**Bilateral and country-specific drivers of geopolitical risk transmission**

Mudassar Hasan\*\*

School of Economics and Finance

Massey University

Auckland, New Zealand

E-mail: m.hasan1@massey.ac.nz

Supervisors:

Faruk Balli

School of Economics and Finance

Massey University

Auckland, New Zealand

Tel: +64 9 414 0800 Ext. 43445

E-mail: F.Balli@massey.ac.nz

Hatice-Ozer Balli

School of Economics and Finance

Massey University

Auckland, New Zealand

Tel: +64 9 414 0800 Ext. 43446

E-mail: H.Ozer-Balli@massey.ac.nz

Russell Gregory-Allen

School of Economics and Finance

Massey University

Auckland, New Zealand

Tel: +64 9 414 0800 Ext. 43171

E-mail: R.Gregory-Allen@massey.ac.nz

\*\*Corresponding author: Mudassar Hasan, School of Economics and Finance, Massey Business School, Massey University, Auckland, New Zealand, E-mail: m.hasan1@massey.ac.nz

**Bilateral and country-specific drivers of geopolitical risk transmission**

**Abstract**

Geopolitical risk (GPR) tends to cascade from one country to another. Understanding GPR transmission is important to devising risk management strategies for institutional investors and corporate managers, and national security policies for governments. In this paper, we measure and explain cross-country transmission of GPR. Our sample covers 19 country-based GPR indexes of Caldara and Iacoviello (2018) from January 1985 to December 2016. We apply the spillover model of Diebold and Yilmaz (2012) to measure pairwise as well as system-wide GPR transmission. The estimation results show a substantial amount of GPR transmission across our sample countries, with certain countries and geographical clusters being more prominent than others. We then explain the pairwise GPR transmission using a cross-sectional regression motivated by a gravity model framework. We find that certain bilateral linkages such as bilateral trade and geographical proximity significantly explain the pairwise GPR transmission. This transmission is positively associated with both countries’ debt burdens and geographical sizes, transmitting country’s fiscal imbalance, and is negatively associated with recipient country’s economic size. The results imply that these factors may be used to predict the trajectory of GPR, which is an important input for the assessment of cross-border investment appraisals as well as international stability initiatives.

**Keywords:**  Geopolitical risk, gravity model, cross-country transmission

**JEL Classification:** G12, G15, C32

1. Introduction

This research investigates whether and why geopolitical risk (hereinafter GPR) transmission[[1]](#footnote-1) occurs across countries. Caldara and Iacoviello (2018) show that news stories featuring geopolitical conflicts contain information about GPR associated with those conflicts. Primary examples of such geopolitical conflicts include wars, terrorist acts, ethnic and political violence, and geopolitical tensions. Conflict contagion literature considers the role of information flows in spreading single conflicts across borders. In particular, media information associated with a domestic conflict flows across borders, increasing the likelihood of similar conflict there (Beiser, 2011). More specific examples where this flow of media information carried geopolitical conflicts across countries include political conflict, armed civil conflict, and ethnic conflicts (Beiser, 2013; Hill & Rothchild, 1986; Weidmann, 2015). Since the media information about each of those conflicts essentially reflects GPR of that conflict, one may argue that the flow of media information does not merely spread the physical conflict, it rather carries GPR of that conflict from country to another. A theoretical expectation, thus, exists about the transmission of GPR occurring in the form of information flow. We ask, therefore, whether and to what extent GPR transmission in the form of information flows occurs.

We further ask why this GPR transmission may occur. Here, we rely on another stream of the conflict contagion literature in which a disease-conflict analogy is often employed to explain the cross-country transmission of the geopolitical conflicts. Instances where this analogy is specifically used include the spread of political violence (Braithwaite, 2010; Buhaug & Gleditsch, 2008) and terrorism (Blomberg & Rosendorff, 2006). This analogy proposes that the magnitude with which a conflict spreads varies with the extent of social interaction between two countries (Buhaug & Gleditsch, 2008), and that a gravity model framework successfully captures this kind of interaction. Since GPR transmission is expected to happen via information flow, we need to appreciate whether the gravity model framework works for information flows. Literature suggests this framework has been successfully employed to explain other forms of information transmission such as economic reforms (Fidrmuc & Karaja, 2013), stock market volatilities (Balli, Balli, Louis, & Vo, 2015), and economic policy uncertainties (Balli, Uddin, Mudassar, & Yoon, 2017). Therefore, we use this framework to explain the cross-country transmission of GPR. Our approach may be useful to investors, corporate managers, and policy makers in predicting the direction of GPR from one country to another.

There are some possible justifications of how GPR transmission may happen via information. In today’s world, countries are becoming increasingly interdependent. Global information flows also reflect this increased international interdependence (Mowlana, 1997). As global information flows are likely to increase more in future (Beiser, 2011), so do the information flow of GPR. Also, advances in information technology, mainly the internet and, recently, the social media networks such as Twitter, Facebook, and YouTube have contributed to the speed and scale of information transmission. These technological developments may also expedite GPR transmission. Another mechanism suggested in literature is that people learn from the information about foreign conflicts and emulate those conflicts in their own states (Hill & Rothchild, 1986; Hill, Rothchild, & Cameron, 1998). The process of emulation generates more GPR in domestic territories and tends to amplify GPR transmission. There’s also a fear or concern mechanism. People tend to become concerned or fearful after receiving information about domestic or international conflict breakouts. Conflicts with wider repercussions trigger as a result of this increasing suspicion and mobilization (Kuran, 1998). This may also contribute to GPR transmission.

Ascertaining and explaining GPR transmission is crucial for a practical reason; that is, to devising international risk management strategies and national security policies. Several geopolitical events[[2]](#footnote-2) and international reports[[3]](#footnote-3) repeatedly highlight the concerns among policy makers, investors, and corporate managers about the contagious nature of GPR. Suárez-de Vivero and Mateos (2017) offer a good collection of such reports that frequently highlight this issue. By summarising these documents, the authors caution that GPR concerns are set to grow in future, with much wider ramifications for countries, businesses, and individuals. In particular, following trends of widespread and long term nature are emerging in relation to GPR. First, international governance is becoming weaker and power is shifting from traditional state actors to non-state actors; this may lead to a global crises. Second, increasing national sentiment is fuelling extremism among general public. Third, the internal and external threats are mounting due to the spread of extremist ideologies. And finally, the proliferation of weapons of mass destruction is changing the geopolitical landscape of the world. These trends, which are clearly associated with GPR, are destined to increase GPR transmission on a global scale. Suárez-de Vivero and Mateos (2017) also note a growing importance of cross-country consequences of GPR for investors, corporate manager, and policy makers. In particular, financial corporations and insurance sector consider GPR information in their analytical forecasts. Central banks, business investors, and newspaper also consider GPR a key ingredient[[4]](#footnote-4) of investment and policy decisions (Caldara & Iacoviello, 2018). Therefore, understanding cross country links of GPR is important to investors, corporate managers, and policy makers for mainly predicting, and as a result, managing, and avoiding geopolitical surprises. In this way, businesses take steps to manage their credit risk, build resilient supply chains, develop crisis response plans, and secure credit and political risk insurance to better protect their assets.

GPR transmission has received limited attention in the geopolitical conflict literature. While GPR is an essential attribute of geopolitical conflicts, this literature generally overlooks the role of GPR when explaining or predicting the spread of such conflicts. Studies often explain how a geopolitical conflicts undergoes a spread, diffusion, or contagion in its physical form (Blomberg & Rosendorff, 2006; Braithwaite, 2010; Buhaug & Gleditsch, 2008; Salehyan & Gleditsch, 2006). Other hold flows of media information responsible for those physically transmitted conflicts (Beiser, 2013; Hill & Rothchild, 1986; Weidmann, 2015). Many also aim to predict single geopolitical conflicts such as interstate wars (Beck, King, & Zeng, 2000; Ward, Siverson, & Cao, 2007), civil wars (Ward, Greenhill, & Bakke, 2010), geopolitical tensions (Chadefaux, 2014) or other political unrests like state failures, human rights violations, ethnic conflict, genocide, political instability (De Mesquita, 2010; Gleditsch & Ward, 2013; Schneider, Gleditsch, & Carey, 2010). Some focus on predicting the evolution of a specific conflict (Pevehouse & Goldstein, 1999; Schrodt & Gerner, 2000).

The preceding studies have some other limitations as well. First, while explaining the spread of a geopolitical conflict, the studies generally look at the physical spread of a conflict occurs in terms of events, not in terms of information. Here they often rely on event-based data, which work well in hindsight but contain limited predictive value. Second, they typically rely on single or individual conflicts while ignoring the possibility that multiple conflicts can occur at the same time. In reality, however, many geopolitical conflicts occur simultaneously and are often interlinked. Studies aiming to predict geopolitical conflicts also ignore this possibility. Finally, even the studies relying on news based measures for conflict prediction often suggest dichotomous or probabilistic forecasts about a single conflict under study. Binary predictions are criticised for producing a black-and-white forecasts of geopolitical conflicts, which are continuously occurring phenomenon. Probabilistic predictions (Chadefaux, 2014), on the other hand, are fraught with imperfections in the dataset they are based upon. Moreover, some (for instance, Huff and Lutz (1974)) studies only rely on a particular region, like Central Africa, and use a historical analysis of the regional geography. This kind of analysis is highly subjective and calls for appeal to a rich statistical analysis. Furthermore, Central Africa may have been very important in 1970s, but lately GPR concerns have become progressively rampant throughout the world and this trend is not likely to subside soon. Studying other regions, therefore, may be more relevant now. From the gaps in the literature, a rich statistical analysis of GPR transmission is needed.

We estimate total and pairwise GPR transmissions by applying the spillover model of Diebold and Yilmaz (2012) on GPR series for 19 countries. This method has several advantages over other models that have been applied in the previous studies. First, the measure is simple to compute as the results of variance decomposition do not hinge on the sequence of variables. Second, the measure is tractable. It allows the measurement of the spillovers across multiple data series, and therefore the measure can be used to study GPR spillovers from one country to multiple countries and vice versa. The model application shows a substantial amount of total and pairwise GPR transmission across our sample countries. GPR transmission is, however, more pronounced for some countries and regions than others. We pictorially describe the pairwise transmission results using a spring graph made from Gephi. It is an open source, highly interactive, and user-friendly software that allows uses to discover and visualize network patterns among data. From this graph, a clear geographical clustering amongst these transmissions emerges which further leads us to explain the pairwise GPR transmissions. Motivated by a gravity model framework, we subject these pairwise GPR transmissions to a cross-sectional regression. We find that certain bilateral factors such as bilateral trade, border sharing, and common distance play an important role in transmitting GPR shocks from a country to another. While increases in debt burden, geographical size, and fiscal imbalance makes a country transmit more GPR shocks, an increase in the first two factors also broadens a country’s exposure to those shocks. A larger economic size, however, boosts a country’s resilience against such shocks.

This study offers following contributions to the literature. First, we propose another perspective by studying the transmission of GPR in the form of information flows associated with geopolitical conflicts, in contrast to the studies that only consider the role that information flows play in spreading a physical conflict (Beiser, 2013; Hill & Rothchild, 1986; Weidmann, 2015). We specifically view this information content to carry GPR across borders. Second, although we are primarily interested in the factors that set the direction of GPR transmission, one may predict the course of a country’s GPR towards another country using this approach. We caution, however, that this approach may not predict specific geopolitical conflicts, as opposed to the existing studies that offer dichotomous or probabilistic predictions on such conflicts or aim to drive conditions most conducive to such conflicts (Fearon & Laitin, 2003; Glaser, 2000; Huth, 2009; Powell, 2004). Third, instead of appealing to a latent variable such as cross country events denoting information transmission, we observe actual information flows by involving the news based GPR indexes of Caldara and Iacoviello (2018). By overcoming the data imperfections found in Chadefaux (2014), these indexes improve the reliability of GPR transmission. Moreover, in contrast to the preceding study, which intended to predict war based on a measure of geopolitical tensions, we identify certain bilateral linkages and country specific factors that may explain GPR transmission. Fourth, we build upon Huff and Lutz (1974) by applying a robust statistical analysis to a sample of 19 countries other than Central Africa. Finally, we suggest a new type of informational spillovers in the form of GPR transmission, apart from the ones already introduced (Balli et al., 2015; Balli et al., 2017; Fidrmuc & Karaja, 2013).

This study includes following sections. Section-2 lays out the methodological details and dataset. Section-3 reports empirical findings and discussion. Section-5 concludes.

1. Data and methodology

2.1. Dataset

As mentioned above, we use monthly series of newly constructed GPR indexes (Caldara & Iacoviello, 2018) for 19 countries. This data are downloaded from economic policy uncertainty website[[5]](#footnote-5) over a period from January 1985 to December 2016. Based on availability of the data, our sample countries include Argentina, Brazil, China, Colombia, India, Indonesia, Israel, Korea, Malaysia, Mexico, Philippines, Russia, Saudi Arabia, South Africa, Thailand, Turkey, Ukraine, United States, and Venezuela. Data on certain bilateral and country specific factors, which we consider as potential determinants of pairwise GPR transmission, are also collected over the same period. The bilateral factors include bilateral trade, colonial ties, contiguity, common language, and geographical distance between two countries. The country-specific factors are foreign debt, budget deficit, stock market capitalization, and geographical area of each country. The Appendix provided at the end describes those variables along with their data sources.

 Existing GPR proxies lack certain features that a GPR indicator should have in order to be used in the measurement of GPR transmission. These features broaden the scope of GPR transmission by enabling us to capture geographically wide, historically long, and sufficiently frequent interactions among multiple country GPRs. In general, other indicators that may serve as a proxy for GPR provide a limited scale of geographic, historic, conflict coverage. Those proxies are either hard to quantify, or rely on single wars and hindsight, or fail to capture equally important instances when peace prevailed instead of war (Leetaru, 2011). Some are less frequent and thereby fail to track or anticipate mounting tensions and conflict outbreaks in shorter periods (Beck et al., 2000; Beck, King, & Zeng, 2004; De Marchi, Gelpi, & Grynaviski, 2004; Gleditsch & Ward, 2013). More importantly, those proxies are not standardized and therefore not comparable across countries. Another critical issue with the existing GPR proxies (such as political unrest, war, conflict etc.) is that they reflect a rather narrow view of GPR. GPR, however, has a much broader scope and essentially surrounds all sorts of geopolitical conflicts. A GPR measure that overcomes these limitations may enable us to better capture the dynamics of cross-country GPR transmission.

The GPR[[6]](#footnote-6) measure of Caldara and Iacoviello (2018) controls for those shortcomings. It has been developed from news information[[7]](#footnote-7). This information is the product of fast and accurate coverage of rising GPRs across the world. Capturing this information, the GPR index also avoids the problem of hindsight by using only information available at the time. Furthermore, newspapers have an important advantage over the event-based data, in that they can report GPR even when no actual event has occurred. The GPR index is therefore not only a robust measure of GPR but also carries better predictive content to forecast GPR. This index is sufficiently wide in terms of geographic and historic coverage since it offers more frequent, long term, GPR series for many countries; the monthly GPR series are available for 19 countries from 1985 to date. The more data we have on GPR, the better is GPR transmission captured. It’s also a broad GPR measure because instead of tracking a single or a certain kind of conflict, it captures news information on multiple conflicts at the same time. As pointed out by Caldara and Iacoviello (2018) that the GPR indexes used herein broaden the scope of GPR transmission by allowing for fluctuations in the level of GPR within and across countries, and hence ensuring reliable inferences and better insights into the (cross-country) effects exerted.

2.2. Pairwise transmissions

To measure total and pairwise GPR transmission among our sample countries, we apply the spillover model of Diebold and Yilmaz (2012). It allows for the identification of directional mean spillover effects across GPR series. This approach is widely used in academic literature mainly because the efficiency and the simplicity of its estimates, see (Bubák, Kočenda, & Žikeš, 2011; Demirer, Diebold, Liu, & Yilmaz, 2018; Yilmaz, 2010). It also overcomes the limitations of geographical examination conducted by Huff and Lutz (1974) by offering a rich statistical analysis.

The generalized spillover index of lets us define spillovers as the fractions of the $H$-step-ahead error variances in forecasting $x\_{i}$ that are due to shocks to $x\_{j}$ ($i\ne j)$ for $i, j=1,2,\cdots ,N$. Where $x\_{i}$ and $x\_{j}$ represent the rates of change of GPR series *i* and *j*, and *N* is the total number of GPR series (in our case 19). They measure spillovers in a generalized VAR framework.[[8]](#footnote-8)

Consider a covariance stationary $N$-variable VAR$(p)$, $x\_{t}=\sum\_{i=1}^{p}ϕ\_{i}x\_{t-i}+ε\_{t},$ where $x\_{i}$ is the $N×1$ vector of the endogenous variables, $ε \~ (0,Σ)$ is a vector of independently and identically distributed disturbances. The moving average representation is written as $x\_{t}=\sum\_{j=0}^{\infty }A\_{j}ε\_{t-j}$, where the $ N×N$ coefficient matrices $A\_{j}$ obey a recursion of the form $A\_{j}=\sum\_{j=1}^{p}ϕ\_{j}A\_{j-p}$, with $A\_{0}$ being an $N×N$ identity matrix and $A\_{j}=0$ for $j<0.$

The spillovers can be defined by generalized forecast error variance decompositions of the moving average representation of the VAR model. The $H$-step-ahead generalized forecast error variance decomposition can be written as follow:

$θ\_{ij}\left(H\right)=\frac{σ\_{jj}^{-1}\sum\_{h=0}^{H-1}\left(e\_{i}^{'}A\_{h }Σ e\_{j}\right)^{2}}{\sum\_{h=0}^{H-1}\left(e\_{i}^{'}A\_{h }Σ A\_{h}^{'}e\_{i}\right)} ,$ (1)

where $Σ$ is the variance matrix of the vector of errors $ε$. $σ\_{jj}$ is the standard deviation of the error term of the $j^{th}$ equation, and $e\_{i}$ and $e\_{j}$ are selection vector with a value of one for the $i^{th}$ and $j^{th}$elements, respectively, and zero otherwise.

Since the own- and cross-variable variance contribution shares do not sum to one under the generalized decomposition, each entry of the variance decomposition matrix is normalized by its row sum as follows:

$\tilde{θ}\_{ij}\left(H\right)=\frac{θ\_{ij}\left(H\right)}{\sum\_{j=1}^{N}θ\_{ij}\left(H\right)},$ (2)

By construction, $\sum\_{j=1}^{N}\tilde{θ}\_{ij}(H)=1$ and $\sum\_{i,j=1}^{N}\tilde{θ}\_{ij}(H)=N.$

Thus, a total spillover $(TS)$ index can be defined as

$TS\left(H\right)=\frac{\sum\_{i,j=1,i\ne j}^{N}\tilde{θ}\_{ij}(H)}{\sum\_{i,j=1}^{N}\tilde{θ}\_{ij}(H)}×100=\frac{\sum\_{i,j=1,i\ne j}^{N}\tilde{θ}\_{ij}(H)}{N}×100 .$ (3)

This index measures the average contribution of spillovers from shocks to all (other) GPRs to the total forecast error variance. Similarly, the directional spillovers $(DS)$ transmitted by GPR $i$ to another GPR$ j$ can be measured by

$DS\_{i\rightarrow j}\left(H\right)=\frac{\sum\_{j=1,i\ne j}^{N}\tilde{θ}\_{ji}(H)}{\sum\_{i,j=1}^{N}\tilde{θ}\_{ji}(H)}×100=\frac{\sum\_{j=1,i\ne j}^{N}\tilde{θ}\_{ji}(H)}{N}×100 .$ (4)

The results of total and pairwise GPR transmissions are shown in Table 1. We also draw a pictorial description of these results in Fig 1. For this purpose, we used an open-source Gephi software (<https://gephi.github.io/>) for network visualization.

2.3. Cross-sectional determinants

Once we compute the pairwise GPR transmissions, the next step is to explain it. Now w invoke to the gravity model. The gravity model, which was originally developed for international trade (e.g., Head, Mayer, and Ries (2010)), has recently been successful in explaining the cross country transmission of conflict and information. The fundamental concept of the gravity model is that the flow of goods and people between two destinations is directly proportional to their respective economic masses (or income levels) and inversely proportional to distance between them (Morley, Rosselló, & Santana-Gallego, 2014). Studies that have used the gravity model framework for explaining the spread of a conflict typically hinge on an analogy between infectious disease and the spread of a conflict (Blomberg & Rosendorff, 2006; Braithwaite, 2010; Buhaug & Gleditsch, 2008). This analogy suggests that the spread of a conflict varies with the degree of interaction between interacting units (normally countries). This dyadic interaction between a pair of countries is captured by the gravity model framework by involving each country’s size and the bilateral distance between them. Assuming the same set of constraints shape the information transmission (in our case GPR transmission) associated with a conflict, we would expect closer countries to experience higher level of the transmission than the distant ones.

The meaning of size and distance may, however, differ based upon the context in which the gravity model is applied (Fidrmuc & Karaja, 2013). Distance may be interpreted as how farther or closer two countries are in terms of their bilateral linkages such as geographical proximity, cultural and historical similarity, or economic ties. Size may also refer to economic, geographic, or public (population) mass of a country.

We measure economic distance by bilateral trade; the magnitude of bilateral trade captures how distant or close the countries are in economic terms. In literature, there is a mixed evidence on the role of bilateral trade the spread or eruption of geopolitical conflicts (see Barbieri (1996), for a summary of the debate). Most studies support the pacific benefit of trade; that is, bilateral trade promote peace or reduces conflict between states (Hegre, Oneal, & Russett, 2010). Other find that trade does not deter conflict (Keshk, Pollins, & Reuveny, 2004; Kim & Rousseau, 2005). Some also argue that higher trade or extensive economic interdependence increases the likelihood of interstate conflict (Barbieri, 1996; Choucri & North, 1989; Waltz, 1979). Many consider trade as irrelevant or less important to interstate conflicts (Blanchard & Ripsman, 1994; Buzan, 1984; Levy, 1989).

In our case, however, it’s not the physical conflict that we are trying to explain, our aim is to see whether or not the pairwise GPR transmission occurring in the form of transnational information flows is affected by bilateral trade. We argue that bilateral trade is likely to increase the GPR transmission between two countries. Our argument is based on the cross border concerns that prevail among the public, businesses, and governments when two countries trade more. People immediately become concerned about geopolitical event or conflicts happening in the countries where they or their governments have economic interests. Because of strong trade ties between two countries, a hike in foreign GPR would cause concerns in local public and thereby would increase GPR in home country. In other words, GPR will transmit across trading partners because of underlying concerns (Kuran, 1998) that emerge from the recognition of mutual benefits of bilateral trade. Therefore, other things equal, we would expect as positive association between bilateral trade and pairwise GPR transmission. In addition, bilateral trade may foster learning mechanism. Trade improves interstate linkages and removes communication barriers which will facilitate information flows and thereby learning will become easier. This social learning mechanism may stimulate local public to emulate foreign geopolitical conflict in home country (Hill & Rothchild, 1986; Hill et al., 1998). In this way, it will facilitate GPR transmission. Bilateral trade was also present in the information transmission models of (Balli et al., 2015; Balli et al., 2017).

In our model, contiguity (or border sharing) and bilateral distance represent the extent of geographical distance (or proximity) between two countries. Both factors have been previously included in the models that explain the spread of conflicts beyond state boundaries. For instance, Buhaug and Gleditsch (2008) find that proximity to a conflict explains the spillover effect on the probability of a domestic conflict onset. Similarly, Hegre et al. (2010) find that while contiguity tends to increase the spread of a conflict, distance has an opposite effect. That is, the extent of proximity explains the scale of conflict spread. Moreover, Blomberg and Rosendorff (2006) show that distance and border significantly explain the transnational terrorism flows. Because of their importance, previous research has suggested that the contiguity and the distance between two states’ capitals should both be used in analyses of interstate violence (Oneal & Russett, 1999). Reasons are very simple. States that share a border are particularly prone to conflict, and non-contiguous states in the same region are more likely to fight than more remote pairs. Nor is a dichotomous indicator of contiguity highly correlated with distance. Following this literature, we also include border sharing and bilateral distance in our model. Accordingly, we would expect contiguity to increase and distance to decrease the pairwise GPR transmission. Contiguity and distance were also included in the information transmission models of Fidrmuc and Karaja (2013) and Balli et al. (2017); but only distance was considered by Balli et al. (2015).

Common language, colony, and common colony are used to capture the cultural and historical distance between a pair of countries. These variables were also present in the information transmission models (Balli et al., 2015; Balli et al., 2017; Fidrmuc & Karaja, 2013). The fear on concern (Kuran, 1998) and emulation through social learning (Hill & Rothchild, 1986; Hill et al., 1998) effects may be invoked here. Accordingly, one may argue that linguistic and historical ties contribute to concern and learning thus facilitate the transmission process. This argument is indeed plausible since Blomberg and Rosendorff (2006) found common language’s role in transmitting terrorism across countries. Thus, we expect a positive association between pairwise GPR transmission and cultural and historical distance between two countries.

Large countries can project their power at great distance and engage several countries at once. They have more neighbours and far-reaching economic and political interests. Thus, a nation’s size indicates both opportunity and willingness to involve in a conflict. Literature shows that just like proximity, countries’ sizes influence the likelihood of interstate conflicts (Bearce & Fisher, 2002; Hegre, 2008; Kenneth, 1962; Werner, 1999; Xiang, Xu, & Keteku, 2007). In this literature, GDP per capita or just GDP, population size, and geographical area are orthodox candidates for country size (Braithwaite, 2010; Buhaug & Gleditsch, 2008; Hegre et al., 2010). However, we include only two considering their relevance. Geographical area is included because GPR is intrinsically a geographic attribute of conflict, and therefore is area vital to our study. Following Blomberg and Rosendorff (2006), therefore, we include geographical area of each country in our model. To represent economic size, however, we use stock market capitalization of each country in the pair. This is because essentially we are measuring the information transmission of GPR and studies have shown that stock market capitalization is more relevant when it comes to such information transmission processes (Balli et al., 2015; Balli et al., 2017). Economic size may also be interpreted as state capacity to deal with disturbing issues. Bigger economies have the resources to cope with problems. Studies also suggest that state capacity diminishes the likelihood with which states will experience new conflict (Braithwaite, 2010), implying a negative association between GPR transmission and economic size ((stock market capitalization). We would expect a positive (negative) association between area (stock market capitalization) and GPR transmission.

Finally, some studies have also associated the spread of conflict to a so called ‘bad neighbourhood’ effect (Iqbal & Starr, 2008). These studies typically argue that the state undergoing a range of economic, social, and political problems are likely to be contagious for their neighbouring. Countries experiencing economic problems often do badly at managing fiscal balance and foreign debt. Alongside, Balli et al. (2017) find that by fiscal imbalances and financial liabilities of the countries are responsible for cross country information spillovers associated with economic policy uncertainties. Combining these two notions, one may argue that fiscal imbalance and foreign debt of each country increases the pairwise GPR transmission. This is why we add central government’s debt and fiscal imbalance (budget deficit) in our model.

Since the factors listed above may be considered possible determinants of pairwise GPR transmission, we hypothesise that this transmission is determined by bilateral factors such as bilateral trade, common language, colonial ties, and geographical proximity, and country-specific factors namely fiscal imbalances, debt burdens, stock market capitalisations[[9]](#footnote-9). This relationship may be expressed by the following cross-sectional regression;

 $DS\_{ij}=α\_{o}+α\_{1}Log(Exports\_{ij}+Imports\_{ij})+α\_{2}Contiguous\_{ij}+α\_{3}Colony\_{ij}+α\_{4}Common Colony\_{ij}+α\_{5}Common Language\_{ij}+α\_{6}Log(Distance\_{ij})+β\*X\_{i and j}+ϵ\_{ij}$ (5)

where $DS\_{ij}$ represents the amount of mean GPR spillover from $Country\_{i}$to $Country\_{j}$. $Log(Exports\_{ij}+Imports\_{ij})$ is an indicator for bilateral trade between country *i* and country *j*. $Contigous\_{ij} $is a dummy variable representing whether or not two countries share borders. $Colony\_{ij}$ and $Common Colony\_{ij}$ are two dummies indicating colonial dependence and whether both countries have remained under same colonial power, respectively. $Common Language\_{ij}$ is a dummy variable for common language and $Log(Distance\_{ij})$ is the logarithm of the distance between capital cities of two countries. $X\_{i and j} $contains country-specific factors namely budget deficit, central government debt, geographical area, and stock market capitalisation of both countries.

1. Empirical Findings

Table 1 provides the estimates of GPR spillovers, respectively, each country receives from (rows) and transmits to (columns) another country. The table also show the total mean spillovers each country transmits to all other countries (to others), as well as those each country receives from all other countries (from others). Finally, the table also include the amounts of total (or system-wide) mean spillovers.

Table 1 offers several key features of the GPR transmissions. First, the table indicates that the total mean spillover is about 42%. Second, in general, countries that transmit more spillovers to others are also the ones that receive more, while the amounts of transmission are slightly higher than those of reception. In particular, the US (73), Russia (59), Brazil (52), China (58), and Saudi Arabia (52) are amongst the highest contributors to the forecast error variance of the remaining countries. In contrast, the US (59), Russia (52), Brazil (53), China (54), and Saudi Arabia (51) are also the main receivers of forecast error variance from the remaining countries. Third, countries with larger geographical size are mainly responsible for the highest amount of GPR spillovers. Note that the countries listed above are also the ones with larger geographical size. Fourth, a higher amount of spillover is observed among countries that are situated in the same geographical region, with some exceptions of course. For neighbouring countries (which share borders), the amount of GPR transmission is even higher. In general, the closer (farther) the countries, the higher (lower) the amount of spillover amongst them. Finally, trading partners have higher magnitude of pairwise spillovers between them.

Fig. 1 exhibits a pictorial description of the key observations taken from Table 1. The figure shows a static (full-sample) network graph of mean spillovers. It is obvious from the figure that most of the countries in the same geographical region are clustered around each other, meaning there is a higher amount of GPR transmission amongst them. This is typically the case for Southeast Asia, Latin America, East Asia, Gulf, and East European Plain. However, the number of countries and the extent of transmission (i.e., the closeness) within a cluster varies across clusters. In particular, the number of countries within a cluster range from five (Brazil, Argentina, Mexico, Colombia, and Venezuela) in Latin America to two (Russia and Ukraine) in East European Plain; and the countries in Gulf (Israel, Turkey[[10]](#footnote-10), and Saudi Arabia) are much closer than the ones in Latin America. In addition, a country with the largest geographical size within each region is normally the leading participant of GPR spillovers in that region. For instance, look at Latin America, East European Plain, and South Asia, where the leading countries, shown in ‘Red’ nodes, are Brazil, Russia, and China respectively. Finally, the US is the highest participant in GPR transmission across the sample countries, as can be noted from its central location in the figure.

In passing, note that the geographic clustering is seemingly ubiquitous in the GPR transmission. It is not clear, however, whether this clustering is only explained by geographic factors or some other bilateral and country specific factors also determine it. To this end, we proceed further and dig deeper into the cross-country GPR transmissions. Accordingly, we involve certain bilateral and country-specific factor that may explain this transmission. We, therefore, subject the pairwise GPR transmissions to the cross-sectional regression based the gravity model framework.

Table 2 includes the coefficient estimates of the determinants of pairwise GPR transmission, $DS\_{ij}$. Notice that GPR spillover from a $Country\_{i}$ to another $Country\_{j}$, $DS\_{ij}$ , in Eq.(4) is the dependent variable in Eq. (5). Note also that while $Country\_{i}$ is the transmitter of GPR shocks, $Country\_{j}$ is one that receives those shocks. Column (1) of the table includes estimates of the gravity model with bilateral linkages while column (2) shows estimates of the gravity model extended which incorporates country-specific variables. As motivated in the methodology above, we conjecture that bilateral linkages and country specific factors included in the Eq. (5) may be the possible determinants of $DS\_{ij}$.

Column (1) and (2) clearly show that bilateral trade and geographical proximity significantly explain the pairwise GPR transmission. In column (1), bilateral trade is a significant determinant of the pairwise GPR transmission at the 1% level. A 1 % increases in $Exports\_{ij}+Imports\_{ij}$ increases $DS\_{ij}$ by 0.0025 %. This impact increases slightly to 0.0040 % in column (2). Border sharing is also a substantial driver of $DS\_{ij}$. In column (1), the coefficient of $Contigous\_{ij}$ implies that, on average, a $Country\_{i}$ that shares a border with another $Country\_{j}$ transmits 1.45%, and 1.23% in column (2), higher amount of $DS\_{ij}$ to $Country\_{j}$ than a comparable country that does not share a border. Bilateral distance is negatively associated with $DS\_{ij}$ at 1% significance level. A 1% increase in $Distance\_{ij}$ decreases $DS\_{ij}$ by 0.0082% in column (1) and by 0.0043% in column (2).

These findings suggest that the extent of economic distance (bilateral trade) and geographical proximity (bilateral distance and border sharing) mainly determines the magnitude of GPR transmission between two countries. The finding that bilateral trade causes GPR to transmit across countries confirm that trade or extensive economic interdependence increases the likelihood of interstate conflict (Barbieri, 1996; Choucri & North, 1989; Waltz, 1979). The increased GPR transmission because of bilateral trade will reflect this increased likelihood of conflict between trading partners. Higher bilateral trade also implies stronger economic interdependence between states. This interdependence may cause violence or unrest in one country to spill over to the countries stronger trade ties. It may destabilize trade and economic relations, provoke distress migrations, and lead to complex humanitarian disasters in the other country. These are all various forms of geopolitical conflicts that lead to GPR. We have recently seen such GPR emerging from Syria and spreading to neighbouring countries like Turkey, causing or multiplying disruptions in those countries’ geopolitical landscape. Hence, the finding on bilateral does not support the pacific benefit of trade; that is, bilateral trade promote peace or reduces conflict (Hegre et al., 2010). However, cultural and historical distance (colonial ties and language similarity) are not found relevant to this transmission. This may be because of sample limitations. Only few countries in our sample have similar languages. Even less number of countries have colonial tries. It is not clear therefore whether these factors explain GPR transmission. Although we still expect a relationship, a different dataset, such as Europe, may help capturing this relationship.

Our findings on geographical proximity confirm Blomberg and Rosendorff (2006) provide evidence that distance and border significantly explain the transnational terrorism flows. These findings also corroborate with those on spread of a physical conflict (Buhaug & Gleditsch, 2008; Hegre et al., 2010; Oneal & Russett, 1999). As expected contiguity increases and distance decreases the pairwise GPR transmission. Considering GPR transmission as information flow, our findings also support (Balli et al., 2015; Balli et al., 2017; Fidrmuc & Karaja, 2013). Overall, it implies that geographical proximity facilitates information transmission of GPR. In general, these findings contradict the view of Virilio (1986) who suggested that territory has lost its significance and that speed is more important in geopolitics than place.

 Column (2) shows that domestic attributes also play an important role in the pairwise GPR transmission. At 1% significance level, the budget deficit of $Country\_{i}$ is an important factor in explaining $DS\_{ij}$. Keeping other factors constant, a 1%[[11]](#footnote-11) increase in the country’s budget deficit (or say fiscal imbalance) increases $DS\_{ij}$ from $Country\_{i}$ to $Country\_{j}$ by 0.12%. This indicates that a transmitting country’s widening fiscal imbalance increase the GPR transmission from it. Yet, the relationship between a receiving country’s fiscal imbalance and the GPR transmission coming towards it is not clear. Central government’s debt each country is also an important factor in the pairwise GPR transmission. A 1% (as percentage of GDP) rise in $Debt\_{i}$ produces an increment of 0.02% in $DS\_{ij}$ at 1% significance level. Likewise, a 1% increase in $Debt\_{j}$ increase $DS\_{ij}$ by 0.01% at 10% level. This suggests that countries’ rising debt levels not only increase the transmission of GPR shocks from them but also the reception of those shocks coming towards them. On the other hand, the economic size of a receiving country decreases the amount of international GPR shock transmitted towards it. Clearly, stock market capitalization (which is a proxy for the economic size a country) of $Country\_{j}$ is negatively associated with the magnitude of $DS\_{ij}$. Percentages increase of $MarketCapitalization\_{j}$ decreases the amount of $DS\_{ij}$ by 0.003% at 5% significance level. This means that a country’s economic size is a potent deterrent to foreign GPR shocks. The bigger the economy of a country, the more resilient the country would be against those shocks. As pointed suggested by Braithwaite (2010) that state capacity diminishes the likelihood with which states will experience new conflict.

The results on fiscal imbalance as well as central government debt indicate to the existence of bad neighbourhood effect in interstate conflict literature, see Iqbal and Starr (2008), for instance. These findings suggest that states undergoing economic problems are likely to be contagious for their neighbours. These findings also support Balli et al. (2017) that fiscal imbalances and financial liabilities of the countries are responsible for cross country information spillovers of economic policy uncertainty. Our study, however, relate these variables to information spillover of GPR.

 Since the notion of geopolitics, and therefore GPR, is essentially linked to geography, the results on geographical size (area) are of critical importance. We find that geographical size (area) of both countries significantly determine the pairwise GPR spillovers. For the sake of brevity, the interpretation of one coefficient will suffice. Look at the coefficient of $Log(Area\_{i})$ in column (2) for this purpose. It means a 1% rise in $Area\_{i}$ produces an increment of 0.0019% in $DS\_{ij}$ at 5% significance level. The coefficient of $Log(Area\_{j})$ should be interpreted in the same way. Clearly, the coefficient of $Log(Area\_{j})$ is also positive and significant at 10% level. Taken together, the findings on geographical area suggest the larger the geographical size of a country, the higher the amount of GPR shocks transmitted (and received) by that country. Main examples of geographically large countries include Russia, Brazil, Saudi Arabia, and the US. The dominant role of these countries is evident from both Fig 1 and Table 1. In general, our findings on area corroborate the consistent finding that countries’ sizes influence the likelihood of interstate conflicts (Bearce & Fisher, 2002; Hegre, 2008; Kenneth, 1962; Werner, 1999; Xiang et al., 2007).

In summary, our results reveal a substantial amount of GPR transmission across our sample countries. Bilateral factors such as bilateral trade, border sharing, and common distance play an important role in transmitting GPR shocks from a country to another. While an increase in debt burden, geographical size, and fiscal imbalance contribute to a country transmitting more GPR shocks, a rise in the first two factors also increase a country’s exposure to those shocks. However, larger economic size improves a country’s resilience against external GPR shocks.

1. Conclusion

This study quantifies GPR transmission across 19 countries and finds bilateral and country-specific determinants of this transmission. We use 19 news-based GPR indexes of Caldara and Iacoviello (2018) for this purpose. After employing the estimation methodology of Diebold and Yilmaz (2012), we find a considerable amount of GPR transmission across our sample countries. A pictorial description of these results depicts a clear geographical clustering among GPRs. Using a gravity model framework we then find the bilateral and country-specific factors that explain the pairwise GPR transmission. Investors, managers, and governments find it useful to incorporate these results into their decision making processes.

In particular, institutional investor and multinational corporations are often concerned with making assessments and predictions about GPRs that arise from local and international arena. For them, the bilateral linkages and country specific indicators suggested here may be useful in predicting the course of GPR transmission between two countries. These factors may also improve their assessments about a country’s susceptibility from or resilience against foreign GPR shocks. Furthermore, since their investments are usually spread over several geographical regions, the GPR’s geographic clustering improves their understanding on the GPR concentrated regions as well as on the role of each country’s GPR within those regions. In this way, this study provides a broader picture for devising risk management strategies (perhaps by buying political violence and/or terrorism insurance) and evaluating investment appraisals. Policy makers may also refer to this research when developing national security and counter-terrorism policies. Our findings suggest governments to be particularly attentive to the geopolitical events occurring in their neighbourhood and the ones involving their trading partners. This is because GPRs caused by those events may have adverse consequences for domestic geopolitical landscape. Since shirking bilateral trade and exploiting geographical factors is not possible, improving fiscal imbalances, lowering debt burdens, and strengthening the domestic economy are few steps that may foster countries’ resilience against foreign GPR shocks.

Although we made an effort to estimate GPR transmission, these estimations are essentially cross-sectional, static, and based on news information flows. There are many questions that demand further investigations. Future research may investigate the dynamics of GPR transmission in terms of speed, volume, or time. In particularly, researchers may examine the time varying behaviour of pairwise and total GPR transmissions. This objective may be achieved by applying time varying spillover model of Diebold and Yilmaz (2012). Moreover, this research strictly relied on a gravity model framework, and the factors particular to this framework. There is, however, an exhaustive list of factors and approaches that may explain this phenomena better.

In this study, we have neither identified any transmission mediums such as internet, phone calls, television, or radio that might facilitate GPR transmission, nor have we pointed out the types of geopolitical conflicts from where a country’s GPR emanates. First question may be answered by extending investigation of Weidmann (2015), who associated conflict spread to transnational phone calls. Second question may be answered by creating news based indexes that can capture GPR of individual conflicts, and then by using those narrow indexes along with the approach used in this study.

|  |
| --- |
| **Table 1**  |
| Total directional mean spillovers of GPR |
|   | Argentina | Brazil | China | Colombia | India | Indonesia | Israel | Korea | Malaysia | Mexico | Philippines | Russia | Saudi Arabia | South Africa | Thailand | Turkey | Ukraine | United States | Venezuela | From Others |
| United States  | 2.58 | 2.28 | 5.95 | 0.49 | 6.08 | 1.95 | 6.82 | 0.58 | 4.22 | 3.20 | 2.62 | 7.64 | 6.75 | 1.19 | 0.88 | 4.78 | 0.18 | 40.81 | 1.00 | 59.19 |
| Turkey | 0.93 | 1.54 | 3.01 | 0.10 | 0.87 | 0.42 | 7.11 | 0.47 | 1.08 | 2.87 | 0.40 | 6.68 | 6.96 | 1.48 | 0.52 | 57.21 | 1.01 | 7.04 | 0.30 | 42.79 |
| Mexico | 2.71 | 4.23 | 4.58 | 3.34 | 3.04 | 2.88 | 1.05 | 1.94 | 2.28 | 51.29 | 2.52 | 2.50 | 3.60 | 0.74 | 2.28 | 3.17 | 1.02 | 3.72 | 3.14 | 48.71 |
| Korea | 2.25 | 7.25 | 11.39 | 0.42 | 0.22 | 1.29 | 0.26 | 63.04 | 2.09 | 2.20 | 0.74 | 1.41 | 0.44 | 2.82 | 2.21 | 0.19 | 0.44 | 0.98 | 0.36 | 36.96 |
| Russia | 2.07 | 2.20 | 7.37 | 0.60 | 6.20 | 0.60 | 3.83 | 0.71 | 1.48 | 1.91 | 0.68 | 48.22 | 2.92 | 0.56 | 1.60 | 4.54 | 6.98 | 6.92 | 0.61 | 51.78 |
| India | 0.44 | 1.05 | 4.66 | 1.15 | 63.84 | 1.72 | 2.69 | 0.14 | 1.88 | 2.65 | 2.65 | 4.4 | 1.77 | 0.91 | 1.96 | 0.63 | 0.23 | 6.16 | 1.08 | 36.16 |
| Brazil | 7.91 | 46.94 | 3.86 | 3.34 | 3.49 | 2.34 | 1.61 | 6.11 | 2.69 | 4.82 | 1.51 | 1.72 | 2.81 | 1.99 | 0.67 | 1.28 | 0.63 | 3.13 | 3.16 | 53.06 |
| China | 1.51 | 3.70 | 45.73 | 0.97 | 5.24 | 0.84 | 2.15 | 8.69 | 2.50 | 4.20 | 2.52 | 6.67 | 2.16 | 0.75 | 2.32 | 2.26 | 1.07 | 6.63 | 0.11 | 54.27 |
| Indonesia | 1.15 | 1.79 | 1.22 | 1.00 | 2.68 | 59.6 | 0.33 | 0.89 | 7.28 | 2.22 | 2.77 | 1.03 | 1.24 | 0.75 | 8.09 | 0.62 | 1.61 | 2.34 | 3.38 | 40.4 |
| Saudi Arabia | 1.63 | 3.00 | 3.10 | 0.79 | 2.45 | 0.54 | 9.16 | 0.69 | 1.98 | 4.54 | 1.02 | 4.37 | 48.95 | 1.17 | 0.23 | 6.67 | 0.43 | 7.97 | 1.32 | 51.05 |
| South Africa | 5.20 | 3.29 | 0.46 | 0.41 | 2.24 | 0.16 | 1.35 | 4.28 | 1.07 | 0.86 | 2.00 | 0.52 | 1.68 | 70.99 | 0.86 | 1.01 | 1.16 | 1.91 | 0.56 | 29.01 |
| Argentina | 52.76 | 8.84 | 1.67 | 4.22 | 1.48 | 1.50 | 0.89 | 1.97 | 0.82 | 2.89 | 2.08 | 1.55 | 1.59 | 6.91 | 0.38 | 1.16 | 1.86 | 3.09 | 4.34 | 47.24 |
| Colombia | 3.71 | 4.33 | 1.12 | 68.19 | 2.32 | 1.14 | 0.45 | 0.60 | 0.64 | 4.69 | 2.15 | 0.69 | 1.19 | 0.94 | 0.32 | 0.71 | 0.35 | 0.77 | 5.69 | 31.81 |
| Venezuela | 4.05 | 3.79 | 0.06 | 4.64 | 1.26 | 4.12 | 0.18 | 1.18 | 2.56 | 4.21 | 1.92 | 0.14 | 3.80 | 0.42 | 0.52 | 0.33 | 1.00 | 2.81 | 63.01 | 36.99 |
| Thailand | 0.26 | 0.74 | 2.10 | 0.63 | 2.07 | 7.73 | 0.10 | 1.44 | 7.04 | 1.48 | 5.23 | 1.16 | 0.53 | 0.61 | 67.35 | 0.31 | 0.64 | 0.39 | 0.17 | 32.65 |
| Ukraine | 1.77 | 0.86 | 0.69 | 1.61 | 1.16 | 0.32 | 1.45 | 0.46 | 0.56 | 1.12 | 0.21 | 9.97 | 0.98 | 1.64 | 0.58 | 1.24 | 73.97 | 0.43 | 0.97 | 26.03 |
| Israel | 0.84 | 0.73 | 1.52 | 0.56 | 2.71 | 0.38 | 59.19 | 0.18 | 0.58 | 0.93 | 1.03 | 5.28 | 8.88 | 1.05 | 0.15 | 5.78 | 1.05 | 8.64 | 0.52 | 40.81 |
| Malaysia | 0.64 | 1.75 | 2.52 | 0.35 | 1.21 | 6.33 | 0.77 | 2.39 | 57.11 | 1.89 | 3.10 | 1.93 | 3.63 | 1.29 | 5.58 | 1.18 | 0.89 | 6.98 | 0.49 | 42.89 |
| Philippines | 1.25 | 0.82 | 2.53 | 1.02 | 2.04 | 4.19 | 1.20 | 1.32 | 2.46 | 1.49 | 65.87 | 1.33 | 1.13 | 1.38 | 5.51 | 2.01 | 0.27 | 3.26 | 0.91 | 34.13 |
| To Others | 40.89 | 52.17 | 57.8 | 25.64 | 46.78 | 38.46 | 41.42 | 34.04 | 43.2 | 48.15 | 35.15 | 58.96 | 52.06 | 26.59 | 34.66 | 37.87 | 20.83 | 73.18 | 28.1 | **41.89%** |
| **Notes:** The sample is from January, 1985 through December, 2016, and the predictive horizon is 12 months. The ij-th entry of the upper-left 19 × 19 country submatrix gives the ij-th pairwise directional spillover; i.e., the percent of 12-months-ahead forecast error variance in GPR of country i due to shocks from GPR in country j. The rightmost (From Others) column gives total directional spillover (from); i.e., row sums (from all others to i). The bottom (To Others) row gives total directional spillover (to); i.e., column sums (to all others from j). The bottom-right element (in boldface) is total spillover (mean ‘‘from’’ spillover, or equivalently, mean ‘‘to’’ spillover) |

**Fig. 1** Pairwise directional mean spillovers of GPR (Spring Graph)

****

**Notes:** The Spring Graph presented in **Fig. 1** shows the pairwise mean (static) spillovers among sample countries. The colours of nodes (circles) are in the following order: green (25th percentile), yellow (50th percentile), orange (75th percentile) and red (> 75th percentile). There are two aspects to the pairwise “To Others” spillovers i.e. the width and the shade of the arrow. Wider and darker arrow represents higher pairwise “To Others” spillovers.

**Table 3**

Determinants of Pairwise GPR Spillovers

|  |  |  |
| --- | --- | --- |
|  *Variable* | *Gravity Model**(1)* | *Gravity Model (Extended)* *(2)* |
| *Log(Exportsij + Importsij)* | 0.25\*\*\* | 0.40\*\*\* |
| (0.08) | (0.08) |
| *Contiguousij* | 1.45\*\*\* | 1.23\*\* |
| (0.55) | (0.56) |
| *Colonyij* | 1.24 | 1.20 |
| (0.81) | (0.93) |
| *Common Colonyij* | -0.11 | 0.13 |
| (0.94) | (1.21) |
| *Common Languageij* | 0.48 | 0.45 |
| (0.31) | (0.31) |
| *Log(Distanceij)* | -0.82\*\*\* | -0.43\*\* |
| (0.25) | (0.18) |
| *Budget Deficiti* |  | 0.12\*\*\* |
|  | (0.03) |
| *Budget Deficitj* |  | 0.05 |
|  | (0.04) |
| *Debti* |  | 0.02\*\*\* |
|  | (0.01) |
| *Debtj* |  | 0.01\* |
|  | (0.01) |
| *Log(Areai)* |  | 0.19\*\* |
|  | (0.09) |
| *Log(Areaj)* |  | 0.10\* |
|  | (0.06) |
| *Log(Market Capitalizationi)* |  | -0.14 |
|  | (0.13) |
| *Log(Market Capitalizationj)* |  | -0.30\*\* |
|  | (0.14) |
|  *R2* | 29.02% | 36.56% |
| *Total Observations* | 361 | 361 |
| Notes: Table 3 reports the results of cross-sectional estimation with HAC standard errors in parentheses. \*, \*\*, and \*\*\* indicate the significance of t-statistics at 10%, 5%, and 1% levels respectively. |

|  |
| --- |
| **Appendix: Details of data and sources** |
| **Variable name** | **Definition** | **Source** |
| Exportsij  | Share of the total exports of origin country i to country j relative to the total exports of country i. It is averaged for the period between 1985 and 2016. | OECD STAN Bilateral Trade Database |
|   |
| Importsij | Share of the total imports of origin country i from country j relative to the total imports of country i. It is averaged for the period between 1985 and 2016. | OECD STAN Bilateral Trade Database |
|   |
| Contiguousij | A binary variable that takes 1 if origin country i and country j are sharing a border, and 0 otherwise. | CEPII |
|   |
| Colonyij | A binary variable that takes 1 if origin country i has been a colony of country j, and 0 otherwise. | CEPII |
|   |
| Common Colonyij | A binary variable that takes 1 if origin country i and country j have remained under the influence of same colonial power, and 0 otherwise. | CEPII |
|   |
| Common Languageij | A binary variable that takes 1 if origin country i and country j share at least one common language, and 0 otherwise. | CEPII |
|   |
| Distanceij | Physical distance (in kilometers) between origin country i and country j. | CEPII |
|   |
| Budget Deficiti | Budget deficit (surplus) of country i as a percentage of its GDP. The figure is averaged for the period between 1985 and 2016. | World Development Indicators (WDI) |
|   |
| Budget Deficitj | Budget deficit (surplus) of country j as a percentage of its GDP. The figure is averaged for the period between 1985 and 2016. | World Development Indicators (WDI) |
|   |
| Debti | Central government debt of country i as a percentage of its GDP. The figure is averaged for the period between 1985 and 2016. | World Development Indicators (WDI) |
|   |
| Debtj | Central government debt of country j as a percentage of its GDP. The figure is averaged for the period between 1985 and 2016. | World Development Indicators (WDI) |
|   |
| Areai | Geographical area (in squared kilometers) of country i. The figure is averaged for the period between 1985 and 2016. | World Development Indicators (WDI) |
|   |
| Areaj | Geographical area (in squared kilometers) of country j. The figure is averaged for the period between 1985 and 2016. | World Development Indicators (WDI) |
|   |
| Market Capitalizationi | Stock market capitalization of country i as a percentage of its GDP. The figure is averaged for the period between 1985 and 2016. | World Development Indicators (WDI) |
|   |
| Market Capitalizationj | Stock market capitalization of country j as a percentage of its GDP. The figure is averaged for the period between 1985 and 2016. | World Development Indicators (WDI) |
|   |
| DSij | Directional mean spillover (in percent) of GPR transmitted by origin country i to country j. | These amounts are calculated by authors by applying the spillover model of Diebold and Yilmaz (2012) on 19 GPR series of Caldara and Iacoviello (2017). These series are available on http://www.policyuncertainty.com/ |
|   |

**References**

Balli, F., Balli, H. O., Louis, R. J., & Vo, T. K. (2015). The transmission of market shocks and bilateral linkages: Evidence from emerging economies. *International Review of Financial Analysis, 42*, 349-357.

Balli, F., Uddin, G. S., Mudassar, H., & Yoon, S.-M. (2017). Cross-country determinants of economic policy uncertainty spillovers. *Economics Letters, 156*, 179-183. doi:10.1016/j.econlet.2017.05.016

Barbieri, K. (1996). Economic interdependence: A path to peace or a source of interstate conflict? *Journal of Peace Research, 33*(1), 29-49.

Bearce, D. H., & Fisher, E. O. N. (2002). Economic geography, trade, and war. *Journal of Conflict Resolution, 46*(3), 365-393.

Beck, N., King, G., & Zeng, L. (2000). Improving quantitative studies of international conflict: A conjecture. *American Political Science Review, 94*(1), 21-35.

Beck, N., King, G., & Zeng, L. (2004). Theory and evidence in international conflict: a response to de Marchi, Gelpi, and Grynaviski. *American Political Science Review, 98*(2), 379-389.

Beiser, J. (2011). *Looking Beyond Borders: Identification, Information, and Ethnic Conflict Contagion*. Working paper, University College London London, UK.

Beiser, J. (2013). *Trampling out the spark? Governments' strategic reaction to the threat of ethnic conflict contagion*. PhD thesis. Working paper, University College London London, UK.

Blanchard, J.-M. F., & Ripsman, N. M. (1994). *Peace through economic interdependence? Appeasement in 1936.* Paper presented at the annual meeting of the American Political Science Association, New York.

Blomberg, S. B., & Rosendorff, B. P. (2006). *A gravity model of globalization, democracy and transnational terrorism*. USC CLEO Research Paper No. C06-6. Retrieved from SSRN: [https://ssrn.com/abstract=904204](https://ssrn.com/abstract%3D904204)

Braithwaite, A. (2010). Resisting infection: How state capacity conditions conflict contagion. *Journal of Peace Research, 47*(3), 311-319. doi:10.1177/0022343310362164

Bubák, V., Kočenda, E., & Žikeš, F. (2011). Volatility transmission in emerging European foreign exchange markets. *Journal of Banking & Finance, 35*(11), 2829-2841.

Buhaug, H., & Gleditsch, K. S. (2008). Contagion or confusion? Why conflicts cluster in space. *International Studies Quarterly, 52*(2), 215-233.

Buzan, B. (1984). Economic structure and international security: The limits of the liberal case. *International Organization, 38*(4), 597-624.

Caldara, D., & Iacoviello, M. (2018). *Measuring geopolitical risk*. Federal Reserve Board. International Finance Discussion Paper. Retrieved from <https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3117773>

Chadefaux, T. (2014). Early warning signals for war in the news. *Journal of Peace Research, 51*(1), 5-18. doi:10.1177/0022343313507302

Choucri, N., & North, R. C. (1989). Lateral pressure in international relations: Concept and theory. *Handbook of war studies*, 289-326.

De Marchi, S., Gelpi, C., & Grynaviski, J. D. (2004). Untangling neural nets. *American Political Science Review, 98*(2), 371-378.

De Mesquita, B. B. (2010). *The predictioneer's game: Using the logic of brazen self-interest to see and shape the future*: Random House Incorporated.

Demirer, M., Diebold, F. X., Liu, L., & Yilmaz, K. (2018). Estimating global bank network connectedness. *Journal of Applied Econometrics, 33*(1), 1-15.

Deutsch, K. W. (1957). Mass communications and the loss of freedom in national decision-making: A possible research approach to interstate conflicts. *Conflict Resolution, 1*(2), 200-211.

Diebold, F. X., & Yilmaz, K. (2012). Better to give than to receive: Predictive directional measurement of volatility spillovers. *International Journal of Forecasting, 28*(1), 57-66.

Fearon, J. D., & Laitin, D. D. (2003). Ethnicity, insurgency, and civil war. *American Political Science Review, 97*(1), 75-90.

Fidrmuc, J., & Karaja, E. (2013). Uncertainty, informational spillovers and policy reform: A gravity model approach. *European Journal of Political Economy, 32*, 182-192. doi:10.1016/j.ejpoleco.2013.07.003

George, A. L. (1956). Prediction of political action by means of propaganda analysis. *The Public Opinion Quarterly, 20*(1), 334-345.

Glaser, C. L. (2000). The causes and consequences of arms races. *Annual Review of Political Science, 3*(1), 251-276.

Gleditsch, K. S., & Ward, M. D. (2013). Forecasting is difficult, especially about the future: Using contentious issues to forecast interstate disputes. *Journal of Peace Research, 50*(1), 17-31.

Head, K., Mayer, T., & Ries, J. (2010). The erosion of colonial trade linkages after independence. *Journal of International Economics, 81*(1), 1-14. doi:10.1016/j.jinteco.2010.01.002

Hegre, H. (2008). Gravitating toward war: Preponderance may pacify, but power kills. *Journal of Conflict Resolution, 52*(4), 566-589.

Hegre, H., Oneal, J. R., & Russett, B. (2010). Trade does promote peace: New simultaneous estimates of the reciprocal effects of trade and conflict. *Journal of Peace Research, 47*(6), 763-774.

Hill, S., & Rothchild, D. (1986). The contagion of political conflict in Africa and the world. *Journal of Conflict Resolution, 30*(4), 716-735.

Hill, S., Rothchild, D., & Cameron, C. (1998). Tactical information and the diffusion of peaceful protests. *The International Spread of Ethnic Conflict*, 61-88.

Huff, D. L., & Lutz, J. M. (1974). The contagion of political unrest in independent Black Africa. *Economic Geography, 50*(4), 352-367.

Hunt, W. B. (1997). *Getting to war: Predicting international conflict with mass media indicators*: University of Michigan Press.

Huth, P. K. (2009). *Standing your ground: Territorial disputes and international conflict*: University of Michigan Press.

Iqbal, Z., & Starr, H. (2008). Bad Neighbors: Failed States and Their Consequences. *Conflict Management and Peace Science, 25*(4), 315-331. doi:10.1080/07388940802397400

Kenneth, B. E. (1962). Conflict and Defense: A General Theory. In: Harper & Row, Publishers, New York.

Keshk, O. M., Pollins, B. M., & Reuveny, R. (2004). Trade still follows the flag: The primacy of politics in a simultaneous model of interdependence and armed conflict. *The Journal of Politics, 66*(4), 1155-1179.

Kim, H. M., & Rousseau, D. L. (2005). The Classical Liberals Were Half Right (or Half Wrong): New Tests of the ‘Liberal Peace’, 1960-88. *Journal of Peace Research, 42*(5), 523-543.

Koop, G., Pesaran, M. H., & Potter, S. M. (1996). Impulse response analysis in nonlinear multivariate models. *Journal of Econometrics, 74*(1), 119-147.

Kuran, T. (1998). Ethnic dissimilation and its international diffusion. *The International Spread of Ethnic Conflict*, 35-60.

Leetaru, K. (2011). Culturomics 2.0: Forecasting large-scale human behavior using global news media tone in time and space. *First Monday, 16*(9).

Levy, J. S. (1989). The Causes of War: A Review of Theories and Evidence. Behavior, Society, and Nuclear War. P. Tetlock, JL Husbands, R. Jervis, PC Stern and C. Tilly. In: New York, Oxford University Press.

Morley, C., Rosselló, J., & Santana-Gallego, M. (2014). Gravity models for tourism demand: theory and use. *Annals of Tourism Research, 48*, 1-10.

Mowlana, H. (1997). *Global information and world communication: New frontiers in international relations*. London: Sage Publications.

Oneal, J. R., & Russett, B. (1999). Assessing the liberal peace with alternative specifications: Trade still reduces conflict. *Journal of Peace Research, 36*(4), 423-442.

Pesaran, H. H., & Shin, Y. (1998). Generalized impulse response analysis in linear multivariate models. *Economics Letters, 58*(1), 17-29.

Pevehouse, J. C., & Goldstein, J. S. (1999). Serbian compliance or defiance in Kosovo? Statistical analysis and real-time predictions. *Journal of Conflict Resolution, 43*(4), 538-546.

Powell, R. (2004). The inefficient use of power: Costly conflict with complete information. *American Political Science Review, 98*(2), 231-241.

Salehyan, I., & Gleditsch, K. S. (2006). Refugees and the spread of civil war. *International Organization, 60*(2), 335-366.

Schneider, G., Gleditsch, N. P., & Carey, S. C. (2010). Exploring the past, anticipating the future: A symposium. *International Studies Review, 12*(1), 1-7.

Schrodt, P. A., & Gerner, D. J. (2000). Cluster-based early warning indicators for political change in the contemporary Levant. *American Political Science Review, 94*(4), 803-817.

Suárez-de Vivero, J. L., & Mateos, J. C. R. (2017). Forecasting geopolitical risks: Oceans as source of instability. *Marine Policy, 75*, 19-28.

Virilio, P. (1986). Speed and politics: An essay on dromology, translated by Mark Polizzotti. *New York: Semiotext (e)*.

Waltz, K. (1979). *Theory of international relations*. New York: Random House.

Ward, M. D., Greenhill, B. D., & Bakke, K. M. (2010). The perils of policy by p-value: Predicting civil conflicts. *Journal of Peace Research, 47*(4), 363-375.

Ward, M. D., Siverson, R. M., & Cao, X. (2007). Disputes, democracies, and dependencies: A reexamination of the Kantian peace. *American Journal of Political Science, 51*(3), 583-601.

Weidmann, N. B. (2015). Communication networks and the transnational spread of ethnic conflict. *Journal of Peace Research, 52*(3), 285-296.

Werner, S. (1999). Choosing demands strategically: The distribution of power, the distribution of benefits, and the risk of conflict. *Journal of Conflict Resolution, 43*(6), 705-726.

Xiang, J., Xu, X., & Keteku, G. (2007). Power: The missing link in the trade conflict relationship. *Journal of Conflict Resolution, 51*(4), 646-663.

Yilmaz, K. (2010). Return and volatility spillovers among the East Asian equity markets. *Journal of Asian Economics, 21*(3), 304-313.

1. Instead of distinguishing between contagion, spillover, diffusion, and spread, we consider each of them as a transmission mechanism/process because essentially it is the information transmission that is pervasive in those processes. [↑](#footnote-ref-1)
2. A few noticeable examples include the Gulf War; 2003 Iraq invasion and 9/11 in 2001; the more recently happened Ukraine/Russia crisis and terrorist attacks in Paris; and the ongoing escalation of Syrian conflict, the US-North Korea tensions over nuclear proliferation, the Qatar–Saudi Arabia proxy conflict, the US’s recognition of Jerusalem as Israel’s capital, and the US’s cancellation of Iran’s nuclear deal. [↑](#footnote-ref-2)
3. See Global Risks Reports of 2016, 2017, 2018; World Economic Outlook, October 2017, and Economic Bulletin, March 2016, published by the World Economic Forum, International Monetary Fund, and European Central Bank, respectively. All these reports highlight the growing importance of GPR and its transmission. [↑](#footnote-ref-3)
4. Caldara and Iacoviello (2018) specifically refer to 2017 Bank of England’ Systemic Risk Survey and the survey conducted by Wells Fargo/Gallup in May 2017. Both surveys discuss growing GPR concerns among investors, manager, and policy makers. [↑](#footnote-ref-4)
5. The website, <http://www.policyuncertainty.com>, contains other component indexes for the US such as GPR\_threat, GPR\_act, GPR\_narrow, GPR\_broad, GPR\_nuclearthreat etc. However, we used the ‘benchmark’ index for the country in our analysis. [↑](#footnote-ref-5)
6. The GPR index is constructed by counting the occurrence of words related to GPR in leading international newspapers (Caldara & Iacoviello, 2018). [↑](#footnote-ref-6)
7. Since media content carries useful signals on cross-country conflicts (Deutsch, 1957; George, 1956; Hunt, 1997), the press is considered a reliable source for GPR related information. [↑](#footnote-ref-7)
8. In simple VAR framework, the results of variance decomposition and therefore spillovers are driven by Cholesky factor orthogonalization and are potentially order-dependent. However, the spillover measures based on a generalized VAR framework, the results are not order-dependent. For more details, see Koop, Pesaran, and Potter (1996) and Pesaran and Shin (1998). [↑](#footnote-ref-8)
9. Some of these factors such as common language and geographical proximity were also suggested by the Emerging Risk Report (2016), produced by LLOYD’S, in their ‘framework for understanding the emergence and spread of civil unrest’. [↑](#footnote-ref-9)
10. For the sake of grouping, we consider Turkey as part of Gulf because being a Muslim country it may be more affected by the GPRs of Israel and Saudi Arabia than other countries, except the US, in the sample. [↑](#footnote-ref-10)
11. Note that budget deficit, debt (central government debt), and market capitalization of each country have been measured as a percentage of gross domestic product (GDP) of the respective country. See Appendix for variable explanation. [↑](#footnote-ref-11)