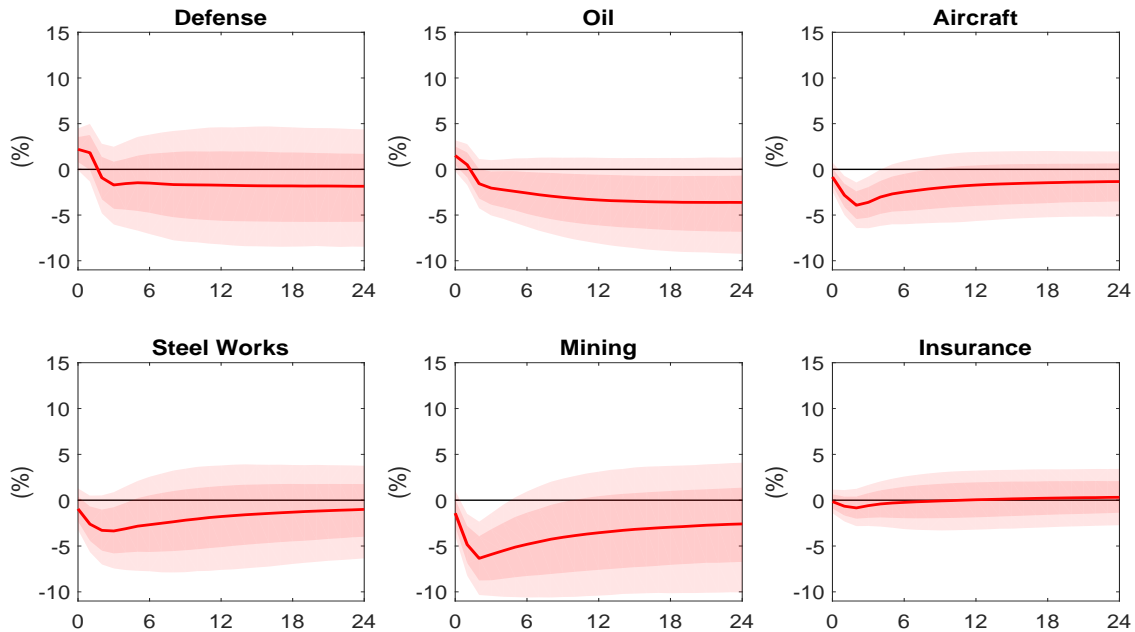
(b) Response of selected variables to a GPT shock

NOTE: The green (red) line in each panel depicts the median impulse response of the specified variable to a rise in the GPA (GPT) index. The dark and light shaded bands represent the 68 and 90 percent pointwise credible sets, respectively. The responses of the GPA, GPT, and of the EPU indexes are reported in levels. The horizontal axis measures months since the shock.

Figure 12: THE IMPACT OF INCREASED GEOPOLITICAL RISK: ACTS VS. THREATS
(EXCESS RETURN IN SELECTED INDUSTRIES)



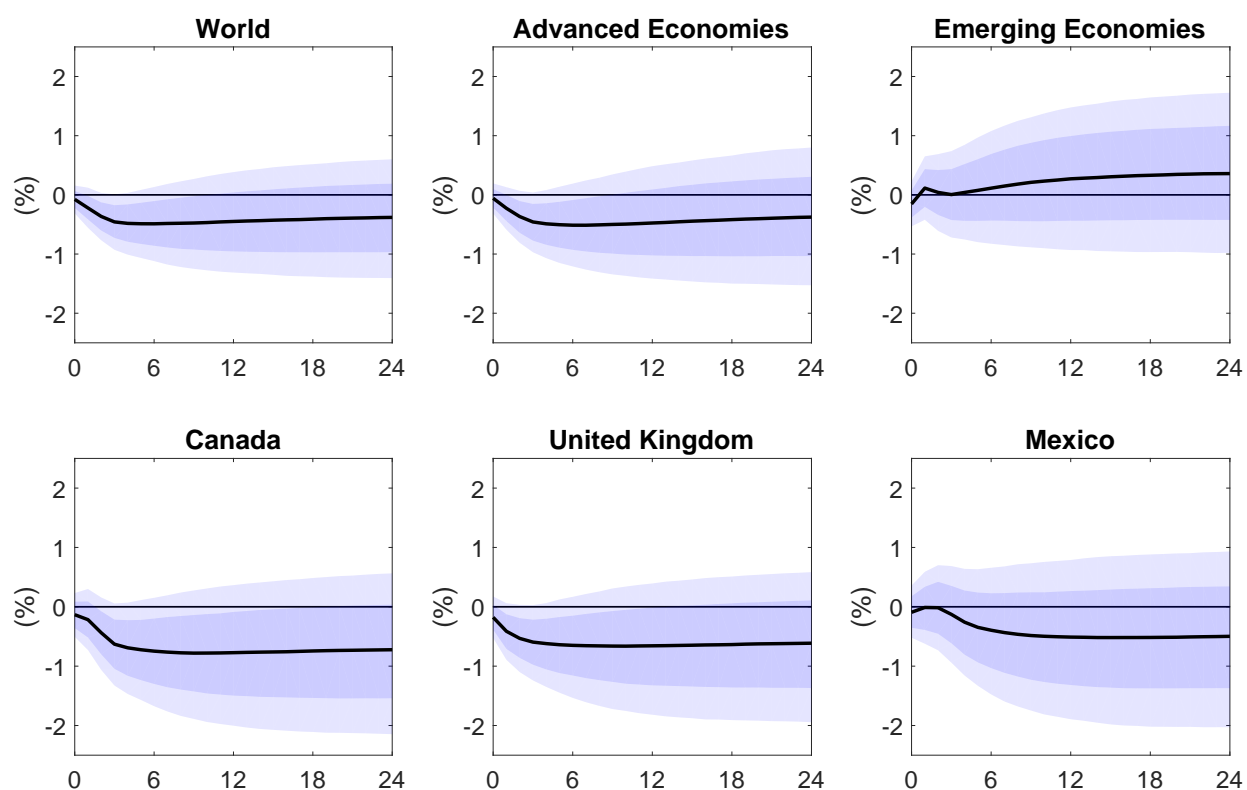
(a) Response of excess return in selected industries to a GPA Shock



(b) Response of excess return in selected industries to a GPT Shock

NOTE: The green (red) line in each panel depicts the median impulse response of excess return in selected industries over the S&P 500 to a rise 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 months since the shock.

Figure 13: THE INTERNATIONAL IMPACT OF INCREASED GEOPOLITICAL RISK
(INDUSTRIAL PRODUCTION FOR SELECTED COUNTRIES AND REGIONS)



NOTE: The black solid line in each panel depicts the median impulse response of industrial production for selected countries and regions to a rise of 167 points in the GPR index. The size of the shock equals the average change in the index following the nine episodes of largest increases in the GPR index. The dark and light shaded bands represent the 68 and 90 percent pointwise credible sets, respectively. The horizontal axis measures months since the shock.

Appendix

A.1 Additional Details on the Construction of the GPR Index

The benchmark geopolitical risk (GPR) index is constructed by running a search query in the ProQuest Newsstand Database. We search the archives of the following newspapers (start date availability in parentheses): *Boston Globe* (1/1/1985); *Chicago Tribune* (1/1/1985); *The Daily Telegraph* (4/1/1991); *Financial Times* (5/31/1996); *The 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 for robustness in Figure A.2, expressed as a share of news articles for each of the newspapers.⁴⁰ 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).

To construct our benchmark index, we run the search query shown in Figure A.8.⁴¹ The index is the aggregate number of articles returned by the search, divided by the total number of articles, indexed to 100 in the 2000–09 decade.

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.5.

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.

⁴⁰ The actual indexes are a simple normalization of the articles' share.

⁴¹ We use the search tips and wild cards discussed at <https://proquest.libguides.com/proquestplatform/tips>.

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.⁴² 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 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.

⁴² 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.

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 attributable to well-defined historical events at both a monthly and at 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. 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 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.6 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 (the correlation with the change in log industrial production is 0.03), thus allaying concerns that an omitted variable biases the results both “geopolitical risk” and economic outcomes (*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?*)

A.4 Robustness of VAR Results

The effects of the GPR shock are robust to a number of robustness checks. First, the 9/11 terrorist attacks are 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). The 9/11 terrorist attacks were not a typical geopolitical event, as they targeted the world financial capital. Additionally, the 9/11 attacks also had a great impact on news coverage of terrorism and more broadly of geopolitical events outside the United States. Moreover, 9/11 is potentially associated with a structural break in the index, which remained persistently elevated after the terrorist attack. Thus, it is important to ask whether the bulk of our results come from this single episode.

Figure A.9 reports the impulse responses to a GPR shock estimated using a VAR model that includes dummies for September and October 2001, and another VAR model that uses a censored version of the GPR index.⁴³ We construct the censored GPR index 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. The resulting index, which consists of 9 episodes, captures large increases in geopolitical risk, and gives zero weight to small variations in the index.

The impulse responses to a GPR shock in the models with the 9/11 dummies and with the censored GPR are very similar to those from the baseline model. By censoring the GPR index, a GPR shock induces a very temporary increase in geopolitical risk, which is zero 3 months after the shock. The lack of persistence translates into a more muted response of the stock market index and of corporate spreads.

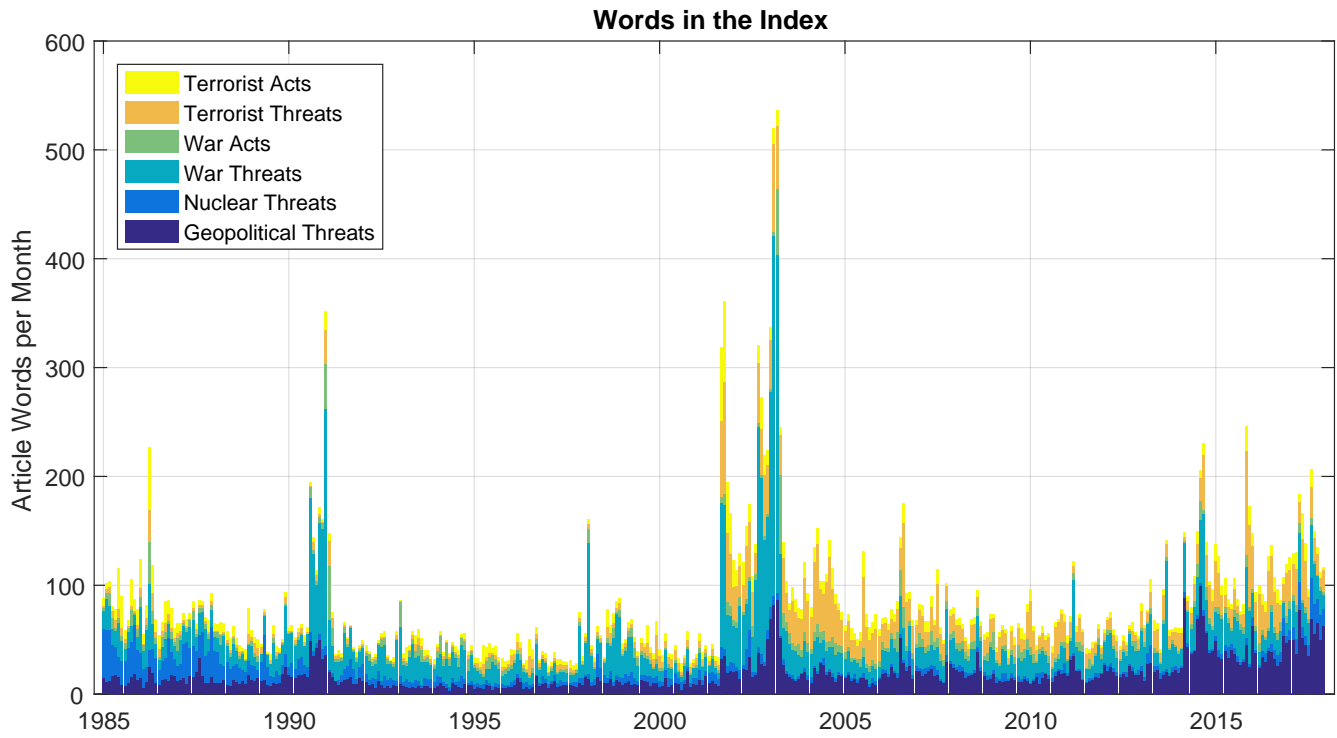
Second, in Figure A.10 we explore the robustness to an alternative Cholesky ordering where we order the GPR index last. In this case, the impact response to a GPR shock of all other variables in the VAR is restricted to be zero. These exclusion restrictions attenuate the recessionary effects of the shock. Nonetheless, the drop in IP and employment is economically significant, and zero is excluded from the 90 percent credible set at the six month horizon. Similarly, the response of oil prices remains negative for the benchmark model specification. Not surprisingly, the response of the other variables—all fast-moving variables that quickly respond to shocks—is different compared to the baseline. In particular, consumer sentiment and the stock market no longer drop on impact, and their dynamic response is positive. The response of trade and the two-year Treasury yield is also attenuated. Yet, this identification is not our benchmark precisely because, given the nature

⁴³ We include a dummy for both September and October because news coverage of the 9/11 terrorist attacks and especially their geopolitical implications was higher in October than in September.

of geopolitical risks, our working hypothesis is that it is more likely that consumer confidence and stock prices drop and that the EPU increases in response to a GPR shock rather than the reverse. At the same time, this exercise highlights that GPR shocks have independent real effects on the U.S. economy and on oil prices despite shutting down plausible transmission channels such as EPU and the stock market.

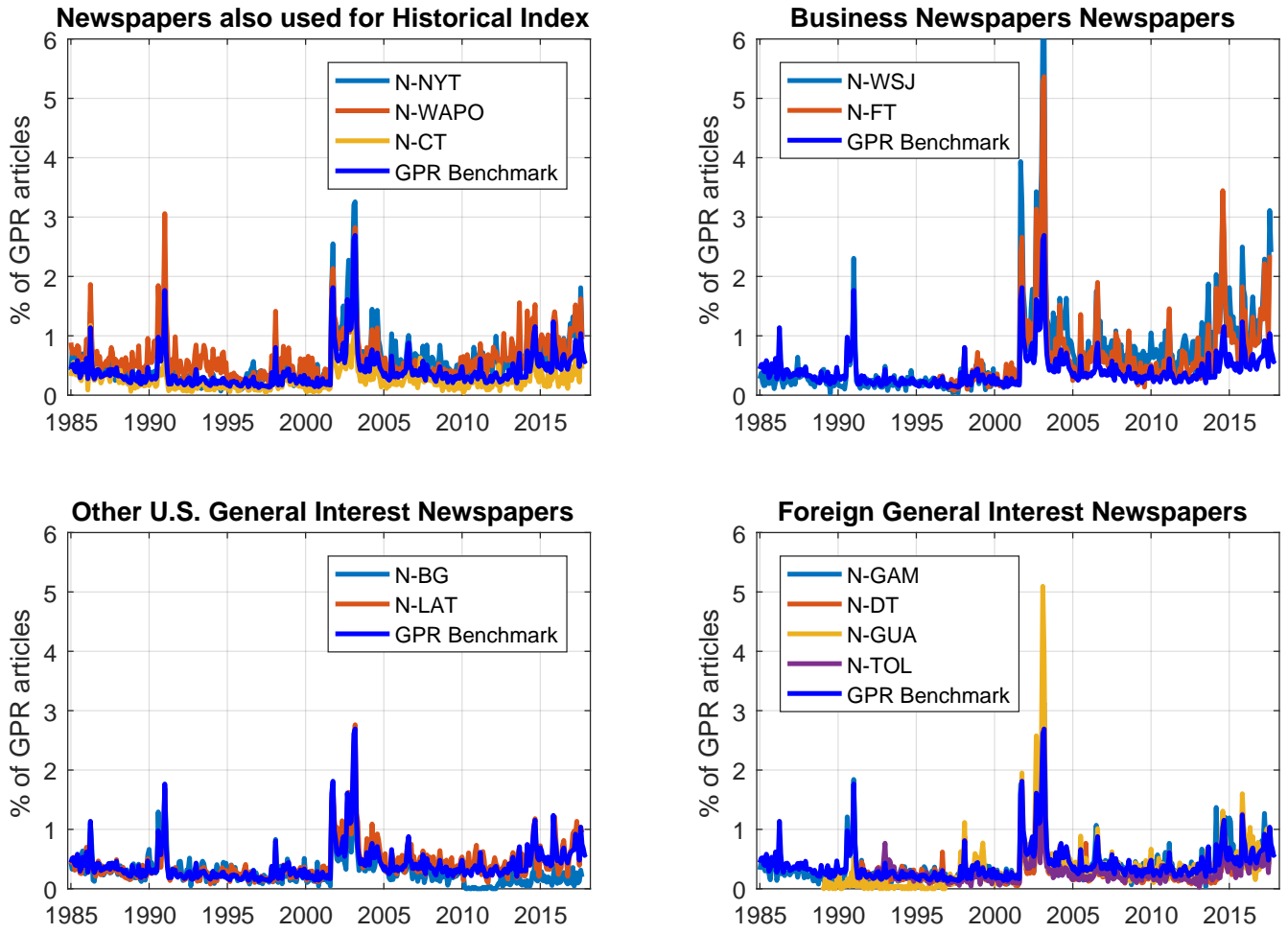
Finally, in Figure [A.11](#) we show that the results are robust to replacing the EPU with the VIX. The impulse responses are somewhat attenuated, but all responses are highly significant, economically and statistically.

Figure A.1: THE GEOPOLITICAL RISK INDEX:
CONTRIBUTION OF VARIOUS SEARCH GROUPS



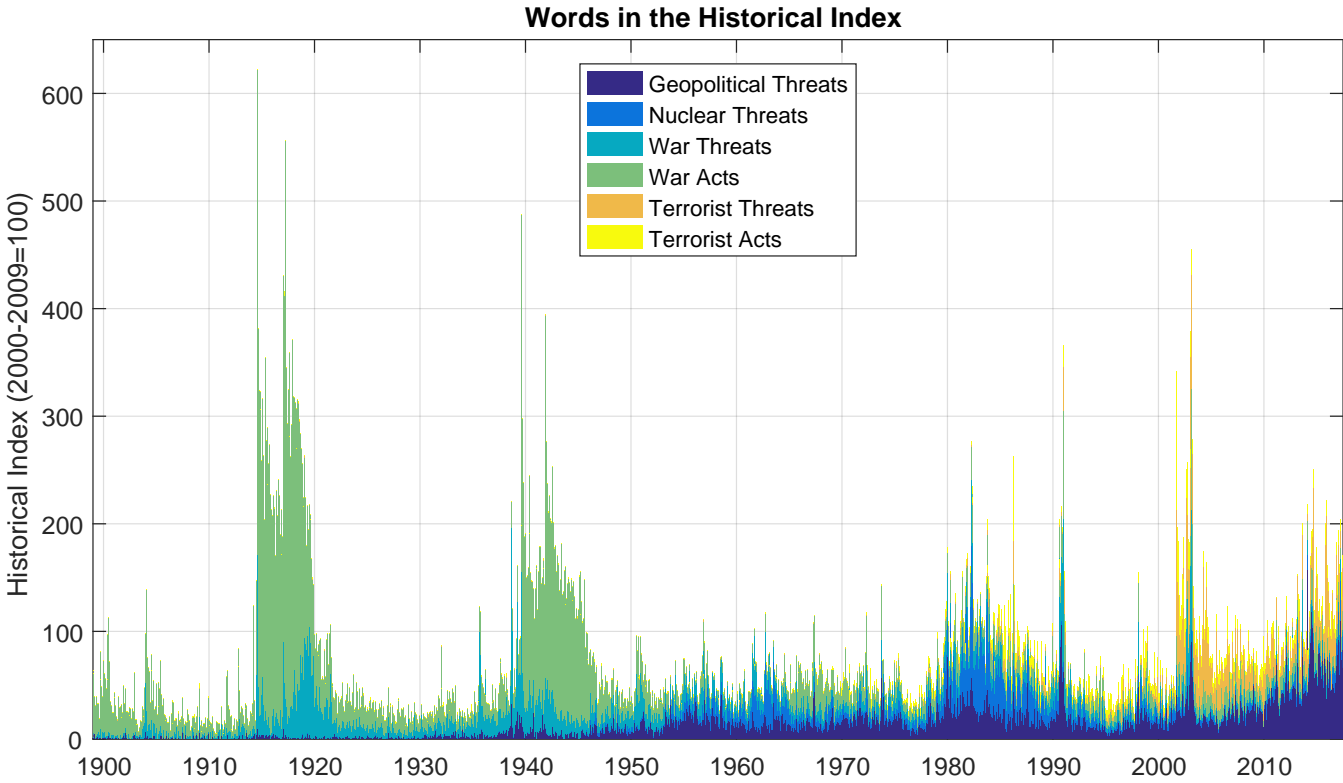
NOTE: The chart plots the monthly cumulative contribution to the GPR index of the articles associated with the six search groups described in Table 1. Higher geopolitical risk since the 2000s reflects increased mentions of both terrorist acts and terrorist threats, as well as an increased use of words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

Figure A.2: SHARE OF GPR ARTICLES BY INDIVIDUAL NEWSPAPER



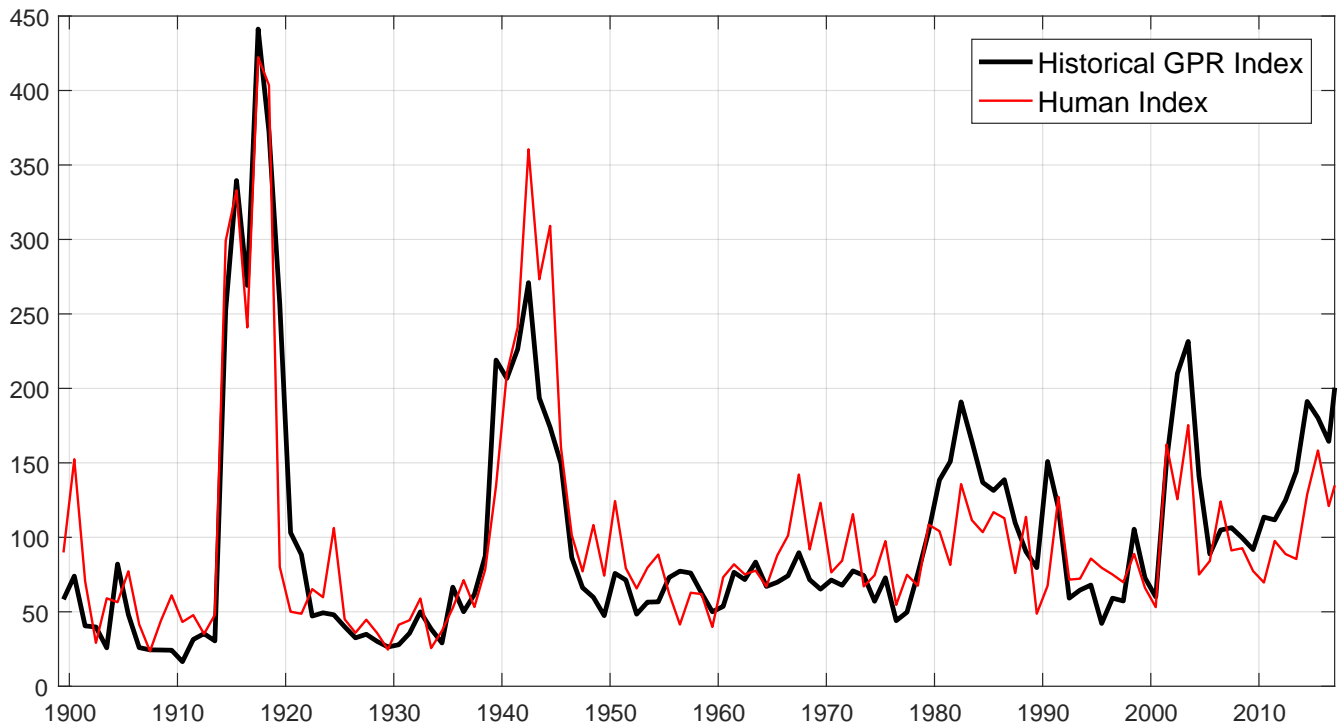
NOTE: Each panel plots the share of articles containing words related to geopolitical risk for each of the 11 newspapers.

Figure A.3: THE HISTORICAL GEOPOLITICAL RISK INDEX:
CONTRIBUTION OF VARIOUS SEARCH GROUPS



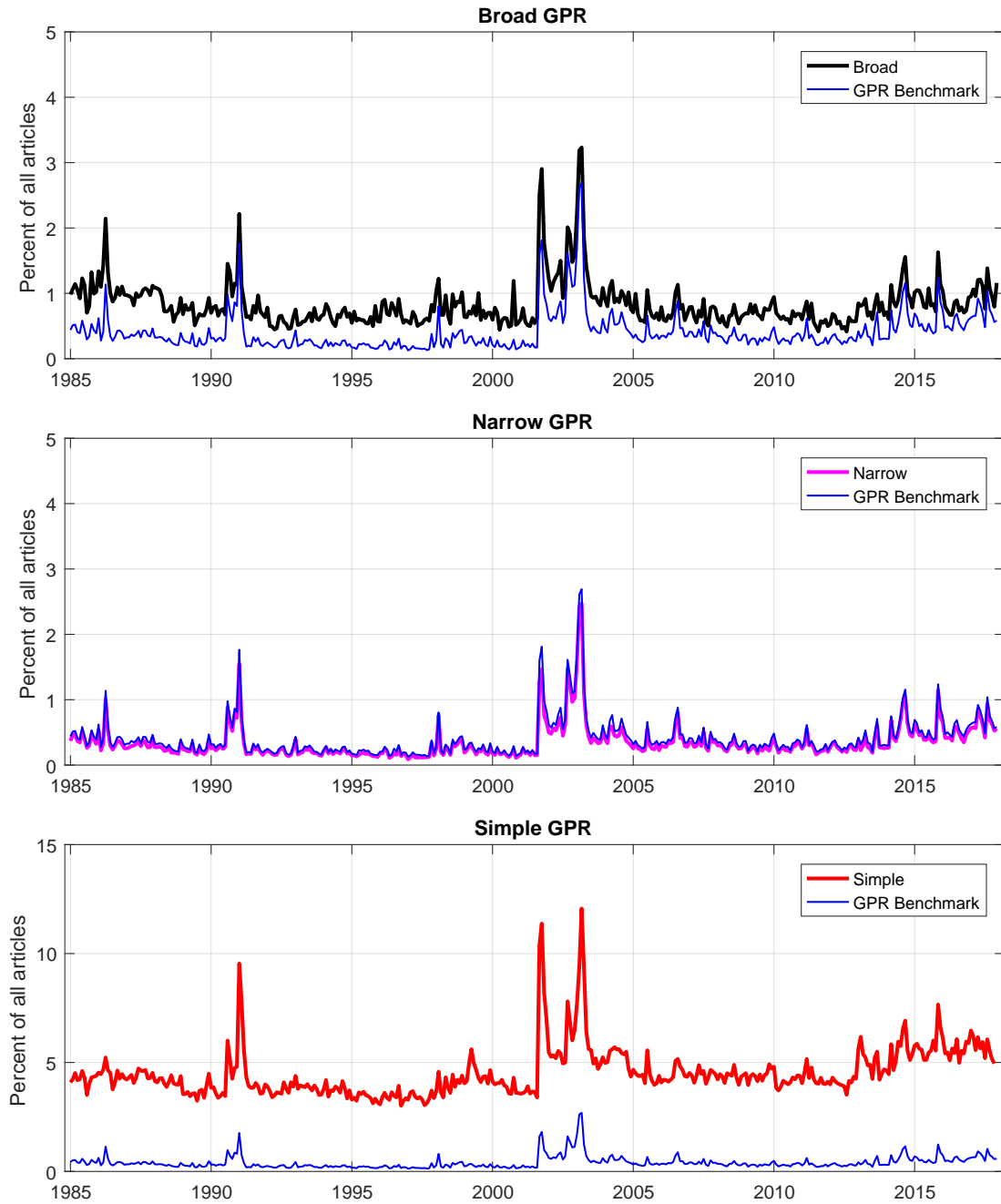
NOTE: The chart plots the cumulative contribution to the historical GPR index (GPRH) of the articles associated with the six search groups described in Table 1.

Figure A.4: HUMAN AND COMPUTER-GENERATED HISTORICAL GPR INDEXES



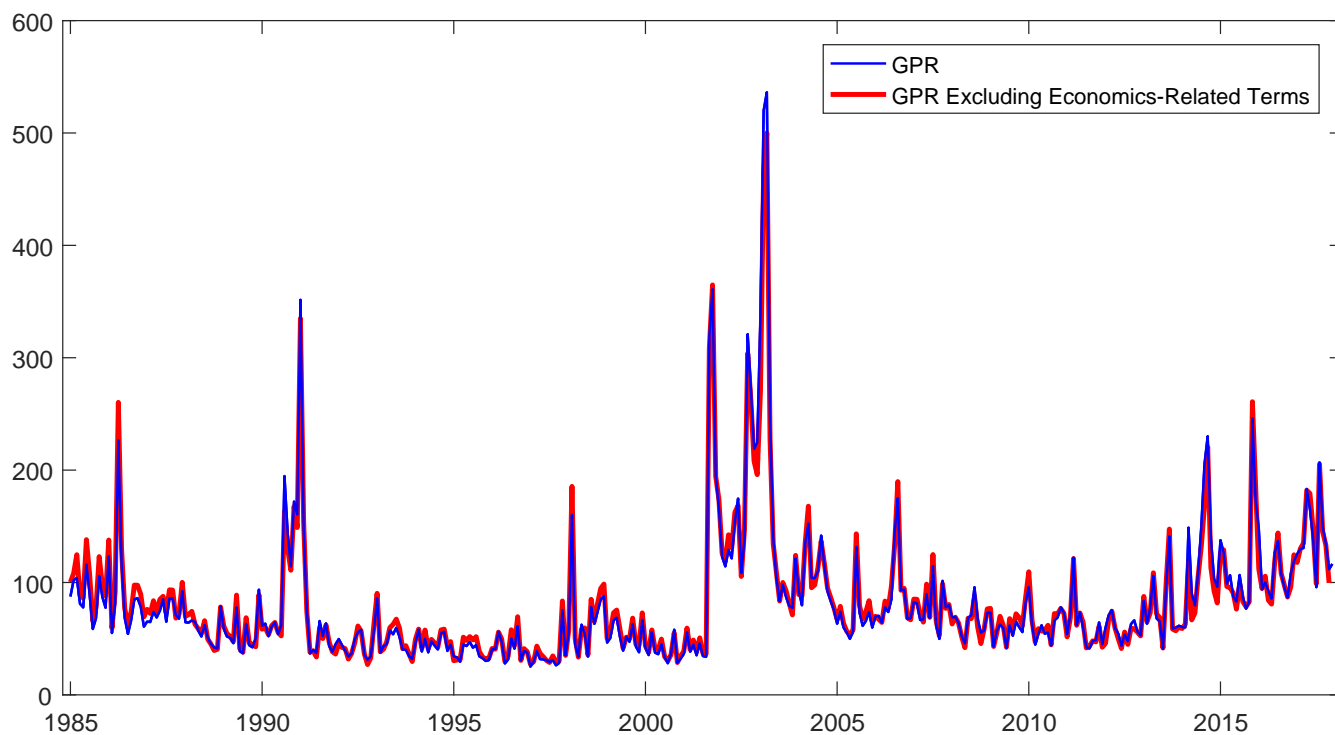
NOTE: Time-series comparison from 1899 to 2016 based on 7,416 articles. The series are plotted annually to reduce sampling variability. Both series are normalized to 100 throughout the sample.

Figure A.5: THE GPR INDEX AND THREE ALTERNATIVES



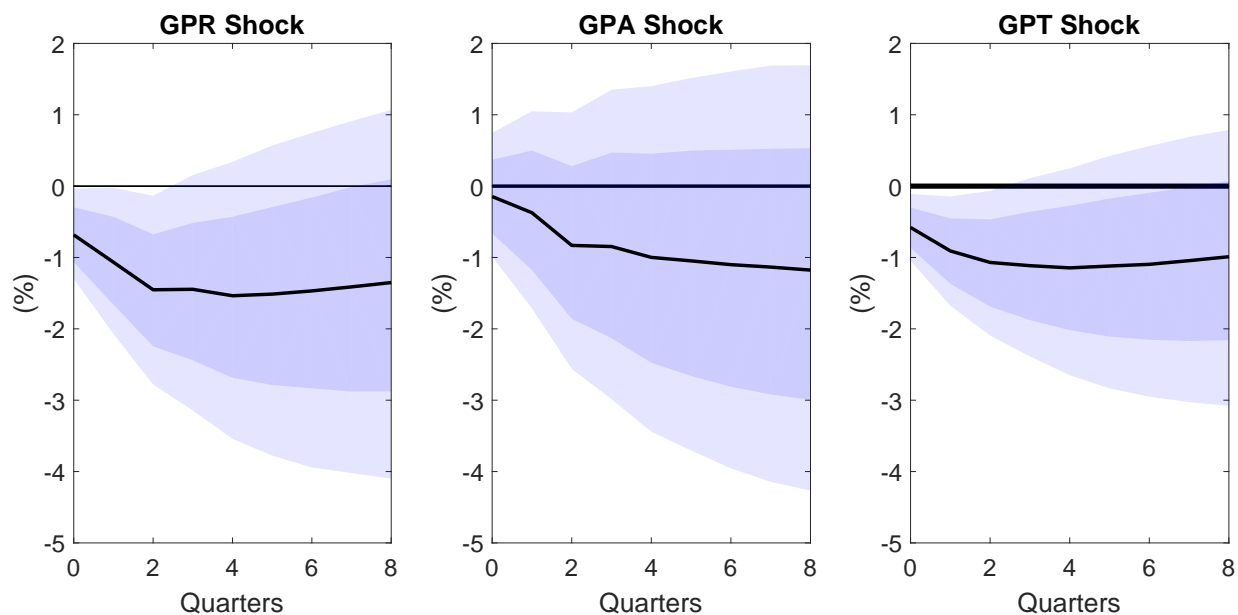
NOTE: The broad GPR combines the search terms in Table 1 with bigrams that an algorithm—based on Bayes’ rule—signals as very likely indicators of rising geopolitical tensions. The narrow GPR excludes articles containing search terms which, in the human audit, were most likely associated with false positives. 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.6: 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.7: THE IMPACT OF INCREASED GEOPOLITICAL RISK ON PRIVATE INVESTMENT



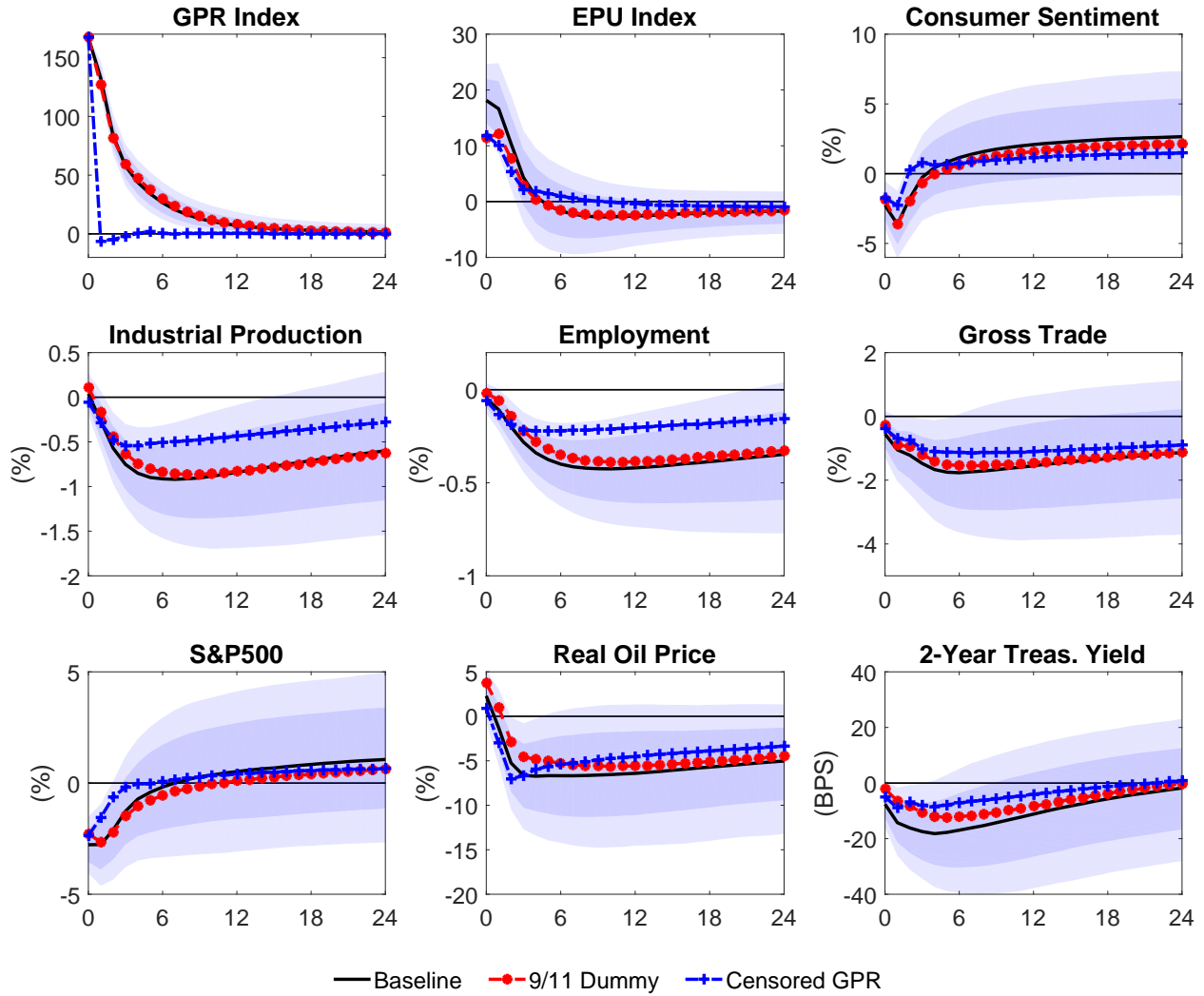
NOTE: The black solid line in each panel depicts the median impulse response of private investment—defined as the sum of nonresidential private investment and consumption of durable goods—to a shock to the GPR index (left panel), to a shock to the GPA index (middle panel), and to a shock to the GPT index (right panel). The dark and light shaded bands represent the 68 and 90 percent point-wise credible set, respectively. The horizontal axis measures months since the shock.

Figure A.8: 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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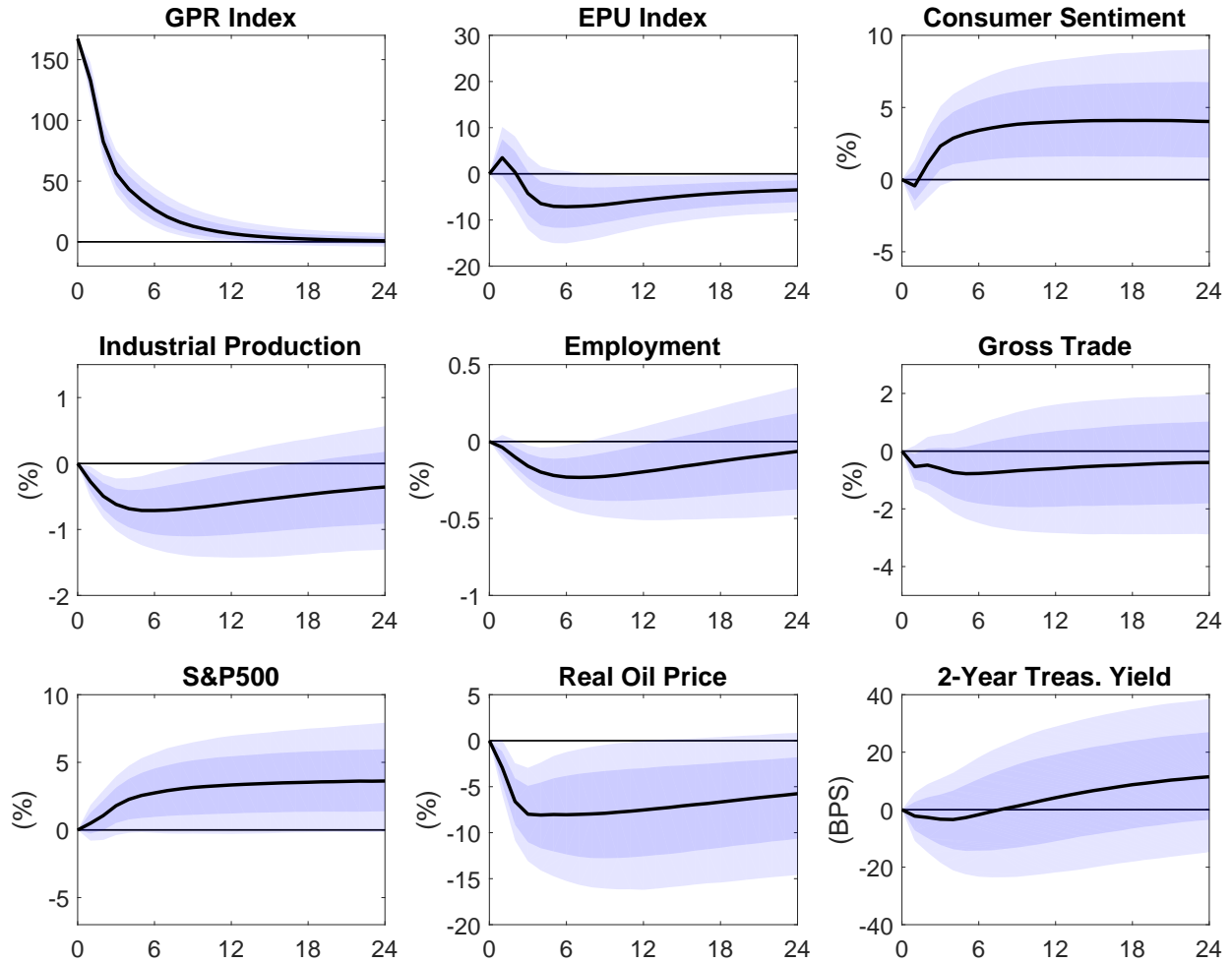
NOTE: The index is the share of number of articles returned by the search above, divided by the total number of articles, indexed to 100 in the 2000–2009 decade.

Figure A.9: THE IMPACT OF INCREASED GEOPOLITICAL RISK:
ALTERNATIVE SPECIFICATIONS



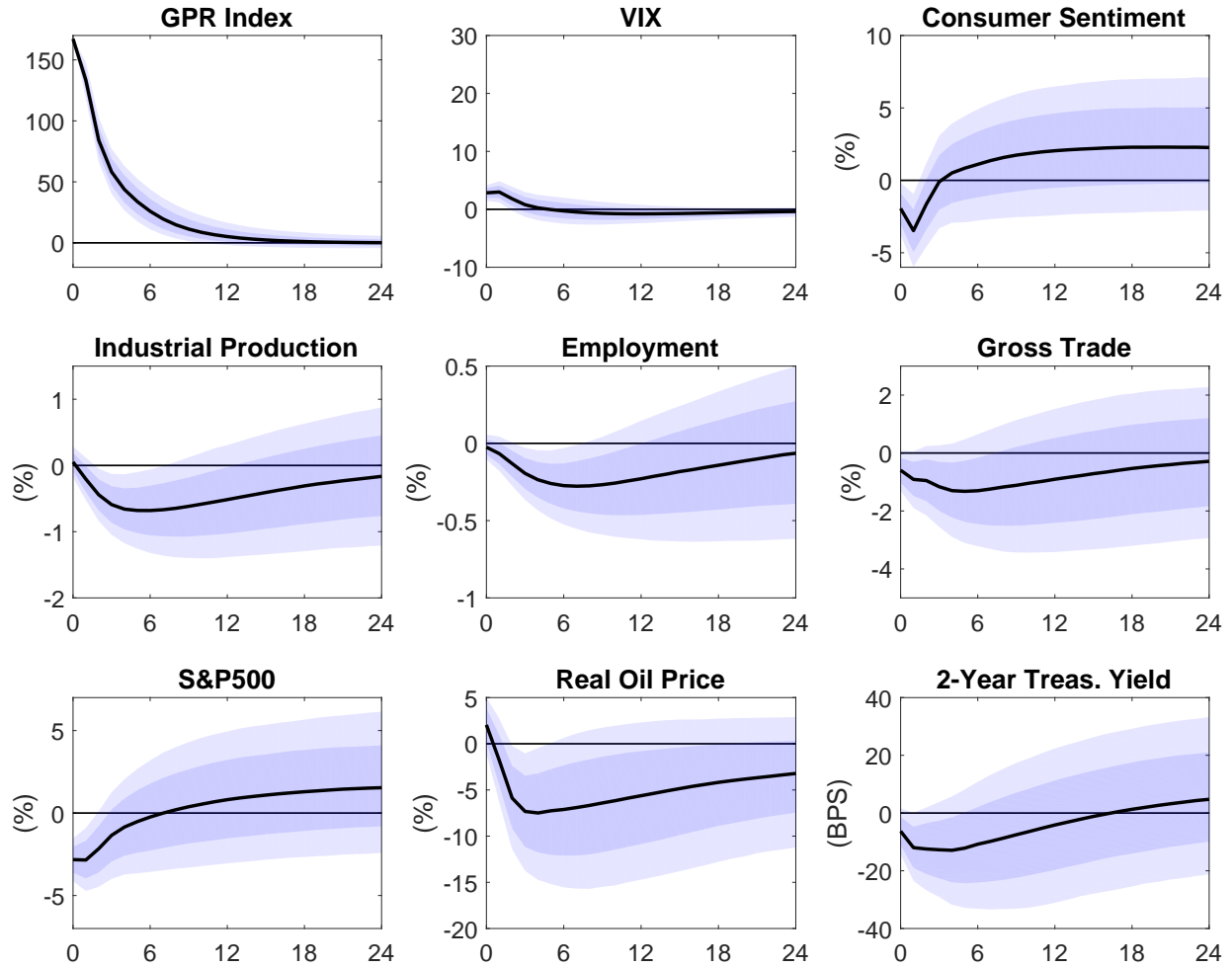
NOTE: The black solid line in each panel depicts the median impulse response of the specified variable to a rise of 167 points in the GPR index in the baseline VAR specification. Lines with round markers depict responses to a VAR that includes a dummy for September and October 2001. Lines with cross markers depict responses when the GPR index is replaced by a censored version that equals the GPR index for the months associated with the nine episodes of largest increases in the index, and is zero in all other months. The size of the shock equals the average change in the index following the nine episodes of largest increases in the GPR index. The dark and light shaded bands represent the 68 and 90 percent pointwise credible sets from the baseline model, respectively. The responses of the GPR index and of the [Baker, Bloom, and Davis \(2016\)](#) EPU index are reported in levels. The horizontal axis measures months since the shock.

Figure A.10: THE IMPACT OF INCREASED GEOPOLITICAL RISK:
ALTERNATIVE CHOLESKI ORDERING WITH GPR LAST



NOTE: The black solid line in each panel depicts the median impulse response of the specified variable to a rise of 167 points in the GPR index. Compared to the baseline model, we identify a GPR shock by ordering the GPR index last in a Cholesky ordering. The size of the shock equals the average change in the index following the nine episodes of largest increases in the GPR index. The dark and light shaded bands represent the 68 and 90 percent pointwise credible sets, respectively. The responses of the GPR index and of the [Baker, Bloom, and Davis \(2016\)](#) EPU index are reported in levels. The horizontal axis measures months since the shock.

Figure A.11: THE IMPACT OF INCREASED GEOPOLITICAL RISK:
REPLACING THE EPU INDEX WITH THE VIX



NOTE: The black solid line in each panel depicts the median impulse response of the specified variable to a rise of 167 points in the GPR index. Compared to the baseline model, we replace the EPU index with the VIX. The size of the shock equals the average change in the index following the nine episodes of largest increases in the GPR index. The dark and light shaded bands represent the 68 and 90 percent pointwise credible sets, respectively. The responses of the GPR index and of the VIX are reported in levels. The horizontal axis measures months since the shock.

Figure A.12: NEWSPAPERS' 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