Trade Linkage and Transmission of Geopolitical Risks: Evidence from the Peace Progress in 2018[*]

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Abstract

Purpose – Using unexpected changes in geopolitical tensions on the Korean peninsula as a quasi-natural experimental setting, we examine whether and how geopolitical risks travel across borders through firm-level imports and exports linkages. We also test whether the effects are driven by either imports or exports and assess whether firms can effectively hedge themselves against geopolitical risks.

Design/methodology – We focus on a series of unanticipated geopolitical events taken place in Korea in 2018. Making use of the shocks to geopolitical climate, we identify five milestone events toward peace talks. We employ the event studies methodology. We examine heterogenous firm-level stock price reactions around key event dates depending on firms' exposure to geopolitical risks. As a measure of firms' exposure to geopolitical risks in Korea, we utilize a text-based measure of firm-level trade links. When a firm announces and discusses its purchase of inputs from Korea or sales of outputs to Korea in their annual disclosure filings, we define a firm to have a trade relationship with Korea and have exposure to Korean geopolitical risks. Similarly, we use a measure of a firm's hedging policies based on a firm's textual mention of the use of foreign exchange derivatives in their annual disclosure.

Findings – We find that U.S. firms that have direct trade links to Korea gained significantly more value when the intensity of geopolitical risks drops compared to firms without such trade links to Korea. The effects are pronounced for firms purchasing inputs from or selling outputs to Korea. We find that the effectiveness of foreign exchange hedging against geopolitical risks is limited.

Originality/value – We document the international transmission of geopolitical uncertainty through trade linkages. Export links as well as import links serve as important nexus of transmission of geopolitical risks across borders. Hedging strategies involving foreign-exchanges derivatives do not seem to insulate firms again geopolitical risks. With the recent movements of localization and reshuffling of the global value chain, our results suggest a significant impact of geopolitical risks in Korea on the construction of the global value chain.

Keywords: Announcement Returns, Exports And Imports, Firm Value, Geopolitical Risk, Hedging Policies
JEL Classifications: B17, G15, G18

1. Introduction

The interdependence of firms across the world has been rapidly increased for the past few decades due to globalization. One notable implication is that an abrupt change in geopolitical climate stemming from foreign countries now effectively propagates to domestic firms, thereby affecting a firm's investment decisions and asset prices. Thus, consideration of

geopolitical risk originating in both domestic and foreign countries increasingly commands the attention of investors and scholars.[1] At the same time, it is also important to understand that the degree of risk transmission is not homogenous since the participation in the global value chain network is different across firms. This highlights the importance of considering trade links in the examination of possible consequences of geopolitical risk at the firm level. From the asset pricing perspective, a firm that has a direct trade link should be more susceptible to any shock from foreign countries.

To investigate the heterogeneous responses to geopolitical risk across firms through trade links, Korea in early 2018 provides an ideal setting for detecting the cross-border transmission of geopolitical risks. During 2016 and 2017, tensions between the South and North Korea intensified following a record number of missiles launched by the North. Later, on February 9, 2018, it was announced that a group of high-ranking North Korean officials had arrived in Seoul to discuss diplomatic and strategic cooperation to be initiated in the near future. Moreover, both Koreas announced that an inter-Korean summit would be held within a few months. Subsequently, on April 27, 2018, the North and South held a summit. North Korea and U.S. also held a summit in June. These news stories dramatically alleviated the prevailing geopolitical tension on the Korean peninsula.

In this paper, we five milestone events toward the relief of geopolitical tensions to examine heterogeneous firm-level responses to an unexpected change in geopolitical climate. We hypothesize that the unexpected and new mood of peace predicts whether and how stock returns of U.S. firms respond to unexpected changes in foreign geopolitical risks based on their exposure to geopolitical risks in Korea. Specifically, we predict that firms that have a direct trade linkage to Korea would exhibit a gain in returns when such a sudden drop in geopolitical tension occurs in Korea. This prediction is mostly based on recent literature on asset pricing with political risk. For example, Pastor and Veronesi (2012) develop a general equilibrium model to show a drop in stock price when a sudden increase in political uncertainty. Pastor and Veronesi (2013) confirm that political risk is indeed a systematic risk which effect is more pronounced during weak economic conditions. We extend these results to geopolitical contexts.

To empirically test our hypothesis, we use firms' economic links to Korea based on the information available in 10-K filings of Hoberg and Moon (2017) as a measure of U.S. firms' trade link to Korea. Hoberg and Moon (2017) read 10-K filings of U.S. public firms and collect information on a firm's foreign exposures based on text-based measures of the offshore sale of output or purchase of input. We define a U.S. firm to have a trade link to Korea when its 10-K mentions that they either sell goods to, purchase inputs from, or have operating plants in Korea in the past three years.

With our measure of trade links, we test the return response of U.S. firms around the event dates. By focusing on price reactions around these unexpected events, we can effectively isolate the causal effect of geopolitical risk on returns. Consistent with our hypothesis, we find that firms with significant return exposure to Korea tend to exhibit stronger return sensitivity to sudden changes in the geopolitical uncertainty in Korea. For example, firms that directly have a trade link to Korea show a higher average three-day cumulative return than firms that

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[1] The results from a Gallup 2017 survey (http://www.businesswire.com/news/home/20170613005348/en/) show that geopolitical risks rank as greater threat for investors than political or economic uncertainty. About 75 percent of the respondents expressed concerns about geopolitical affairs such as military and diplomatic conflicts.

do not. The return response is also significant in terms of economic magnitude that hovers around 0.6% to 1% depending on event dates. The result is robust to firms using foreign exchange (FX) derivatives suggesting that the benefits of FX hedges against geopolitical risks are limited. Lastly, we find that both input purchases and output sales are important in transmitting geopolitical risks.

Our study mostly contributes to the literature of political uncertainty on asset prices. Starting from Pastor and Veronesi (2012/2013), there is a growing literature that examines how political uncertainty translates into stock price. Liu, Shu and Wei (2017) employ a political scandal in China in 2012 as an exogenous shock to political stability and found a significant price drop for firms that are more sensitive to political shocks. Kelly, Pastor and Veronesi (2016) find a similar pattern in equity option markets. Caldara and Iacoviello (2018) build an index to proxy for geopolitical risk (GPR) from various sources of articles related to geopolitical risks and document that the stock index decreases when geopolitical uncertainty increases. However, their analysis is limited to an aggregate market index and does not provide empirical evidence using firm-level data. Our results complement the findings of Caldara and Iacoviello (2018) by showing a heterogeneous response at the individual firm level using plausibly exogenous changes in political stability from the Korean peninsula.

Moreover, investors and policymakers are keen on whether peace talks in Korean peninsula can bring economic benefits in addition to political benefits. Our study can provide evidence suggesting peace talks progress accomplish economic value creation. These results are also consistent with finding that extreme instability such as terrorism attacks hinder growth (Blomberg, Hess and Orphanides, 2004) and expectations of individual investors (Glaser and Weber, 2005). Since we exploit a specific setting in Korea, the results are very relevant to investors and policymakers whose focus includes Korean firms in global supply chains and product markets. Second, instead of examining longer-run aggregate changes such as export performance, we examine heterogeneous firm-level market reactions upon news announcements.

Our results showing the value implications of Korean peace talks in association with the global market structure and value chain contribute to the literature (Jang Yong-Joon, 2020). Changes in political risks dynamics in Korea can affect intra-industry reallocation (Melitz, 2003) and particularly for exporters (Bernard et al., 2007). This is also related to the findings of Yoo Jeong-Ho, Park Seul-Ki and Cheong In-Kyo (2020) which emphasize the role of government policies in providing material real impacts on the structure of the global value chain. The results can be understood in relation to the literature showing free trade agreements have a significant impact on the value chain and export growth (eg., Cho Jung-Hwan, 2019; Evert and Oh Jin-Hwan, 2019; Park Jin-Woo and Park Myong-Sop, 2019; Kwak Su-Young et al. 2020). Our results manifest that Korean firms are well integrated into global value chain. Our work has implications for the impact of geopolitical risk considerations in shaping the global value chain (Gereffi, 2014; Alvstam, Ivarsson and Petersen, 2020).

Methodologically, we utilize text-based micro-level mapping of trade linkages between Korea and U.S.. With the rapid advances in textual analysis techniques, researchers become more capable of processing and making use of a vast amount of information available in written texts. One type of such text with information is corporations' annual disclosure. We record firm-level export and import links to Korea, based on the texts of corporate filings.

The remainder of this paper is organized as follows. In Section II, we review the related literature and develop testable hypotheses. In Section III, we first list the key events of 2018

inter-Korean summit. Then, we describe the data sets and define the key variable that measures U.S. firms' exposure to geopolitical risk to Korea. We also explain our empirical framework. In Section IV, we report the empirical results. Section V concludes.

2. Literature and Hypothesis

Government policies clearly affect firm operations as they fundamentally shape an economy's business environment. Therefore, any uncertainties arising from government policies can be a source of systematic risk to firms' operations.

There is also a growing literature on the effect of policy uncertainty on corporate policies and firm value. Çolak, Durnev and Qian (2017) examine the initial public offerings (IPO) activity around U.S. gubernatorial elections, which serves as a proxy for uncertainty in politics and government policies. Using national elections across 43 countries, Bhattacharya et al. (2017) find a significant drop in innovation activities when government policy becomes more uncertain. Bonaime, Gulen and Ion (2018) empirically show a negative relation between acquisition likelihood and policy uncertainty.

From the asset pricing perspective, studies suggest aggregate political and policy risk plays a role in asset returns. One difficulty has been the measurement of systematic risk since the degree of policy uncertainty cannot be directly observed. To circumvent this issue, some recent studies offer insight on measuring policy uncertainty. Baker, Bloom and Davis (2016) construct an index that captures news-based economic policy uncertainty (EPU), including issues related to national security, taxes, and fiscal policies. Caldara and Iacoviello (2018) create an index of geopolitical risks using the frequency of articles related to geopolitical risks based on geopolitical events with U.S. involvement. This index aims to capture geopolitical risks that are most relevant for North America and Britain. Pastor and Veronesi (2012/2013) develop a general equilibrium framework to show how political uncertainty is associated with an increase in stock risk premia using an index devised in Baker, Bloom and Davis (2016). Instead, Liu, Shu and Wei (2017) test the model predictions exploiting a natural experiment in China.[2]

The policy uncertainty in one country may also affect other countries due to the globally integrated market, as discussed in Bekaert et al. (2016). Bekaert et al. (2016) also document the effect depends on firms' global engagement. Levine and Schmukler (2006) investigate the effect of trade on stock liquidity, and Claessens, Tong and Wei (2012) study how trade networks propagate shocks across borders during the 2007-2009 financial crisis. Barrot, Loualiche and Sauvagnat (2019) utilize shipping costs to capture globalization exposure and document globalization risk premium stemming from the displacement risks due to import competition.

Hypothesis 1: The firm-level stock market returns are stronger for firms having direct trade links to Korea compared to firms not having trade links.

We adopt the event studies approach. We examine whether and how a firm's stock price moves around key geopolitical events. The larger the magnitude of abnormal movements at

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[2] For additional studies on the financial effects of policy uncertainty, please refer to Liu and Zhang (2015), Cheng and Yen (2020), Dai, Xiong and Zhou (2021), and Schwarz and Dalmácio (2020).

the time of an event, the more significant (unanticipated) impact of an event on the wealth of the firms' shareholders.

Our main hypothesis is about heterogeneous firm reactions depending on their trade linkages to the Korean market. When sudden changes in the geopolitical environment change in Korea, this would have stronger and more direct effects for firms either purchasing inputs from Korea or selling products to Korea compared to firms without these trade links to Korea.

To measure this trade linkage, we adopt recent advances in text-based approach and measure firm-level trade linkages based on corporations' annual disclosure filings.

Hypothesis 2: Firms may not be able to fully hedge themselves against their exposure to geopolitical risks.

Literature suggests that the geopolitical risks are distinct from existing financial and economic risk measures such as exchange rate risk. Furthermore, since some of geopolitical shifts in environments are very hard to predict, it would be highly costly for firms to hedge when shocks do not arrive in an anticipated way (Rampini, Sufi and Viswanathan, 2014). This can make firms hesitant about actively engaging in costly hedging against geopolitical risks. We hypothesize that firms may not be able to fully hedge themselves from geopolitical risks via the usage of FX hedges.

Firms doing imports or exports may have need for hedging strategies to mitigate the risks stemming from foreign countries. Based on corporate disclosures, we find about half of firms in our sample use foreign exchange (FX) financial derivatives to hedge their exposure to foreign markets. We assess the effectiveness of firms' hedging strategies against their geopolitical risk exposure.

3. Empirical Design and Data

3.1. Defining Event Dates for a Sharp Turn in Uncertainty

Our empirical setting enables us to focus on the unexpected reconciliation between the North and the South Korean administrations in early 2018. During 2016 and 2017, tension over the status quo on the Korean peninsula escalated dramatically, caused largely by a surge in missile tests by North Korea in 2017. In this paper, we focus on a series of peace talks events in 2018, which happened the first time in more than a decade.

Kim Jung-Un abruptly changed his position in early 2018, causing a dramatic shift in the political climate. Starting from early January in 2018, Kim Jung-Un all of sudden called for talks with Seoul and announced his intention of sending a delegation to South Korea for discussing North Korea's participation in the upcoming PyeongChang Olympics. In response, South Korea proposed talks at Panmunjom.

Later, on February 9, 2018, it was announced that a group of high-ranking North Korean officials including Kim Jung-Un's sister had arrived in Seoul to discuss diplomatic and strategic cooperation to be initiated shortly. Moreover, both Koreas announced that an inter-Korean summit would be held within a few months.

Subsequently, on April 27, 2018, the North and South held a summit at Panmunjom, which was in more than a decade. On May 22, South Korea and U.S. had a meeting in Washington in advance of a planned summit between North Korea and U.S. Although it was still unclear

if the North Korea and U.S. summit would happen, some news outlets reported the summit would most likely take place in Singapore in June. On June 12, North Korea and the U.S. held a summit in Singapore. This series of events dramatically alleviated the prevailing geopolitical tension on the Korean peninsula.

Fig. 1. EPU Index of South Korea
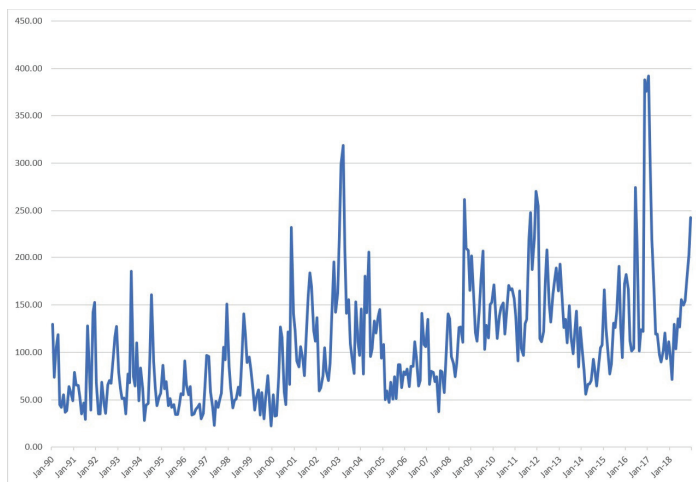
Source: Baker, Bloom and Davis (2016) data.

In order to better illustrate this point, we show a graph of the news-based Korean political uncertainty index devised by Baker, Bloom and Davis (2016) in Fig. 1. The EPU index has a feature that distinguishes it from uncertainty indexes such as the CBOE VIX, which relies on financial market movements. The EPU index measures various types of news-based uncertainty, including tax policy, national security, and sovereign debt crises. Given the significance of the progress that the two Koreas made during the event dates, news about national security and geopolitical issues related to North Korea dominated news coverage during the event window.

As shown in Fig. 1, these events significantly affect the level of Korean EPU. We observe a dramatic rise in the uncertainty index during late 2016 and 2017 due to the political scandal of South Korea and a record number of missile launches from North Korea. During 2017, North Korea engaged in the highest-ever number of intercontinental ballistic missile launches. This intensified the geopolitical tension in Korea as well as in the world.[3] As the peace talk progresses, the EPU level decreases in 2018. The movements in EPU index during early 2018 coincides with the changes in news coverage of national security issues involving South and North Korea. This pattern confirms that the events that we are utilizing in this paper were indeed a sudden and significant drop in geopolitical risks involving Korean peninsula.

We adopt the event studies approach to capture these sharp changes in geopolitical risks in Korea and asset prices during a short period of time. We identify the first event date as January

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[3] See https://www.bbc.com/news/world-asia-42160227.

2nd when South Korea and North Korea both showed their willingness to meet and discuss cooperation opportunities. This was a sharp turn in the mood between the two Koreas compared to the tensions in 2017.

We then identify the next event date as February 9, when high-ranking officials of the North Korean government visited Seoul and engaged in a full-day leadership meeting in South Korea. Kim Jong Un invited South Korea to hold a summit. The invitation was accepted by the South. The two sides arranged for future diplomatic cooperation, including the aforementioned summit.[4]

The third event date is April 27, when the first 2018 inter-Korea summit took place at Panmunjom, where North and South Korea signed the Panmunjom Declaration for Peace, Prosperity, and Unification on the Korean Peninsula. We set May 22 as the next event date, when President Moon visited Washington for meeting with President Trump. Finally, the last event date is June 12 when North Korea-U. S. Summit was held in Singapore.[5]

3.2. Data

We obtain stock price data of publicly listed U.S. firms from Center for Research in Security Prices (CRSP) and the firms' financial accounting information from Standard and Poor's Compustat. Following the standard procedures to filter out data errors, we exclude observations with negative stock prices. The returns are winsorized at 1% and 99% levels. We exclude firms with total assets less than 1 million, and less than 50 trading days.

To measure U.S. firms' risk exposure to geopolitical uncertainty in the Korean peninsula, we draw on the existing trade linkages between U.S. corporations and Korean firms. Hoberg and Moon (2017) read 10-K filings of U.S. public firms and collect information on a firm's foreign exposures based on text-based measures of the offshore sale of output and purchase of input. We also make use of the FX derivative hedging database (Hoberg and Moon, 2017). To gauge the hedging activities of corporations, we utilize textual analysis data on firms' textual mentions of usage of their FX Hedging instruments.

The number of total firms at the end 2017 is 3,324 in the CRSP/Compustat merged sample. After matching with trade linkage data of Hoberg and Moon (2017), there are 3,193 firms remaining in the sample. As noted, we exclude firms with total assets less than 1 million, and less than 50 trading days. These constraints further exclude 10 firms. Lastly, the data constraint imposed by negative stock return reduce the sample to 3,167 firms.

We present the summary statistics for the sample in Table 1. 10 percent of firms report in their 10-K fillings about their foreign exposures to Korean markets. A larger proportion of firms are using foreign currency derivatives, which makes sense since this includes instruments linked to not only Korea won but also other currencies. The average size and leverage values of firms in our sample is comparable to that in the Compustat universe. The summary statistics are aligned with the significant role of Korean firms in the global value chain (Chung Sung-Hoon, 2016; Zhang and Su, 2021).

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[4] See https://www.reuters.com/article/us-olympics-2018-northkorea-southkorea/kim-jong-un-invites-south-korean-president-for-summit-south-korea-idUSKBN1FU05F.

[5] We mainly focus on events during 2018, since the geopolitical atmosphere showed a sharp turn compared to 2017. Although there was a continuation of increased geopolitical tensions throughout 2017, we also examine returns reactions surrounding some important missile testing events in 2017 in the Appendix.

Table 1. Summary Statistics

	Mean	SD	P10	P50	P90
Trade Links	0.091	0.288	0.000	0.000	0.000
Input Link	0.055	0.229	0.000	0.000	0.000
Output sales Links	0.071	0.257	0.000	0.000	0.000
FX Hedge	0.504	0.500	0.000	1.000	1.000
Size	6.670	2.276	3.682	6.733	9.545
Leverage	0.351	0.298	0.000	0.328	0.789
Tobin's Q	2.088	2.127	0.938	1.416	4.025
Cash	0.639	0.254	0.340	0.680	0.915
Observations	3167				

Notes: Trade Link = trade link indicator variable, Input Link = input purchase link indicator variable, Output Link = output sales link indicator variable, FX Hedge = Foreign Exchange hedge indicator variable, Size = logarithm of total assets, Leverage = financial leverage, Cash = cash to asset ratio.

3.3. Measures of Exposure to Geopolitical Risks in Korea

We obtain firm-level geopolitical risk exposure based on the firms' trade links to Korea. U.S. Public corporations include discussions about their trade linkages such as output sales and input purchases in their 10-K filings. We define a U.S. firm to have trade links to Korea when its 10-K filing mentions it has either offshore sale of outputs to Korea or purchase of inputs from Korea in the prior year. Trade Link variable is an indicator variable when a company either sells its output to Korea or buys inputs from Korea. This is a firm-year level variable. Similarly, we consider the extent to which firms hedge themselves from FX changes. FX Hedge variable is an indicator variable when a firm discloses in its 10-K filing that the company is employing foreign currency derivatives in the prior year.

3.4. Event Studies Methodology

We examine whether and how firms' stock prices move around key events. The assumption is that the mean of abnormal returns is equal to zero without the unexpected release of significant new information. When a company is unaffected by the news (or the news delivered only as much as what was expected), the abnormal returns would be equal to zero.

As a tool to empirically evaluate the impact of events, researchers find event studies useful. This is because the (unanticipated) impact of an event on the wealth of the firms' shareholders are captured by the magnitude of abnormal returns at the time of an event (Kothari and Warmer, 2006). To measure the impact of news more precisely, we examine the behavior of firms' daily stock returns rather than monthly returns (eg., MacKinlay, 1997; Kothari and Warmer, 2006).

The event studies approach fits well into our research purpose. We employ an event studies approach and examine stock price reactions around the North and South Korean summit to measure the firm-level impacts of peace talk progresses. We focus on cross-sectional differences in stock price reactions to gauge the significance of international geopolitical risks on asset prices. By adopting an event studies approach, we effectively hold economic fundamentals fixed and isolate the effects of geopolitical uncertainty during a short event window.

The dependent variable of interest is the cumulative abnormal returns (CAR) around the short window of the announcement. The three-trading-day period between one day prior to an event and one day after an event is the time window over which we compute a firm's cumulative stock returns. We use Capital Asset Pricing Model (CAPM) and Fama and French (1993) three-factor model (FF) to compute a stock's expected returns without significant events. We compute cumulative abnormal returns relative to the CAPM (CAPM Adjusted CAR) and the FF three-factor model (FF Adjusted CAR) to further account for stock price reactions that are caused by changes in common risk factors.

To estimate the model-implied benchmark returns, we first estimate a firm's sensitivity to factors, following Dimson (1979) using the most recent 36 months of daily returns prior to a month before the event. We calculate the abnormal returns on each stock as the residual return on each stock after subtracting the expected returns predicted by the CAPM and the Fama-French three-factor model.

We then examine whether and how the CAR of each firm moved during a short event window surrounding news events. We took a step beyond simple aggregate-level event-studies analysis. By comparing the price reactions of firms with trade links to Korea to firms without such trade links, we examine heterogeneous reactions across firms with varying degrees of exposure to Korea. This empirical setting is particularly useful to test out hypotheses, since it effectively rules out alternative explanations based on the common movements in the market.

4. Results

Based on the event-studies analysis, we compare the price reactions of firms with and without trade linkages to Korea.

4.1. Main Results – The Effects of Trade Linkages

We examine heterogeneous firm-level responses to an unexpected change in geopolitical climate. In our empirical specification, we use the CAR of each firm i for the period running from a day prior to a day after each event as the main dependent variable. Specifically, for each milestone event date, we estimate the following model to test cross-sectional variations in market reactions:

$$CAR_i = \alpha + \beta * Trade\ Link_i + \gamma * Ctrls_i + \epsilon_i. \tag{1}$$

where Trade Link denotes the main covariate of interest based on firm-level trade links to Korea. Ctrls is a vector of control variables, including the log of total assets, leverage, Tobin's Q, and cash holding measured at the end of 2017. We also include industry fixed effects based on the Fama-French 48 industry classification. Standard errors are clustered at the Fama-French 48-industry level.

In Table 2, we report the main estimation results. The announcement returns surrounding the key event dates discussed in 3.1 are presented in each column. In the first column, we show the estimation results of CAR surrounding January 2nd on firms' trade linkages to Korea. The sign of β coefficient is positive. We find that U.S. firms with existing trade links to Korea enjoy strongly positive returns when Korean political uncertainty suddenly drops. In

other words, the same firms were suffering from value loss when the level of geopolitical risks escalated. The magnitudes of estimates are economically meaningful. For the results on February 9th event (shown in column (2)), we find consistent results.

Table 2. Heterogeneous Effects of Geopolitical Risks on Firms' Stock Returns Depending on Firms' Trade Links to Korea

	(1)	(2)	(3)	(4)	(5)
	Panel A: CAPM Adjusted CAR				
	Jan 2nd	Feb 9th	Apr 27th	May 22th	June 12th
Trade Link	0.833**	1.106***	0.302	0.976***	0.799***
	(2.46)	(3.47)	(0.83)	(3.40)	(2.77)
Size	-0.188***	-0.011	-0.195***	0.044	0.001
	(-3.30)	(-0.20)	(-3.16)	(0.90)	(0.02)
Leverage	0.710*	0.738**	0.562	-0.544*	-0.262
	(1.92)	(2.12)	(1.40)	(-1.72)	(-0.83)
Tobin's Q	0.014	-0.071	0.039	0.036	0.123***
	(0.27)	(-1.50)	(0.73)	(0.83)	(2.87)
Cash	-1.522***	0.766*	0.099	-0.354	0.693*
	(-3.26)	(1.74)	(0.20)	(-0.89)	(1.74)
Observations	3167	3137	3086	3095	3089
R-Squared	0.093	0.039	0.034	0.045	0.054
FF48 Ind FE	Yes	Yes	Yes	Yes	Yes
	Panel B: FF Adjusted CAR				
	Jan 2nd	Feb 9th	Apr 27th	May 22th	June 12th
Trade Link	0.802**	1.116***	0.277	0.961***	0.734**
	(2.37)	(3.51)	(0.76)	(3.34)	(2.57)
Size	-0.214***	-0.023	-0.184***	-0.031	0.083*
	(-3.76)	(-0.43)	(-2.97)	(-0.63)	(1.72)
Leverage	0.803**	0.711**	0.605	-0.448	-0.183
	(2.17)	(2.04)	(1.51)	(-1.41)	(-0.58)
Tobin's Q	-0.020	-0.058	0.012	0.024	0.044
	(-0.40)	(-1.23)	(0.22)	(0.56)	(1.04)
Cash	-1.397***	0.864**	-0.014	0.123	0.065
	(-2.98)	(1.97)	(-0.03)	(0.31)	(0.17)
Observations	3167	3137	3086	3095	3089
R-Squared	0.098	0.037	0.027	0.032	0.061
FF48 Ind FE	Yes	Yes	Yes	Yes	Yes

Notes: 1. Standard errors are clustered at the Fama-French 48 Industry level.
2. The t value in brackets, ***, ** and * refer to significance at 1%, 5% and 10% levels or better, respectively.

For the results regarding April 27th (shown in column (3)), although it is not as precise and quantitatively smaller, the results show that the estimated β coefficient is positive. The result suggests that the event delivered what was already expected in the market, and much of the information had been incorporated into firm value prior to the event. Policy commentators argued that the actual summit did not deliver much in the way of unexpected real policy changes. It is important to note that South Korean and North Korean leaders did not show resistance toward the taking place of the inter-Korea Summit. Both sides sent a strong signal

that this inter-Korea summit was going to be held as planned. Also, the planned summit date was announced well in advance. The results are consistent with the general consensus that the dramatic turn in the mood in January and February, and the mood of peace continued without a sharp turn till the inter-Korean Summit.

We also consider May 22, when the South Korean President Moon Jae-in visited Washington to discuss the dealing with North Korea and details about the possible summit between North Korea and the U.S. We find the sign of β coefficient to be positive the statistically significant. There were cancellation threats going on from both sides between North Korea and the U.S., and there was a high level of uncertainty regarding the happening of the Singapore summit. The summit and high-level meeting between South Korea and the U.S. seemed to succeed to send the signal to the market that the Singapore summit can happen.

Lastly, we find consistent results using the event on June 12. In Column (5), we show that firms with trade linkages to Korea gain value when the peace talks between North Korea the U.S. alleviated geopolitical tension in the Korean peninsula. As discussed above, the strong results are consistent with the context that there existed a high level of uncertainty about the occurrence of the Singapore summit.

4.2. Analysis Considering Hedging Policies

The literature suggests that FX derivatives are not as effective when project horizon is long (Kim Young-Sang, Mathur and Nam Jou-Ahn, 2006) or the uncertainty of quantity of demand is high (Chowdhry and Howe, 1999). In markets in which shocks are hard to predict, risk management tools are financially costly (Rampini, Sufi and Viswanathan, 2014), or risk management tools are illiquid or less standard, hedging strategies may not be optimal for firms, which may be particularly relevant for policy uncertainty derivatives.

Based on this strand of literature and line of reasoning, we hypothesize that firms' hedging activities regarding foreign exchange movements may not be able to fully absorb shocks to geopolitical uncertainty. When FX hedges are effective against geopolitical uncertainty shocks, we would expect the valuations of hedging firms are less sensitive to changes in geopolitical risks.

We find results that are highly consistent with the main findings. In Table 3, we present the results after we consider firms' FX hedging activities. We document that shocks to geopolitical risks affect firm value even when firms engaged in FX derivatives hedging. The firms that are linked to Korea through the global value chain experience sharp price appreciation when the geopolitical tensions are relieved and peace talks proceed.

Even for U.S. firms with significant risk management tools in place, the coefficients β remain positive and statistically significant, suggesting that it is difficult to diversify away from geopolitical uncertainty. When we consider the magnitude of estimated coefficients on trade linkages and the interaction terms with FX hedge, we observe trade linkages have an overall positive value impact. The effect of FX hedge is mostly insignificant. We find negative coefficients on interaction term for February and June events, which implies a partial hedging effect of FX derivates in response to the alleviated geopolitical risk for firms that have direct trade links to Korea. The total effects of trade linkages remain positive. The results suggest geopolitical risks are distinct from exchange rate risk. Overall, the results support the hypothesis that geopolitical uncertainty on the Korean peninsula is priced and the benefits of FX hedges against geopolitical risks are limited.

Table 3. Assessing the Risk-mitigating Effects of Foreign Exchange Hedges

	(1)	(2)	(3)	(4)	(5)
	Panel A: CAPM Adjusted CAR				
	Jan 2nd	**Feb 9th**	**Apr 27th**	**May 22th**	**June 12th**
Trade Link	1.223*	2.013***	-0.332	1.447***	2.261***
	(1.93)	(3.38)	(-0.55)	(2.64)	(4.14)
Trade Link × FX Hedge	-0.572	-1.251*	0.331	-0.650	-2.023***
	(-0.77)	(-1.80)	(0.47)	(-1.02)	(-3.20)
FX Hedge	0.288	0.086	-0.203	0.113	0.318*
	(1.29)	(0.41)	(-0.97)	(0.59)	(1.67)
Size	-0.206***	-0.011	-0.151***	0.038	-0.014
	(-3.49)	(-0.19)	(-2.71)	(0.76)	(-0.27)
Leverage	0.721*	0.752**	0.072	-0.532*	-0.226
	(1.95)	(2.16)	(0.21)	(-1.68)	(-0.71)
Tobin's Q	0.014	-0.069	0.036	0.036	0.124***
	(0.28)	(-1.47)	(0.76)	(0.84)	(2.90)
Cash	-1.567***	0.767*	0.329	-0.364	0.665*
	(-3.34)	(1.74)	(0.75)	(-0.92)	(1.66)
Observations	3167	3137	3087	3095	3089
R-Squared	0.093	0.040	0.048	0.045	0.058
FF48 Ind FE	Yes	Yes	Yes	Yes	Yes
	Panel B: FF Adjusted CAR				
	Jan 2nd	**Feb 9th**	**Apr 27th**	**May 22th**	**June 12th**
Trade Link	1.238*	2.001***	-0.289	1.443***	2.360***
	(1.95)	(3.36)	(-0.48)	(2.63)	(4.36)
Trade Link × FX Hedge	-0.638	-1.220*	0.185	-0.667	-2.246***
	(-0.86)	(-1.76)	(0.26)	(-1.05)	(-3.58)
FX Hedge	0.302	0.078	-0.173	0.129	0.337*
	(1.36)	(0.37)	(-0.83)	(0.68)	(1.79)
Size	-0.234***	-0.023	-0.188***	-0.037	0.068
	(-3.95)	(-0.41)	(-3.38)	(-0.74)	(1.36)
Leverage	0.815**	0.724**	0.250	-0.436	-0.143
	(2.20)	(2.08)	(0.71)	(-1.38)	(-0.45)
Tobin's Q	-0.020	-0.057	-0.030	0.024	0.046
	(-0.39)	(-1.20)	(-0.64)	(0.57)	(1.08)
Cash	-1.444***	0.867**	0.475	0.109	0.038
	(-3.07)	(1.96)	(1.08)	(0.27)	(0.10)
Observations	3167	3137	3087	3095	3089
R-Squared	0.099	0.038	0.048	0.032	0.065
FF48 Ind FE	Yes	Yes	Yes	Yes	Yes

Notes: 1. Standard errors are clustered at the Fama-French 48 Industry level.
2. The t value in brackets, ***, ** and * refer to significance at 1%, 5% and 10% levels or better, respectively.

4.3. Analysis Considering Input Purchases and Output Sales

A country participates in the international trade networks in two ways: importing intermediate goods for the production of exports and exporting intermediate goods for the production of exports by other countries (Hummels, Ishii and Yi, 2001). Motivated by this classification, we decompose our trade links measure into two components, namely, output sales to Korea and input purchases from Korea. This corresponds to exports to Korea and imports from Korea.

Table 4. Heterogeneous Effects of Geopolitical Risks on Firms' Stock Returns Depending on Firms' Export Relationship with Korea

	(1)	(2)	(3)	(4)	(5)
	Panel A: CAPM Adjusted CAR				
	Jan 2nd	**Feb 9th**	**Apr 27th**	**May 22th**	**June 12th**
Output Link	0.219	1.404***	0.251	1.200***	0.999***
	(0.58)	(3.98)	(0.62)	(3.76)	(3.13)
Size	-0.179***	-0.010	-0.194***	0.044	0.001
	(-3.15)	(-0.20)	(-3.14)	(0.92)	(0.02)
Leverage	0.695*	0.747**	0.561	-0.535*	-0.254
	(1.88)	(2.15)	(1.40)	(-1.69)	(-0.80)
Tobin's Q	0.009	-0.072	0.038	0.034	0.122***
	(0.17)	(-1.53)	(0.71)	(0.80)	(2.85)
Cash	-1.480***	0.761*	0.104	-0.356	0.689*
	(-3.16)	(1.73)	(0.21)	(-0.90)	(1.73)
Observations	3167	3137	3086	3095	3089
R-Squared	0.091	0.040	0.034	0.046	0.055
FF48 Ind FE	Yes	Yes	Yes	Yes	Yes
	Panel B: FF Adjusted CAR				
	Jan 2nd	**Feb 9th**	**Apr 27th**	**May 22th**	**June 12th**
Output Link	0.175	1.416***	0.222	1.174***	0.931***
	(0.46)	(4.02)	(0.55)	(3.68)	(2.94)
Size	-0.206***	-0.023	-0.182***	-0.030	0.083*
	(-3.61)	(-0.42)	(-2.95)	(-0.61)	(1.72)
Leverage	0.789**	0.720**	0.604	-0.440	-0.175
	(2.13)	(2.07)	(1.51)	(-1.39)	(-0.56)
Tobin's Q	-0.025	-0.060	0.011	0.023	0.043
	(-0.50)	(-1.26)	(0.20)	(0.53)	(1.02)
Cash	-1.355***	0.859*	-0.008	0.121	0.062
	(-2.89)	(1.96)	(-0.02)	(0.31)	(0.16)
Observations	3167	3137	3086	3095	3089
R-Squared	0.097	0.038	0.027	0.033	0.062
FF48 Ind FE	Yes	Yes	Yes	Yes	Yes

Notes: 1. Standard errors are clustered at the Fama-French 48 Industry level.
2. The t value in brackets, ***, ** and * refer to significance at 1%, 5% and 10% levels or better, respectively.

Our results in Tables 4 and 5 show that both import and export linkages serve as critical nexus of transmitting geopolitical risks. We estimate the model (1) with Trade Link replaced by either input or output link variable. When we examine the results closely, U.S. firms purchasing inputs from Korea seem to show more immediate reactions during the progress made toward peace talks. This can be due to the reason that firms importing goods from Korea are more likely to face potential changes in tariffs or input price changes earlier than firms exporting goods to Korea. Purchasing of inputs should take place earlier than collecting sales from selling products to Korea. We postulate that this timing gap between buying inputs and selling products can affect the announcement returns reactions that we observe in the tests.

Table 5. Heterogeneous Effects of Geopolitical Risks on Firms' Stock Returns Depending on Firms' Import Relationship with Korea

	(1)	(2)	(3)	(4)	(5)
	Panel A: CAPM Adjusted CAR				
	Jan 2nd	Feb 9th	Apr 27th	May 22th	June 12th
Input Link	1.737***	0.814**	0.557	0.844**	0.354
	(4.09)	(2.03)	(1.22)	(2.35)	(0.98)
Size	-0.190***	-0.003	-0.196***	0.050	0.009
	(-3.35)	(-0.05)	(-3.18)	(1.04)	(0.18)
Leverage	0.727**	0.729**	0.566	-0.554*	-0.278
	(1.97)	(2.09)	(1.41)	(-1.75)	(-0.87)
Tobin's Q	0.012	-0.077	0.039	0.031	0.118***
	(0.24)	(-1.62)	(0.71)	(0.72)	(2.76)
Cash	-1.562***	0.793*	0.089	-0.338	0.723*
	(-3.35)	(1.80)	(0.18)	(-0.85)	(1.81)
Observations	3167	3137	3086	3095	3089
R-Squared	0.096	0.036	0.034	0.043	0.052
FF48 Ind FE	Yes	Yes	Yes	Yes	Yes
	Panel B: FF Adjusted CAR				
	Jan 2nd	Feb 9th	Apr 27th	May 22th	June 12th
Input Link	1.736***	0.826**	0.532	0.869**	0.260
	(4.08)	(2.06)	(1.17)	(2.41)	(0.72)
Size	-0.217***	-0.015	-0.184***	-0.024	0.091*
	(-3.83)	(-0.27)	(-2.99)	(-0.50)	(1.88)
Leverage	0.821**	0.702**	0.610	-0.458	-0.199
	(2.22)	(2.01)	(1.52)	(-1.44)	(-0.63)
Tobin's Q	-0.022	-0.064	0.011	0.020	0.040
	(-0.43)	(-1.36)	(0.21)	(0.46)	(0.94)
Cash	-1.439***	0.891**	-0.024	0.137	0.096
	(-3.08)	(2.03)	(-0.05)	(0.34)	(0.24)
Observations	3167	3137	3086	3095	3089
R-Squared	0.101	0.034	0.027	0.030	0.059
FF48 Ind FE	Yes	Yes	Yes	Yes	Yes

Notes: 1. Standard errors are clustered at the Fama-French 48 Industry level.
2. The t value in brackets, ***, ** and * refer to significance at 1%, 5% and 10% levels or better, respectively.

5. Conclusion

We study whether and how U.S. firms' valuation changes in response to geopolitical uncertainty in the Korean peninsula. We focus on a set of milestone events regarding the peace talks move in the Korean peninsula in 2018. This news received extensive media coverage, as the previous Korean Summit had been held in 2007, and an inter-Korean summit had not been held for more than a decade. In stark contrast to 2016 and 2017, the Korean EPU index shows a sharp drop in January of 2018.

Making use of firm-level data of import and export of goods between Korea and U.S., we study the value implication of these trade linkages when unexpected shocks to geopolitical uncertainty occur. Since Korean firms are well integrated into the global value chain networks, we find that geopolitical events significantly affect the valuation of firms connected through the global value chain. We also find that the effectiveness of FX hedges against geopolitical risks is limited.

Using geopolitical events that altered the level of geopolitical tension and uncertainty in Korea, we show that unanticipated changes in policy uncertainty affect stock prices depending on firms' connectedness to Korea. We document heterogeneous return responses at the firm- level depending on the trade linkages to the Korean market. Even when we consider the corporations' FX hedges, we find that geopolitical risk is priced in the market and travels across borders. Our results suggest geopolitical risk to be an important factor in the construction of the global value chain.

Appendix

We mainly focus on events during 2018, since the geopolitical atmosphere showed a sharp turn compared to 2017. Although there was a continuation of increased geopolitical tensions throughout 2017, we now examine CAR reactions surrounding some important missile testing events in 2017. On April 15, 2017, North Korea launched a missile. Important news on April 15 was that the U.S. National Security Advisor said: "all options are on the table" as possible actions. Also, U.S. Vice President Pence said "Pence again stated that "the era of strategic patience is over."

On Nov. 28, North Korea fired an intercontinental ballistic that flew higher and longer than any previous launches. The missile landed near Japan's exclusive economic zone. The finding confirms our main results. When geopolitical risks are heightened, we see that firms with trade linkages to Korea exhibit negative return reactions.

Table A.1. Heterogeneous Effects of Geopolitical Risks on Firms' Stock Returns Depending on Firms' Trade Links to Korea - Surrounding Missile Launches in 2017

	(1)	(2)
	Panel A: CAPM Adjusted CAR	
	April 15th	**Nov 28th**
Trade Link	-0.613*	-1.214***
	(-1.79)	(-3.21)
Size	0.037	0.434***
	(0.64)	(6.81)
Leverage	-0.032	-1.182***
	(-0.09)	(-2.86)
Tobin's Q	0.012	0.023
	(0.22)	(0.41)
Cash	1.638***	-2.941***
	(3.46)	(-5.62)
Observations	3328	3172
R-Squared	0.042	0.145
FF48 Ind FE	Yes	Yes
	Panel B: FF Adjusted CAR	
	April 15th	**Nov 28th**
Trade Link	-0.612*	-1.140***
	(-1.79)	(-2.95)
Size	0.070	0.412***
	(1.21)	(6.31)
Leverage	0.062	-1.455***
	(0.17)	(-3.45)
Tobin's Q	-0.016	0.153***
	(-0.31)	(2.66)
Cash	1.398***	-2.563***
	(2.95)	(-4.79)
Observations	3328	3172
R-Squared	0.034	0.133
FF48 Ind FE	Yes	Yes

Notes: 1. Standard errors are clustered at the Fama-French 48 Industry level.
2. The t value in brackets, ***, ** and * refer to significance at 1%, 5% and 10% levels or better, respectively.

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