Finance and Economics Discussion Series
Divisions of Research & Statistics and Monetary Affairs
Federal Reserve Board, Washington, D.C.

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2016-037

Please cite this paper as:
Gerlach, Jeffrey R. and Youngsuk Yook (2016). "Political Conflict and Foreign Portfolio Investment: Evidence from North Korean Attacks," Finance and Economics Discussion Series 2016-037. Washington: Board of Governors of the Federal Reserve System, http://dx.doi.org/10.17016/FEDS.2016.037.

Political Conflict and Foreign Portfolio Investment: Evidence from North Korean Attacks

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April 2016

ABSTRACT

We examine the response of foreign (i.e., non-South Korean) investors to escalating political conflict and its impact on the South Korean stock market surrounding 13 North Korean military attacks between 1999 and 2010. Using domestic (i.e., South Korean) institutions and individuals as benchmarks, we evaluate the trading behavior and performance of foreign investors. Following attacks, foreigners increase their holdings of Korean stocks and buy more shares of risky stocks. Performance results show foreigners maintain their pre-attack level of performance while domestic individuals, who make the overwhelming majority of domestic trades, perform worse. In addition, domestic institutions improve their performance. Overall, the results are consistent with the predictions based on the benefits of international diversification. Unlike domestic individuals, foreigners trade more shares than usual and deviate from their general strategy of positive feedback trading.

Keywords: Political conflict; Foreign portfolio investment; North Korean attacks

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1. Introduction

Emerging market economies command increasingly greater weight in foreign investment portfolios, making foreign investors more susceptible to the risks associated with politically or economically fragile regimes. Political conflicts are common in many areas of the world, including large parts of Africa, Asia, and the Middle East. Accordingly, a growing literature has examined the economic effect of war, terror, and more generally, political instability, providing insight into the impact of political conflicts on the economy and financial markets.[1] However, previous studies tend to focus on the aggregate effect and do not distinguish the roles played by foreign and domestic investors. A host country's political risk may have different implications for foreign investors than for domestic investors, leading them to respond differently. Thus, the role foreign investors play in the local equity market subsequent to political conflicts can be very different from what is implied by the effects aggregated over all investor types. The literature on international capital flows suggests that foreign and domestic investors can be motivated by different factors (e.g., Forbes and Warnock, 2012; Rothenberg and Warnock, 2011). A decomposition into foreign and domestic investors not only provides insight into foreign portfolio investment decisions but also has policy implications in that a different policy response may be required depending on whether an observed pattern is driven by foreigners or domestic investors. Our study attempts to fill this gap in the literature by analyzing the behavior of foreign (i.e., non-South Korean) investors separately from that of domestic (i.e., South Korean) investors surrounding events that escalate geopolitical risk on the Korean peninsula.

Since the Korean War ceased in 1953 without a peace treaty,[2] North Korea has intermittently initiated military conflicts such as border fights and naval battles. These abrupt attacks raise concerns about the possibility of an all-out war between the two Koreas. Increased instability in the region can discourage corporate investment and domestic consumption, which in turn can hurt equity markets. According to the *Wall Street Journal*, political instability is one of the reasons why Korean stocks trade at the lowest valuation among Asia's major markets – about eleven times expected earnings in 2010.[3] However,

[1] See Section 2 for a review of relevant literature.

[2] The Korean War started when North Korea invaded South Korea in 1950. Fighting ceased in 1953 with an armistice that restored the border between the two Koreas near the 38th Parallel and created the Korean Demilitarized Zone (DMZ), a buffer zone between the two Koreas. Technically, the two Koreas are still at war.

[3] *The Wall Street Journal Online*, Mohammed Hadi and James Simms, "As ties go south, Korean investors shrug," 24 November 2010.

North Korean risk is not limited to domestic investors in the Korean markets. The reclusive state also poses a potentially serious threat to neighboring countries such as Japan and Taiwan. Furthermore, today's interconnected economies and well-diversified foreign portfolio investment imply that North Korea poses real political risk to many investors around the world. Indeed, Nomura Securities ranked the inter-Korean tension as the world's 5th most serious geopolitical risk in 2012.[4]

The conflict between South Korea and North Korea presents a unique setting to study the impact of political risk on stock markets. First, the timing of the North Korean attacks is largely exogenous from the perspective of investors. As we discuss in Section 3.3, the attacks are to some extent predictable, but there is still a lot of uncertainty about their exact timing and magnitude. Unlike some cases of increased political risk in which economic factors may have contributed to the political conflict, the attacks seem to be driven mostly by internal political processes in North Korea. Given that the country is insulated from the rest of the world, it is highly unlikely the timing of the attacks is influenced by developments in the South Korean stock market. Second, political events around the world tend to be unique in nature and one-off developments, making it difficult to obtain reliable results based on an extended period of time-series data. North Korean attacks are different in that they are recurring events with 13 attacks during the sample period of 12 years. Third, unlike many political crises in which the precise starting date is hard to pinpoint (e.g., Willard, Guinnane, and Rosen (1996) and Zussman, Zussman, Nielsen (2008)), these military attacks are observable; thus the exact timing of attacks can be identified.

Our investigation uses a novel data set. The Korean stock market makes publicly available daily transactions data aggregated by three investor types: foreigners, domestic institutions, and domestic individuals. The breakdown into different investor types allows us to analyze the difference in difference by evaluating foreigners' behavior before and after the attacks relative to that of domestic investors. Because foreign investors tend to be large institutions, having two sets of benchmarks, domestic institutions and domestic individuals, also helps pin down whether the observed trading patterns of foreigners are attributable to foreign characteristics or institutional characteristics. In addition, the Korean stock market is an attractive testing ground for several reasons. First, the market imposes no restrictions on foreign ownership during our sample period of 1999 through 2010. Second, the market has a high level of foreign participation with foreign ownership representing 32.9% of total market

[4]Nomura Securities International Inc., 2011, Global FX Outlook 2012.

capitalization in the KOSPI market, South Korea's main stock exchange in 2010 year-end. Third, the Korean stock market is large and liquid, with its annual turnover the 9th highest in the world and its total market capitalization the 17th highest in 2011. In sum, we have a unique setting for testing how foreign investors respond to unexpected and repeating political conflicts.

Since our analysis is primarily focused on the response of foreign investors, it requires a sample of stocks with nontrivial foreign ownership. While the average foreign ownership stake in Korean stocks is high, the size of foreign ownership varies substantially across stocks. Kang, Lee, and Park (2010), for example, document that half of the stocks listed on the Korea Stock Exchange have foreign ownership of less than 1% for the 2000-2004 period. As such, an equal treatment of all Korean stocks cannot provide an accurate assessment of the behavior of international investors. We consider stocks that were included in the Morgan Stanley Capital International (MSCI) Korea index in 2010 because having greater representation in the MSCI Index tends to drive investment by foreigners (Ferreira and Matos, 2008). Excluding the stocks with missing transactions information results in the final sample of 53 Korean stocks. The 53 sample stocks, which constitute more than half of KOSPI's total market capitalization, closely track the market around the attacks. The KOSPI and sample stock average daily returns are –0.78% and –0.85%, respectively, on attack days. In dollar terms, KOSPI's market capitalization drops by an average of $4 billion, roughly 0.5% of the country's GDP, on days of North Korean attacks during our sample period. This is substantial considering that it represents a drop in one day. Not surprisingly, regression analysis reveals that the sample stock returns become positively correlated with the size of stocks following attacks, suggesting flight to safety.

We use this unique setting to understand what drives foreign investors' trading strategies and performance during attacks. The home bias literature suggests that local investors are endowed with superior information about companies located in close geograpahic proximity, and that this information asymmetry leads to a bias in their investment portfolios (e.g., Brennan and Cao, 1997; Gehrig, 1993; Coval and Moskowitz, 1999, 2001). Kang and Stulz (1997) further show that home bias may manifest in a foreign country in the form of higher holdings of large firms by foreign investors than suggested by market portfolios. That is, domestic investors may have more information about the companies headquartered in Korea, allowing them to evaluate the effect of political risks on operations and profits of these firms better. We then would expect foreigners to reduce the size of their Korean portfolios

following attacks, and to shift their portfolio weights among Korean stocks toward larger firms where the information asymmetry problem is less severe. Alternatively, foreigners may demand more risky stocks to realize the well-documented benefits of international diversification.[5] Foreigners are better positioned to bear the risk associated with an escalating geopolitical conflict because Korean stocks are likely to have relatively small weights in their international investment portfolios. Domestic investors' portfolios, on the other hand, are likely to be highly concentrated on Korean assets such as houses and human capital. Thus, the hypothesis implies that foreigners buy more Korean stocks on net after the North Korean attacks. Also, they are likely to receive a premium for bearing additional political risk according to the standard risk-return tradeoff.

We document three main findings. First, the trading volume analysis shows that foreign investors increase their holdings of the sample stocks after the attacks while domestic individuals, who account for over 80% of domestic trades, withdraw from the market, and domestic institutions hold a middle ground. Foreigners are also the only net sellers of high export-to-sales stocks on attack days. Firms that have a substantial share of revenues coming from overseas are likely to be less affected by local political conflicts. Thus, these patterns can be interpreted as foreigners generally assuming more political risk, consistent with the international diversification hypothesis. Furthermore, foreign investors become net buyers of high book-to-market stocks after the attacks. The willingness of foreigners to buy value stocks is consistent with the view that foreigners are better able to bear increases in political risk to the extent that book-to-market ratios are associated with risk factors (e.g., Fama and French, 1992, 1993).

Second, we examine whether foreigners outperform domestic traders following attacks. We evaluate performance by measuring the buy ratio, which is defined as the fraction of future winners (the stocks with the highest future returns) and future losers that an investor group buys on a given day. Essentially, we evaluate each investor group's ability to pick winners and avoid losers. We find that foreigners' performance neither improves nor deteriorates while domestic individuals perform worse and domestic institutions improve their performance significantly following attacks. On a broader level, this is consistent with the international diversification hypothesis in that foreigners, who bear additional risk following attacks, perform better than an average domestic trader (note that domestic individuals make up the overwhelming majority of domestic trading volume). On a more granular level, however,

[5] See Section 4.2 for more detail.

the breakdown into domestic institutions and individuals produces mixed results. Because foreigners are mostly institutional investors, comparing foreigners with domestic institutions in particular may be more relevant when it comes to evaluating their relative information advantage. Domestic institutions' superior performance suggests that domestic institutions are more informed than foreigners, providing support for the home bias hypothesis.

Finally, we examine whether foreign investors tend to destabilize domestic equity markets following an increase in geopolitical risk. We consider the well-documented strategy of positive-feedback trading in the international finance literature, which refers to buying past winners and selling past losers. This strategy can contribute to short-term price destabilization because negative post-attack market returns would induce positive feedback traders to sell more shares, which in turn puts downward pressure on prices, destabilizing the market further in the short run (De Long, Shleifer, Summers, and Waldmann, 1990). If foreigners engage in positive feedback trading following the attacks, their trading would contribute to destabilization by magnifying the initial price decreases caused by the attacks. We find that foreign investors generally employ a positive feedback strategy in the Korean market, but that they do not on the days of North Korean attacks. Combined with the earlier evidence that foreigners' total and net trading volume increases following attacks, the results suggest foreigners are unlikely to destabilize the market.

Overall, these attack-day changes in foreigners' trading pattern and performance are consistent with the international diversification hypothesis where foreigners update their risk assessment of Korean stocks upon attacks and trade to rebalance their portfolios accordingly. These patterns are also consistent with unsophisticated domestic individuals overreacting to the attacks and foreign investors trading to take advantage of the response of domestic individuals. Our results are robust to various sensitivity checks including comparing subsamples, examining different investment horizons for future returns, replacing the raw returns with market-adjusted returns, and making exchange rate adjustments. Furthermore, the documented effects are stronger for more severe attacks proxied by lower attack-day market returns, suggesting that confounding effects are not likely driving the results. However, we note a caveat that our study does not address possible short-sale activities around attacks, which may affect the attack-day trading strategies.

The rest of the paper proceeds as follows. Section 2 reviews the literature and discusses our contribution. Section 3 provides institutional details on the Korean stock market, summary statistics of our sample stocks, and a description of the North Korean attacks. Section 4 examines the changes in trading patterns of the three investor groups around attacks and Section 5 analyzes the performance results. Section 6 examines whether foreigners' post-attack trading activities contribute to destabilizing the market. Section 7 provides various robustness checks, and Section 8 concludes.

2. Literature Review

This study adds to the growing literature on the economic consequences of political conflicts. Eckstein and Tsiddon (2004) model the effect of terror on the economy and find that terror leads to lower output and welfare in equilibrium. McCandless (1996) presents a model in which military events during the U.S. Civil War are shown to be important in describing the movements of the prices of money in both the northern and southern states. Martin, Mayer, and Thoenig (2008) analyze theoretically and empirically the relationship between military conflicts and trade.

Empirically, many researchers have implemented event-study methodologies to investigate the economic consequences of military or terrorist attacks. For instance, Eldor and Melnick (2004) analyze how stock and foreign exchange markets react to terror that occurs in Israel. Abadie and Gardeazabal (2003) estimate the economic costs of the terrorist conflict in the Basque Country in Spain. Bram, Orr, and Rapaport (2002) estimate the cost of the September 11 attack on New York City. Nordhaus (2002) and Davis, Murphy, and Topel (2009) estimate the costs of the war with Iraq. Amihud and Wohl (2004) and Rigobon and Sack (2005) examine the impact of the war with Iraq on financial variables such as stock prices, bond spreads, oil prices, and exchange rates. Fisman, Hamao, and Wang (2013) analyze stock market responses to episodes of hostility between China and Japan.

More broadly, Chen and Siems (2004), Chesney, Reshetar, Karaman (2010), and Karolyi and Martell (2010) document the effect of various terrorist and military attacks on global capital markets. Using a panel of 177 countries, Blomberg, Hess and Orphanides (2004) compare the macroeconomic consequences of terrorism with those of other types of conflict such as external wars or internal con-

flict. Glick and Taylor (2010) study the effects of war on bilateral trade. Karolyi (2006) provides an overview of the consequences of terrorism for financial markets.

Several papers have examined the Korean stock market response to North Korean military actions, or more broadly, to news about North Korean developments. Ahn, Jeon, and Chay (2010) find that the Korean stock market reacts significantly to news related to the inter-Korean relations. Lee (2006) focuses on the news about North Korea's nuclear weapons and finds similar results. Pak et al. (2015) examine the Korean stocks listed on the New York Stock Exchange and document that news related to North Korea have a significant impact on the volatility of these stocks. Nam (2002) and Kim (2011), on the other hand, document insignificant price responses to major North Korean developments.

While these studies focus on the aggregate effects of political conflicts, we focus on the differences in the response across different investor types. Foreign and domestic investors can be motivated by different factors, thus responding differently to political conflicts. A decomposition of foreign and domestic investors sheds light on how geopolitical risk affects foreign portfolio investment decisions. The disaggregate level analysis also has policy implications in that a different policy response may be required depending on whether an observed pattern is driven by foreign or domestic investors. Our study highlights that foreign investors perceive North Korean risk differently from domestic investors and respond differently. Our work complements Kim and Jung (2014), who analyze intraday trading and short-sale activities. They document a negative post-attack return on the Korean stock market as well as a significant increase in short-sale activities by some foreign investors in the days leading up to the attacks.

3. Data Description

3.1. The Korean Stock Market

The Korean stock market offers several advantages as an empirical setting for the study of international equity investment. First, the market makes available daily transactions and ownership data aggregated by three investor types – foreigners, domestic institutions, and domestic individuals. Thus, the data allow us to evaluate the response of foreign investors to attacks using domestic investors as bench-

marks. A further distinction between domestic institutions and domestic individuals helps us understand whether observed foreign trading patterns stem from foreign attributes or institutional attributes. Given that foreign investors tend to be large institutions,[6] their trading patterns in the Korean market may manifest both foreign and institutional traits.

Second, the Korean market imposes no restrictions on foreign ownership for our sample period. The Korean market was first open to foreign investors in January 1992 with certain ownership restrictions. Initially foreign investors were not allowed to own more than 10% of a stock collectively and 3% individually. The ceilings on collective and individual foreign ownership were gradually increased over time to reach 100% in May 1998, when all ownership restrictions for foreign investors were removed.[7] Our sample period begins in 1999 to avoid a possible bias stemming from the time-varying restrictions on foreign ownership between 1992 and 1998.

Third, the Korean market shows active foreign participation. Foreign participation has rapidly increased over time, and as of year-end 2010, the number of registered foreign traders was 31,060 and their ownership stakes accounted for 32.9% of the total market capitalization in the KOSPI market.

Finally, the Korean market is liquid and sizable. Korea's stock market consists of two markets: the KOSPI market as the main stock exchange and the KOSDAQ market as a venue for small and medium sized enterprises. According to the Korea Exchange (2010), the two stock markets combined offered 1,806 listed equity issues with total market capitalization of KRW 1,240 trillion ($1,093 billion) at the end of 2010.[8] The KOSPI market comprised the majority of the total market capitalization with KRW 1,142 trillion, an amount approximately 97% of the country's GDP, with 777 listed companies. KOSPI's average daily trading volume was 381 million shares with an average daily trading value of KRW 5.6 trillion. According to the World Federation of Exchanges, the KOSPI and KOSDAQ markets combined are ranked 17th in terms of market capitalization and 9th in terms of trading volume among member exchanges (Korea Exchange, 2011).

[6] See Choe, Kho, and Stulz (1999) and Kim and Wei (2002), among others. In particular, a proprietary data set employed by Kim and Wei (2002) reveals that the majority of foreign investors in the Korean stock market are indeed institutions.

[7] The exceptions were key regulated industries such as utilities and telecommunications in which the Korean government had ownership stakes of over 30%.

[8] The dollar value was obtained using the exchange rate at the end of 2010.

3.2. Sample Firms

While foreign participation in the Korean market is substantial, the magnitude of foreign ownership varies considerably across firms. Kang, Lee, and Park (2010), for example, document that the median foreign ownership for the stocks listed on the Korea Stock Exchange is less than 1% while the mean is 11.5% for the 2000–2004 period. As such, an equal treatment of all Korean stocks cannot provide an accurate assessment of the behavior of international investors. Rather, our analysis requires a set of stocks with nontrivial foreign ownership. Thus, we consider the stocks that were included in the Morgan Stanley Capital International (MSCI) Korea index at the end of 2010. We restrict our sample to the stocks for which market data are available for the entire sample period of 1999 through 2010. These steps produce 53 stocks for our sample. We expect our sample stocks to represent well foreign trading activities in the Korean market as MSCI is a leading provider of international equity benchmarks that are widely used by institutional investors.[9] Having greater representation in the MSCI World Index is documented to drive investment by foreigners (Ferreira and Matos, 2008). For our sample stocks, we obtain daily transactions and ownership data compiled by DataGuidePro and aggregated by three investor types – foreigners, domestic institutions, and domestic individuals.[10] Our sample period begins in 1999, which ensures that our analysis does not suffer from a possible bias from the time-varying restrictions on foreign ownership that were present between 1992 and 1998. Extending the sample period to the date of financial liberalization (January 1992) would add only 7 data points to our sample while exposing the test results to possible bias due to the effect of time-varying foreign ownership limits on investment decisions.

Table 1 reports descriptive statistics by year for the 53 firms in our sample. The second column shows that average daily returns vary between -.18% and .25% from year to year. The next three columns report daily turnover averaged and summed over the sample firms each year as well as the fraction of the total constituted by foreign investors. The sum of the daily turnover across the 53 sample stocks was KRW 2.8 trillion in 2010, approximately 50% of KOSPI's total turnover of KRW 5.8 trillion in the same year. The final three columns present the year-end market capitalizations averaged

[9] Ferreira, Massa, and Matos (2010) note that 90% of international institutional equity assets are benchmarked to MSCI indices according to surveys such as the Thomson Extel Pan-European survey and the Global Equities Study. Hau, Massa, and Peress (2010) also show that the rebalancing of the MSCI Global Equity Index announced in December 2000 had a substantial influence on subsequent portfolio choices of international equity flows.

[10] Government and municipal investors are excluded from the analysis.

and summed over the sample firms as well as the fraction of market capitalization owned by foreign investors. The sum of market capitalization over the sample stocks was 608 trillion at 2010 year-end, constituting roughly 53% of KOSPI's total market capitalization. The 53 sample firms clearly overrepresent the KOSPI market in terms of market capitalization and turnover, considering that a total of 777 companies are listed in the KOSPI market. Given that large and liquid firms tend to suffer less from information frictions, information asymmetry between foreign and domestic investors is likely to be smaller in our sample, which is comprised of relatively larger stocks. Thus, if anything, our sample biases us against finding a meaningful difference between foreigners and locals, providing more conservative results.

Next, the foreign ownership statistics show that the average foreign ownership of the 53 sample firms was 23% in 1999, the first year after the removal of foreign ownership restrictions. From that point forward, foreign ownership gradually increased to a peak of 46% in 2004. At the end of 2010, foreigners in aggregate owned 37% of the total market capitalization of the 53 stocks while owning only 33% of the KOSPI market.[11] That implies that foreigners are slightly overrepresented in the sample stocks relative to the KOSPI market. Finally, the comparison of foreign ownership stakes and turnover reveals that foreigners are not frequent traders relative to domestic investors. The fraction of turnover constituted by foreign investors is smaller than the fraction of their ownership. For example, the foreigner ownership stake was 37% at year-end 2010, but the rate of turnover in that year was 23%.

3.3. Description of the North Korean Attacks

For our study, we consider North Korean attacks against South Korea over the period from 1999 to 2010. We define an attack as an event such as a border fight or naval battle in which North Korea exhibits military aggression against South Korea, resulting in the exchange of fire between the two Koreas. We also include nuclear tests, which, while not direct attacks on South Korean soil, carry an equally, if not more threatening message. Note, though, that we do not include verbal threats from North Korea in our analysis because they are very frequent, and rarely credible.

[11] KOSPI market statistics were obtained from Korea Exchange (2010).

We describe the North Korean attacks as "largely" exogenous because, although it is difficult to predict the timing and magnitude of the attacks, there is evidence that they are to a certain degree predictable. Kim, Kang, and Lee (2016) show that the tone of foreign news coverage, particularly the British press, and dates around the birthdays of North Korean top leaders are significant predictors of the attacks. The pseudo-r^2 values in their models of the timing of North Korean attacks are in the range of 5%-6%. The relatively low pseudo-r^2 values are consistent with our characterization of the attacks as largely exogenous to market participants in South Korea. Nuclear attacks in particular tend to be preceded by somewhat informed guesses by analysts and officials.[12] We address this concern by repeating the analysis excluding the two nuclear tests and find that the substantive results do not change. For example, the attack on the South Korean island of Yeonpyeong in 2010, which killed four people and left a village in flames, came as a complete surprise to South Koreans. The communist state had not attacked civilians directly since fighting during the Korean War, which ceased more than 50 years earlier.[13] North Korea's unpredictable behavior is highlighted in a recent Financial Times article, which argues that investors should be more concerned with North Korea than Iran mainly because North Korea's government is uniquely unpredictable whereas Iran's theocracy is an open book[14].

We obtained the attack information from several sources. We first searched for articles in Factiva that mention North Korean military aggression. The identified attacks were cross-examined with news articles to pinpoint the exact local time of the incidents. These steps produced a total of 13 attacks for the sample period. We double-checked the validity of our data by examining the Congressional Research Service (2007) report prepared for the U.S. Congress, which lists North Korean provocative actions through 2007. We confirmed that the attacks identified in the report are identical to our sample of attacks for the 1999–2007 period. Table 2 provides descriptions of the attacks as well as summary statistics about the stock market performance on the days of the attacks. As expected, the market suffers a sizable loss on average when attacks occur. The attack-day mean KOSPI return is -0.89% over the previous one-year mean returns, which translates into the loss of $4 billion of market capitalization on average on the days of attacks. The attack-day KOSPI returns fluctuate considerably likely due to

[12]Mullen, Jethro,"Five things to know about North Korea's planned nuclear test," *CNN*, 6 February 2013.

[13]Shin, Hae-in,"N.K. commits 221 provocations since 1953," *Korea Herald*, 5 January 2011. Note that the 221 provocations include not only physical attacks but also verbal threats.

[14]Financial Times, Ian Bremmer,"Worry more about North Korea than about Iran," 12 April 2012.

the variation in the magnitude of attacks, from as low as -2.63% (June 15, 1999) to as high as 1.62% (October 29, 2010). The 53 sample firms exhibit a similar pattern of daily returns.

If the poor market performance on attack days reflects political risk generated by the North Korean attacks, then the magnitude of the attack-day market performance should vary with the perceived degree of political risk. We utilize news coverage of attacks as a measure of perceived political risk. We use Factiva to search three major news sources, the Wall Street Journal, the Financial Times, and the New York Times, for a period of seven days after the attacks to identify articles covering those attacks. Table 2 reports the results for the two subsamples of attacks sorted according to the news article coverage. When the attacks receive more media attention (i.e., the article counts are higher than or equal to the median value), the market performance is worse with an average KOSPI return of -1.18% over the previous year. In contrast, the average KOSPI return is -0.56% over the previous year when the attacks receive less media attention. The 53 sample stocks exhibit the same pattern. The pattern in the data is consistent with our premise that the stock market performance reflects political risks associated with inter-Korean conflicts.

4. Trading Patterns and Political Risk

4.1. Stock Returns Around Attacks

We first examine the cross-section of stock returns around the attacks. Are all stocks affected uniformly or are some stocks more vulnerable to geopolitical risk than others? We investigate this question by regressing attack-day stock returns against a set of firm characteristics. The variables representing firm characteristics include size (log of market capitalization), leverage (the ratio of total liabilities to total assets minus book value of equity plus market value of equity), book-to-market ratio (book value of equity divided by the market value of equity), return on assets (net income divided by total assets), beta (estimated using weekly stock return data over the previous one-year period), and industry indicators.[15] Also included are foreign ownership stakes prior to attacks and their net trading volume on attack days. Data on firm characteristics are obtained from the KIS-Value database.

[15]The observations are classified into three industry groups: manufacturing (49% of the sample stocks), financial services (19%), and others (32%).

We also consider measures to proxy for a firm's political sensitivity. First, export/sales (the ratio of export revenues to total sales) may capture a firm's exposure to political risk because firms that have a substantial part of revenues coming from overseas are likely to be less affected by domestic events. Second, firms operating in the Kaesong Industrial Region, a special economic zone in North Korea set up by the two Koreas to promote economic cooperation, may be affected more by the tension between the two Koreas. Third, firms in the defense industry may be more sensitive to military conflicts. We construct Kaesong and Defense indicator variables according to the classifications provided by Ahn, Jeon, and Chay (2010) and Kim and Jung (2014).

The first two columns of Table 3 show the results using all stock/day observations on attack days and on pre-attack days (five trading days preceding the attacks), respectively.[16] The final column reports the differences in coefficients between the first two regressions. The results show that size (market capitalization) is not associated with returns in the pre-attack period, but become strongly correlated with returns on attack days. This change is statistically significant at the 1% level. The relatively high demand for large cap stocks following attacks is suggestive of flight to safety in response to escalating political conflict to the extent that size captures risk factors (e.g., Banz, 1981; Fama and French, 1992, 1993). Investors also shy away from financial industry stocks following attacks although the change is only marginally significant. Foreigners' net trading volume is positively related to returns on both attack and pre-attack days.

4.2. Analysis of Trading Volume

We next examine trading volume of each investor group to see whether the demand for less risky stocks documented in the previous subsection is driven by a particular investor group. The home bias literature suggests that information asymmetry leads foreigners to hold a disproportionately smaller fraction of foreign stocks (e.g., Gehrig, 1993; Brennan and Cao, 1997; Ahearne, Griever, Warnock, 2004; Portes and Rey, 2005).[17] Furthermore, the information disadvantage relative to domestic investors may lead foreigners to hold a bigger fraction of large and liquid firms in their foreign portfolios than indicated

[16] Table 3 reports the results using raw returns. The results are essentially unchanged when we use several different measures of excess returns adjusted by rolling windows of mean daily Kospi returns ranging from 10 to 90 days.

[17] Other explanations of home bias such as direct barriers to international investment are unlikely to play an important role in our within-country setting concerning a short window surrounding attacks.

by market portfolios (Kang and Stulz (1997)). We hypothesize that if domestic investors are endowed with superior information about the companies headquartered in Korea, foreigners are likely to reduce the size of their Korean portfolios following attacks and, within Korean portfolios, shift weights toward larger firms where the information asymmetry problem is less severe. North Korean actions have drawn much attention from the international community over time, including extensive international media coverage of the country. Thus, foreign investors may have the same access to information regarding the timing of North Korean attacks as domestic investors. However, domestic investors may have advantages in evaluating the effect of the attacks on companies operating locally.

On the other hand, foreigners may demand more risky stocks to realize the well-documented benefits of international diversification (e.g., Grubel, 1968; Levy and Sarnat, 1970; Solnik, 1974; Grauer and Hakansson, 1987; DeSantis and Gerard, 1997). The international diversification hypothesis implies that foreigners are better positioned to bear the risk associated with an escalating geopolitical conflict because Korean stocks are likely to have relatively small weights in their international investment portfolios.

An examination of attack-day trading volume shows that foreigners increase the size of their portfolios of the sample stocks after attacks, providing support for the international diversification hypothesis. Panel A of Table 4 reports the three investor types' average attack-day trading volume as well as their average daily volume over the five trading days preceding attacks. On the days of attacks, foreigners are net buyers of the 53 sample stocks, buying 9.4% more while selling only 4.5% more than in the days preceding attacks. Their net to total volume ratio (2.8%) is the highest of the three investor types, suggesting that foreigners are more willing to bear the additional risk of an increase in political risk. Domestic individuals become net sellers of the 53 sample stocks with the lowest net to total volume ratio of -0.5%.

The total volume result reveals a similar pattern in which foreigners step up trading on the days of attacks compared to pre-attack days while domestic individuals withdraw from the market. Foreign investors trade 7% more shares on the days of attacks relative to the previous five trading days. By contrast, domestic individuals' trading volume declines sharply (25.5%). Domestic institutions show the least change, trading less by a moderate amount of 3.1%.

We next investigate foreigners' portfolio rebalancing patterns within their Korean portfolios by regressing the net trading volume of each investor type against a set of firm characteristics. We run two sets of regressions, one for stock/day observations on attack days and the other for observations on the five trading days preceding the attacks, and compare the coefficients of the two regressions. The firm characteristic variables are defined as before. The foreign investors' previous ownership stake (%) is included as a control variable because portfolio rebalancing decisions are influenced by the level of prior portfolio holdings. The dependent variable is net trading volume transformed using the following procedure:

$$y = ln(Vol + \sqrt{1 + Vol^2}). \tag{1}$$

This variation of a log transformation preserves the negative values of net volume (Busse and Hefeker (2007)). Panel B of Table 4 presents the results. The first two columns report results for foreigners on attack and pre-attack days. The second column also reports whether the differences between the attack-day and pre-attack-day coefficients are statistically significant. The coefficients on the book-to-market ratio indicate that foreigners become net purchasers of value stocks (high book-to-market ratios) on attack days. This indicates a shift toward more risky stocks following attacks to the extent that high book-to-market ratios are associated with risk factors (e.g., Fama and French, 1992, 1993; Petkova and Zhang, 2005). While not statistically overwhelming (10%), this change is in stark contrast to the pattern exhibited by domestic individuals, who stop buying high book-to-market stocks on net after the attacks. This change exhibited by domestic individuals is statistically significant at the 5% level. As noted before, the comparison between foreigners and domestic individuals is important because domestic individuals constitute the overwhelming majority of domestic trading volume.

Also interesting is that, both on attack and pre-attack days, foreigners are net sellers of high export/sales stocks while domestic institutions are net buyers. Furthermore, foreigners are the only net sellers of geographically diversified firms on attack days. Firms that have a substantial part of revenues coming from overseas are likely to be less affected by local political conflicts. Thus, this pattern can be interpreted as foreigners generally assuming more political risk, consistent with the international diversification hypothesis. There is some evidence that foreigners avoid Kaesong stocks on pre-attack days (10% significance) but this pattern goes away on attack days. Overall, the findings suggest that

foreigners depart from their typical trading behavior in response to the inter-Korean conflict by changing the size and weights of their portfolios of the 53 sample stocks to bear more political risk, providing support for the international diversification hypothesis.

5. Investor Performance and Political Risk

This section examines changes in foreigners' performance around attacks using domestic investors as benchmarks. The international diversification hypothesis suggests that foreigners should bear additional risk following attacks and thus receive a premium while domestic individuals, who sell shares to avoid political risk, should pay a premium according to the standard risk-return tradeoff. On the other hand, the home bias literature suggests that domestic investors would perform better following attacks due to an advantage in evaluating the effect of political risk on local firms. We evaluate the performance using a buy ratio, the fraction of future winners and losers an investor group buys on a given day, similar to Grinblatt and Keloharju (2000). Performance can be measured in various ways including comparisons of portfolio returns and transaction costs.[18] Our choice of a performance measure is based on two considerations. First, since our empirical setting concerns a short window surrounding attacks, we focus on the choice of stocks that investors buy and sell on attack days. That is, we are more concerned with the *relative* change made to the portfolios on attack days than with the overall composition of the portfolios, which is highly correlated with the investors' prior ownership positions. Second, we compare an investor group's choice among the cross-section of stocks across different points in time rather than stock returns per se. Because an attack has a negative effect on stock returns on average, a time-series comparison of stock returns purchased before and after attacks may not accurately capture an investor's ability to choose stocks.

We define the buy ratio as the number of shares of firm i an investor group buys on day t divided by the total number of the firm's shares bought and sold by the same investor group on that day:

$$Buy\ Ratio_{it} = \frac{\text{Shares of Firm } i \text{ Purchased on Day } t}{\text{Shares of Firm } i \text{ Purchased on Day } t + \text{Shares of Firm } i \text{ Sold on Day } t}. \quad (2)$$

[18] Some studies examine transaction costs borne by investors (e.g., Choe, Kho, and Stulz, 2005; Dvorak, 2005), but this requires access to intra-day transactions data by investor types.

The 5-day, 20-day, and 60-day future returns are calculated for each stock *i* and each day *t* by summing the daily returns over the period from day *t*+1 to *t*+5, *t*+20, and *t*+60, respectively. For attack days, we select stock/day observations with the 100 highest and lowest returns (approximately the top 15% and bottom 15% of the 689 stock/day observations) for each of the 5-day, 20-day, and 60-day periods following the attacks. We repeat the same process for non-attack days, selecting the same proportion of stock/day observations with the highest and lowest future returns. We then calculate the mean buy ratio for winners (stocks with the highest future returns) and losers (stocks with the lowest future returns) for each of the return windows on attack and non-attack days. The longest investment horizon tracks 60 trading days following attacks, approximately three months, which should be sufficiently long given that the shock caused by attacks tends to be relatively short-lived. We evaluate the performance by the difference in buy ratios between the highest-return stocks (H) and the lowest-return stocks (L) chosen on a given day by each investor group, where the difference is denoted by $H-L$. An average buy ratio of 0.5 indicates that the performance is no better than that of a randomly selected portfolio. A buy ratio greater than 0.5 for a winner (H) or loser (L) portfolio indicates that an investor group bought disproportionately more stocks that were subsequently winners or losers. Thus, $H-L$ should be significantly positive if an investor group systematically buys a larger fraction of winners and a smaller fraction of losers.

Table 5 presents mean buy ratios for different investment horizons. For example, Panel B describes the results for the future return window of 20 trading days. The first row of Panel B shows the 20-day mean cumulative returns for the highest-return and lowest-return stocks averaged over attack days and non-attack days, respectively. The next three rows show the mean buy ratio for each of the three investor groups. The first six columns report the mean buy ratios for the highest-return and lowest-return stocks as well as $H-L$, the differences between the highest-return and lowest-return stocks for attack and non-attack days, respectively. For non-attack days, the buy ratios are close to 0.5, which means none of the three groups buys an unusually large number of shares that subsequently have extremely good or bad performance. Naturally, $H-L$ is close to 0. Foreigners, for instance, have an $H-L$ value of -0.01, which indicates that foreigners buy slightly more future losers than future winners. In general, all three investor groups have buy ratios close to 0.5 and $H-L$ differences close to 0 on non-attack days.

On attack days, however, there is a considerably more variation in the buy ratios. The first two columns of Panel B show that domestic institutions have a buy ratio of 0.58 for the winners and 0.44 for the losers. That means that, on attack days, domestic institutions buy a larger fraction of stocks that subsequently have high returns and buy a smaller fraction of stocks that subsequently have low returns. Consequently, their $H-L$ value of 0.14 on attack days represents a substantial improvement (0.11) over the value of 0.03 on non-attack days. This improvement, denoted by $Attack(H-L)-No\,Attack(H-L)$, is statistically significant at the 1% level. Foreign investors have slightly worse performance results on attack days, with the buy ratio falling to 0.50 for the highest-return stocks and rising to 0.53 for the lowest-return stocks. Overall, their ability to choose winners and to avoid losers changes little as indicated by the $Attack(H-L)-No\,Attack(H-L)$ value of -0.03, which is not significantly different from zero. Finally, domestic individuals produce the worst results of all three groups in terms of their performance relative to non-attack days. The $Attack(H-L)-No\,Attack(H-L)$ value is -0.04 and statistically significant at the 1% level. The 5-day and 60-day investment horizons exhibit similar patterns, suggesting that the findings are not sensitive to the choice of investment horizons. Domestic institutions show improvement in all three return windows, two of which are statistically significant at the 1% level. Domestic individuals show deterioration in all three windows, two of which are statistically significant at the 1% level. Foreigners hold the middle ground with statistically insignificant and economically marginal changes across all three windows.

Taken together, the results show that the foreigners' responses to attacks have very different performance consequences from those of domestic investors. Domestic individuals, who turn into net sellers following attacks, perform worse following attacks. Foreigners, who are net buyers, do not perform worse as domestic individuals do, but they do not show improvement, either. Domestic institutions improve their performance following attacks. On a broader level, this is consistent with the international diversification hypothesis in that foreigners, who bear additional risk following attacks, perform better than an average domestic trader (note that domestic individuals make up almost 86% of domestic trades on attack days). These results also suggest that domestic individuals do not have an information advantage over foreigners when it comes to evaluating the effect of North Korean attacks.[19] The results are

[19]This is consistent with the view that individual investors do not have value-relevant information about the local stocks they trade (Seasholes and Zhu, 2010)

also consistent with the view that unsophisticated domestic individuals overreact to the attacks, leading to their under-performance relative to foreign investors.

On a more granular level, however, because foreigners are mostly institutional investors, it is reasonable to compare foreigners with domestic institutions when it comes to evaluating their relative information advantage. The fact that domestic institutions improve their performance significantly following attacks while foreigners maintain the same level suggests that domestic institutions are more informed than foreigners, providing some support for the home bias hypothesis. We also note that our results are not necessarily at odds with previous studies documenting foreign investors outperforming domestic institutions (e.g., Grinblatt and Keloharju, 2000) in that we focus on particular events pertaining to political conflicts whereas the previous studies examine the performance averaged over several years of data which may not contain events associated with political conflicts.

6. Analysis of Feedback Trading Strategies

We next investigate how the response of foreigners affects the market. As documented in Section 3, foreigners buy more shares on net following attacks and trade more than usual while domestic individuals withdraw from the market as indicated by the sharp reduction (25.5%) in their total trading volume. Having relatively smaller exposure to the geopolitical risks, foreigners seem well-positioned to contribute to stabilizing the markets by sharing the risks with domestic individuals whose portfolios are more concentrated in Korean assets that include nonfinancial assets such as houses and human capital. In this section, we provide additional evidence supporting this view by analyzing the changes in foreigners' trading strategies around the attacks.

6.1. Univariate Analysis

We examine whether attacks influence foreigners' trading strategies and, in particular, the strategy of positive-feedback trading, which refers to buying past winners and selling past losers. The positive association between net equity flows and returns is one of the stylized facts in international finance. Several within-country studies document a positive feedback strategy on the part of foreign investors

in Korea (Choe, Kho, and Stulz, 1999) and in Japan (Karolyi, 2002) surrounding the Asian financial crisis in the late 1990s, and in Finland (Grinblatt and Keloharju, 2000). In addition, cross-country studies document a positive correlation between international equity flows and contemporaneous or lagged stock returns, as evidence suggestive of a positive feedback or momentum strategy (e.g., Bohn and Tesar, 1996; Brennan and Cao, 1997; Froot, O'Connell, and Seasholes, 2001).[20] Positive feedback traders can contribute to short-term price destabilization because negative post-attack market returns would induce positive feedback traders to sell more shares, which in turn puts downward pressure on prices, destabilizing the market further in the short run (De Long, Shleifer, Summers, and Waldmann, 1990). Thus, if international investors maintained their well-documented feedback trading strategy following attacks, they could exert a destabilizing influence on the Korean equity market.

We identify feedback trading patterns using the methodology of Choe, Kho, and Stulz (1999) to make our results comparable. We evaluate whether a given investor group engages in feedback trading strategies by comparing its order imbalances on a given day with its previous-day returns. The order imbalance (OI) for each firm/trading day is defined as the net buy volume divided by daily volume averaged over the ten previous trading days, where net buy volume is the number of shares bought minus the number of shares sold such that:

$$OI_{it} = \frac{\text{Shares of Firm } i \text{ Purchased on Day } t - \text{Shares of Firm } i \text{ Sold on Day } t}{\text{Average Daily Volume from Day } t\text{-10 through Day } t\text{-1}}. \quad (3)$$

Note that average daily volume is calculated excluding the attack day t because the attack-day volume may be affected by an attack. The order imbalances for attack and non-attack days are sorted separately for each of the three investor groups – foreigners, domestic institutions, and domestic individuals – into quintiles based on the previous-day returns.[21] The order imbalances are then averaged across each quintile.

Panel A of Table 6 shows the average order imbalances for the quintile portfolios formed based on the previous-day returns. On non-attack days, foreigners and domestic institutions engage in positive

[20] Replacing bilateral flow data with portfolio positions data, Curcuru, Thomas, Warnock, and Wongswan (2011) document that U.S. investors are not return chasers in foreign equity markets.

[21] The five groups are not exactly the same in size because in some cases the previous day's returns at the cutoff points for each quintile have multiple observations. We adjust the cutoff points so that all observations with the same return belong to the same portfolio.

feedback trading, buying stocks with high previous-day returns and selling stocks with low previous-day returns on net. They sell P1 and P2 stocks (the portfolios with the lower previous-day returns) and buy P4 and P5 stocks (the portfolios with the higher previous-day returns). Furthermore, their order imbalances monotonically rise from P1 to P5. Domestic individuals display the opposite pattern in which stocks with low previous-day returns are associated with large and positive order imbalances, or high net purchases, and vice versa. Since non-attack days constitute the vast majority of the sample period, we can conclude that, for our sample period, foreigners and domestic institutions are generally positive feedback traders while domestic individuals are negative feedback traders. This general pattern is consistent with the findings of Choe, Kho, and Stulz (1999), who document the trading behavior of the three investor types in the Korean market surrounding the Asian financial crisis in 1997.

The patterns change on attack days, particularly among foreign investors. Foreigners no longer pursue positive-feedback strategies. Their order imbalances are now highest among the P2 and P3 portfolios with 0.044 and 0.068, respectively, rather than among P4 and P5 portfolios. Also notable is that foreigners seem to be buying more across the board as indicated by positive order imbalances in four of the five portfolios, consistent with an increase in foreigners' net trading volume following attacks documented in Section 3. We further consider the possibility that investors base their trading strategies on longer frequencies. Previous studies have examined the feedback trading pattern in various frequencies according to their empirical settings and data availability.[22] Panels B and C of Table 6 report average order imbalances over the two-day and five-day windows, respectively, for quintile portfolios formed based on the returns over the previous two-day periods. The results are not sensitive to changes in the length of windows. Taken together, the findings suggest that foreigners' trading activities surrounding attacks are not likely to have a destabilizing effect on the Korean equity market.

Unlike foreigners, domestic individuals make little change to their usual trading strategy when attacks occur. The attack-day patterns are not monotonic and statistical significance is weaker due in part to the smaller sample size on attack days. Nonetheless, individuals continue to buy past losers (P1 and P2) and sell past winners (P4 and P5), and P5–P1 remains negative and significant across Panels

[22] For example, Choe, Kho, and Stulz (1999) examine daily frequency, Lakonishok, Shleifer, and Vishny (1992) and Wermers (1999) quarterly, and Nofsinger and Sias (1999) annual. In many cases, data availability tends to dictate the choice of frequency. In our empirical setting, a one-day window should suffice to capture the change in trading patterns surrounding North Korean attacks.

A, B, and C. Domestic institutions deviate somewhat from the monotonically increasing pattern of non-attack days but they continue to sell stocks in the two lowest-return quintiles (P1 and P2) and buy from the two highest-return quintiles (P4 and P5) across Panels A, B, and C. However, P5–P1 becomes insignificant in Panels B and C, suggesting domestic institutions deviate somewhat from their usual positive feedback trading strategies in longer windows (2-day and 5-day windows).

6.2. Regression Analysis

Next, we examine the feedback trading strategy in a multivariate setting, controlling for lagged stock returns, market returns, and USD-KRW exchange rate changes. The inclusion of market returns allows for the possibility that investors may employ a feedback trading strategy based on market returns rather than individual stock returns. Exchange rate changes are included because foreign investors generally repatriate their income and capital.[23] The regression specification is as follows:

$$\begin{aligned} OI_{it} &= \beta_0 + \beta_1 Attack_t + \beta_2 r_{i,t-1} + \beta_3 r_{i,t-1} Attack_t + \beta_4 rm_{t-1} + \beta_5 rm_{t-1} Attack_t + \beta_6 s_{t-1} \\ &\quad + \beta_7 s_{t-1} Attack_t + \beta_8 Kaesong_i + \beta_9 Kaesong_i Attack_t + \beta_{10} Defense_i \\ &\quad + \beta_{11} Defense_i Attack_t + \varepsilon_{it}, \end{aligned} \tag{4}$$

where OI_{it} is the order imbalance of firm i on day t, r_{it} is the stock return of firm i on day t, rm_t is the return on the KOSPI composite index on day t, and s_t is the USD-KRW exchange rate on day t. *Attack* is set to one on attack days and zero otherwise, Kaesong indicates whether the company has production facilities in the Kaesong Industrial Region, and Defense measures whether the company supplies materials to the Department of Defense.

Table 7 reports the results of the regressions for the three investor groups. On non-attack days, foreigners' order imbalances are positively related to lagged stock returns, r_{t-1}, but, on attack days, the coefficient on lagged returns drops by -0.600 as shown by the interaction term ($r_{t-1} \cdot Attack_t$). Also,

[23] We use the USD-KRW exchange rate because US investors constitute the largest fraction of foreign investors. Foreign investors intending to invest directly in the Korean securities market must register with the Financial Supervisory Service and obtain an Investment Registration Certificate, and the Korea Exchange (2010) reports the number of registered foreign investors by nationality at each year-end from 2000 through 2010. Among foreign investors, US nationals constitute the largest fraction of foreign investors – between 34% to 39% depending on the year. Japanese nationals are a distant second, comprising 8% to 10% of the number of registered foreign investors.

tests of linear combinations in the last two rows show that the attack-day coefficient of the stock return ($r_{t-1} + r_{t-1} \cdot Attack_t$) of 0.180 is statistically insignificant, indicating that foreigners no longer pursue their usual strategy of positive feedback trading after the attacks. Domestic investors, on the other hand, maintain their usual trading strategies on attack days. The lagged stock return variable for domestic individuals has a negative and significant coefficient both on attack and non-attack days though the coefficient is less negative on attack days (-0.810 on attack days as opposed to -1.616 on non-attack days), suggesting they engage in a contrarian strategy on attack and non-attack days alike. Similarly, the lagged stock return variable for domestic institutions has a positive and significant coefficient both on attack and non-attack days.

In sum, after controlling for market returns and exchange rate changes, the feedback trading patterns of the three investor types documented in the univariate tests in Table 6 remain unchanged. Results are also similar when contemporaneous values of returns and exchange rate variables are included to control for the effects of intra-day feedback trading (unreported). These changes in foreigners' trading patterns seem consistent with the international diversification hypothesis where foreigners update their risk assessment of Korean stocks upon attacks and trade more to rebalance their portfolios accordingly. These patterns are also consistent with unsophisticated domestic individuals overreacting to the attacks while foreign investors trade to take advantage of the response of domestic individuals following attacks.

7. Robustness Checks and Additional Analysis

7.1. Magnitude of Attacks

We conduct various robustness checks on the observed feedback trading patterns and performance results. First, Table 2 indicates that some attacks have a more detrimental impact on the market than others. If attacks caused foreigners to deviate from their usual trading pattern and performance, then we would expect more severe attacks to be associated with greater deviations from the general pattern. We test this conjecture by repeating the analysis of order imbalances and mean buy ratios on subsamples of attacks with different magnitudes. The attack-day sample is sorted into two subgroups based on the

severity of attacks, where the magnitude of attacks is proxied by the market performance on a given attack day relative to the median market return across all attack days.

Panel A of Table 8 calculates mean buy ratios for the two subsamples. The results show that the subsample of more severe attacks displays the same pattern as the attack-day pattern found in the full sample while the subsample of less severe attacks does not exhibit any statistically significant pattern. The findings are consistent with the view that the patterns in buy ratios documented in Table 5 are indeed driven by the attacks. Next, Panel B of Table 8 reports order imbalance results for the subsample analysis. As predicted, the more severe attacks (represented by the lower-than-median KOSPI return subsample) are associated with greater deviations from the feedback strategy on the part of foreigners. On the days of more severe attacks, foreigners no longer buy past winners (P5). In fact, they sell the highest-return stocks (P5) more than they sell the lowest-return stocks (P1), as indicated by their order imbalances of -0.025 for P5 and of -0.018 for P1. On the days of less severe attacks, on the other hand, foreign investors continue to buy past winners with an order imbalance of 0.033 and to sell past losers with an order imbalance of -0.007, although the magnitude of the imbalances is smaller than on non-attack days. For domestic investors, the difference in order imbalances between the days of more severe attacks and the days of less severe attacks is much smaller. Similar to the full sample results, the trading strategy of domestic investors appears to be less affected by attacks. Alternatively, we use the news coverage described in Section 2.3 as a measure of the magnitude of an attack. The subsample analysis using article counts produces similar results (unreported).

7.2. Additional Robustness Tests

We next consider the effect of changes in exchange rates on the portfolio choices of foreign investors because many foreign investors measure their returns in dollars. Table 9 shows buy ratios calculated based on the dollar returns. The overall results change little, indicating that exchange rate fluctuations do not drive the documented patterns of portfolio choices made by the three investor groups on attack days.

We also examine whether the results are driven by a subsample of a certain time period. To test this possibility, we sort the attack-day sample into two subsamples according to the chronological order of

the attacks. Table 10 reports the results. Overall, the statistical significance in the subsample analysis is lower than in the full sample analysis due to the reduction in the sample size. However, the order imbalances of foreign investors are similar across the different sub-periods. The differences in their order imbalances between past winners and past losers (P5 – P1) are 0.023 for the earlier period and 0.018 for the later period, respectively. In sum, the foreign investors' attack-day trading patterns remain fairly consistent across the sample and do not seem to be driven by trading patterns in a particular sub-period.

Finally, we note that some attacks have overlapping 60-day return windows due to short intervals between attacks. We recalculate buy ratios excluding the attacks with overlapping windows, and confirm that the results remain unchanged (unreported).

7.3. Discussion of Alternative Events

One could consider specific non-political events to evaluate whether the documented pattern is driven by the political nature of the events. For example, natural disasters such as earthquakes and typhoons are exogenous events in the sense that they are not caused by the decisions of political leaders in the countries where they occur. According to the Center for Research on the Epidemiology of Disasters,[24] South Korea had 35 incidences of natural disasters during our sample period. However, the impact of these disaster is too small to draw a meaningful inference. The average damage of the natural disasters is only $313 million. While we cannot directly measure the dollar value of damages incurred by North Korean attacks, we can take a hint from the stock market reaction. The market capitalization drops by about $4 billion on average on the days of attacks. One could also consider the Asian financial crisis in 1997. However, it is empirically challenging to establish a causal relationship because of the endogenous nature of the crisis development. Furthermore, the crisis was a one-off event so it is difficult to generalize the pattern in the data. The consideration of alternative events reinforces the fact that the North Korean attacks present a unique setting to study the effect of increases in political risk.

[24] See http://www.emdat.be/database.

8. Conclusion

We examine foreign investors' trading patterns and performance surrounding 13 North Korean military attacks against South Korea between 1999 and 2010. We document three main findings. First, following attacks, foreigners increase their holdings of the sample Korean stocks and hold more risky stocks proxied by high book-to-market ratios. Second, performance results show that foreigners maintain their pre-attack level of performance while domestic individuals, who constitute the overwhelming majority of domestic trading volume, perform much worse following attacks. Domestic institutions improve their performance. Third, foreigners' attack-day trading activities are unlikely to have a destabilizing effect on the Korean equity market. Foreigners step in to buy shares, primarily from domestic individuals, in the wake of the North Korean attacks. Foreigners trade more shares than usual while domestic individuals trade substantially less. Also, foreigners do not engage in their usual strategy of positive-feedback trading on attack days.

Overall, these results are consistent with the view that foreigners are better positioned to bear the risk associated with an escalating geopolitical conflict. Another non-mutually exclusive explanation is that foreigners trade to take advantage of unsophisticated domestic individuals overreacting to the attacks. The results also highlight that foreign investors perceive North Korean risk differently from domestic investors. Foreigners' responses to political conflict and their impact on the local market are very different from those of domestic investors, highlighting the importance of a separate analysis for foreign and domestic investors.

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Table 1
Summary Statistics

This table provides descriptive statistics for our sample of 53 stocks by year from 1999 through 2010. The second column reports the daily returns averaged over the 53 sample firms each year. The next three columns report the daily turnover averaged and summed over the sample firms as well as the fraction of total turnover accounted for by foreign investors. Turnover (unit: KRW billions) is defined as the number of shares traded multiplied by the price at which the shares are traded. The final three columns present the year-end market capitalizations averaged and summed over the sample firms as well as the fraction of total market capitalization owned by foreign investors.

Year	Mean Daily	Daily Turnover (unit: KRW billions)			Year-end Market Cap (unit: KRW billions)		
	Return (%)	Mean	Sum	Foreigners (%)	Mean	Sum	Foreigners (%)
1999	0.24	28.0	1,485.1	7.87	4,439.3	235,284.9	22.53
2000	-0.18	24.1	1,278.5	14.24	2,351.6	124,634.0	32.34
2001	0.25	19.2	1,018.3	14.65	3,067.0	162,549.8	40.25
2002	0.01	27.2	1,443.1	15.67	2,988.5	158,389.7	41.11
2003	0.19	20.8	1,102.3	19.57	4,035.6	213,886.8	44.80
2004	0.13	21.4	1,132.1	27.14	4,439.2	235,278.2	46.21
2005	0.25	27.4	1,454.8	25.41	6,583.9	348,944.4	43.06
2006	0.10	33.1	1,755.8	29.14	7,091.1	375,830.2	40.21
2007	0.23	50.3	2,668.2	29.00	9,304.1	493,116.1	34.92
2008	-0.15	49.2	2,607.8	29.56	5,902.1	312,813.1	31.78
2009	0.22	51.6	2,732.2	20.82	9,167.0	485,849.9	37.07
2010	0.12	52.8	2,796.7	23.29	11,464.8	607,636.9	37.45

Table 2
Stock Market Performance Around North Korean Attacks

This table describes the North Korean attacks on South Korea and South Korea's stock market performance on the days of attacks. The table lists all 13 attacks considered in the study and the nature of these attacks. The third column reports attack-day returns over the previous one-year returns averaged over the 53 sample stocks. If the attack occurred when the stock market was closed, the first trading day after the attack is used. The last two columns report the KOSPI (South Korea's main stock exchange) attack-day returns over the previous one-year returns as well as the change in the KOSPI's total market capitalization following attacks. The market capitalization is reported in U.S. dollars and reflects the exchange rate on the day of a given attack. The final six rows summarize the results for the two subsamples of attacks sorted on the news article coverage as well as for the full sample. We search the Wall Street Journal, Financial Times, and the New York Times in Factiva to identify the articles covering the attacks for the duration of seven days following each attack. The subsample with article counts lower than (higher than or equal to) the median includes the attacks that receive less (more) media attentions.

		Sample Firms	KOSPI	
		Mean Daily	Daily	Change in Market
Date of Attack	Nature of Attack	Return (%)	Return (%)	Cap ($ millions)
June 15, 1999	Naval Battle	-3.19	-2.63	-4,464
November 27, 2001	Border Fight	-0.59	-0.76	-1,311
June 29, 2002	Naval Battle	-0.26	0.36	1,250
July 17, 2003	Border Fight	-2.46	-2.37	-6,251
October 9, 2006	Nuclear Test	-3.33	-2.46	-16,675
August 6, 2007	Border Fight	-1.29	-1.32	-12,031
May 25, 2009	Nuclear Test	0.55	-0.13	-1,254
November 10, 2009	Naval Battle	-0.03	0.20	2,446
January 27, 2010	Artillery Battle	-0.64	-0.87	-5,564
March 26, 2010	S. Korean Naval Ship Sunk	-0.82	-0.48	-2,470
May 20, 2010	Announcement on the Ship*	-1.99	-1.90	-13,722
October 29, 2010	Border Fight	1.83	1.62	15,656
November 23, 2010	Artillery Battle	-0.99	-0.87	-7,393
Subsamples Sorted on News Article Counts				
Article Counts $<$ Median		-0.57	-0.56	-1,375
Article Counts $\geq$ Median		-1.40	-1.18	-6,219
All 13 attacks	Mean	-1.02	-0.89	-3,983
	t-stat	(-8.95)	(-2.58)	
	N	689	13	

* Although there was speculation that North Korea was involved in the sinking of the South Korean naval ship on March 26, 2010, the official investigation results announced on May 20, 2010 confirmed that North Korea is responsible for sinking the ship.

Table 3
Attack-day Return Regressions

This table presents a regression analysis of returns on attack days and pre-attack days (five trading days preceding the attacks). The daily returns of the 53 sample stocks are regressed against a set of firm characteristics. Firm characteristic variables include size (log of market capitalization), leverage ratio (the ratio of total liabilities to total assets minus book value of equity plus market value of equity), book-to-market ratio (book value of equity divided by the market value of equity), return on assets (net income divided by total assets), beta (which is estimated using weekly returns data over the previous one-year period), export/sales (the ratio of export revenues to total sales), and industry indicators. The observations are classified into three industry groups: manufacturing (49% of the sample stocks), financial services (19%), and others (32%). Also included are Kaesong and Defense indicators, foreigner ownership stakes at the end of the previous trading day, and foreign investors' net trading volume on attack days. Kaesong is set to one if the company has production facilities in the Kaesong Industrial Region, and Defense is set to one if the company supplies materials to the Department of Defense. The first column reports results using all stock/day observations on attack days. The next column presents regression results using all stock/day observations on pre-attack days. The final column reports the differences in coefficients between the first two regressions. The corresponding *t*-statistics are reported in parentheses.

	Attack Days	Pre-Attack Days	Differences
Constant	-5.167 ***	0.860	-6.028 ***
	(-3.09)	(0.96)	(-3.18)
Ln(Market Cap)	0.321 ***	-0.042	0.363 ***
	(2.94)	(-0.72)	(2.93)
Leverage	0.006	0.000	0.006
	(1.17)	(0.44)	(1.15)
Book-to-Market	-0.154	-0.066	-0.088
	(-1.04)	(-0.87)	(-0.53)
Return on Assets	-0.426	-0.354	-0.072
	(-0.54)	(-0.84)	(-0.08)
Beta	-0.210	-0.035	-0.175
	(-0.73)	(-0.23)	(-0.53)
Manufacturing	0.566 *	0.081	0.485
	(1.96)	(0.52)	(1.48)
Financial	-0.794 **	0.050	-0.844 *
	(-2.06)	(0.24)	(-1.93)
Export/Sales	-0.756	0.052	-0.808
	(-1.59)	(0.20)	(-1.50)
Kaesong	-0.086	0.078	-0.164
	(-0.29)	(0.48)	(-0.48)
Defense	0.052	0.131	-0.080
	(0.13)	(0.64)	(-0.18)
Foreigner Stake	0.004	-0.004	0.007
	(0.45)	(-0.83)	(0.79)
Foreigner Net Volume	0.044 ***	0.063 ***	-0.019 *
	(4.37)	(11.70)	(-1.65)
Adj. R^2	0.064	0.036	
N	689	3,445	

*, **, and *** indicate significance at the 10, 5, and 1 percent.

Table 4
Trading Activity Around the North Korean Attacks

Panel A reports the daily trading volume aggregated over the 53 sample stocks and averaged over the 13 attack days. Trading volume is reported for the days of attacks and the five preceding trading days by three investor types: foreigners, domestic institutions, and domestic individuals. Trading volume (unit: shares) measures the number of shares traded by each investor type. Net/Total (%) is the ratio of net volume to total volume, where net volume is the difference between buy volume and sell volume and total volume is the sum of buy volume and sell volume. The percentage change in trading volume compares the attack-day trading volume to daily trading volume averaged over the previous five trading days. Panel B presents a regression analysis of net trading volume by each of the three investor groups. The trading volume of the 53 sample stocks is regressed against a set of firm characteristic variables for stock/day observations on attack days and on pre-attack days separately, where pre-attack days are defined as five trading days preceding the attacks. The dependent variable is defined as a variation of log transformation of net trading volume as follows: $ln(Vol + \sqrt{1+Vol^2})$. The t-statistics are reported in parentheses. Also reported are the t-statistics for the differences in coefficients between attack-days and pre-attack days. Firm characteristic variables include size (log of market capitalization), leverage ratio (the ratio of total liabilities to total assets minus book value of equity plus market value of equity), book-to-market ratio (book value of equity divided by the market value of equity), return on assets (net income divided by total assets), beta (which is estimated using weekly returns data over the previous one-year period), and export/sales (the ratio of export revenues to total sales). Also included are the Kaesong and Defense indicators, foreigner ownership stake at the end of the previous trading day, and industry indicators (manufacturing, financial services, and others).

Panel A: Daily Trading Volume Averaged Over 13 Attack Days

	Buy	Sell	Total	Net/Total (%)
Foreigners				
Five previous days	152,238	150,809	303,047	0.5%
Attack days	166,570	157,624	324,194	2.8%
Changes (%)	9.4%	4.5%	7.0%	
Domestic Institutions				
Five previous days	203,895	223,845	427,740	-4.7%
Attack days	209,874	204,690	414,564	1.3%
Changes (%)	2.9%	-8.6%	-3.1%	
Domestic Individuals				
Five previous days	1,748,307	1,726,667	3,474,974	0.6%
Attack days	1,288,546	1,301,223	2,589,769	-0.5%
Changes (%)	-26.3%	-24.6%	-25.5%	

Panel B: Net Trading Volume Regressions

	Foreigners		D. Individuals		D. Institutions	
	Attack	Pre-Attack	Attack	Pre-Attack	Attack	Pre-Attack
Constant	-1.743	3.059	0.242	-7.362 **	0.772	6.028 **
	(-0.27)	(1.08)	(0.04)	(-2.47)	(0.12)	(2.06)
Ln(Market Cap)	-0.003	-0.113	-0.001	0.543 ***	-0.183	-0.456 **
	(-0.01)	(-0.61)	(-0.003)	(2.78)	(-0.43)	(-2.38)
Leverage	-0.024	-0.001	-0.012	0.001	0.029	0.001
	(-1.26)	(-0.98)	(-0.620)	(0.95)	(1.48)	(0.93)
Book-to-Market	1.062 *	0.050 ^{c}	-0.937	0.398 ^{b}	0.897	-0.814 ***^{,a}
	(1.89)	(0.21)	(-1.582)	(1.56)	(1.56)	(-3.26)
Return on Assets	1.002	-2.231 *	-6.799 **	-0.949 ^{c}	5.673 *	4.254 ***
	(0.33)	(-1.66)	(-2.153)	(-0.67)	(1.85)	(3.08)
Beta	1.442	0.047	0.347	0.090	-1.784	-0.854 *
	(1.31)	(0.10)	(0.30)	(0.17)	(-1.58)	(-1.68)
Foreigner Stake	0.002	0.002	-0.031	-0.025 *	0.035	0.002
	(0.06)	(0.18)	(-0.97)	(-1.76)	(1.12)	(0.17)
Manufacturing	1.846 *	-0.190 ^{c}	0.648	0.808	-0.740	-0.247
	(1.68)	(-0.38)	(0.56)	(1.56)	(-0.66)	(-0.49)
Financial	-1.845	-1.546 **	1.799	1.251 *	1.771	0.320
	(-1.26)	(-2.35)	(1.17)	(1.81)	(1.18)	(0.47)
Export/Sales	-5.114 ***	-1.965 **	0.136	-1.960 **	5.575 ***	3.414 ***
	(-2.83)	(-2.43)	(0.07)	(-2.31)	(3.02)	(4.10)
Kaesung	0.388	-0.840 *	0.800	0.701	-1.166	0.374
	(0.34)	(-1.65)	(0.67)	(1.31)	(-1.00)	(0.71)
Defense	1.708	0.077	0.540	-0.190	0.367	-0.403
	(1.17)	(0.12)	(0.35)	(-0.28)	(0.25)	(-0.60)
Adj. R^2	0.007	0.001	0.004	0.003	0.017	0.012
N	689	3,445	689	3,445	689	3,445

*, **, and *** indicate significance at the 10, 5, and 1 percent levels, respectively. a, b, and c denote significant differences between attack and pre-attack days at the 1, 5, and 10 percent levels, respectively.

Table 5
Buy Ratios

This table reports the buy ratios of the winners and losers selected by each investor type on attack days and non-attack days, respectively. The buy ratio is defined as follows:

$$Buy\ Ratio_{it} = \frac{\text{Shares of Firm } i \text{ Purchased on Day } t}{\text{Shares of Firm } i \text{ Purchased on Day } t + \text{Shares of Firm } i \text{ Sold on Day } t}.$$

The stock/day observations are sorted by subsequent returns over 5-day, 20-day, and 60-day windows, where the future returns are the sum of the daily returns for each stock starting from day *t+1*. For attack days, we select the 100 highest and lowest returns, which is approximately the top and bottom 15% of all observations (=100/689 attack-day observations), for each of the 5-day, 20-day, and 60-day periods. For non-attack days, we select the same fraction of observations and assign them into the highest and lowest return categories. We then calculate the mean buy ratio for each group of investors for each of the return windows on attack and non-attack days. The first two columns report, for each investor type, the mean buy ratios of the 100 highest-return stocks and of the 100 lowest-return stocks on attack days. The next column shows the difference in buy ratios between the highest-return stocks and the lowest-return stocks, which is denoted by H–L. The next three columns report the mean buy ratios and their differences (H–L) for non-attack days. The final two columns report the difference between the H–L value on attack days and the H–L value on non-attack days for each of the investor groups, which is denoted by Attack (H–L) – No Attack (H–L). The corresponding *t*-statistics are reported in parentheses.

Panel A: 5-Day Future Returns

	Attack Days			No Attack Days			Attack (H–L) –	
	Highest	Lowest	H – L	Highest	Lowest	H – L	No Attack (H–L)	
Average Return (%)	13.64	-6.93		13.09	-11.45			
Mean Buy Ratios								
Foreigner	0.51	0.46	0.05	0.51	0.51	0.00	0.03	(0.72)
Institution	0.55	0.50	0.05	0.50	0.47	0.03	0.02	(0.70)
Individual	0.46	0.50	-0.04	0.50	0.49	0.01	-0.04 ***	(-2.62)

Panel B: 20-Day Future Returns

	Attack Days			No Attack Days			Attack (H–L) –	
	Highest	Lowest	H – L	Highest	Lowest	H – L	No Attack (H–L)	
Average Return (%)	26.84	-11.06		25.99	-21.21			
Mean Buy Ratio								
Foreigner	0.50	0.53	-0.03	0.51	0.52	-0.01	-0.03	(-0.56)
Institution	0.58	0.44	0.14	0.50	0.47	0.03	0.11 ***	(3.27)
Individual	0.47	0.51	-0.04	0.49	0.49	0.00	-0.04 ***	(-2.84)

Panel C: 60-Day Future Returns

	Attack Days			No Attack Days			Attack (H–L) –	
	Highest	Lowest	H – L	Highest	Lowest	H – L	No Attack (H–L)	
Average Return (%)	46.97	-18.53		50.15	-33.82			
Mean Buy Ratio								
Foreigner	0.52	0.51	0.01	0.52	0.53	-0.01	0.01	(0.25)
Institution	0.56	0.41	0.15	0.49	0.48	0.01	0.15 ***	(4.32)
Individual	0.48	0.49	-0.01	0.49	0.49	0.00	-0.01	(-0.78)

*, **, and *** indicate significance at the 10, 5, and 1 percent levels, respectively.

Table 6
Order Imbalances of Lagged Return Portfolios

Panel A shows order imbalances for quintile portfolios formed based on stock returns on the previous trading day. The order imbalance for each firm/trading day is defined as the net buy volume divided by average daily volume over the previous ten trading days, where net buy volume is the number of shares bought minus the number of shares sold:

$$OI_{it} = \frac{\text{Shares of Firm } i \text{ Purchased on Day } t \text{ - Shares of Firm } i \text{ Sold on Day } t}{\text{Average Daily Volume from Day } t\text{-10 through Day } t\text{-1}}.$$

The order imbalances for attack and non-attack days are sorted separately for each of the three investor groups – foreigners, domestic institutions, and domestic individuals – into quintiles based on the previous-day returns. The order imbalances are then averaged across each quintile. The corresponding *t*-statistics are reported in parentheses. Panel B repeats the analysis using a 2-day window. The average order imbalances are calculated over a two-day period for the quintile portfolios formed based on stock returns over the previous two trading days. Panel C reports the average order imbalances over a five-day window for the quintile portfolios formed based on stock returns over the previous five trading days.

Panel A: 1-Day Window

Prior-Day	Order Imbalances					
Return Portfolios	Foreigners		Individuals		Institutions	
Non-Attack Days (number of observaitons: 156,668)						
P1 (lowest)	-0.041	(-7.18)	0.105	(4.56)	-0.060	(-3.58)
P2	-0.015	(-8.15)	0.032	(21.04)	-0.019	(-11.48)
P3	0.003	(2.24)	-0.010	(-6.41)	0.004	(2.60)
P4	0.024	(15.52)	-0.046	(-18.81)	0.017	(9.67)
P5 (highest)	0.044	(26.32)	-0.081	(-36.62)	0.032	(19.74)
P5 – P1	0.085	(14.18)	-0.186	(-8.05)	0.092	(5.49)
Attack Days (number of observaitons: 669)						
P1 (lowest)	-0.011	(-0.65)	0.021	(1.17)	-0.015	(-0.90)
P2	0.044	(1.84)	0.014	(0.68)	-0.056	(-2.40)
P3	0.068	(1.33)	-0.042	(-1.82)	-0.027	(-0.71)
P4	0.012	(0.62)	-0.054	(-3.06)	0.038	(2.15)
P5 (highest)	0.009	(0.74)	-0.045	(-3.05)	0.029	(2.30)
P5 – P1	0.020	(0.97)	-0.066	(-2.88)	0.044	(2.15)

Panel B: 2-Day Window

Prior-Day	Order Imbalances					
Return Portfolios	Foreigners		D. Individuals		D. Institutions	
Non-Attack Days						
P1 (lowest)	-0.046	(-3.37)	0.132	(2.52)	-0.082	(-2.20)
P2	-0.008	(-3.02)	0.015	(4.21)	-0.013	(-5.15)
P3	0.014	(5.15)	-0.006	(-0.61)	-0.012	(-1.19)
P4	0.033	(11.69)	-0.050	(-16.17)	0.013	(4.12)
P5 (highest)	0.034	(12.72)	-0.064	(-17.11)	0.020	(7.19)
P5 – P1	0.080	(5.73)	-0.197	(-3.74)	0.102	(2.73)
Attack Days						
P1 (lowest)	0.000	(0.00)	0.058	(1.64)	-0.050	(-1.04)
P2	-0.019	(-0.77)	0.064	(2.22)	-0.040	(-1.45)
P3	0.098	(3.34)	-0.095	(-3.13)	-0.004	(-0.15)
P4	-0.002	(-0.07)	-0.036	(-1.09)	0.036	(0.94)
P5 (highest)	0.023	(0.87)	-0.077	(-3.06)	0.028	(0.79)
P5 – P1	0.023	(0.34)	-0.135	(-3.04)	0.077	(1.27)

Panel C: 5-Day Window

Prior-Day	Order Imbalances					
Return Portfolios	Foreigners		D. Individuals		D. Institutions	
Non-Attack Days						
P1 (lowest)	-0.130	(-2.50)	0.297	(2.46)	-0.194	(-2.66)
P2	-0.008	(-1.50)	0.030	(4.33)	-0.023	(-4.28)
P3	0.045	(8.13)	-0.046	(-7.09)	-0.009	(-1.75)
P4	0.070	(12.68)	-0.110	(-20.34)	0.024	(4.46)
P5 (highest)	0.043	(7.93)	-0.097	(-20.19)	0.043	(9.05)
P5 – P1	0.173	(3.31)	-0.394	(-3.26)	0.237	(3.24)
Attack Days						
P1 (lowest)	-0.022	(-0.34)	0.082	(1.30)	-0.063	(-1.24)
P2	0.109	(0.98)	0.087	(1.27)	-0.210	(-2.27)
P3	0.112	(1.85)	0.010	(0.16)	-0.122	(-2.10)
P4	0.041	(0.60)	-0.096	(-1.59)	0.040	(0.75)
P5 (highest)	0.076	(1.28)	-0.133	(-2.05)	0.017	(0.26)
P5 – P1	0.097	(1.11)	-0.215	(-2.38)	0.081	(0.96)

Table 7
Order Imbalances Regressions

This table presents the regression results of the attack-day feedback trading strategy of the three investor types relative to that of non-attack days. The regression specification is as follows:

$$\begin{aligned} OI_{it} &= \beta_0 + \beta_1 Attack_t + \beta_2 r_{i,t-1} + \beta_3 r_{i,t-1} Attack_t + \beta_4 rm_{t-1} + \beta_5 rm_{t-1} Attack_t + \beta_6 s_{t-1} + \beta_7 s_{t-1} Attack_t \\ &\quad + \beta_8 Kaesong_i + \beta_9 Kaesong_i Attack_t + \beta_{10} Defense_i + \beta_{11} Defense_i Attack_t + \varepsilon_{it}, \end{aligned}$$

where OI_{it} is the order imbalance of firm i on day t, r_{it} is the stock return of firm i on day t, rm_t is the return on the KOSPI composite index on day day t, and s_t is the USD-KRW exchange rate on day day t. Attack is set to one on attack days and zero otherwise. Kaesong is set to one if the company has production facilities in the Kaesong Industrial Region, and Defense is set to one if the company supplies materials to the Department of Defense. The corresponding t-statistics are reported in parentheses.

	Foreigners	D. Individuals	D. Institutions
Constant	0.427 ***	-0.558 ***	-0.120 *
	(5.86)	(-7.25)	(-1.70)
$Attack_t$	1.349	-1.254	-0.141
	(1.21)	(-1.07)	(-0.13)
r_{t-1}	0.780 ***	-1.616 ***	0.760 ***
	(37.61)	(-73.83)	(37.88)
$r_{t-1} \cdot Attack_t$	-0.600 *	0.806 **	-0.155
	(-1.84)	(2.34)	(-0.49)
rm_{t-1}	-0.059	1.354 ***	-1.151 ***
	(-1.46)	(31.90)	(-29.57)
$rm_{t-1} \cdot Attack_t$	-1.160 *	0.684	0.100
	(-1.95)	(1.09)	(0.17)
s_{t-1}	-0.266 ***	0.387 ***	-0.151 *
	(-3.04)	(4.19)	(-1.78)
$s_{t-1} \cdot Attack_t$	-7.302 ***	1.144	4.049 ***
	(-4.56)	(0.68)	(2.61)
$Kaesong_t$	-0.116	0.079	0.042
	(-0.77)	(0.50)	(0.29)
$Kaesong_t \cdot Attack_t$	4.738 **	-1.426	-2.936
	(2.08)	(-0.59)	(-1.33)
$Defense_t$	-0.372 *	-0.061	-0.091
	(-1.93)	(-0.30)	(-0.49)
$Defense_t \cdot Attack_t$	0.154	-0.385	1.416
	(0.05)	(-0.13)	(0.50)
Adj. R^2	0.071	0.034	0.010
N	157,410	157,410	157,410
Tests for Linear Combinations of Coefficients			
r_{t-1} + $r_{t-1} \cdot Attack_t$	0.180	-0.810 **	0.605 *
t-statistic	0.55	-2.35	1.92

Table 8
Magnitude of Attacks

This table examines subsamples of attacks with different magnitudes. The attack-day sample is sorted into two subsamples according to the attack-day KOSPI returns. An attack is considered to be more (less) severe if the attack-day market return is lower (higher) than the average attack-day market return. Panel A reports mean buy ratios for the two subsamples. For each subsample, we select the same fraction of observations for the highest and lowest return categories and calculate buy ratios as described previously. [Attack (H–L) – No Attack (H–L)] measures the difference between the H–L value on attack days and the H–L value on non-attack days, where H–L is the difference in buy ratios between the highest-return stocks and the lowest-return stocks. Panel B examines order imbalances separately for more severe attacks and less severe attacks. For each of the subsamples, order imbalances are calculated for quintile portfolios formed based on the previous-day return for each of the three investor groups. The corresponding *t*-statistics are reported in parentheses.

Panel A: Mean Buy Ratios

Investor Type	Attack (H–L) – No Attack (H–L)					
	5-Day Future Returns		20-Day Future Returns		60-Day Future Returns	
Less Severe Attacks: Higher-Than-Median KOSPI Return Subsample						
Foreigner	0.10	(1.47)	-0.02	(-0.30)	-0.02	(-0.29)
Institution	-0.04	(-0.80)	0.01	(0.27)	0.02	(0.35)
Individual	0.00	(-0.22)	-0.03	(-1.44)	-0.01	(-0.26)
More Severe Attacks: Lower-Than-Median KOSPI Return Subsample						
Foreigner	0.00	(-0.04)	0.14 *	(1.86)	0.08	(1.14)
Institution	-0.02	(-0.38)	0.12 **	(2.52)	0.12 **	(2.55)
Individual	-0.03	(-1.31)	-0.06 ***	(-3.13)	-0.03	(-1.46)

*, **, and *** indicate significance at the 10, 5, and 1 percent levels, respectively.

Panel B: Order Imbalances

Prior-Day	Order Imbalances					
Return Portfolios	Foreigners		D. Individuals		D. Institutions	
Less Severe Attacks: Higher-than-median KOSPI return subsample						
P1 (lowest)	-0.007	(-0.30)	0.028	(1.21)	-0.025	(-1.02)
P2	0.034	(1.29)	0.042	(1.58)	-0.077	(-3.09)
P3	0.021	(1.08)	-0.035	(-1.33)	0.014	(0.60)
P4	0.021	(0.86)	-0.040	(-1.92)	0.010	(0.41)
P5 (highest)	0.033	(2.30)	-0.040	(-2.22)	0.003	(0.16)
P5 – P1	0.039	(1.48)	-0.068	(-2.32)	0.027	(0.93)
More Severe Attacks: Lower-than-median KOSPI return subsample						
P1 (lowest)	-0.018	(-0.72)	0.018	(0.69)	-0.010	(-0.50)
P2	0.064	(1.45)	-0.023	(-0.72)	-0.035	(-0.85)
P3	0.135	(1.18)	-0.071	(-1.83)	-0.064	(-0.76)
P4	0.006	(0.16)	-0.077	(-2.10)	0.065	(2.41)
P5 (highest)	-0.025	(-1.32)	-0.039	(-1.67)	0.059	(3.53)
P5 – P1	-0.007	(-0.24)	-0.057	(-1.62)	0.069	(2.61)

Table 9
Exchange Rate Adjusted Buy Ratios

This table reports mean buy ratios adjusted by exchange rate changes. The stock returns adjusted by USD-KRW exchange rate changes are used to calculate the mean buy ratios. The corresponding *t*-statistics are reported in parentheses.

Investor Type	Attack (H–L) – No Attack (H–L)					
	5-Day Future Returns		20-Day Future Returns		60-Day Future Returns	
Foreigner	0.06	(1.34)	-0.04	(-0.76)	0.00	(0.02)
D. Institution	0.03	(0.81)	0.10 ***	(3.11)	0.13 ***	(3.99)
D. Individual	-0.05 ***	(-3.21)	-0.05 ***	(-3.13)	0.00	(-0.21)

*, **, and *** indicate significance at the 10, 5, and 1 percent levels, respectively.

Table 10
Order Imbalances and Chronology of Attacks

This table compares order imbalances for the earlier period and those for the later period. The sample is sorted into two subsamples according to the chronological order of the attacks. For each of the two subsamples, order imbalances are calculated for quintile portfolios formed based on the previous-day return for each of the three investor groups.

Panel A: Order Imbalances in the earlier-period subsample

Prior-Day	Order Imbalances					
Return Portfolios	Foreigners		D. Individuals		D. Institutions	
Non-Attack Days						
P1 (lowest)	-0.047	(-6.36)	0.107	(3.62)	-0.058	(-2.67)
P2	-0.020	(-8.66)	0.028	(15.83)	-0.010	(-5.33)
P3	0.001	(0.72)	-0.012	(-6.49)	0.008	(4.46)
P4	0.029	(15.03)	-0.046	(-14.50)	0.013	(6.02)
P5 (highest)	0.050	(25.24)	-0.076	(-27.53)	0.022	(11.12)
P5 – P1	0.096	(12.58)	-0.183	(-6.10)	0.079	(3.64)
Attack Days						
P1 (lowest)	-0.013	(-0.46)	-0.014	(-0.52)	0.018	(0.74)
P2	0.039	(1.29)	-0.053	(-1.54)	0.006	(0.20)
P3	0.179	(1.43)	-0.110	(-2.57)	-0.079	(-0.87)
P4	0.047	(1.40)	-0.093	(-3.12)	0.042	(1.81)
P5 (highest)	0.010	(0.60)	-0.028	(-1.59)	0.012	(0.87)
P5 – P1	0.023	(0.73)	-0.014	(-0.45)	-0.006	(-0.23)

Panel B: Order Imbalances in the later-period subsample

Non-Attack Days						
P1 (lowest)	-0.022	(-7.18)	0.097	(28.67)	-0.069	(-21.77)
P2	-0.001	(-0.38)	0.044	(14.43)	-0.042	(-15.15)
P3	0.009	(3.73)	-0.004	(-1.55)	-0.008	(-3.03)
P4	0.012	(4.72)	-0.046	(-15.70)	0.027	(9.79)
P5 (highest)	0.024	(8.18)	-0.099	(-33.28)	0.067	(23.75)
P5 – P1	0.046	(10.84)	-0.196	(-43.63)	0.135	(32.13)
Attack Days						
P1 (lowest)	-0.009	(-0.46)	0.053	(2.37)	-0.045	(-2.13)
P2	0.048	(1.33)	0.069	(2.96)	-0.108	(-3.06)
P3	-0.003	(-0.16)	0.001	(0.03)	0.007	(0.32)
P4	-0.014	(-0.61)	-0.025	(-1.20)	0.035	(1.36)
P5 (highest)	0.008	(0.43)	-0.067	(-2.68)	0.050	(2.25)
P5 – P1	0.018	(0.63)	-0.120	(-3.58)	0.095	(3.10)