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## Erklärungen und Versicherung

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# Contents

# Abstract

There are many dynamics reshaping global macroeconomics and finance. This cumulative dissertation empirically examines the impacts on the global economy of two major global dynamics, disaster risks, and China's rise. Chapter 1 introduces the motivation and summarizes the dissertation. Chapter 2 investigates how geopolitical risks affect financial stress in major emerging economies across the whole financial system and its sub-sectors (banking, stock, foreign exchange, bond). Chapter 3 shows how different disaster risks (financial, geopolitical, natural-technological) explain the returns and risk premiums of stock and housing in advanced economies between 1870 and 2015. Chapter 4 examines how the rise of China is contributing to higher economic growth in emerging economies, especially after the Global financial crisis of 2007–2008. Chapter 5 illustrates how a close trade and investment relation with China has helped African countries to reduce poverty and to improve their income distribution.

# 1 Introduction

In their "Global Trends 2040" report, the National Intelligence Council argues that the key international emerging dynamics are featured by the rise of China and the increase of conflict risks (National Intelligence Council, 2021). In their "The Global Risks" report, the World Economic Forum lists environmental and geopolitical disasters as among the biggest threats to the world (World Economic Forum, 2021). The rise of China and disaster risks, which are not only geopolitical but also natural and technological, are among the most important topics dominating public, academic and political discussions on the present and future of the global economy. Despite their importance, the consequences of these important emerging dynamics have attracted limited attention from researchers. There is little known about the impact of rising China and how rare disaster risks are reshaping global finance. These research issues carry special weight for economic policymaking, the practice of investors in turbulent and benign times, and the general understanding of scholars and the public of the status of the global economy and its major challenges. This dissertation aims to fill certain gaps in empirical research on the major drivers of the global macroeconomy and financial markets.

It is widely believed that the rise of China is changing the global economy. The Economist argues that "Many trends that appear global are in fact mostly Chinese" (The Economist, 2018). The emergence of China's economic power is observed in many, if not all, aspects of trade, investment, international relations, security, and the environment. To what extent can the rise of China affect the developing world? Have the impacts of rising China been observed in the African countries with which it partners? In addition to the broad presence of China in the global economy, the risk of disasters, especially in geopolitical form, is another factor contributing to the tremendous changes in the global economy. How do these risks affect financial stability in emerging economies? How do these risks influence financial assets in advanced economies?

My dissertation provides answers to these questions through several empirical investigations. I investigate how the rise of China and disaster risks, which are among the most noticeable sources of uncertainty in the 21st century, can transform the world and the age in which we live. This dissertation demonstrates that China is an important driver of growth and inclusive prosperity in the developing world. In addition, I show that geopolitical risks have remarkable impacts on the financial market stability in emerging economies and asset markets

in advanced economies. I provide some predictions, as well as policy recommendations and further insights for policymakers, investors, and researchers. The dissertation may serve as a point of departure for future studies on the major patterns that dominate the dynamics of macroeconomics and finance in the coming years.

Chapter 2 presents my joint paper with Deniz Karaman Örsal, "Geopolitical risks and financial stress in emerging economies". This article investigates the impact of geopolitical risks (GPRs) on financial conditions in major emerging economies from 1985 to 2019. We show that GPRs might work as a booster rather than a trigger of financial stress in emerging economies: GPRs remarkably intensify financial instability but have trivial effects on benign financial conditions. In these economies, the impacts of GPRs on foreign exchange markets and, to a smaller degree, the banking industry and debt markets are more severe than on the stock market. In contrast, the adverse consequences of GPRs in advanced economies are observed in their stock markets but not in other segments of their financial systems. These findings provide important insights for policymakers and investors in making decisions in the current times of geopolitical uncertainty. We have applied recently developed quantile regression techniques for panel data and extended the financial stress dataset; these are the two other key contributions of our work.

Chapter 3 presents my single-authored paper, "The Impacts of Rare Disasters on Asset Returns and Risk Premiums in Advanced Economies (1870-2015)". I use a novel dataset on stock and housing prices in advanced economies from 1870 to 2015 to empirically examine the impacts of three types of disasters (financial, geopolitical, and natural-technological) on asset returns and risk premiums. This paper uses novel measurements of various types of unexpected catastrophes over a period of around 100 years. Stock is sensitive to financial stress but resilient to both geopolitical and natural–technological risks. Housing returns suffer from a moderate drop induced by financial and geopolitical crises but are insignificantly affected by natural-technological catastrophes. These findings are helpful for investors to select appropriate hedging vehicles and to adjust their asset allocation against external shocks. Furthermore, this paper empirically verifies the rare disaster-based solution for the puzzle of unexpectedly high housing and stock risk premiums. I show that the widely accepted rare-disaster-based solution insufficiently explains the housing puzzle but works well in the case of stock.

Chapter 4 presents my joint paper with Deniz Örsal, "A new and benign hegemon on the horizon? The Chinese century and growth in the Global South". Our paper examines the role of trade with China in enhancing economic growth in developing countries using time series econometric techniques for a quarterly sample from 2000 to 2016. We empirically test both the general export/import-led growth hypothesis and, at a deeper level, how exports or imports with different partners might produce different growth impacts. In this paper, we show empirically that imports from but not exports to China contribute significantly to growth in 22 major emerging countries. Compared to trade with China, trade with the other

developing and emerging (EME) and advanced (AdE) economies brings greater benefits in terms of growth in the examined sample. However, the global financial crisis has marked the decreasing role of EME and AdE and the increasing contribution of China in driving growth in the global South. By using the common correlated effects estimation, our models take into account the nature of macro time series panels (non-stationarity, cointegration, break, cross-sectional dependence, and heterogeneity), which are often ignored in the growth-by-destination literature.

Chapter 5 presents my joint paper with Jörg Schwiebert, "China's Role in Mitigating Poverty and Inequality in Africa: An Empirical Query". This paper investigates how strengthened economic relations with China contributed to poverty reduction and inequality mitigation in African countries between 1995 and 2017. We show that imports from China are associated with a substantially lower poverty rate in China's partner countries. However, the impacts are only pronounced when the imports are machinery and equipment rather than manufactured goods. In addition, financial flows from China through foreign direct investment (FDI) and contracts for infrastructure projects lift a substantial segment of the African population out of absolute poverty. Furthermore, the financial flows from China help improve income distribution in the African continent. However, total exports or exports of raw materials and fuels to China are uncorrelated with income distribution in the examined sample. In stark contrast, the impacts on the income distribution of economic relations with the United States (US), in the form of US imports and FDI, are trivial. However, we do see some positive effects on poverty in Africa of exports to the US. Our paper makes a methodological contribution by using a novel estimation method, the bivariate fractional response model, which is rarely used in poverty and inequality research. This method takes into account both the fractional nature of poverty and inequality indices and their correlation.

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# 2 Geopolitical Risks and Financial Stress in Emerging Economies

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**Abstract:**
We investigate the impacts of geopolitical risks (GPRs) on financial stress (FS) in major emerging economies between 1985 and 2019. Applying a recently developed panel quantile estimation method, we show that GPRs pose serious risks to the stability of the financial condition in emerging economies. Namely, when FS is already equal to or above average, GPRs intensify this instability to a remarkable degree. In contrast, GPRs do not ignite the stress when the financial situation is benign. In emerging economies, foreign exchange markets, and to a lesser extent, the banking industry, and the debt market suffer more severe consequences of geopolitical tensions than the stock market. In contrast, advanced economies, represented by the Group of Seven (G7) economies, have witnessed detrimental consequences of GPRs on their stock markets but negligible effects on other parts of their financial systems.

**Keywords:** geopolitical risks; financial stress; emerging economies; stock market; banking sector; foreign exchange market; debt market.

**JEL classification:** F36, F62, G15

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## 2.1 Introduction

Ushering in an era of great uncertainty, geopolitical risks (GPRs) are among the most important dangers to the global economy. They are considered major threats to the stability of the world on many fronts, including economics, politics, and technology (The Economist, 2021). These risks can emerge from a wide range of events, both local and global: from military interventions, terrorist attacks, trade disputes, and political gridlock, to climate change, cyberattacks, and the COVID-19 pandemic (Blackrock Investment Institute, 2021). Given the increasingly integrated world, geopolitical threats can quickly accelerate on a global scale and spread their huge consequences. Understanding the ramifications of geopolitical turmoil on emerging economies is of great interest to many academic, political, and business circles. This article aims to investigate how much the financial stress (FS) in emerging economies can be attributed to geopolitical uncertainties.

In his speech on June 30, 2016, Mark Carney, the Governor of the Bank of England, argues that GPRs are one of three components of "the uncertainty trinity", which is responsible for "a form of economic post-traumatic stress disorder amongst households and businesses, as well as in financial markets" (Carney, Mark, 2016, p.5). He further shows that GPRs have significant repercussions on risk awareness and economic decisions of individuals, and they clearly negate the output. At the "Challenges for Monetary Policy" symposium in Kansas City, Jerome H. Powell, the 16th Chair of Federal Reserve, also lists GPRs, which cause strong reaction of financial markets, as one of the major challenges to the conduct of monetary policies in the US (Powell, 2019). Viewing a broader landscape, the International Monetary Fund and the World Bank have constantly put geopolitical tensions as an important challenge and major source of instability around the globe (see IMF 2021a, IMF 2021b, World Bank 2021 for examples).

Monitoring the developments of GPRs become an important part of the business agendas of many banks, asset management companies, and consultancy firms, among others, McKinsey (2016), JP Morgan (2019), Blackrock Investment Institute (2021), The Economist (2021), BCA Research (2021), and IHS Markit (2021), to name a few. For example, Blackrock Investment Institute (2021) uses its own dashboard to trace the weekly development of global GPRs. The Economist (2021) monitors major global risks with special attention to geopolitical problems in its coverage. BCA Research (2021) and IHS Markit (2021) provide regular reports for the business world to track worldwide geopolitical uncertainties and their business implications. The geopolitical risk barometer of Caldara and Iacoviello (2017) has been used widely in the business world (Petrov et al., 2019). Wade and Lauro (2019) emphasize that GPRs are often considered as the greatest tail risk for investors.

There are several efforts in the empirical literature to examine the influences of GPRs on some separate parts of the financial environment in emerging economies. The studies identify three major issues. First, how to measure GPRs and FS properly and systematically in emerging economies at a high frequency? Second, how to account for the typical features

of long financial time series in examining the impacts? Finally, how to provide not only a comprehensive picture of the impacts on the whole financial system but also a detailed description of the subsectors or the mechanism of the impacts?

Using monthly data from 1985 to 2019 for 17 major emerging economies, we attempt to address all three issues. First, we use comprehensive and comparable indicators of GPRs, aggregate and subsector FS across all major emerging economies. Our data have clear advantages in terms of coverage, frequency, and consistency. Second, in terms of method, we apply the panel quantile regression method recently proposed by Machado and Silva (2019). In general, the quantile method is more robust than ordinary least squares estimation when the series include outliers and have non-normal distributions, and this is the case for FS indices. Third, by dividing the overall financial sector into different segments: stock market, debt market, foreign exchange market, and banking industry, we can determine which parts of the financial markets are more vulnerable to GPRs. This detailed analysis might enable a better understanding of the impacts of geopolitical turbulence. Fourth, we compare the implications of GPRs, which occur mostly in the emerging world, on G7 countries[2] to evaluate the contagion of geopolitical threats. To our knowledge, a comparison between emerging and advanced economies on the consequences of GPRs is rare in the literature.

Our analysis provides important insights for policymakers and investors to react better to geopolitical threats, which are occurring with increasing frequency. We point out that GPRs have pronounced impacts on a global scale. In general, heightened GPRs aggravate the stress in the financial system. The impacts are diverse, depending on the subsectors affected, the severity of financial stress, and the country groups being examined. These findings are of high relevance for monitoring global financial markets, managing and preparing for macro risks, and making investment decisions in both normal and turbulent times. This has become more important since geopolitical uncertainties are more complex, interregional, contagious, and increasingly unpredictable.

Our paper is structured into five parts. Following this introduction, Sections 2.2 and 2.3 briefly review the theoretical and empirical literature on GPRs, FS, and how they are connected. Sections 2.4 and 2.5 present our model and estimation results. We conclude our paper in the last section.

## 2.2 Theoretical Framework

Our research topic pertains to the literature on the consequences of terrorist attacks, wars, conflicts (Eckstein and Tsiddon, 2004), rare disasters (Barro, 2006), and uncertainty shocks (Bloom, 2009). Such geopolitical turbulence can directly or indirectly affect the financial situation in emerging economies through macro- and micro-channels. (for a review, see Lenain et al. 2002, Blomberg et al. 2004 Frey et al. 2007, Ferguson 2008, Sandler and Enders

[2]Canada, France, Germany, Italy, Japan, the UK and the US

2008, Gaibulloev and Sandler 2019, and Wang and Young 2020, among others). At the macro level, GPRs might enormously depreciate the human and capital resources of nations in the short and long term. Defense spending and the cost of war increase in parallel with conflicts and other security risks (Eckstein and Tsiddon, 2004). Furthermore, both ongoing and potential conflicts might threaten the stability of countries, damaging foreign capital and trade flows and breaking the connection to the outside world (Caldara and Iacoviello 2017, Sandler and Enders 2008, Petrov et al. 2019, Glick and Taylor 2010). At the micro level, by causing uncertainties, GPRs might distort individual economic behavior, undermine consumer confidence, and drive down sentiments, leading to poor decisions on investments, consumption, and savings. GPRs also have damaging effects on human well-being, triggered by insecurity and fears (Lenain et al. 2002, Frey et al. 2007, Petrov et al. 2019).

A widely cited theoretical framework for the impact of terror on the well-being of individuals and the macroeconomy is presented by Eckstein and Tsiddon (2004). Their approach is an extension of the Blanchard–Yaari model (Yaari 1965, Blanchard 1985, Blanchard et al. 1989), which assumes the individuals live in a closed economy with an infinite horizon. Eckstein and Tsiddon (2004) argue that terror shortens life expectancy and increases the life uncertainty of citizens. Governments react to the consequences of terror by increasing their defense spending, but the amounts cannot offset the damages yielded by terror. As a result, terror reduces investment, output, and consumption. It depreciates individual health and destroys human capital.

Another relevant theoretical framework is the rare macroeconomic disasters model developed by Barro (2006) to resolve the asset-pricing puzzles. Wars are included among the rare disasters that rarely occur but can cause tremendous harm to the macroeconomy (Barro and Ursúa, 2008). The huge drops in consumption that accompany such disasters—even though they are rare—help to explain the dynamics of many financial asset prices and risk premiums over time, such as stock, real estate, government bills, exchange rates, and options (see Tsai and Wachter 2015, Nakamura et al. 2013, Barro and Liao 2021 for details).

Throughout the history, geopolitical instability has been a source of uncertainty shocks. Bloom (2009) constructs a model to simulate a macroeconomic uncertainty shock, which results in a huge and fast drop in consumption followed by a quick recovery in output and employment. Bloom (2009) argues that such uncertainty shocks could force firms to cut off their production temporarily. But the recoveries would be expected in the medium term because of the increased volatility caused by the shock. This implies that GPRs might have strong but short-term impacts on the overall economy.

## 2.3 Empirical Literature

The empirical studies in this area provide extensive evidence that geopolitical challenges are a noteworthy source of fluctuations in worldwide financial markets. A descriptive study by

Ferguson (2008) demonstrates that wars severely affect GDP, consumer prices, exchange rates, inflation, commodity prices, and long-term bond yields in Germany, Russia, the UK, and the US. Baur and Smales (2020) find that stock and bond markets respond adversely to GPRs, but precious metals are resilient under geopolitical challenges. Balcilar et al. (2018) argue that GPRs drive stock market volatility rather than returns for BRICS economies. They also show that the effect of GPRs is particularly strong at return quantiles below the mean. Apergis et al. (2018) demonstrate that GPRs can forecast the dynamics of stock returns and volatility in many companies in the defense industry from 1985 to 2016. Clance et al. (2019) show that GPRs increase the probability of recessions for a sample of 17 advanced countries from 1899 to 2013. Das et al. (2019) conclude that GPRs have robust effects on stock markets in 24 emerging markets from 1997 to 2018. Recently, Wang and Young (2020) prove that an increase of one standard deviation in the monthly number of terrorist attacks results in an increase of more than $50 million in government bond funds and a decline of $75 million in aggregate flows to equity funds.

Other studies point out that geopolitical turbulence can affect financial conditions indirectly through output, investment, trade, or consumption, to name a few. Cheng and Chiu (2018) show that GPRs have considerable consequences for the business cycles for almost all emerging economies in the world. In other words, GPRs have created significant contractions of output in their sample. Caldara and Iacoviello (2017) find that GPRs cause slower growth in expected GDP and total factor productivity. However, Egger and Gassebner (2015) find only a moderate effect of international terrorism on bilateral and multilateral trade and income. Gaibulloev and Sandler (2019) review the impacts of terrorism on GDP, trade, stock exchanges, tourism, and foreign investment. According to their review, there are only trivial impacts to the whole economy, but subsectors such as tourism and investment experience more adverse but rather transient effects.

Despite some important findings in the empirical literature, there are three nontrivial gaps: the quantification of GPRs and FS, the estimation methods, and the extent of coverage. Our paper aims to fill these gaps.

### 2.3.1 Geopolitical Risks Indexes

To close these gaps, first of all, we use a novel measurement of GPRs. To the best of our knowledge, two major ways are used in the literature to measure GPRs. The first one is geopolitical risk (GPR) indexes constructed by Caldara and Iacoviello (2017) and the second one the index from the International Crisis Behavior (ICB) Project (Brecher, Wilkenfeld, et al. 1997, Beardsley et al. 2020). GPR indexes calculate the number of articles related to GPRs (including nuclear threats, war, and terrorist threats and acts) divided by the total number of published articles since 1899 in three major newspapers, The New York Times, the Chicago Tribune, and The Washington Post. ICB index counts all military-security crises since the end of World War I, across all countries in the world.

We use the GPR index computed by Caldara and Iacoviello (2017) because it has some advantages compared to ICB in quantifying GPRs. First, in comparison with ICB, a GPR index can provide a more accurate picture of how investors perceive geopolitical instability. This is because a GPR index is based on major newspapers, which are quickly updated and are closely related to investors' interests. Moreover, the frequency of words related to geopolitics might reflect the severity of the risks better than the number of crises recorded by historians or researchers, who might find it difficult to quantify the monetary or financial damage of conflicts. The newspaper-based index also covers a wider range of geopolitical threats than the ICB index, which counts only actual conflicts. This is particularly important today when geopolitical tensions directly or indirectly reflect complex issues, such as trade disputes and climate change, which are highly relevant to geopolitics but do not cause actual military conflicts. Furthermore, at a high frequency, such as monthly or daily, conflicts can be recorded better by GPR than by ICB because the start and end dates of actual conflicts are not always clear.

In the literature, the use of ICB and similar datasets on terrorist events is often associated with the event study method (see Chesney et al. 2011 and Petrov et al. 2019 for examples). Some limitations of the event study approach, such as potential bias in sample selection or imprecise identification of events on a timeline (MacKinlay, 1997), become more noticeable in our research context. That is, it is hard to collect data on terrorist or conflict events with high accuracy for a large number of emerging economies across many years. This makes a comprehensive event-based analysis of the GPR–FS relationship more challenging.

### 2.3.2 Financial Stress Index

Second, we compute an FS index for all major emerging economies from 1985 to 2019. Measurement of FS has attracted a great deal of attention from academic and policy perspectives. an index of financial conditions conveys important signals of the economy's health, and it can drive economic intervention policies and market dynamics (for recent examples, see Afonso and Jalles (2020) for the responses of sovereign indebtedness to different financial conditions, IMF (2021a) for how we evaluate the global financial stability through financial conditions barometer).

In the literature, there are three popular indices used to quantify FS[3]. Duprey et al. (2017) construct FS indices for EU countries, and they are used by the European Central Bank to monitor financial developments in Europe (European Central Bank, 2021). The benchmark index comprises the performance of the stock price index, 10-year government bond yields, real effective exchange rates, banking sector stress, and the housing market. Extending their approach to emerging economies might be difficult because of the limited availability of data in the developing world. Another approach is by Koop and Korobilis (2014), who

[3]Because of the similarity in the construction and usage, throughout this manuscript, we use "financial stress" and unfavorable financial condition interchangeably.

use a factor model to construct financial conditions for many countries. Their method has been applied by the International Monetary Fund to measure financial situations in major economies or regions of the world (IMF, 2017). To construct the FS index, Koop and Korobilis (2014) use corporate spreads, term spreads, inter-bank spreads, sovereign spreads, changes in long-term interest rates, equity and house price returns, equity return volatility, the change in the market share of the financial sector, and credit growth. Their approach yields a comprehensive index rather than a separate look at the segments of financial systems. However, extending their approach to many emerging economies over several decades might be problematic because getting long-term data for different countries might be difficult. Another index, the OFR (OFR, 2021), covers three geographical regions: the U.S., other advanced economies, and emerging economies. It uses five financial indicators: credit, equity valuation, funding, safe assets, and volatility. This index might be appropriate for showing regional rather than country-level variations.

Our quantification of FS in this paper constructs a comparable and complete dataset for all major emerging economies, addressing the challenges for measurement noted above. In this paper, we compute the FS based on the approach of Balakrishnan et al. (2011), which has been extended by Park and Mercado Jr (2014) and currently applied by Asian Development Bank (ADB, 2021). This approach provides has great potential for constructing the financial situations of the countries in our sample. The subcomponents of this index include banking-sector beta, stock market returns, stock market volatility, sovereign debt spreads, and the exchange market pressure index ($EMPI$). This index not only covers a wide range of the subsectors in financial markets, but it also can be extended to many emerging economies for a long time horizon at a monthly frequency.

### 2.3.3 Panel quantile regression for financial time series

Regarding estimation method, we use quantile regression analysis. It offers a high level of flexibility in modeling financial time series, but it has barely been used in FS research. Quantile regression considerably expands the estimating options beyond the conditional mean analysis provided by traditional least-square models (Xiao 2012, Uribe and Guillen 2020). In other words, quantile regression provides insights not only on average or mean-to-mean relationships but also the relationships at high and low extremes and all other components of the distribution. In our paper, quantile regression answers two questions: Does geopolitical uncertainty affect financial stress symmetrically? How do different GPRs affect FS at different quantiles, especially during extreme episodes? The expansion beyond simple average modeling is particularly useful because the relationship between GPRs and financial markets can be very different during tranquil and turbulent periods of the market, resulting in very different responses to a potential threat. Thus, quantile regression is a promising tool to investigate the complicated relationship underlining many economic phenomena and beyond (Uribe and Guillen, 2020).

Uribe and Guillen (2020) summarize several other properties that make quantile regression useful for studying financial time series. For example, quantile regression is robust to outliers. Moreover, as a semi-parametric method, it does not require strict distributional assumptions as a conventional linear model does. In addition, quantile regression is robust to a rather heterogeneous error structure or an error structure that is not specified by Gaussian processes. These advantages make quantile regression a preferable choice over linear models in examining the dynamics in financial markets Uribe and Guillen (2020).

To our knowledge, the work of Balcilar et al. (2018) is among the very few studies of FS using quantile regression. However, they focus on single-unit analysis. In this paper, we use panel data analysis, which has more capacity than a time series approach (for one cross-section) in modeling financial dynamics (Hsiao, 2007).

### 2.3.4 Coverage of research

Most studies in this area focus on very specific parts of the financial system or a specific group of countries. For example, Baur and Smales (2020) focus on some commodities, and Balcilar et al. (2018) study stock markets in BRICS countries. Chesney et al. (2011) provide global coverage, but their event study focuses on advanced rather than emerging economies.

Despite their importance in both academic and policy perspectives, such investigations, including both general (financial situations) and detailed levels (components of the financial sector), have not received much attention from researchers. By dividing the overall financial sector into different subsectors: stock markets, the debt market, foreign exchange markets, and the banking industry, we can determine the implications of GPRs for these core parts of the financial system in detail. Saisana and Tarantola (2002) argue that using subindicators is a pragmatic solution for addressing some weaknesses of composite indicators, such as offering too simple policy advise.

Another contribution of our work in terms of its coverage is our comparison of emerging and G7 economies over the long period from 1985 to 2019. Sandler and Enders (2008) are among the few who compare how advanced and emerging economies might react to GPRs. They argue that the differences in the economic management capacity of advanced and emerging economies are essential to explain the disparity between them in fighting terrorism. Some cross-country analyses of the impacts of terrorism on the macroeconomy are Blomberg et al. (2004), Tavares (2004), and Abadie and Gardeazabal (2008). However, these studies do not separate advanced and emerging groups in their analyses.

## 2.4 Model and Data

This part presents our methodology with two approaches—a fixed-effects panel data model and a quantile panel data model. Then we clarify how FS is constructed. Finally, we report the data description and unit root tests for time series and panel data.

### 2.4.1 Fixed-effects and quantile panel data model

To examine the impacts of GPRs on financial conditions, we start with a standard panel regression. This simple model serves two purposes. First, we want to verify major findings in the literature on the drivers of FS in emerging economies. Second, the standard fixed-effects panel data model might work as a benchmark analysis. This model is a reference point for another methodological approach, namely, our quantile regression analysis in the next part.

The baseline panel model is specified as follows:

$$Y^s_{t,m} = \alpha^s + \beta^s GPR_{t,m} + \gamma^s Control_{t,m} + \epsilon^s_{t,m} \tag{2.1}$$

for $m = 1, ..., n$ and $t = 1, ...T$. $Y^s_{t,m}$ denotes FS for sector $s$, which can be the whole financial sector or its segments, of economy $m$ at time $t$. $GPR_{t,m}$ denotes the GPR index for country $m$ at time $t$. $Control_{t,m}$ denotes an array of the contagion of financial conditions in other emerging and advanced economies, global control variables, economy-specific variables, economy and year fixed effects. Other symbols are constant coefficient $\alpha$, coefficients of interest $\beta$ and error term $\epsilon$. The concern on reverse-causality or endogeneity of GPRs in FS regression is largely mitigated. This is because GPRs, which are highly relevant to conflict events, are almost exogenous to financial conditions.

After estimating the standard panel regression model, we conduct a quantile regression analysis for panel data, which reflects a methodological contribution of our paper. There are several recently-developed quantile regression estimators for panel data (see Santos Silva (2019), Machado and Silva (2019), Galvao and Kato (2017) for a short review). In this paper, we use the approach developed by Machado and Silva (2019) for quantile model with individual ("fixed") effects. Firpo et al. (2009) call Machado and Silva (2019)'s approach as "conditional" quantile regression (CQR) to differentiate with their own "unconditional" quantile regression (UQR). The quantiles in CQR are not predefined (as in UQR) but are determined conditional on the control variables. Compared to other "conditional" quantile approaches in the literature, Machado and Silva (2019)'s approach has several advantages such as simple computation, allowing fixed effects to impact the entire distributions, applicability for non-linear models with multiple endogenous variables (Machado and Silva, 2019).

The general model is specified as:

$$Y_{t,m} = \alpha_m + \beta X_{t,m} + (\theta_m + Z_{t,m}\gamma)U_{t,m} \tag{2.2}$$

where $(\alpha, \beta, \theta, \gamma)$ denote unknown parameters, $Z$ is a k-vector of the transformations of the components of $X$ as the vector of exogenous independent variables, for element $l$, $Z_l = \underline{Z}_l(X)$ ($l = 1, 2, 3, ...k$). Country fixed effects $m$ are captured by $(\alpha_m, \theta_m)$. We assume $P[\theta_i + Z_{t,m}\gamma > 0] = 1$, both $X_{t,m}$ and $U_{t,m}$ are $i.i.d.$ across $m$ and $t$ and $U_{t,m}$ is independent of $X_{t,m}$ with $E(U) = 0$ and $E(|U|) = 1$.

We want to estimate the conditional quantiles of a random variable $Y$ whose distribution conditional on a set of explanatory variables $X$, $Q_Y(\tau|X)$ as:

$$Q_Y(\tau|X) = (\alpha_m + \theta_m q(\tau)) + \beta X_{t,m} + Z_{t,m}\gamma q(\tau) \tag{2.3}$$

with the quantile$-\tau$ country fixed effect (distribution effect) being $\alpha_m(\tau) \equiv \alpha_m + \theta_m q(\tau)$. This effect might change over different quantiles$-\tau$. With $Z = X$:

$$Q_Y(\tau|X) = (\alpha_m + \theta_m q(\tau)) + X_{t,m}(\beta + \gamma q(\tau)) \tag{2.4}$$

from this equation, we can obtain the coefficients of $X$ $\beta(\tau, X) = \beta + \gamma q(\tau)$ and their marginal effects at different quantiles (see more at Machado and Silva 2019).

To estimate the quantile coefficients, Machado and Silva (2019) propose the quantiles-via-moments approach. Their procedure includes two fixed effects regressions to obtain $\beta$ and $\gamma$, simple calculations for $\alpha$ and $\theta$, and a computation of a univariate quantile. The authors acknowledge that their proposed approach is still inconsistent in case $n$ and $T$ are small (incidental parameters problem), however, one of its advantages is that the implementation is quite easy. Furthermore, their simulation exercise shows that the bias has been significantly mitigated if $n/T < 10$, which is clearly our case with monthly data of around 30 years.

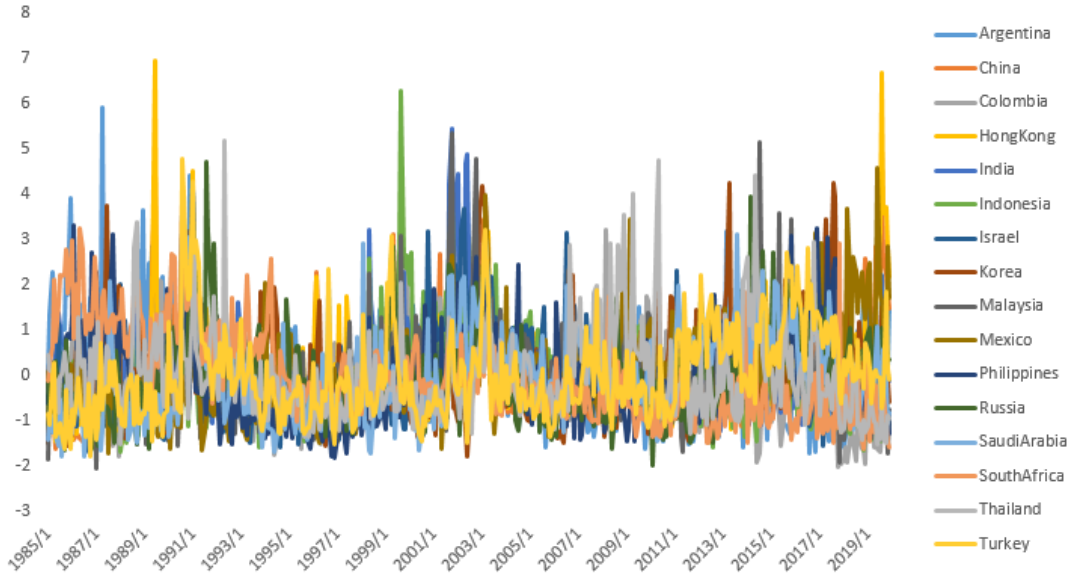
### 2.4.2 GPRs and aggregate and sub-sector FS indices

Our sample includes 17 major emerging economies from 1985 to 2019. The economies investigated in our sample are Argentina, Brazil, China, Colombia, Hong Kong, India, Indonesia, Israel, Korea, Malaysia, Mexico, Philippines, Russia, Saudi Arabia, South Africa, Thailand, Turkey. The selection of economies depends only on the availability of GPRs and FS data.

To measure GPRs, we use data for emerging economies from Caldara and Iacoviello (2017). Following Caldara and Iacoviello (2017), our variables are standardized for the convenience of interpretation and comparison. Figure 2.1 shows the diverse dynamics of geopolitical vulnerability in emerging economies with the periods related with the collapse of the Soviet Union, the turn of the century, global financial crisis, and recent years being the most challenging time. The notable differences indicate the varied nature of emerging economies regarding geopolitical situation.

We follow Balakrishnan et al. (2011) and Park and Mercado Jr (2014) to compute the aggregate FS index (*FS-Agg.*) for the whole financial system from the FS indices of its five

Figure 2.1: Geopolitical Risks Index: 1985-2019




segments: banking sector (*FS-Bank*), currencies market (*FS-EMPI*, *EMPI* refers to exchange market pressure index), debt market (*FS-Bond*), stock market return (*FS-Stock-rtn*), and stock market volatility (*FS-Stock-vol*). The construction of sub-sector FS indices follows Balakrishnan et al. (2011) as presented below:

Banking sector $beta$ measures how risky the banking sector is in comparison with the whole economy. That is, it quantifies the relationship between the banking sector stock price index return ($r$) and the overall stock market price index return ($m$):

$$beta = \frac{cov(r, m)}{var(m)} \tag{2.5}$$

Exchange market pressure index (*EMPI*) measures the depreciation of the local currency with respect of US dollar and the reduction in foreign exchange reserves. With $\Delta e$ and $\Delta RES$ being month-on-month percent changes in the foreign exchange rate and foreign exchange reserves, respectively, and $\sigma$ and $\mu$ being the standard deviation and mean, respectively, we compute:

$$EMPI_{i,t} = \frac{(\Delta e_{i,t} - \mu_{i,\Delta e})}{\sigma_{i,\Delta e}} - \frac{(\Delta RES_{i,t} - \mu_{i,\Delta RES})}{\sigma_{i,\Delta RES}} \tag{2.6}$$

To proxy the financial stress in the bond market (*FS-Bond*), we use yield differentials between long-term (10-year) local government bonds and US treasury bonds. In the literature, there are many ways to measure sovereign risks (Popescu and Turcu 2017, Singh et al. 2021). We use the sovereign yield spreads to have more available data.

Stock return (*Stock-rtn*) is calculated as the difference between current and previous 12 month stock price index in natural logarithms. Namely,

$$\textit{Stock-rtn}_{i,t} = ln(Stock_{i,t}) - ln(Stock_{i,t-12}) \tag{2.7}$$

Stress of the stock market return is computed by multiplying the *Stock-rtn* by minus one, so that higher FS in stock market means a decrease in stock return.

Stock volatility (*Stock-vol*) $\sigma^2$ is measured by a GARCH (1,1) process as follows:

$$\sigma^2 = \omega + \phi_1 \varepsilon_{t-1}^2 + \phi_2 \sigma_{t-1}^2 \tag{2.8}$$

where $\sigma^2$ and $\varepsilon$ are the variance and error term in the return regression as an autoregressive process with 12 lags.

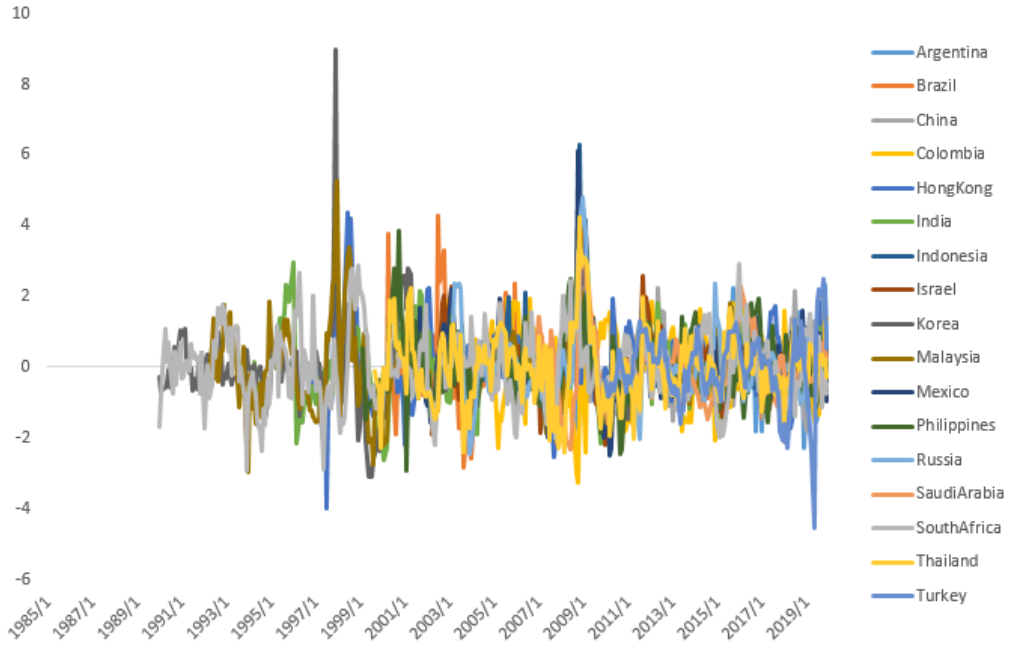
There are several ways to construct a composite FS index: simple averaging of component indices, variance-equal weights, and principal component analysis. The simple average approach is easy to compute, but it might be biased toward some extreme values for the FS in certain subsectors. A variance-equal weighting procedure can be more representative than the simple average approach, but it might be arbitrary in the selection of weighting methods. One popular weighting method is to use the size of the component financial sectors out of the whole financial market, but such weights are not available for all examined countries for the whole time period. Moreover, Park and Mercado Jr (2014) argue that the variance-equal weighting method often produces erratic and volatile patterns. Based on the practice of ADB (2021) and Park and Mercado Jr (2014), we construct the aggregate FS index using principal component analysis with Hodrick–Prescott high-pass filter for standardized subsector FS indices. Following Park and Mercado Jr (2014), we first deploy two components of the principal component analysis to represent the overall dynamics of financial conditions.

Figure 2.2 shows our aggregate FS indices over time. The most turbulent times for most emerging economies are around the global financial crisis. Other stressful times are at the regional or country level, such as the Asian financial crisis, the Russian default, the Brazil crisis in 1997–1998, the Turkish stock market crash, the outbreak of SARS, and economic crises in Argentina and some other Latin American economies in the early 2000s.

The selection of control variables in our models follows Balakrishnan et al. (2011) and Park and Mercado Jr (2014). We use FS indices of other emerging economies and the G7 countries to proxy transmission effects. Including these transmission variables has been confirmed by the FS literature (Balakrishnan et al., 2011). Individual economy control variables include annual GDP growth, fiscal account measured by general government net lending/borrowing as a percentage of GDP, the current account balance as a percentage of GDP, the Chinn–Ito Financial Openness Index, and trade openness as the percentage of trade in GDP. Global control variables include monthly commodity price changes, the global economic activity index, and the LIBOR 3-month rate. All economy-specific control variables are at a yearly frequency.[4] As a common practice in the literature, some control variables are in first-difference transformation in case of unit root concerns for data in the original form.

[4]Park and Mercado Jr (2014) interpolates yearly data to create monthly data to examine the determinants

Figure 2.2: Aggregate Financial Stress Index: 1985-2019




### 2.4.3 Data description

Table 2.3 reports descriptive statistics and sources of our sample. We test for stationarity of our time series by using Dickey-Fuller for univariate data and Pesaran's unit root test in presence of cross section dependence for panel data (Pesaran 2007, Dickey and Fuller 1979). The results of unit root tests show that the null hypotheses of the unit root are rejected at a 5% significance level for both tests.

## 2.5 Empirical Results

This section presents our major findings on the unfavorable and diverse effects of GPRs on financial conditions in emerging and advanced economies. In the tables, we report analytical standard errors together with bootstrapped standard errors clustered at the level of the economy (100 replications), as reported in Machado and Silva (2019) and Firpo et al. (2009). It should be noted that the clustered standard errors, which are robust to heteroskedasticity and within-cluster error correlation, might have the asymptotic tests that

of FS. In our analysis, the main interests are not to investigate the determinants of FS, moreover, the interpolation methodology normally does not show the real data, thus we keep the economy-specific control variables at their original frequency.

Table 2.1: Data Description

| Variable | Obs. | Mean | Std. | Min | Max | UR stat. | Test | Fre. | Sources |
|---|---|---|---|---|---|---|---|---|---|
| FS-Agg. | 4002 | 0 | 1 | -4.53 | 8.96 | -16.27*** | pescadf | M | Datastream |
| FS-Bank | 5536 | 0 | 1 | -4.45 | 6.28 | -13.12*** | pescadf | M | Datastream |
| FS-EMPI | 6941 | 0 | 1 | -12.4 | 13.2 | -20.06*** | pescadf | M | Datastream |
| FS-Bond | 4122 | 0 | 1 | -3.07 | 5.4 | -3.17*** | pescadf | M | Datastream |
| FS-Stock-rtn | 6336 | 0 | 1 | -5.19 | 3.91 | -10.78*** | pescadf | M | Datastream |
| FS-Stock-vol | 6336 | 0 | 1 | -1.63 | 10.20 | -7.00*** | pescadf | M | Datastream |
| GPRs | 7140 | 0 | 1 | -2.07 | 6.94 | -13.00*** | pescadf | M | CI |
| Glo.Com.Pr | 7140 | 0.34 | 3.40 | -15.4 | 17.0 | -14.65*** | DF | M | WB |
| Glo.Eco.Act. | 7140 | 0.04 | 0.38 | -2.17 | 1.14 | -7.04*** | DF | M | DFED |
| Glo.LIBOR | 6919 | -0.02 | 0.25 | -1.59 | 1.24 | -16.2*** | DF | M | FRED |
| GDP-gr | 7068 | 4.29 | 4.25 | -14.5 | 17 | -5.85*** | pescadf | Y | WB |
| Fiscal-acc. | 6792 | -1.93 | 4.16 | -17.2 | 29.8 | -2.50*** | pescadf | Y | WB |
| Balance-acc. | 7056 | 0.70 | 5.39 | -20.8 | 27.4 | -2.86*** | pescadf | Y | WB |
| Fin.Open. | 6804 | .004 | 0.09 | -0.59 | 0.59 | -3.50*** | pescadf | Y | WB |
| Trade.Open. | 6888 | 0.72 | 8.37 | -41.8 | 84.3 | -6.18*** | pescadf | Y | WB |

*, ** and ***: significance at 10%, 5% and 1%, respectively, for unit root tests (UR).

DF: Dickey-Fuller test with trend. pescadf: Pesaran (2007) test, lagged 2 (4) for yearly (monthly) data.

DF Null: Variable contains a unit root. Pescadf Null: All panels contain unit roots.

Fre.: Frequency of data, monthly (M) or yearly (Y). CI: Caldara and Iacoviello (2017)

FRED: FED of St. Louis. DFED: Dallas FED extended from Kilian (2009). WB: World Bank

over-reject, especially when the number of clusters is not large (Cameron et al., 2008). In our case, there are only 17 clusters (economies), the interpretation based on clustered standard errors and their corresponding tests might be too conservative, while the argument based on analytical standard errors might be too aggressive.

### 2.5.1 GPRs and FS in Emerging Economies: Fixed-Effects Model

Table 2.2 shows that GPRs matter greatly to FS in emerging economies. One standard deviation increase in GPRs causes between 0.033 (model 5) and 0.085 (model 1) standard deviation increases in the composite FS index. The impacts are statistically significant over different specifications with different sets of control variables. The magnitude of such effects is equal to one-third of the contagion caused by the FS in advanced economies and slightly higher than the impacts of a one-percent decline in GDP growth. Our models explain about 30% of the dynamics of the financial situations of emerging economies, comparable to previous studies, such as Park and Mercado Jr (2014).

Regarding control variables, Table 2.2 qualitatively confirms some major findings shown in Park and Mercado Jr (2014) and Balakrishnan et al. (2011), which also cover all major emerging economies. The significant effects of global economic activity, GDP growth, and trade openness are as expected. Furthermore, we illustrate that the impacts of contagion from other emerging economies are substantially higher than that from advanced economies. These findings are qualitatively similar to those of Park and Mercado Jr (2014) and Balakrishnan et al. (2011), though the magnitude of these effects is somewhat different.

In addition, our models point out that the contagion of the financial conditions in advanced and other emerging economies holds the most significant explanatory powers for the dynamics of the financial conditions. Specifically, model 2 with only GPRs and contagion explains 33.3%, while the model with all the control variables explains slightly more variability of FS (34.9% in model 5). This might be because our global control variables are the same for all countries and their impacts might be already absorbed by regional FS indices. Furthermore, our economy-specific variables are at an annual frequency while the dependent variables are at a monthly frequency. Our analysis does not aim to be a comprehensive investigation of the determinants of FS, and we have tried to keep the model parsimonious without losing significant explanatory power. In later analyses, therefore, we only use FS indices in emerging and advanced economies as control variables.

Table 2.3 highlights the impacts of GPRs on some divisions of the financial industry. The main findings of Table 2.2 suggest that there should be at least some notable effects of GPRs on some parts of the financial industry. A deeper investigation of Table 2.3 shows that only some effects of geopolitical turbulence can be seen in the currencies market. The stock markets, both return and volatility measurements, the banking sector, and the bond market encounter effects that are not statistically significant (except for the simplest model specification for stock returns). These results suggest that the OLS approach might not be

Table 2.2: GPR and Aggregate FS in Emerging Economies: Fixed-Effects Regression (FE)

| Model | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|
| | FS-Agg. | FS-Agg. | FS-Agg. | FS-Agg. | FS-Agg. |
| GPRs | 0.085*** | 0.044*** | 0.036** | 0.042*** | 0.033*** |
| | (0.016) | (0.014) | (0.014) | (0.012) | (0.011) |
| FS-Agg.eme. | | 0.400*** | 0.345*** | 0.402*** | 0.347*** |
| | | (0.058) | (0.027) | (0.058) | (0.054) |
| FS-Agg.adv. | | 0.162*** | 0.099*** | 0.161*** | 0.099*** |
| | | (0.038) | (0.033) | (0.037) | (0.033) |
| Glo.Com.Pr. | | | 0.005 | | 0.005 |
| | | | (0.005) | | (0.004) |
| Glo.Eco.Act. | | | -0.550*** | | -0.547*** |
| | | | (0.155) | | (0.156) |
| Glo.LIBOR | | | -0.194* | | -0.195* |
| | | | (0.100) | | (0.100) |
| GDP-gr | | | | -0.028** | -0.028*** |
| | | | | (0.01) | (0.009) |
| Fiscal-acc | | | | -0.005 | -0.005 |
| | | | | (0.006) | (0.006) |
| Balance-acc | | | | -0.016*** | -0.015*** |
| | | | | (0.004) | (0.004) |
| Fin.Open. | | | | -0.186 | 0.170 |
| | | | | (0.325) | (0.324) |
| Trade.Open. | | | | 0.006** | 0.007** |
| | | | | (0.002) | (0.003) |
| Obs. | 4002 | 4002 | 4002 | 4002 | 4002 |
| R-squared | 0.128 | 0.333 | 0.347 | 0.335 | 0.349 |
| VIFs | 5.17 | 5.05 | 4.99 | 4.95 | 4.90 |

*, ** and ***: significance at 10%, 5% and 1%, respectively

Robust standard errors are in round brackets. VIFs: variance inflation factors

Year and Country Controls in all models.

Table 2.3: GPRs and FS in sub-sectors in Emerging Economies: Fixed-Effects Regression (FE)

| Model | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|
| | FS-Bank | FS-Bank | FS-Bank | FS-Bank | FS-Bank |
| GPRs | 0.021 | 0.022 | 0.030 | 0.023 | 0.030 |
| | (0.029) | (0.028) | (0.029) | (0.029) | (0.030) |
| Controls | No | Yes(a) | Yes(a+b) | Yes(a+c) | Yes(a+b+c) |
| Obs. | 5536 | 5536 | 5536 | 5502 | 5502 |
| R-squared | 0.037 | 0.050 | 0.054 | 0.052 | 0.057 |
| | FS-EMPI | FS-EMPI | FS-EMPI | FS-EMPI | FS-EMPI |
| GPRs | 0.032** | 0.031* | 0.031** | 0.021* | 0.021* |
| | (0.014) | (0.015) | (0.014) | (0.011) | (0.011) |
| Controls | No | Yes(a) | Yes(a+b) | Yes(a+c) | Yes(a+b+c) |
| Obs. | 6941 | 6941 | 6761 | 6563 | 6552 |
| R-squared | 0.028 | 0.084 | 0.092 | 0.105 | 0.109 |
| | FS-Bond | FS-Bond | FS-Bond | FS-Bond | FS-Bond |
| GPRs | 0.101 | 0.099 | 0.092 | 0.076 | 0.069 |
| | (0.059) | (0.059) | (0.058) | (0.053) | (0.053) |
| Controls | No | Yes(a) | Yes(a+b) | Yes(a+c) | Yes(a+b+c) |
| Obs. | 4122 | 4122 | 4122 | 4122 | 4122 |
| R-squared | 0.268 | 0.278 | 0.282 | 0.319 | 0.324 |
| | FS-Stock-rtn | FS-Stock-rtn | FS-Stock-rtn | FS-Stock-rtn | FS-Stock-rtn |
| GPRs | 0.067** | 0.022 | 0.021 | 0.026 | 0.025 |
| | (0.023) | (0.021) | (0.022) | (0.023) | (0.023) |
| Controls | No | Yes(a) | Yes(a+b) | Yes(a+c) | Yes(a+b+c) |
| Obs. | 6336 | 6336 | 6327 | 6264 | 6256 |
| R-squared | 0.271 | 0.385 | 0.388 | 0.421 | 0.423 |
| | FS-Stock-vol | FS-Stock-vol | FS-Stock-vol | FS-Stock-vol | FS-Stock-vol |
| GPRs | -0.006 | -0.020 | -0.023 | -0.027 | -0.029 |
| | (0.024) | (0.023) | (0.023) | (0.025) | (0.025) |
| Controls | No | Yes(a) | Yes(a+b) | Yes(a+c) | Yes(a+b+c) |
| Obs. | 6336 | 6336 | 6327 | 6264 | 6256 |
| R-squared | 0.378 | 0.404 | 0.404 | 0.418 | 0.419 |

*, ** and ***: significance at 10%, 5% and 1%, respectively. Country & Year effects in all models
Controls: FS indices in other emerging/G7 economies (a), global (b) or country-specific (c)
Robust standard errors are in round brackets.

sufficient to examine the subtle and complicated relations between financial time series. This encourages us to use quantile regression analysis in the following part to explore further the implications of GPRs on financial conditions.[5]

### 2.5.2 GPRs and FS in Emerging Economies: Conditional Quantile Regression

Table 2.4 shows that GPRs do not have statistically significant effects on the FS index at the lowest quantile. The effects are considerably stronger and statistically significant at middle and higher quantiles. This means that GPRs might put more pressure on the financial market, especially when the economy already suffers certain levels of stress. In contrast, when the financial conditions are favorable, GPRs have trivial impacts. In other words, GPRs cannot trigger FS, but they can escalate a worsening situation.[6]

In more detail, Table 2.4 shows that the impacts of geopolitical uncertainties are diverse through different segments of the financial market and across quantiles within a specific segment. First, the banking sector is negatively influenced by GPRs but only in the lowest or middle quantiles. This means that in low quantiles, the greater the GPRs, the higher the FS indices are. The impacts of geopolitical problems become insignificant when the banking industry becomes more unstable. This might be because when the banking sector is already under some stress, other more direct drivers of that stress, such as the macroeconomic situation, monetary policies, intervention policies of the governments, and banks' own "defense" strategies, might play a more significant role than geopolitical issues. For example, Caplain et al. (2017) observe that the banking sector keeps a holistic approach to managing risk, and it seems to overreact during recent geopolitical unpredictability in Asia. Therefore, our findings on the significant impacts of GPRs on FS at low quantiles should be interpreted cautiously because the statistically significant effects disappear when more conservative standard errors (bootstrapped) are reported.

[5]Table 2.3 shows that the R-squared for the regression of stress in banking sector is rather small, indicating that the model specification might be insufficient. However, our main interest is not to comprehensively examine the drivers of the banking sector's performance.

[6]This conclusion is based on the interpretation of the magnitude and the statistical significance of the GPRs' coefficients over quantiles (null hypothesis: coefficient equals zero). It should be noted that the regression result here is based on the conditional quantile function. Different from UQR, CQR only gives information on within- but not between- group dispersion. The increase of GPRs' coefficients from 0.037 to 0.047 (Q1 and Q7, respectively, Table 2.4) indicates only a higher within-group dispersion but presents no clue on between-group dispersion (the overall FS dispersion between different quantiles of the unconditional FS dispersion). Even though, to be more conservative, a test of equality between coefficients of different quantiles is conducted. Following Clogg et al. (1995), we calculate Z-statistics ($Z = \frac{\beta_1 - \beta_2}{\sqrt{(SE\beta_1)^2 + (SE\beta_2)^2}}$, $\beta$ and $SE$ are coefficient and standard errors, respectively) for the GPRs' coefficients of Q9 and Q1 and find the significant differences in the FS-EMPI and FS-Bond but not FS-Agg and FS-Bank regressions. This result still confirms that GPRs strengthen FS at high quantiles (al beit only in foreign exchange and debt markets).

Table 2.4: GPRs and FS in Emerging Economies: Conditional Quantile Regression (CQR)

| | Q1 | Q3 | Q5 | Q7 | Q9 | FE |
|---|---|---|---|---|---|---|
| Dep.Var. | FS-Agg. | FS-Agg. | FS-Agg. | FS-Agg. | FS-Agg. | FS-Agg. |
| GPRs | 0.037 | 0.041 | 0.044 | 0.047 | 0.052 | 0.044 |
| | [0.025] | [0.016]** | [0.014]*** | [0.017]*** | [0.028]* | (0.014)*** |
| | {0.021}* | {0.014}*** | {0.012}*** | {0.015}*** | {0.023}** | |
| Controls | Yes | Yes | Yes | Yes | Yes | Yes |
| Dep.Var. | FS-Bank | FS-Bank | FS-Bank | FS-Bank | FS-Bank | FS-Bank |
| GPRs | 0.049 | 0.035 | 0.025 | 0.013 | -0.007 | 0.023 |
| | [0.024]** | [0.016]** | [0.014]* | [0.018] | [0.030] | (0.028) |
| | {0.029}* | {0.023} | {0.025} | {0.032} | {0.049} | |
| Controls | Yes | Yes | Yes | Yes | Yes | Yes |
| Dep.Var. | FS-EMPI | FS-EMPI | FS-EMPI | FS-EMPI | FS-EMPI | FS-EMPI |
| GPRs | -0.022 | 0.01 | 0.029 | 0.049 | 0.088 | 0.031 |
| | [0.023] | [0.015] | [0.014]** | [0.016]*** | [0.027]*** | (0.015)* |
| | {0.028} | {0.019} | {0.015}* | {0.013}*** | {0.017}*** | |
| Controls | Yes | Yes | Yes | Yes | Yes | Yes |
| Dep.Var. | FS-Bond | FS-Bond | FS-Bond | FS-Bond | FS-Bond | FS-Bond |
| GPRs | 0.054 | 0.076 | 0.095 | 0.117 | 0.147 | 0.099 |
| | [0.028]* | [0.019]*** | [0.017]*** | [0.021]*** | [0.035]*** | (0.059) |
| | {0.058} | {0.058} | {0.061}* | {0.066}* | {0.078}* | |
| Controls | Yes | Yes | Yes | Yes | Yes | Yes |
| Dep.Var. | FS-Stock-rtn | FS-Stock-rtn | FS-Stock-rtn | FS-Stock-rtn | FS-Stock-rtn | FS-Stock-rtn |
| GPRs | 0.036 | 0.028 | 0.022 | 0.016 | 0.008 | 0.022 |
| | [0.941] | [0.594] | [0.349] | [0.118] | [0.205] | (0.021) |
| | {0.030} | {0.023} | {0.021} | {0.024} | {0.031} | |
| Controls | Yes | Yes | Yes | Yes | Yes | Yes |
| Dep.Var. | FS-Stock-vol | FS-Stock-vol | FS-Stock-vol | FS-Stock-vol | FS-Stock-vol | FS-Stock-vol |
| GPRs | -0.006 | -0.012 | -0.018 | -0.026 | -0.038 | -0.020 |
| | [0.018] | [0.012] | [0.015] | [0.026] | [0.048] | (0.023) |
| | {0.029} | {0.025} | {0.023} | {0.025} | {0.034} | |
| Controls | Yes | Yes | Yes | Yes | Yes | Yes |

*, ** and ***: significance at 10%, 5% and 1%, respectively. OLS results in Tables 2,3 (Model 2).

FS indices in other emerging/G7 economies, country & year effects in all models.

Robust, analytical, and clustered standard errors are in round, square and curly brackets, respectively.

In contrast, the effects of GPRs on foreign exchange markets are seen only at medium and high quantiles. Furthermore, the magnitude of these impacts is remarkably stronger than in the overall financial sector. For example, within the 90th quantile, one standard deviation increase in GPRs might lead to an increase of 0.088 standard deviation in the FS index of the currencies market. This value is remarkably higher than the value of 0.052 found in the overall financial market. In other words, geopolitical problems carry substantial implications for the instability of emerging foreign exchange markets, especially when these markets are already in medium or high stress. These findings are quite similar to those of Petrov et al. (2019), who show strong instant and weekly reactions of the currency markets in India, Israel, South Korea, and Turkey to geopolitical events occurring in those economies. Our regression outcome is also consistent with Salisu et al. (2021), who find the varied vulnerability levels of BRICS exchange markets under high pressure from GPRs.

The significant impacts of GPRs on currencies markets in emerging economies can be explained by several channels. For example, GPRs damage international trade (Glick and Taylor, 2010), and this poses a high risk to the stability of exchange rates and international reserves. Furthermore, GPRs trigger flight-to-safety capital flows during geopolitical turmoil. Caldara and Iacoviello (2017) find that an increase of one standard deviation in the GPR index reduces capital flows in emerging economies by 0.23 percentage points, but it increases capital flows in advanced economies by 1 percentage point.

In a pattern similar to that of the currencies market, GPRs affect bond markets across all quantiles, and higher quantiles see more measurable effects. That is, bond markets are highly vulnerable to geopolitical uncertainties when these markets are already under stress. The consequences of GPRs in this section are two times as high as in the overall financial industry. As Presbitero et al. (2016) argue, FS in bond markets (measured by bond spread) might be more severe when countries have weaker trade, fiscal positions, growth, and government effectiveness. Our findings indicate that GPRs might raise considerable concerns about the capacity or effectiveness of governments in emerging markets in managing risks. With more conservative standard errors, Table 2.4 demonstrates significance at the 10% level for the impacts of GPRs on FS at the 50th quantiles and above. Since there is strong evidence of the contagion of sovereign risks, both in the eurozone and globally (see Badarau et al. 2014 for the Eurozone example and Beirne and Fratzscher 2013 for the global evidence), the significant effects of GPRs on the bond market in one country might trigger larger impacts on other countries, especially when the fundamentals are deteriorating during crises and countries are closely connected with others.

In marked contrast to other segments of the financial system, stock markets, regarding both return and volatility measurements, are strong enough to withstand geopolitical turbulence. Table 2.4 shows that GPRs have negligible consequences on FS in stock markets. This confirms the heterogeneous reactions of stock markets in emerging economies to geopolitical uncertainties. Our evidence of a loose correlation between stock market performance and GPRs is also found by Petrov et al. (2019), who conduct a simple descriptive analysis on the link between GPRs and the MSCI World index. Using quantile regression, Balcilar et al.

(2018) also show mixed evidence of the consequences of GPRs in BRICS countries: volatility dynamics seem to be more affected than return dynamics. Russia is very vulnerable while India is resilient to geopolitical shocks.

Our findings on stock markets are in contrast with Arin et al. (2008). Our results show that terror has a significant and negative impact on stock market returns and volatility, and their magnitudes are bigger in emerging markets than in advanced markets. However, the event study of Arin et al. (2008) focuses on only six countries, and they consider only major terrorist events. Like Arin et al. (2008), Petrov et al. (2019) show some negative implications of major geopolitical events on stock returns in four emerging markets. In short, the profound impacts of GPRs on stock markets are found only in the studies that use subjectively selected samples of geopolitical events (mostly large-scale terrorist events, such as in Wade and Lauro 2019) or countries (mostly those with high vulnerability or great exposure to terrorism). Obviously, the selection bias of these event studies comes from looking only at major events in a few countries and in very recent years.

### 2.5.3 GPRs and FS in Emerging Economies: Unconditional Quantile Regression

The CQR analyses presented in the previous section have a very long history, starting in the 1970s with the seminal work of Koenker and Bassett Jr (1978). This approach is seen by many as the best-known quantile method. Another quantile method that has gained some popularity is "unconditional" quantile regression (UQR) developed by Firpo et al. (2009). CQR and UQR answer very different questions even though both examine the impacts of an explanatory variable on the distribution of an outcome. For example, the results of CQR in Table 2.4 shows that the effect of GPRs estimated at the 80th quantile is higher than that at the 10th. This shows that GPRs increase the within-group dispersion, where the "group" includes the FS indices that have the same values of the explanatory variables (other than GPRs). By contrast, UQR examines whether GPRs would increase the overall dispersion of FS as indicated by the disparity between the 80th and the 10th quantiles of the unconditional FS dispersion. Because CQR and UQR address different issues, it is very natural that they might provide different estimation results at different quantiles (see Firpo et al. 2009 and Borah and Basu 2013 for illustrative examples). Considering that the result from UQR might be more pragmatic than CQR in policy contexts (Borah and Basu, 2013), Table 2.5 presents our findings with the UQR approach proposed by Firpo et al. (2009).

It turns out that the major findings from UQR qualitatively verify our previous findings using CQR. Namely, there is strong evidence that GPRs affect FS in the middle and high quantiles. The effects are strong in foreign exchange markets, especially at high quantiles. Similarly, the banking sector and the bond market reflect significant influences of GPRs in low and high quantiles, respectively. However, the significance of the coefficient reported by clustered standard errors in the banking and bond sector regressions is higher 5% in most quantiles.

Table 2.5: GPRs and FS in Emerging Economies: Unconditional Quantile Regression (UQR)

| | Q1 | Q3 | Q5 | Q7 | Q9 |
|---|---|---|---|---|---|
| Dep.Var. | FS-Agg. | FS-Agg. | FS-Agg. | FS-Agg. | FS-Agg. |
| GPRs | 0.047 | 0.031 | 0.033 | 0.032 | 0.060 |
| | [0.025]* | [0.017]* | [0.015]** | [0.018]* | [0.031]* |
| | {0.026}* | {0.020} | {0.017}** | {0.018}* | {0.041} |
| Controls | Yes | Yes | Yes | Yes | Yes |
| Dep.Var. | FS-Bank | FS-Bank | FS-Bank | FS-Bank | FS-Bank |
| GPRs | 0.047 | 0.037 | 0.001 | 0.034 | 0.004 |
| | [0.022]** | [0.014]*** | [0.014] | [0.018]* | [0.028] |
| | {0.037} | {0.024} | {0.037} | {0.034} | {0.057} |
| Controls | Yes | Yes | Yes | Yes | Yes |
| Dep.Var. | FS-EMPI | FS-EMPI | FS-EMPI | FS-EMPI | FS-EMPI |
| GPRs | 0.013 | 0.005 | 0.022 | 0.044 | 0.087 |
| | [0.020] | [0.010] | [0.008]*** | [0.011]*** | [0.023]*** |
| | {0.031} | {0.009} | {0.012}* | {0.014}*** | {0.031}*** |
| Controls | Yes | Yes | Yes | Yes | Yes |
| Dep.Var. | FS-Bond | FS-Bond | FS-Bond | FS-Bond | FS-Bond |
| GPRs | 0.042 | 0.070 | 0.101 | 0.156 | 0.074 |
| | [0.019]** | [0.014]*** | [0.016]*** | [0.028]*** | [0.028]*** |
| | {0.067} | {0.054} | {0.061}* | {0.097} | {0.067} |
| Controls | Yes | Yes | Yes | Yes | Yes |
| Dep.Var. | FS-Stock-rtn | FS-Stock-rtn | FS-Stock-rtn | FS-Stock-rtn | FS-Stock-rtn |
| GPRs | -0.006 | 0.006 | 0.044 | 0.034 | 0.012 |
| | [0.026] | [0.015] | [0.011]*** | [0.011]*** | [0.023] |
| | {0.041} | {0.029} | {0.019}** | {0.022} | {0.031} |
| Controls | Yes | Yes | Yes | Yes | Yes |
| Dep.Var. | FS-Stock-vol | FS-Stock-vol | FS-Stock-vol | FS-Stock-vol | FS-Stock-vol |
| GPRs | 0.002 | 0.003 | -0.003 | -0.015 | -0.064 |
| | [0.009] | [0.007] | [0.008] | [0.016] | [0.030]** |
| | {0.037} | {0.018} | {0.014} | {0.041} | {0.056} |
| Controls | Yes | Yes | Yes | Yes | Yes |

*, ** and ***: significance at 10%, 5% and 1%, respectively.

FS indices in other emerging/G7 economies, country & year effects in all models.

Analytical and clustered standard errors are in square and curly brackets, respectively.

Moreover, the UQR results show that GPRs have significant impacts on stock returns and volatility at certain quantiles. Nevertheless, when clustered standard errors are reported, there is only one quantile in the stock return regression with a 5% statistical significance.

### 2.5.4 GPRs and FS in G7 Economies

Table 2.6 shows the results for advanced economies, represented by the G7. As they do for emerging economies, GPRs have negative implications for the financial situation in advanced economies. One unit increase in the standard deviation of GPRs leads to an increase of around 0.11 standard deviation in the FS index. All coefficients are significant at the 5% level when both analytical and clustered standard errors are reported.

One crucial difference between advanced economies and emerging economies is that the impacts of GPRs in advanced economies are similar regardless of the quantile. In other words, geopolitical disorders from emerging economies might affect financial situations in advanced economies in a rather homogeneous pattern. Conversely, as detailed in Table 2.4, the impacts on emerging economies vary significantly from one quantile to another. Another major difference between emerging and advanced economies is the magnitude of the impacts. The effects of GPRs on the financial conditions of advanced economies are almost three times as high as in emerging economies (for example, 0.120 and 0.047 for advanced and emerging economies, respectively, at the 70th quantile).

Several explanations are possible for the differences between emerging and advanced economies regarding the quantile effects and their magnitudes. First, a GPR index is based on major US newspapers, which might display better the awareness of investors in advanced economies. Another reason might be that emerging economies, which are a major source of geopolitical turmoil, might be more resistant and more familiar with their situation than the outsiders. Therefore, emerging financial markets might be more adaptable to geopolitical shocks than foreign economies. Furthermore, advanced economies are better connected, which might cause GPRs to exert more contagion across geographical locations.

When we come to subsectors, there is an even greater difference between advanced and emerging economies. The stock markets in advanced economies see adverse impacts of GPRs on both market return and market volatility. Furthermore, significant and destructive effects are found in high-stress episodes for both measurements of stress. One possible explanation for these impacts may be that the stock markets are internationally connected, and emerging markets play a significant role in advanced economies. Therefore, the spillover effect of shocks from the outside world, especially from emerging economies, is sizeable. This result is consistent with Chesney et al. (2011), who find significant impacts of 77 large-scale terrorist events (around 80% of these events occurred in emerging economies) on advanced economies.

In contrast, other sections of the financial system, such as currencies markets, bond markets, and banking sectors, are almost unaffected by geopolitical uncertainties from emerging

Table 2.6: GPRs and FS in G7 Economies: Conditional Quantile Regression (CQR)

| | Q1 | Q3 | Q5 | Q7 | Q9 | FE |
|---|---|---|---|---|---|---|
| Dep.Var. | FS-Agg. | FS-Agg. | FS-Agg. | FS-Agg. | FS-Agg. | FS-Agg. |
| GPRs-Global | 0.107 | 0.112 | 0.115 | 0.120 | 0.126 | 0.116 |
| | [0.042]** | [0.027]*** | [0.024]*** | [0.031]*** | [0.051]*** | (0.036)** |
| | {0.047}** | {0.038}*** | {0.034}*** | {0.033}*** | {0.037}*** | |
| Controls | Yes | Yes | Yes | Yes | Yes | Yes |
| Dep.Var. | FS-Bank | FS-Bank | FS-Bank | FS-Bank | FS-Bank | FS-Bank |
| GPRs-Global | 0.059 | 0.045 | 0.035 | 0.023 | 0.002 | 0.033 |
| | [0.031]* | [0.021]** | [0.018]* | [0.023] | [0.041] | (0.031) |
| | {0.014} | {0.007} | {0.011} | {0.017} | {0.028} | |
| Controls | Yes | Yes | Yes | Yes | Yes | Yes |
| Dep.Var. | FS-EMPI | FS-EMPI | FS-EMPI | FS-EMPI | FS-EMPI | FS-EMPI |
| GPRs-Global | 0.021 | 0.009 | 0.002 | -0.005 | -0.016 | 0.002 |
| | [0.083] | [0.053] | [0.053] | [0.068] | [0.111] | (0.012) |
| | {0.014} | {0.007} | {0.011} | {0.017} | {0.028} | |
| Controls | Yes | Yes | Yes | Yes | Yes | Yes |
| Dep.Var. | FS-Bond | FS-Bond | FS-Bond | FS-Bond | FS-Bond | FS-Bond |
| GPRs-Global | 0.013 | 0.009 | 0.006 | 0.002 | -0.002 | 0.006 |
| | [0.051] | [0.035] | [0.032] | [0.043] | [0.068] | (0.009) |
| | {0.009}* | {0.008} | {0.009} | {0.013} | {0.018} | |
| Controls | Yes | Yes | Yes | Yes | Yes | Yes |
| Dep.Var. | FS-Stock-rtn | FS-Stock-rtn | FS-Stock-rtn | FS-Stock-rtn | FS-Stock-rtn | FS-Stock-rtn |
| GPRs-Global | 0.013 | 0.045 | 0.067 | 0.089 | 0.122 | 0.068 |
| | [0.032] | [0.021]** | [0.017]*** | [0.020]*** | [0.033]*** | [0.016)*** |
| | {0.019} | {0.014}*** | {0.014}*** | {0.017}*** | {0.024}*** | |
| Controls | Yes | Yes | Yes | Yes | Yes | Yes |
| Dep.Var. | FS-Stock-vol | FS-Stock-vol | FS-Stock-vol | FS-Stock-vol | FS-Stock-vol | FS-Stock-vol |
| GPRs-Global | 0.012 | 0.032 | 0.049 | 0.069 | 0.105 | 0.056 |
| | [0.052] | [0.038] | [0.030]* | [0.029]** | [0.050]** | (0.016)*** |
| | {0.022} | {0.015}** | {0.013}*** | {0.018}*** | {0.035}*** | |
| Controls | Yes | Yes | Yes | Yes | Yes | Yes |

*, ** and ***: significance at 10%, 5% and 1%, respectively.

FS indices in other emerging/G7 economies, country & year effects in all models.

Data on EMPI and Bond of US is the average of other G7 countries.

Robust, analytical, and clustered standard errors are in round, square and curly brackets, respectively.

UQR results are qualitatively similar and can be provided upon request.

economies. This apparent lack of correlation can be justified by the way the stress indices of these subsectors are aggregated. The $EMPI$ is constructed by using foreign exchange rates and reserves, and the FS index in debt markets measures government bond spreads. All these components are largely driven by domestic factors, with government policies playing an essential role. Moreover, these areas see a dominant role for other advanced economies rather than emerging economies. In other words, these subsectors of all advanced economies are more reliant on the US's subsectors rather than on other emerging economies' subsectors. The banking sectors of advanced economies suffer some disruptive impacts of GPRs at low quantiles, but the impacts are not significant when the clustered standard errors are reported.

Taken together, in emerging economies, the effects of GPRs are stronger at low quantiles in the banking sectors, but stronger at middle or high quantiles in the currencies markets and the government bond markets. In advanced economies, the overall effects of GPRs are substantial and similar across all quantiles of FS. However, significant effects are witnessed only in the stock markets, not in other segments of the financial systems.

## 2.6 Conclusions

Our paper shows that geopolitical disturbances play a prominent role in shaping financial conditions in emerging economies. Further, we investigate which sectors of the financial industry might be more exposed to geopolitical tensions. Our main results show that in emerging economies, foreign exchange markets, and to a smaller degree, the banking and debt sectors might be among the hardest-hit areas. Our quantile analyses prove that the magnitude of the impacts is largely driven by the stress level of the corresponding markets. These profound effects are not observed in stock markets, which are rather robust to external disturbances from geopolitical events. This is in stark contrast to advanced economies, where geopolitical threats have large impacts, but they are concentrated mostly on the stock markets.

These findings could be useful for both political and business decision-makers. Policymakers might see the profound impacts of GPRs on the stability of financial markets. It is recommended that appropriate reaction plans be made against blooming geopolitical uncertainties, especially when the financial markets reveal some stress signals. Moreover, the reaction should consider specific strategies for specific subsectors, because GPRs do not affect all subsectors equally. Investors should consider the fragility of the relevant asset markets when they adjust the different financial classes in their portfolios.

Our paper has presented several questions in need of further investigation. For example, research might explore whether GPRs have particularly strong or weak consequences on other factors in various conditions. Moreover, future studies might investigate the role of GPRs on the duration of FS. This is of vital importance to policymakers and investors to endure vulnerable periods and support the markets in recovery.

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# 3 The impacts of rare disasters on asset returns and risk premiums in advanced economies (1870–2015)

**Author**: Tam NguyenHuu

**Abstract:**
This paper analyses the impacts of rare disasters (financial, geopolitical and natural-technological) on the returns and risk premiums of stock and housing in 17 advanced economies for the period of 1870 to 2015. The stock return is sensitive only to the financial risk but not to the geopolitical and natural-technological ones. The housing return sees moderate impacts of financial and geopolitical disasters, but negligible impacts of natural-technological ones. The rare disasters can explain the surprisingly high risk premium (so-called ”risk premium puzzle”) of stock but not of housing.

**Keywords:** Housing return, Stock return, Risk premium puzzle, Financial crises, Geopolitical risks, Natural and technological catastrophes

**JEL classification:** E21, G12, N40

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# 4 A new and benign hegemon on the horizon? The Chinese century and growth in the Global South

**Authors**: Tam NguyenHuu and Deniz Karaman Örsal
**Abstract:**
The authors investigate how the Global South's gross domestic product (GDP) is impacted by trade with China.While the current literature on the growth impacts of trade (by leading partner countries) often neglects the properties of macro panel data, such as cross-sectional dependence, heterogeneity and structural breaks, their models take these features into account. Their empirical results based on 22 major developing countries from 2000Q1 to 2016Q4 identify positive contributions ofimports from China to GDP in the studied sample, although these effects are smaller compared to imports from other emerging and developing economies (excluding China) (EME) and advanced economies (AdE). The authors also show that, in contrast with considerable impacts of exports to EME and AdE, exports to China have limited effects on the growth of its partners. However, the global financial crisis marks a turning point of China's role as a major driver of growth in the South. Namely, while the positive growth effects of trade with China after the global crisis are on the rise, the opposite is true for EME and AdE. Examining the effects by individual countries, the authors present that the distance between China and its partners, economic and institutional development levels of its partners are almost irrelevant to the contributions of imports from China to its partners' growth. Based on these findings they provide some important policy recommendations for the economies of the Global South.
**Keywords:** China; growth; developing and emerging economies; international trade; panel data econometrics; cross-sectional dependence
**JEL classification:** C23, F43, O4

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# 5 China's role in mitigating poverty and inequality in Africa: an empirical query

**Authors**: Tam NguyenHuu and Jörg Schwiebert

**Abstract:**
Using data from 1995 to 2017, this article shows that China plays a positive role in mitigating poverty and inequality in Africa. Namely, imports from China, especially imports of machinery and equipment but not manufactured goods, alleviate substantially poverty in the region. In addition, China's foreign direct investment (FDI) and China's engagement in infrastructure projects in the continent help not only eradicate poverty, but also narrow income inequality. However, total exports or exports of raw materials and fuels to China are irrelevant to income distribution. We also compare these impacts with the impacts of economic links with the United States (US) and find insignificant effects of the US's imports and FDI on income distribution but some positive effects of exports to the US on poverty in Africa. Our findings are robust when both the fractional nature of poverty and inequality indices and their correlation are taken into account.

**Keywords:** China, inequality, poverty, Africa, fractional probit

**JEL classification:** F63, O11