The Impact of Proximity to Rare Disaster Risk on Real Estate Returns – The Case of Allies of Ukraine

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June 2023

Abstract

Treating the Russian invasion of Ukraine as a disaster event and defining proximity as physical and political closeness, we analyze investors' response to disaster risk by examining the performance of commercial real estate investments (for their immobility and relative homogeneity) in countries of proximity to the invasion. We find that the impact of proximity to the disaster is not uniform across property sectors. Firms with green and newer properties are less likely to experience negative abnormal returns. Our findings highlight the differences in equity risk premium for investments similar in nature and facing the same rare disaster risks. Furthermore, while reducing reliance on brown fuel is important in the case of war, our findings suggest that the managerial mindset on long-term greenness is more important to investment performance.

Keywords: Disaster Risk, Proximity Risk Premia, Russia Invasion of Ukraine, Real Estate, Green Building

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1. Introduction

Continuous outperformance of some stocks that can neither be explained by their perceived systematic risks nor Jensen's alphas could be a reflection of investors' evaluation of disaster or crisis risk premia. There have been abundant studies since Barro (2006) on rare disaster risk as an explanation for this equity premium puzzle (Mehra and Prescott, 1985).[1] Unfortunately, it is difficult to measure disaster risk premia accurately because they correspond to rare events (Tsai and Wachter, 2015). Gulen and Ion (2015) further point out that the impact of a disaster is not necessarily identical cross-sectionally. Also, analyst pessimism concerning earnings after disasters add opacity to the premia (Kong et al., 2021). The difficulty in knowing the type of disaster and then assessing its probability of occurrence has been well narrated as radical uncertainty by Kay and King (2020), the equivalent of "unknown unknowns" stated by Donald Rumsfeld, the former Secretary of Defense.[2] With radical uncertainty, it is not just the uncertainty of when or how something rare will happen (i.e., the long tails in the probability distributions); one simply has no idea of what will happen.

One such very timely rare event is the Russian invasion of Ukraine ("R-U war" hereafter),[3] which is considered "the second largest humanitarian crisis since the 1960s in terms of the number of people who have fled or been displaced …" (Buehler et al., 2022). After Ukraine was attacked by Russia on February 24, 2022, many countries or entities, particularly the European Union (EU) and the U.S., implemented sanctions on Russia. While some countries might have chosen to take sides because they have limited economic interests in Russia, others did so in the hope of ending the war quickly to minimize economic losses, such as facing higher energy prices. It has been shown that the connectedness of oil with financial assets is stronger during a war (Adekoya et al., 2022). The longer this war lasts, the more systemic risks it will create for the world economy (Smit et al., 2022; IMF, 2022a). Even though there is no immediate systemic event, financial stability risks have likely increased. The International Monetary Fund (IMF) has adjusted the global

[1] Examples include Berkman et al. (2017), Chen et al. (2012), and Kim and Kung (2017). Julliard and Ghosh (2012) prove mathematically that the equity premium puzzle is not only due to rare events.
[2] In the U.S. Department of Defense News Briefing by Secretary Donald Rumsfeld and General Myers on February 12, 2002. Retrieved from https://archive.ph/20180320091111/http://archive.defense.gov/Transcripts/Transcript.aspx?TranscriptID=2636#selection-1053.195-1053.202
[3] Climate change and the recent COVID-19 pandemic are also good recent examples.

economic growth for 2022 from 4.4% to 3.6% in April 2022 (IMF, 2022b) and then to 3.2% in 2022 and 2.7% in 2023 in October 2022 (IMF, 2022c).

Inspired by this black swan event, this paper studies the impact of the R-U war on the market reaction of companies investing in properties located in varying proximity to the war. We analyze the proximity risk premium – a version of the equity premium puzzle – for the post-2014 period and abnormal returns around pivotal events of the war. Proximity is defined both as geographical proximity and the nearness to the impact due, for example, to sanctions, energy supply, or a country explicitly declaring itself an ally of Ukraine. Figure 1 depicts the list of countries exposed to the war according to our definition of proximity.

[Figure 1 here]

The Ukraine war offers a good testing event because, unlike other events that would usually linger for some time before they actually start, and/or events or shocks that happen concomitantly (such as a liquidity dry-up of a bank that can be coupled with a credit squeeze in the lending market), the war has a clear start that is not initially linked to any other economic causes. We focus on real estate investments because of their relative homogeneity and immobility which other business and financial activities do not possess. First, the homogeneity of real estate investments ensures that we compare apples with apples under the same conditions.[4] Second, real estate is a lumpy investment that is costly to liquidate or reverse in the short term (see also Evenett and Pisani, 2023, showing that less than 8.5% of firms have divested from Russia). Besides, ownership and location of real estate will likely be constant during this event, not dissimilar to controlled experiments. Hence, external shocks to real estate investments might generate more severe impacts and extensive losses than is the case for other investments. For instance, Lotz et al. (2023) show how investors have accounted for uncertainty premia in securitized real estate returns.

There is substantial literature on the effects of armed conflicts on economies. For example, Mueller (2013) argues that the immediate economic costs of conflict and violence are the slowdown of economic activities (see also Collier, 1999, 2006; Blomberg et al., 2004), followed by that of investments, which are based on expectations about the future. Therefore, the termination of an

[4] In the case of banks, only direct exposure in Russia is explicitly recorded; the significant but not easily identifiable amounts of indirect exposure might pose potential risks that are not quantifiable, hence making comparisons implausible.

armed conflict does not necessarily end the economic downturn. More importantly, the negative effects might spill over to other countries. Qureshi (2013) analyzes how conflicts have affected international trade from the angle of regional contagion and spillover effects (see also Collier and Hoeffler, 2004). The literature on the Ukraine war is just starting to grow. Korovkin and Makarin (2022) studied the effects of the 2014 annexation of Crimea on the production networks of Ukraine. Boungou and Yatié (2022), Kiesel et al. (2023), Sun et al. (2022) and Yousaf et al. (2022) are among the first to study the negative impacts of the war on global stock markets. Using an event study methodology, Kiesel et al. (2023) find that firms with Russian operations were negatively affected by the war during the first 30 days of the conflict. Boungou et al. (2023) analyze the effects of the war on systemic financial risk and report strong financial stress since the invasion (see also Qureshi et al., 2022). Another strand of literature to which our study is related is the impact of sanctions. Several such papers blossomed within two months of the start of the war. Examples are Bianchi and Sosa-Padilla (2022), Deng et al. (2022), Huang and Lu (2022), and Itskhoki and Mukhin (2022). Sonnenfeld et al. (2022) construct a database of 1,200 companies and track whether equity markets respond positively to their leaving Russia while punishing those that are still there.

However, these studies do not point directly to disaster premia. Stulz (2023) and Hirshleifer et al. (2023) are two recent studies that focus on disaster premia, the former on crisis risk, and possible poly-crisis, and the latter on war and other disasters. Our study on proximity risk premium adds to this line of research on disaster premium. Our approach is similar in spirit to Federle et al. (2022), who study the impact of the war on investment returns, accounting for physical distance from the war. They find that negative cumulative returns of stock markets and individual firms were directly related to proximity and hence termed "proximity penalty." Our point of departure is to define proximity by both physical and virtual distance, the latter being investments in allied or affected countries, even if geographically far. Our analysis pertains to investors' perception of the change in the values of these companies because of the change in the values of their international investments near the war. Furthermore, our study distinguishes itself from others that mostly focus on homogeneous investments, such as stock markets. We verify that different types of investments, albeit similar in nature, react differently to the effect of the war. For instance, while all are in real estate, portfolios comprising retail properties could be relocated relatively easily, and the loss would be minimal, whereas industrial premises might be subject to higher risks because of the

immovable infrastructure. We also examine if the losses/gains are due to the proximity risk premium or an overreaction by investors. We do not intend to assess whether the level of the proximity risk premium is correctly priced, but rather if the market has priced any disaster. Finally, since the disaster considered is the R-U war, and Russia is a major exporter of oil, our last question is to examine whether portfolios comprising mainly of green properties would be more resilient ex-ante to the "exposure" (Devine et al., 2023; Eichholtz et al., 2019). This is not dissimilar to the notion proposed by Garel and Petit-Romec (2021) that investors reacted more positively to environmentally responsible firms during the COVID-19 pandemic, which is considered a type of rare disaster.

We are the first to analyze the impacts of the war, directly and indirectly, on the performance of international real estate investment companies in countries with proximity to the war. Previous studies of such impacts were mostly based on incidents happening "at home" rather than because of the locations of their international investments, i.e., "destination." Bernile et al. (2015) and Garcia and Norli (2012), among others, have shown that the headquarters of firms might be a poor reflection of the geographic complexity of their operations (see also Ling et al., 2020, 2021). This is especially true for conglomerates in Europe. This means that knowing what happens at the "destination" is crucial in evaluating international investment performance. Hence, we aim to analyze the impact of war on both the "home" (i.e., the headquarters of the companies) and the "destination" (i.e., where the properties are located) and show that not every type of investment is equally negatively impacted by this political turmoil.

We focus on international real estate companies that invest in countries supporting Ukraine as well as Russia. Since the EU has announced sanctions on Russia, all EU members are potential countries for analysis. Among them, however, those previously relying more on Russia would experience bigger blows. Another group of countries would be those sharing borders with Russia; shelling Ukraine could be a signal of their future safety. As commented by the IMF (2022a), indirect exposure can still lead to a sharp rise in counterparty risks because many non-bank financial intermediaries have investments in Russia. It might also be the case that some emerging market companies have reduced their exposure to Russia because they have already learned the lesson from the 2014 annexation of Crimea.

We analyze rare disaster risk by studying the excess returns and abnormal returns of international commercial real estate (CRE) companies using event studies and multivariate analyses. We first consider a parsimonious model that investigates the interplay between a firm's property holdings in the countries exposed to the war based on its proximity measure and its daily returns in excess of the comparable indices. Consistently negative excess returns would imply investors' adverse reaction to the proximity to disaster. To measure the impacts of the R-U war on international CRE companies, we perform event studies on their cumulative abnormal returns (CARs), with different event dates, including the beginning of the war on February 24, 2022, the date when Russia announced the "unfriendly" country list, and the Moscow Victory Parade Day, to address whether the negative impact continued. Our analyses cover both the countries of origin of the international firms and their investment destination countries satisfying the proximity criteria above. Considering that some investors might have learned the lesson from the 2014 annexation of Crimea and reduced their exposure to Ukraine and Russia, we test the impact of the war on different origins of these international CRE companies and investigate if "this time is different." Furthermore, since a threat is the backfiring of sanctions through the reliance on Russian oil and gas, we also ask whether companies that hold green real estate will likely be more resilient to the war since they are less reliant on the brown fuel from Russia. In other words, we ask whether investors demand a lower rare disaster premium for green investments.

Our main findings are fourfold. First, international CRE firms that hold properties in countries affected by the R-U war experienced negative market reactions during the entire post-Crimea-crisis period (2014-2022) and around pivotal events. This adverse return impact is particularly pronounced for firms with real estate portfolios tilted toward the exposed countries, especially Russia, thus indicating that there is an equity premium rather than overreactions from investors. These results have important implications for investors with economic interests in Russia — a one-standard-deviation increase in the proportion of a firm's property holdings allocated to Russia is associated with an annualized return of -10% on its stocks during the period of January 2014 to September 2022. Interestingly, however, not all types of investments are prone to the same shocks, even though they all are illiquid and immobile real estate assets. Second, our analyses reveal factors that may be more resilient to this war-induced effect. Specifically, firms with larger holdings in green buildings and/or newer structures are less responsive to the adverse effect of the war. By narrowing the scope of our analyses to the post-February-2022 period, we provide

evidence of a surge in return volatility among firms with portfolios tilted toward the countries of proximity. Third, our results suggest that performance this time is different from that during the 2014 Crimea crisis. Finally, the event long-short index we construct sheds light on market efficiency around rare disasters.[5]

Our study contributes to the rare disaster risk literature by showing how a black swan event in one country generates an internationally originated rare disaster risk premium. Our findings pertaining to international real estate investments in the allied countries during the R-U war also contribute to the literature about the resilience of international financial systems, as reflective of the comment of the IMF (IMF, 2022a, p. 1). For instance, Qureshi et al. (2022) find that sanctioning Russia increases the systemic risk for European countries and the U.S. What real estate companies experienced may also affect other components of the financial sector. Policymakers will have to adopt measures to tackle the aftermath of the crisis with poor market liquidity and loss in investor confidence, among other consequences. Finally, this paper contributes to the growing research on ESG by suggesting the importance of preparing for increased resilience to potential disaster risks in the "destination" of international investments through holding portfolios with greener buildings/structures.

The rest of the paper is organized as follows. The next section discusses our research questions. We then present our data sources and variable construction and discuss our methodology. Following this is the empirical strategies we adopt to address our research questions, and then our analyses of the impact of the R-U war on real estate performance. The final section concludes.

2. Research Questions

Our goal is to see how investors respond to international investments in Russia and Ukraine, as well as in countries that have relatively high disaster risk either because they are close to or have sanctioned Russia. Because capital inflows can come from anywhere, the effect of a war can spill over to the "origins" of the investments (i.e., the headquarters of the investment firms). As real

[5] The COVID-19 pandemic is considered a black swan crisis event, too, and may affect our findings that the negative returns could be due to the pandemic rather than the war. However, the worldwide effect from the pandemic would mean all REITs covered in this study should move synchronously, which is not what our findings conclude.

estate companies distinguish themselves from other firms because of the difficulty and inflexibility of changing strategies and relocating efficiently and effectively, we anticipate a negative impact, both direct and indirect losses, on the performance of international firms holding international CRE portfolios allocated to those countries of proximity. The negative performance comes from both *direct* collateral damage due to the war, such as bombing (*physical proximity*), and *indirect* collateral damage due to Russian retaliation to sanctions, for example, the cutoff of energy supply (*proximity due to sanction*s). Thus, our first hypothesis is as follows:

Hypothesis 1. International firms owning properties in countries exposed to the war experience negative (cumulative) abnormal returns.

The type of commercial property might also matter. For instance, it is relatively easier to move tenants' business operations within offices to other countries, and the re-establishment cost for the next tenant would be minimal unless there is damage due to the war. On the other hand, moving a retail shop means entirely closing the branch, and opening it in another country requires the latter to have identical clientele and competitiveness, which is not easy. The situation will be even worse for industrial properties as both reallocation and re-establishment costs could be substantial. Hence, a real estate investor with office properties might be less exposed to the negative impact of the war than one with an industrial property. Given this, the impact would gravitate to companies with identical property types as their main investment focus, a so-called "focus property." These can be translated into the following hypotheses:

Hypothesis 2a. International firms with greater investment allocations to countries exposed to the war experience more negative (cumulative) abnormal returns.

Hypothesis 2b. International firms with greater investment allocations to focus properties in countries exposed to the war experience more negative (cumulative) abnormal returns.

Regarding focus properties, green properties (i.e., those that consume less energy or consume green energy) are required to meet energy efficiency standards and are thus less reliant on brown energy (i.e., oil) than otherwise like-kind properties.[6] Because Russia is a major oil exporter, a

[6] Buildings account for a significant portion of energy demand. The buildings and buildings construction sectors combined are responsible for 30% of total global final energy consumption and 27% of total energy sector emissions. (https://www.iea.org/topics/buildings). A green building uses less overall energy which can notably shrink a building's overall carbon footprint or even have a net positive on the environment (https://www.usgbc.org/press/benefits-of-green-building).

greener property located in a country of proximity that relies on Russia for oil is more likely to, ceteris paribus, be resilient to retaliation from Russia. This should translate into a more moderate negative, if not neutral, impact in return for the real estate fund owning it. On the other hand, older focus properties are associated with higher maintenance and operational costs and higher information asymmetries. They also tend to have lower-quality tenants. We, therefore, propose the following hypotheses:

Hypothesis 3a. Exposed firms with greater allocations to green properties experience less negative (cumulative) abnormal returns.

Hypothesis 3b. Exposed firms with greater allocations to older properties experience more negative (cumulative) abnormal returns.

Finally, we note that this is not the first time Russia has invaded Ukraine. On almost the same day in 2014 (February 20, 2014), Russia invaded Ukraine, and this lasted for two months. The consequence was the annexation of the Crimean Peninsula by Russia. Comparing the annexation with the current one, it is easy to see that this time is different. First, the 2022 invasion has lasted much longer, the affected Ukrainian territory is much larger, and so is the resilience of Ukraine. This time is different also in the impact beyond these two countries. The previous war did not affect other countries much in any aspect. This time, however, there is huge worldwide pressure with high levels of inflation, together with zero, if not negative, economic growth. First, there are sanctions on exports from Russia, as well as on countries doing business with Russia. It also turns out that many developing countries rely heavily on fertilizers exported from Ukraine. No exports mean no crops to harvest in the near future. On the side of developed countries, both Ukraine and Russia make up 10 to 50% of exports in coal, steel, palladium, and nickel. The immediate effect is a blow to, for example, automakers that need steel, aluminum, and copper (Buehler et al., 2022). An example of increasing transportation costs is the suspension of shipments by major European automakers to China by train because of the war (Reuters, 2022). Ukraine is also a major exporter of neon, xenon, and krypton gases, which are crucial to producing computers, cellphones, and electric cars.

Compared to the situation in 2014, there might now be fewer investments in Russia, or less reliance on Russia and, therefore, fewer spillover effects on the countries of concern. In addition, these countries might have already learned the lesson and therefore reacted faster. Thus, we

conjecture that the effect of the R-U war is different this time than the annexation of Crimea in 2014.

Hypothesis 4. The market reaction to the 2014 annexation of Crimea does not predict the market reaction to the 2022 war.

3. Methodology

3.1. Proximity Premium Model

Key to our identification is a firm's proximity to the war, both as geographic footprint exposed to the war (i.e., Ukraine and Russia) and nearness to the impact due to sanctions, energy supply, or in countries allied with Ukraine. We use PropSHR, which is the proportion of a firm's international property portfolio allocated to the country of concern, as the proximity measure. Specifically, we estimate for each firm *i* its property share in country *n* as:

$$PropSHR_{i,n} = \frac{\#\ Properties_{i,n}}{\#\ Properties_i} \quad (1)$$

where # $\text{Properties}_{i,n}$ is the number of properties owned by firm *i* in country *n*. # Properties_i is the total number of properties owned by firm *i* across all countries. Ideally, the property share in a country should be based on the value rather than the number of buildings. Unfortunately, such data for non-U.S. countries are unavailable. Since property type is influential to the earnings of the firm, investments in properties that constitute the core focus of the firms might exert larger impacts from the war than from other types of properties. Hence, we also multiply a dummy, FOCUS (which equals one if the invested property is the focus property of the firm), to PropSHR.

Prior to testing the hypotheses, it is important to consider whether the tests for the war period are representative by also testing the period before the war. Hence, we first conduct regression analyses using a parsimonious specification from January 2014 to September 2022. This specification would allow us to extend our sample conveniently to incorporate the latest developments in the war. Specifically, we examine how the proximity measure would affect the investment daily return by associating daily returns and lagged property shares using the equation below:

$$Y_{i,t} = a_{i,t} + \sum b_i \times PropSHR_{i,y-1} + \gamma_i \times X_{i,t-1} + \sigma_p + \sigma_c + \sigma_e + \sigma_t + \epsilon_{i,t} \quad (2)$$

where $Y_{i,t}$ is the return of firm *i* on day *t.* $PropSHR_{i,y-1}$ is a vector of a firm *i*'s property allocations to the countries affected by the war measured at the end of the previous year (*y*-1). b_i is the proximity risk premium. $X_{i,t-1}$ is the vector of control variables, which include the following lagged firm characteristics identified in prior literature (e.g., Guedhami et al., 2022; Ling et al., 2020) measured as of the beginning of each year. InstOwn is the percentage of a firm's institutional ownership. Size is the logarithm of the book value of assets. MB is the market-to-book ratio. Our proxy for return momentum, Pre-war returns, equals the firm's cumulative return during the fourth quarter of 2021. Investment is the growth rate in noncash assets over the fourth quarter of 2021. Profitability is defined as the ratio of EBITDA to the book value of assets. Fixed effects pertaining to a firm's focus property (σ_p), headquarter's country (σ_c), listed exchange (σ_e, which might be different from the headquarter's country), and year (σ_t) are included.

We measure return, $Y_{i,t}$, in two ways: (1) raw return and (2) naïve excess return. For the latter, we take the difference between a firm's raw return and the return on the comparable index. Because the comparable indices reflect the risk exposure of all international CRE firms, exposed and non-exposed, persistence in the difference between these two returns can be considered as the excess return due to proximity to the war. In other words, the naïve excess return is in some way a proxy for the proximity risk premium (or equity premium). If it were due to investors' overreaction, abnormal returns (both positive and negative) should not persist. It should be noted that our focus is not to estimate the proximity risk premium, such as in Barro (2006) and related studies, as we work with actual returns and not expected returns. We also use Equation (2) with $Y_{i,t}$, taken as volatilities of the two types of returns to see whether and how proximity risks also increase return volatilities.

We further enrich our model by including indicators for major developments of the war, consisting of the dates on which Russia launched a full-scale war against Ukraine (February 24), Russia announced its "unfriendly" country list (March 7), the Moscow Victory Day Parade (May 9), and Sweden and Finland applying to join NATO (May 18). Whenever indicators for major dates are included, date fixed effects are replaced with year fixed effects. Finally, standard errors are clustered by headquarters countries.

3.2. Event Study

We proceed with the examination of the stock market reaction to international CRE investments in Russia and Ukraine. Hypothesis 1 posits that firms with investments in countries related to the R-U war are prone to experiencing negative abnormal returns at the start of the war. We estimate the following Market model using daily stock returns:

$$Ret - rf = \alpha + \beta \times (Mkt - rf) \quad (3)$$

where the market index, Mkt, is based on the FTSE EPRA NAREIT regional index returns. Four global regions, including APAC, Europe, the Americas, and the Middle East & Africa, are matched to each firm based on headquarters location. Our results are robust for alternative indexes, such as the country(region)-level ones. rf is the 30-day Treasury Bill rate. Our estimation window includes 250 days of daily returns and ends 50 days before the event window. The event window is from day -30 to day +30 relative to the event date (e.g., February 24, 2022). Daily abnormal returns (ARs) are then obtained by subtracting the daily estimated return in Equation (3) from the daily realized return. Cumulative abnormal returns (CARs) are the sums of ARs for a designated number of days.

We then conduct multivariate analyses to examine the driving forces of the negative CARs. Short-term event studies, while being less flexible than the parsimonious specification in Equation (2), are less likely to be affected by events that may confound the relation between property allocations to the exposed countries and stock returns (e.g., capital recycling). First, to test Hypothesis 2a, we estimate the following Equation:

$$CAR = a + \sum b \times PropSHR + \gamma \times X + \sigma_p + \sigma_c + \sigma_e + \epsilon \quad (4)$$

where CAR is based on one of the five windows, [0,0], [0,1], [-1,1], [-2,2], and [February 24 (Feb-24) to March 14 (Mar-14)]. PropSHR is a vector of a firm's property allocations to the countries affected by the war. b is the coefficient of interest. We use the same set of control variables as in Equation (2). The fixed effects are similar to those in Equation (2), except that the year (date) fixed effect is not necessary given our focus on the single event date(s). Standard errors are clustered by headquarters countries. To test Hypothesis 2b, we replace PropSHR in Equation (2) with PropSHR FOCUS, which equals the proportion of a firm's CRE portfolio allocated to focus properties located in a particular country in 2021Q4.

We next examine Hypothesis 3a, which projects that portfolios focusing on sustainable properties are prone to less potential impact on returns. Specifically, we estimate the following Equation:

$$CAR = a + \delta \times Green + \gamma \times X + \sigma_p + \sigma_c + \sigma_e + \epsilon \quad (5)$$

where CAR is based on one of the four short-term windows, [0,0], [0,1], [-1,1], and [-2,2]. *Green* is the greenness of a CRE portfolio. We quantify the greenness of a real estate portfolio in two ways. First, we measure greenness using GRESB Vintage, or the number of years since a firm's initial Global Real Estate Sustainability Benchmark (GRESB) adoption. Firms with larger GRESB vintage will likely be more informed about sustainability issues. Second, we measure the greenness of its asset base, Green Assets, by calculating the percentage of properties, PropSHR, certified with LEED or Energy Star as "green" buildings owned by a firm.[7] δ is the coefficient of interest. Controls and fixed effects are the same as in Equation (4). Standard errors are clustered by headquarters countries. To test Hypothesis 3b which posits that the quality of properties might explain the negative market reaction, we replace Green in Equation (4) with Asset Age, which is the average building age of all properties owned by a firm in 2021Q4. To test our final hypothesis (Hypothesis 4), we estimate a richer version of Equation (4) by including the CARs for the 2014 Crimea Crisis as an additional predictor for the potential difference in the market reactions between the two events.

Finally, investors formed their beliefs about the war upon its outbreak; and their initial beliefs might or might not be realized depending on the context of subsequent events. To further understand how the impact of the war materializes, we construct an event long-short index following Fisman and Zitzewitz (2019). The long-short index is a strategy comprising a long position in the firms that outperformed during the initial event and a short position in those that underperformed. In other words, the index values predict the potential impact of subsequent events (e.g., peace talks and sanctions) on CRE performance, thus offering a valuable tool for understanding investors' beliefs about which investments will likely benefit (suffer) from the war.

[7] ENERGY STAR is a certification by the U.S. Environmental Protection Agency (EPA) that the building meets the standards of saving energy and protecting the environment through less greenhouse gas emissions. The Leadership in Energy and Environment Design (LEED) of the U.S. Green Building Council (USGBC) is a certification of "green" buildings in terms of design to achieve good building practices and promote sustainability. Hence, the former is more on performance, while the latter is on the design.

We first group the international firms which outperformed (underperformed) the market (measured by the returns on the FTSE EPRA NAREIT Regional Indexes) on the event date (February 24, 2022). Firms belonging to the outperformed (underperformed) group are then used to form the "Event Long (Short) Index." Specifically, we determine the values of each index on date *T* using the following equation:

$$E_X^T = 100 \sum_{i \in X} \omega_i \prod_{t=e}^{T} [1 + (R_i^t - R_M^t)] \quad (6)$$

where subscript *X* indicates the long (*L*) or short (*S*) position; $\mathrm{R_i^t} - \mathrm{R_M^t}$ is the return of a firm *i* ($\mathrm{R_i^t}$) in excess of that of the market ($\mathrm{R_M^t}$) on date *t*, for $e \leq t \leq T$, where *e* is the event day. These excess returns are then chain-linked and weighted by ω_i, which can be expressed as:

$$\omega_i = MV_i^{Pre} \left| R_i^{Feb\ 24} - R_M^{Feb\ 24} \right| \quad (7)$$

where $\mathrm{MV_i^{pre}}$ is the market capitalization of firm *i* immediately before the event date (February 24); $\left|\mathrm{R_i^{Feb\ 24}} - \mathrm{R_M^{Feb\ 24}}\right|$ is the absolute value of firm *i*'s excess return on the event date. The index values are calculated as the weighted average of the chain-linked excess returns and are set equal to 100 immediately before the event date. Finally, the value of the event long-short index, $\mathrm{E_{LS}^T}$, equals the difference between the long and short indexes, $\mathrm{E_L^T} - \mathrm{E_S^T}$. An index continuously above 100 confirms investors' initial belief on the war. Otherwise, investors' belief is incorrect. Hence, subsequent movements in the resulting index will capture the realization/deviation of investors' beliefs about the war relative to their initial expectations.

4. Data

4.1. Defining Country Proximity

We first identify the countries of proximity to the war as: (1) heavily reliant on Russian oil and/or natural gas; (2) explicitly stopping the trade of oil/gas given (1), including Poland and Bulgaria that refused to pay Russian oil in rubles as demanded by Russia; (3) explicitly announcing support to Ukraine (Estonia, Latvia, Lithuania, and Poland);[8] (4) sharing the borders with Russia

[8] The presidents of these four countries visited Ukraine in mid-April, 2022 (reported, for example, by Reuters, available from https://www.reuters.com/world/europe/leaders-poland-baltic-states-head-kyiv-2022-04-13/).

and Ukraine, or having high exposure to financial assets in Russia; (5) classified as permanently neutral countries that voiced out their support of Ukraine (Sweden and Finland); and (6) the United States, the United Kingdom, and Germany, which are the usual dominating countries, and are the ones offering the most military, humanitarian, and financial aid (O'Hanlon, Stelzenmüller, & Wessel, 2023). Also included is Switzerland, which rarely expresses position, except this time. While our focus is on the allies of Ukraine, we also study the impact on investments in Russia. Foreign non-bank financial intermediaries own 20%, 50%, and 40% of Russia's sovereign debt, corporate debts, and equities in the fourth quarter of 2021 (IMF, 2022a). Any losses from business in Russia would not be trivial to these financial intermediaries, especially because their transfer of funds through SWIFT is cut off. As a result, our list comprises 13 countries, including Russia, as depicted in Figure 1. Ukraine, as the directly hard-hit country in the war, naturally should experience the biggest impact and, therefore, should be included in the sample. Unfortunately, only two properties in Ukraine that are held by the same (unlisted) firm in our data source, not representative enough to be included in the dataset.

4.2. Sample

We identify the international CRE companies which own properties in those countries mentioned above from the S&P Global Real Estate Database. We link our property-level data to company details obtained from S&P Global Companies Database. We delete companies without information on Trading Symbol or traded over-the-counter, with incomplete financial data (e.g., size), and with no property holdings in the 13 chosen countries. Finally, we merge our intermediate dataset with data on security pricing and FTSE-EPRA NAREIT index values obtained from S&P Global. We delete firms with incomplete observations in the estimation window. Our final sample includes 415 international real estate firms (or 667,528 firm-day observations) holding properties in 13 countries exposed to the war, directly or indirectly.

We estimate the naïve excess returns of each firm as the difference between a firm's raw return and the return on the FTSE EPRA NAREIT subindex pertaining to the global region in which the firm is headquartered. Next, we chain-link naïve excess returns to determine the buy-and-hold excess returns (BHERs) index on date T as:

$$BHER_{i,T} = 100 \prod_{t=1}^{T} \left(1 + ER_{i,t}\right) \quad (8)$$

where $ER_{i,t}$ and $BHER_{i,t}$ are the naïve excess returns and the buy-and-hold excess returns, respectively, for firm *i* at time $t \leq T$. Since it is multiplied by 100, a series made up of some positive and some negative naïve excess returns over a period of time would generate a $BHER_{i,T}$ of about 100. The regional BHER index is calculated as the average of BHERs across all sample firms headquartered in a region, weighted by their lagged market capitalization nominated in USD.

Figure 2 depicts the resulting BHER index values from January 1, 2014, to September 2, 2022. There is significant variation in listed real estate company performance across the four global regions, with the most drastic variability witnessed for Europe. While all indices dropped at around both the onset of the pandemic and the date of the war, the drops experienced by European firms dwarf all others, suggesting that the European firms in our sample are much riskier than the average (representative) real estate firm in Europe. Is this finding explained by their economic interests (measured by property holdings) in the countries exposed to the war? We address this question below. Figure 3 shows the cross-sectional distribution of our sample firms' property holdings in the exposed countries in 2021, the year before the war. Panel A suggests that a typical international CRE portfolio allocates 79% of its holdings to the exposed countries in 2021, down from almost 98% in early 2000. Panel B shows that our sample properties are predominately located in the U.S., followed by the U.K., Sweden, and Germany. The U.K. is the second-largest recipient of international CRE investment by our sample companies, with more than 4,000 properties. As depicted in Panel C, most properties are retail (e.g., shopping centers), followed by healthcare. However, Panel D suggests a different landscape in countries other than the U.S., with offices being the largest sector and industrial the second largest.

[Figures 2 and 3 here]

We note the importance of distinguishing between the home country and the country in which the properties of an international firm are located because even if the firm is not located in the "proximity", its earnings will still be affected if its investments are. In addition, a firm's home country might also differ from the country (exchange) in which its stocks are listed. On the other hand, a firm originated in related countries but with businesses elsewhere would be affected not because of its businesses, and therefore should have different degrees of impact.

As mentioned before, different property types will be affected by political unrest differently. Noting that even though firms invest internationally, they may focus on only certain property types, we also group properties into ten categories: Office, Residential, Industrial, Retail, Hospitality, Healthcare, Self-storage, Specialty, Diversified, and Technology (Ling et al., 2020), and then group all firms into the same ten categories based on their property focus. While the ease of relocation, such as offices relative to residential properties, should constitute an adverse impact from the war, energy supply is also a big factor here. Furthermore, logistics are always much affected in periods of war. This means that industrial properties might be hit harder in this war.

We calculate the average of daily portfolio naïve excess returns for each of the six major property types (Industrial, Office, Retail, Residential, Hospitality, and Healthcare), weighted by the lagged market capitalization (price and market capitalization are nominated in USD). In Figure 4, virtually all property types were adversely affected by the COVID-19 pandemic, as evidenced by rising return variability in early 2020. The R-U war, however, has an imbalanced impact on commercial properties. Specifically, the Industrial and Hospitality sectors both experienced negative returns as well as increased return variability around the war. Overall, the return variability and negative returns during the pandemic and the war differ from other times in history in a profound way.

[Figure 4 here]

To examine the impact of the war on different geographies, we calculate portfolio naïve excess returns for each country with any firm headquarters. In Figure 5, the spikes of negative returns and return variability associated with the war are observed for Europe. This effect is most pronounced among the Nordic countries, e.g., Finland and Sweden, which both applied to join NATO on May 18, 2022.

[Figure 5 here]

We further estimate daily volatility, which equals the standard deviation of daily returns over the past 60-day period estimated on a rolling basis. The trends in volatility are depicted in Figures 6 and 7. Consistent with Figures 4 and 5, return volatility surged significantly during the pandemic for all property types. A spike of similar magnitude is observed for industrial and hospitality sectors around the war (Figure 6). A significant surge in return volatility could be explained by investors'

concerns about the prospects of the industrial and hospitality sectors, which might be affected by the disruption to the energy supply and the tourism flow. Nordic countries witnessed a surge in volatilities around the war, likely due to rising military threats (Figure 7).

[Figures 6 and 7 here]

4.3. Main Variable — Property Share

The main variable, PropSHR, ideally should be the value of properties as a share of total portfolio value. However, book value and size (for instance, in square feet) estimates are largely missing for non-U.S. countries (more than half of the sample). The percentage of properties without book value estimates ranges from 8% in Japan to 81% in France. Therefore, we focus on the number of properties when constructing country-level property shares. In Table 1, country-specific PropSHR ranges from 49.55% for the U.S. to 0.08% for Latvia. An average firm in our sample invests 0.72% of its property portfolio in Russia. Entries in Table 1 also show that the U.S. has the highest country-property-specific PropSHR. To complete the story, we also look at the non-focus property types with PropSHR NON-FOCUS (see online appendix). This time, the U.S. is still the most invested, but with a much lower share. All variables and data sources are defined in Appendix 1.

5. Impact of The War

5.1. Proximity Risk Premium

The first set of analyses pertains to the entire period since the annexation of Crimea in 2014. The results of estimating Equation (2) are tabulated in Table 2. Focusing on column (1), for the post-2014 period, PropSHR (Russia) has had a profound negative impact on daily returns, holding everything else constant. The coefficient of PropSHR (Russia) of -0.007, significant at the 1% level, is economically meaningful — a one-standard-deviation increase in PropSHR (Russia) is

associated with a 67-percentage-point decline in daily returns relative to its mean.[9] This statistic translates into an annualized loss of 10% (0.04 × 252 days). Some evidence of a contagion effect is observed for PropSHR (Poland). Turning to the return predictors, the positive effect of IO on returns implies that institutional investors have been closely monitoring the performances. Consistent with our findings in Figures 4 and 5, major dates associated with the evolution of the war are associated with negative return impacts.[10]

[Table 2 here]

The analysis of (negative) returns so far indicates that prices before the war were high enough to verify the existence of an equity premium due to proximity to the war. We now turn to the native excess returns (ERs). Column (2) of Table 2 shows that the coefficient of PropSHR (Russia) is -0.007 (significant at the 1% level), indicating that excess returns persist throughout the sample period, again verifying the existence of an equity premium to compensate for real investments in Russia, rather than excess returns associated with over/underreaction of investors. This is because returns due to investors' reaction will likely dissipate very quickly and would be picked up by year fixed effects, in which case the independent variables, such as PropSHR (Russia), would not exhibit long-term effects in the form of significant coefficients throughout the sample period.

The effect of PropSHR (Russia) on return volatilities in columns (3) and (4) is largely absent. PropSHR variables are negatively associated with volatility for most countries, likely due to the pledgeability of real estate assets (e.g., secured debt). IO is also associated with lower volatility, likely due to better diversification strategies. We find evidence of volatility spikes around important dates such as May 9 and May 18. Combined with the negative return results, it is obvious that the proximity risk premium for investments in Russia has been capitalized into stock prices.

The coefficients on the fixed effects pertaining to a firm's property type focus and listed Exchange are reported in the online appendix. The omitted reference sector is the Technology sector (e.g., data centers). In the online appendix, the effect of property sectors on returns is largely

[9] The standard deviation of PropSHR (Russia) is 5.30. A one-standard-deviation increase in PropSHR (Russia) translates into a four-basis-point (-0.007 × 5.30) decline in excess returns. The average excess return is six basis points.
[10] In untabulated results, we find that the effect of PropSHR (Russia) is robust with respect to the inclusion of the date fixed effects.

muted; except for self-storage. In columns (3) and (4), most property sectors are negatively associated with volatility except for Industrial, Residential, and Technology. That is, equity premiums are considered based on country proximity rather than property types, although volatilities of returns vary across property sectors. As for the Exchange fixed effects, stocks of international real estate firms listed on the Luxembourg Stock Exchange (BDL) and Amsterdam Stock Exchange (ENXTAM) enjoy higher returns. In comparison, those listed on the Frankfurt Stock Exchange (DB) are associated with lower returns. The effect of a firm's listed Exchange on volatility is also mixed. Stocks listed on the Luxembourg Stock Exchange (BDL), the Canadian Securities Exchange (CNSX), and the Frankfurt Stock Exchange (DB) are positively correlated with volatilities. In contrast, those listed on the Amsterdam Stock Exchange (ENXTAM), the Johannesburg Stock Exchange (JSE), the London Stock Exchange (LSE), NASDAQ (NASDAQ), and NYSE (NYSE) are associated with lower volatilities.

We then narrow the scope of our investigation to the subperiod of the war (February 24, 2022). The number of observations reduces from 667,528 to 55,341. In Table 3, the negative return impact of PropSHR (Russia) persists in the post-war period, and its magnitude largely resembles that reported in Table 2. Another interesting finding is that the effect of PropSHR on returns is significant for Latvia. Indicators for important dates are negatively associated with daily returns and abnormal returns.

[Table 3 here]

Turning to the volatility results, in column (3), PropSHR is positively associated with return volatility for Russia and Germany; the coefficients are 0.005 and 0.004, respectively, and are marginally significant. This implies that the returns are more volatile if the investments are located in Russian and Germany. Allocations to Bulgaria and Lithuania, on the other hand, are negatively associated with volatility. On the other hand, PropSHR shows no impact on the volatility of the naïve excess return.

5.2. Event Study

Time-series trends in abnormal returns estimated using Equation (1) are depicted in Panel A of Figure 8. We observe a significant decline in abnormal returns around February 24, 2022, when

Russia launched a full-scale war against Ukraine. In Panels B and C, we plot the abnormal returns for the four core property types and six non-core property types, respectively. For core property types, the most negative abnormal returns are observed among firms focusing on the industrial sector. Among non-core property types, the most significant decline is observed among firms focusing on the energy infrastructure sector. A possible reason is that industrial properties are usually large and hence easy targets for bombardments. Besides, the industrial sector must be supported by good energy and logistic infrastructures. The R-U war is particularly impactful to the energy sector. Interestingly, Panel D shows that, across the four global regions, abnormal returns declined most for international CRE firms headquartered in the Middle East & Africa.

[Figure 8 here]

In other words, in line with our Hypothesis 1, international CRE companies with investments in countries related to the R-U war did experience negative abnormal returns at the start of the war. However, not all types of properties are affected. Besides the industrial properties and energy infrastructure sectors, the other affected property types are hospitality and, to a much lesser extent, offices. In addition, firms with headquarters in the Middle East & Africa are most affected by the war.

5.3. Baseline Analyses

We next analyze if firms with greater property exposure to the war will experience a more negative market reaction using Equation (2) (Hypothesis 2a). We do this by looking at the cumulative abnormal returns, CARs, in time. The CARs around the launch of the R-U war are reported in Panel A of Table 4. All CARs are negative and significant, suggesting that international CRE firm investors perceive the R-U war as value-destroying. For instance, on the event date ([0;0]), the CAR is -0.40% with a Patell *t*-statistic of -2.09. The CAR further declined to -0.64% when we included one day ahead ([0;1]). In Panels B and C, we show that the market also reacted negatively to Russia's "unfriendly" country list announcement on March 7 and to the Moscow Victory Day Parade on May 9, while results for the latter are mostly statistically insignificant. We then repeated this analysis for the 2014 Crimean Crisis (March 18, 2014). Panel D shows that the CARs are either

insignificant or positive. This means that investors either did not react to the 2014 event or considered such a change to be better for their businesses.

[Table 4 here]

Across all model specifications in Table 5, we find that a firm's allocation to Russia (PropSHR (Russia)) negatively and significantly predicts its CARs. For instance, for the event date (column (1)), the coefficient on PropSHR (Russia) is -0.143, significant at the 1% level. Given that an average firm in our sample invests 0.72% of its property portfolio in Russia, PropSHR (Russia) alone would explain -0.10% (-0.143*0.72), or nearly a quarter (-0.10%/-0.43%) of the average CARs on the event date (second row of Table 4, Panel A). This negative effect largely dissipates in the intermediate window (i.e., from February 24 to March 14) and around Russia's "unfriendly" country list announcement but is significant around the Moscow Victory Parade. In addition to PropSHR (Russia), the property shares for two Baltic states—PropSHR (Latvia) and PropSHR (Lithuania)—are also negatively associated with CARs in some specifications. This finding supports the fact of Russia's threat to cut off the natural gas supply to those countries.

[Table 5 here]

Interestingly, PropSHR (Switzerland) is also negative and significant in Columns (3) and (4). As Switzerland stands as one of the primary recipients of Russian deposits and investments, the market might expect its economy to suffer from the upcoming sanctions on Russia. But from the comparison with the insignificant or positive coefficients on the shortest event windows, including the event day and [0, +1], and the intermediate window (Feb-24 to Mar-14), it seems that the negative impact in Columns (2) and (3) is mostly explained by investors' reactions two days before the war. It might be that Russian investors retreated their investments from Switzerland exactly because they were worried that their deposits and investments would be withheld once the war started. As a robustness check, we dropped firms that only invest in U.S. properties, which account for almost half of a typical international CRE portfolio in our sample. Our results are still consistent and are reported in the online appendix.

Ambrose and Linneman (2001) show that the majority of CRE firms focus on one property sector even though they may hold several different types of properties in their portfolios. To test Hypothesis 2b, we define FOCUS as equal to 1 for a property of the same type as its holding firm's focus (Conklin et al., 2018). Then, for each firm, we construct PropSHR separately for FOCUS and NON-FOCUS properties. It is worth noting that using FOCUS as a dummy does not serve the purpose because a firm can hold multiple properties, some are the same as the focus properties, while others are not. We hence completely separate the classification into PropSHR FOCUS and PropSHR NON-FOCUS samples. We predict that the negative return impact should be more pronounced for firms with more FOCUS properties in Russia.

We replace PropSHR in Equation (4) with PropSHR FOCUS and PropSHR NON-FOCUS. In Table 6, the coefficient on PropSHR FOCUS (Russia) is negative and significant in all columns except column (2). For the event date (column (1)), the coefficient on PropSHR FOCUS (Russia) is -0.414 and is significant at the 1% level. Given that FOCUS properties in Russia typically comprise 0.25% of an average firm's property portfolio, PropSHR FOCUS (Russia) would explain -0.10% (-0.414*0.25) of the negative CARs. The magnitude of this effect is comparable to that in Table 5. On the other hand, the coefficient on PropSHR NON-FOCUS (Russia) is insignificant. In other words, there was an effect of the war only on firms investing in properties in Russia that are the same as their focus properties. Furthermore, the significant coefficients on the variable in Columns (3) and (4) also imply that the influence started before the war took place, although the magnitudes are all weaker than on the date the war started.

[Table 6 here]

5.4. On Greenness and Quality of Assets

Sanctions on Russia will likely lead to soaring energy prices. Firms with greater sustainability (e.g., holding more green buildings) might be more resilient to potential disruption(s) in the energy

markets. We next examine Hypothesis 3a about whether portfolios focusing on sustainable properties are less prone to the potential impact on returns.

The results are tabulated in Table 7. Columns (1), (4), (7), and (10) are the baseline results from Equation (5) without either of the Green variables. Columns (2), (5), (8), and (11) are for Green being GRESB Vintage measured at the firm level, while the other columns are for Green Assets. GRESB Vintage is positively and significantly (varying between 5% and 10% significance level) associated with CARs, suggesting that firms with management teams that are more experienced with sustainability issues tend to be more resilient to the R-U war. On the other hand, Green Assets is the proportion of a firm's properties that are green buildings, thereby capturing the greenness of a firm's asset base rather than its managers' green mentality. Asset greenness positively predicts CARs only for relatively longer windows ([-1, +1] and [-2, +2], see columns (9) and (12)). A comparison between the findings based on GRESB Vintage and Green Assets highlights the importance of investors' green mentality relative to the greenness of assets in place, which is an indication of a long-term sustainability strategy.

[Table 7 here]

We further explore the asset qualities (Hypothesis 3b). Specifically, older properties are likely associated with lower quality, greater functional obsolescence, and thus either rely more on brown energy or are costlier to transform to newer energy. Firms owning more of such properties will likely be less resilient to the energy crisis.

We calculate Asset Age by aggregating across building age for all properties owned by a firm as our measure for its asset quality. We then re-estimate Equation (5) by replacing Green with Asset Age. Results are shown in Table 8. Again, the base cases without Asset Age are shown in the odd-numbered Columns. Asset Age is negatively associated with the CAR. For instance, in column (2), the coefficient of Asset Age is -0.027, significant at the 5% level. In an economic sense, this means a one-standard-deviation change in Asset Age decreases abnormal returns by 0.46% (-0.027*17.17, where the latter is the standard deviation of Asset Age from Table 1). Interestingly, the coefficients for the first three windows, i.e., from -1 to +1, are very similar, meaning that the effect was already capitalized into stock prices one day before the war started.

[Table 8 here]

5.5. 2014 Crimea Crisis

Next, we examine whether return responses to the two military conflicts, the 2014 Crimea Crisis and the 2022 R-U war, are correlated (Hypothesis 4). Fahlenbrach, Prilmeier, and Stulz (2012) show that the persistence in risk culture and business model might make some banks more sensitive to crises. Similarly, one would expect similar market reactions to these two conflicts.

We estimate a richer version of Equation (4) by including the CARs for the 2014 Crimea Crisis as an additional predictor. Table 9 suggests that return responses to the two military conflicts are not correlated. This finding is consistent with our event study results in Table 4. Apparently, investors treated the 2014 Crimea Crisis as an isolated event that would not spill out of Ukraine, whereas the impact of the R-U war is truly global.

[Table 9 here]

5.6. Event Long-Short Index

Finally, we leverage the event long-short index to further explore the impact of the war on CRE performance. The long-short index estimated using Equations (6) and (7) is depicted in Figure 9. We examine the rises and declines of the index values separately. In Panel A, we observe declines in the long-short index values amid sanctions 1-3, likely due to investors' expectations that sanctions will effectively attenuate the effect of the war. As a result, the performance of the initially outperforming group (those who may benefit from the war) will likely disappear. During sanctions 4 and 5, however, we do not observe such an effect, indicating that investors' initial beliefs are reinforced.

[Figure 9 here]

In Panel B, surges in the long-short index values associated with failed peace talks were observed in rounds 1-4. These events are associated with the deterioration of the situation and thus will likely benefit the initially outperforming group. This finding might be driven by the realization of investors' beliefs about the war. A similar trend, however, is not observed during round 5, which

is more likely to succeed than previous peace talks. Overall, the movements of the index suggest that investors' initial beliefs about the war formed on February 24 have been gradually reinforced, suggesting information and belief flow fast and the CRE market is efficient.

6. Conclusion

Examining the effects of rare disaster risk on investments is important for investors, but difficult to assess. First, rare events are by definition rare. It is usually difficult to identify clear event dates when they happen, as events can drag along for extended periods of time. There can also be a combination of factors, muddling the impacts of different factors over time. The Russian invasion of Ukraine offers a clean laboratory for such studies because the event date is precise, and the only major factor in the disaster is the war. We focus on rare disaster risk and proximity penalty in terms of physical distance and political closeness on the performance of international CRE companies, using the war as a rare disaster event. We choose real estate investments because of their immobility and relative homogeneity. Our focus is on the location of the properties held rather than the locations of the international CRE companies holding them.

Our analyses suggest that the returns of international firms with investments in countries that are directly or indirectly impacted by the war have been affected, thus contributing to our knowledge of the benefits for firms to hold international assets by showing that proximity to a rare disaster can significantly affect returns. Studying returns, excess returns, and return volatilities of real estate investments from 2014 to 2022, we find that a disaster risk premium for investments in Russia has been considered by investors all along; there is no noticeable trace of investors' over/underreaction. The Russian effect is echoed by the results on cumulative abnormal returns, which show that, while investments in countries of proximity are indeed more impacted by the war, those in Russia are the most affected. International CRE companies with headquarters in Europe are the most affected. Furthermore, industrial and energy infrastructure properties are more affected than residential, retail, and office properties due to varying reallocation and re-establishment costs. Such impact is further magnified for companies focusing on particular property types. Our results thus highlight that portfolio diversification, both in type and in location, is crucial.

We find that mitigating factors of the negative impacts of the war on performance are the degrees of greenness and newness of properties. Interestingly, the managerial mindset of greenness is more important than the greenness of the buildings, implying the importance of a long-term strategy pertaining to green sustainability. Finally, we show that "this time is different", in that investors' reaction to the 2014 annexation of Crimea was very mild and very different from that of the war in 2022.

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Figure 1: Countries of Proximity to the War

This figure depicts the countries exposed to the war according to our definition of "proximity." The countries include Russia, Ukraine, Poland, Bulgaria, Estonia, Latvia, Lithuania, Sweden, Finland, the United States, the United Kingdom, Germany, and Switzerland.

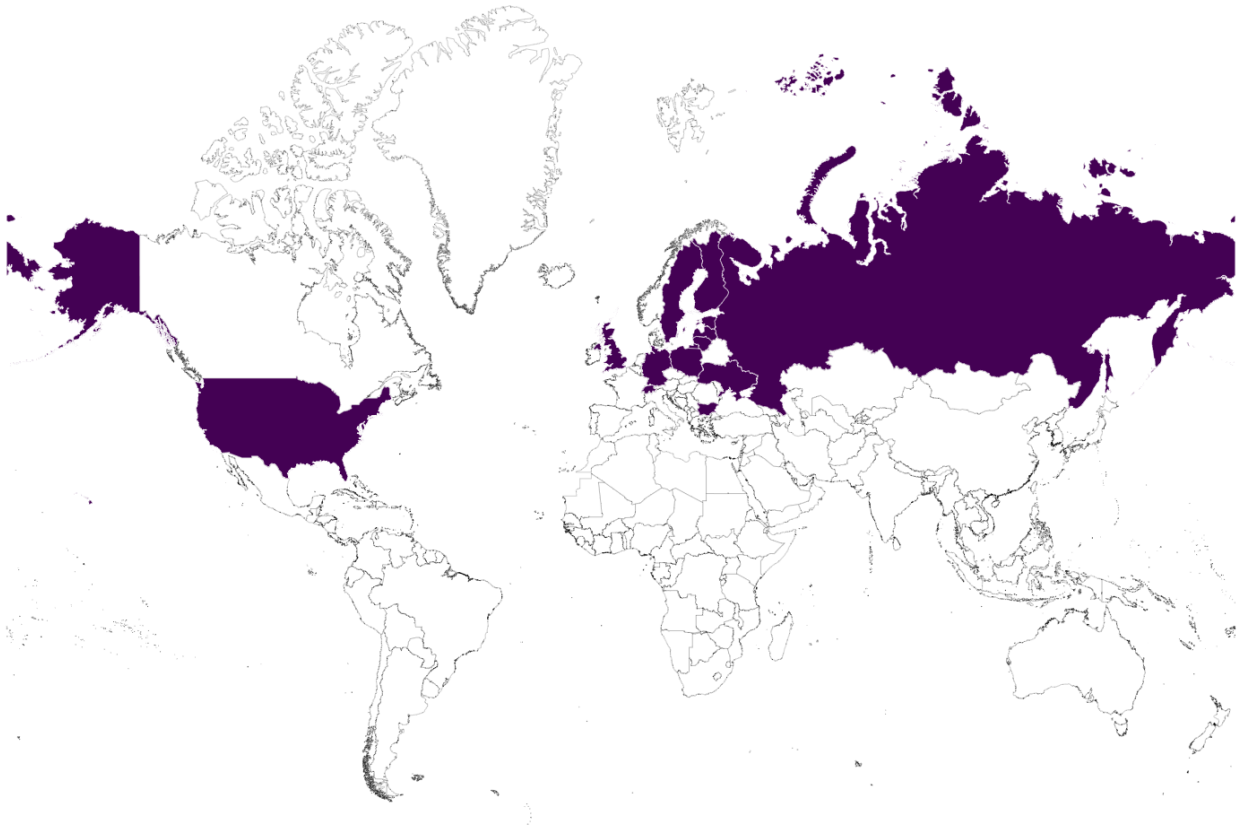


Figure 2: Buy-and-Hold Excess Return Indexes: Global Regions

This figure depicts monthly buy-and-hold excess return (BHER) indexes for four global regions, including Asia-Pacific, Europe, the Americas, and the Middle East & Africa, from January 1, 2014, through September 2, 2022. Each index is set equal to 100 at the beginning of 2014. The vertical line represents the date the war started (February 24, 2022).

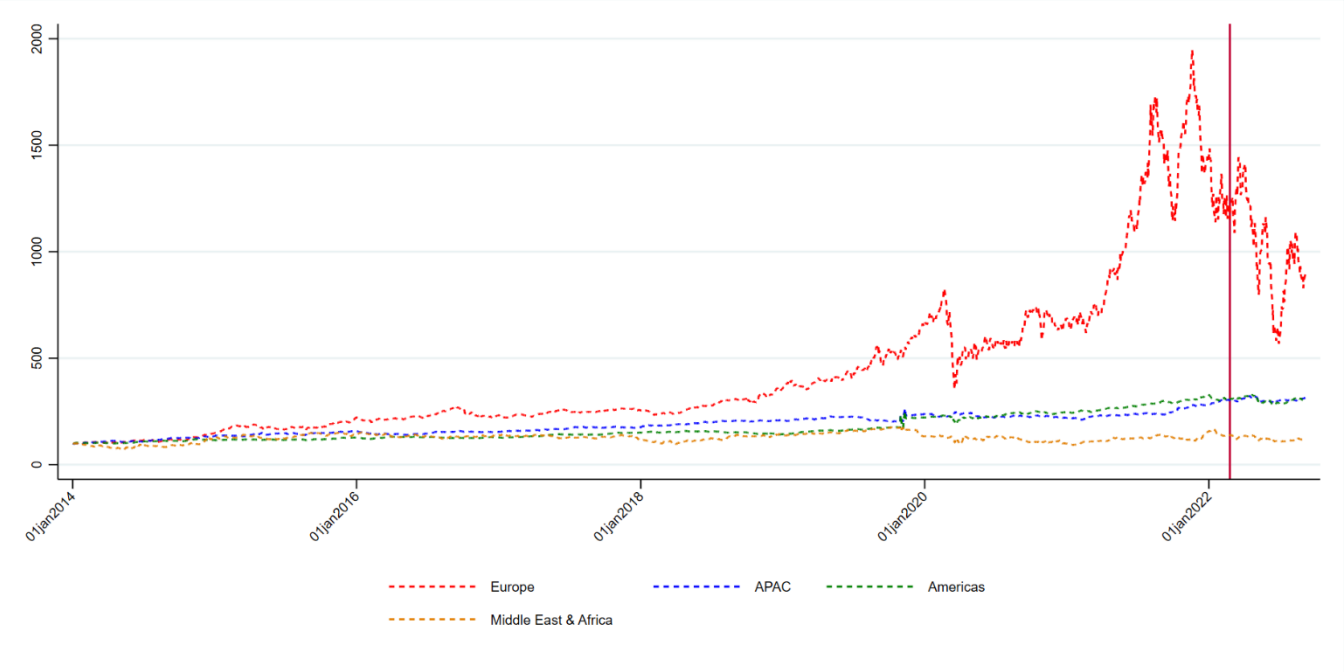


Figure 3: Distributions of Commercial Real Estate Properties

This figure shows the histograms of the properties in our sample. Panel A shows the proportion of an average CRE portfolio allocated to the exposed countries in 2000, 2014, and 2021, respectively. Panel B (Panel C) depicts the Top-5 countries (property types) ranked by the total number of properties as of 2021. See Appendix 1 for variable descriptions.

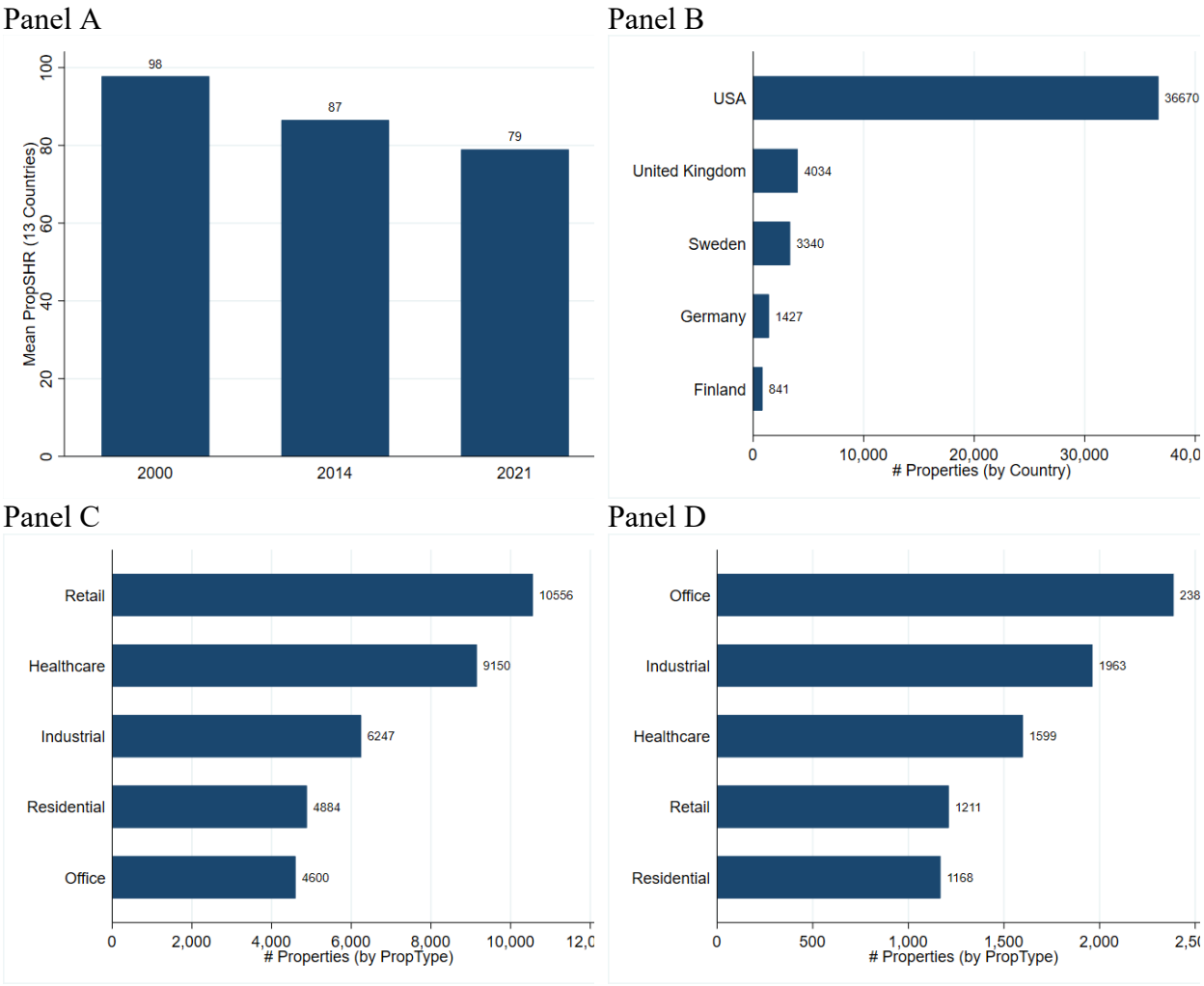


Figure 4: Daily Naïve Excess Returns (Major Property Types)

This figure depicts value-weighted daily naïve excess returns for six major property types, including Industrial, Office, Retail, Residential, Hospitality, and Healthcare, from January 01, 2014, through September 02, 2022. The vertical line represents the date the war started (February 24, 2022).

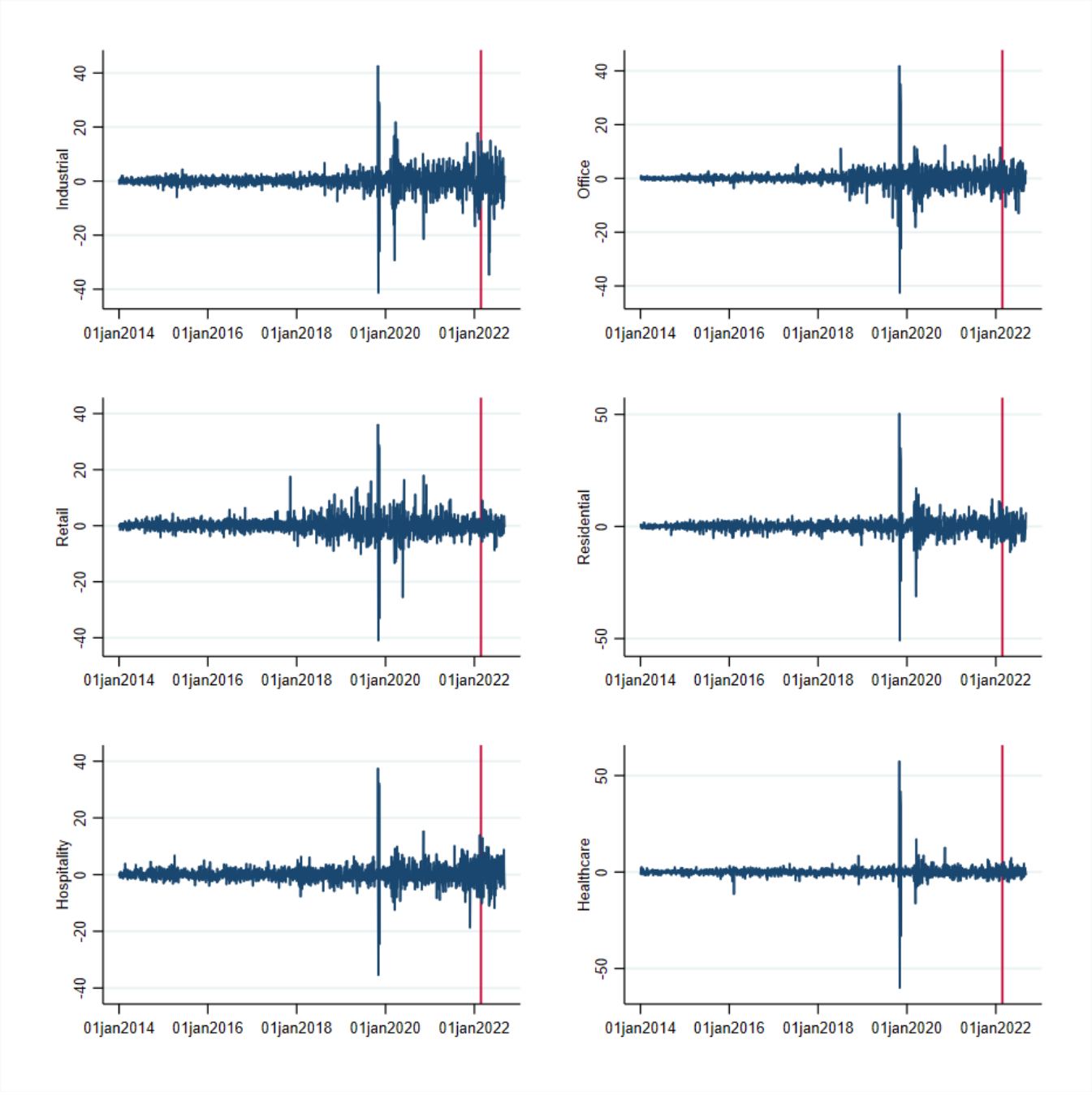


Figure 5: Daily Naïve Excess Returns (Major Countries)

This figure depicts value-weighted daily naïve excess returns for eight major countries, including the U.S., Finland, Germany, Poland, Sweden, Switzerland, Ukraine, and the United Kingdom, from January 01, 2014, through September 02, 2022. The vertical line represents the date the war started (February 24, 2022).

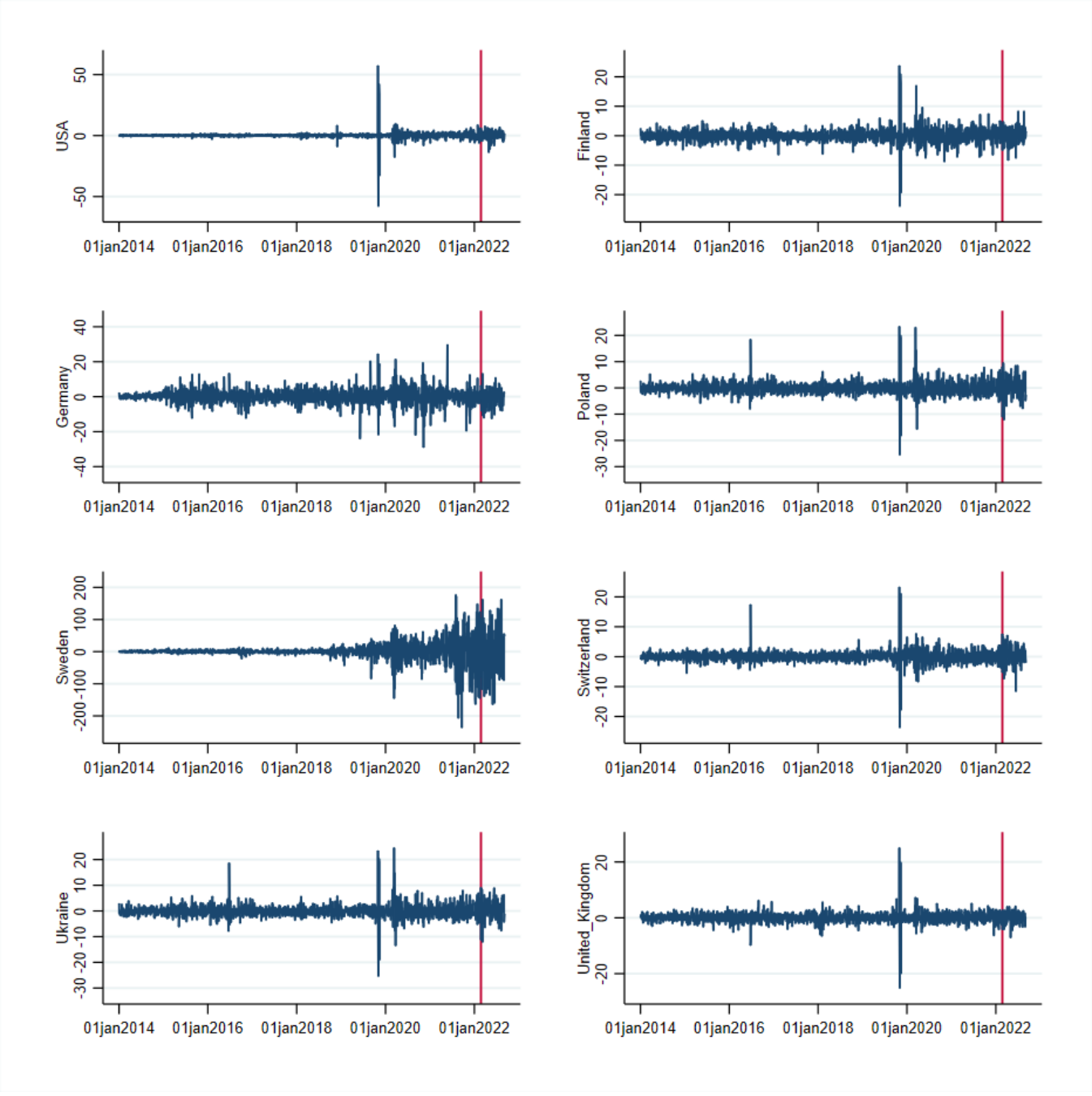


Figure 6: Excess Return Volatilities (Major Property Types)

This figure depicts value-weighted portfolio excess return volatilities for six major property types, including Industrial, Office, Retail, Residential, Hospitality, and Healthcare, from January 01, 2014, through September 02, 2022. The vertical line represents the date the war started (February 24, 2022).

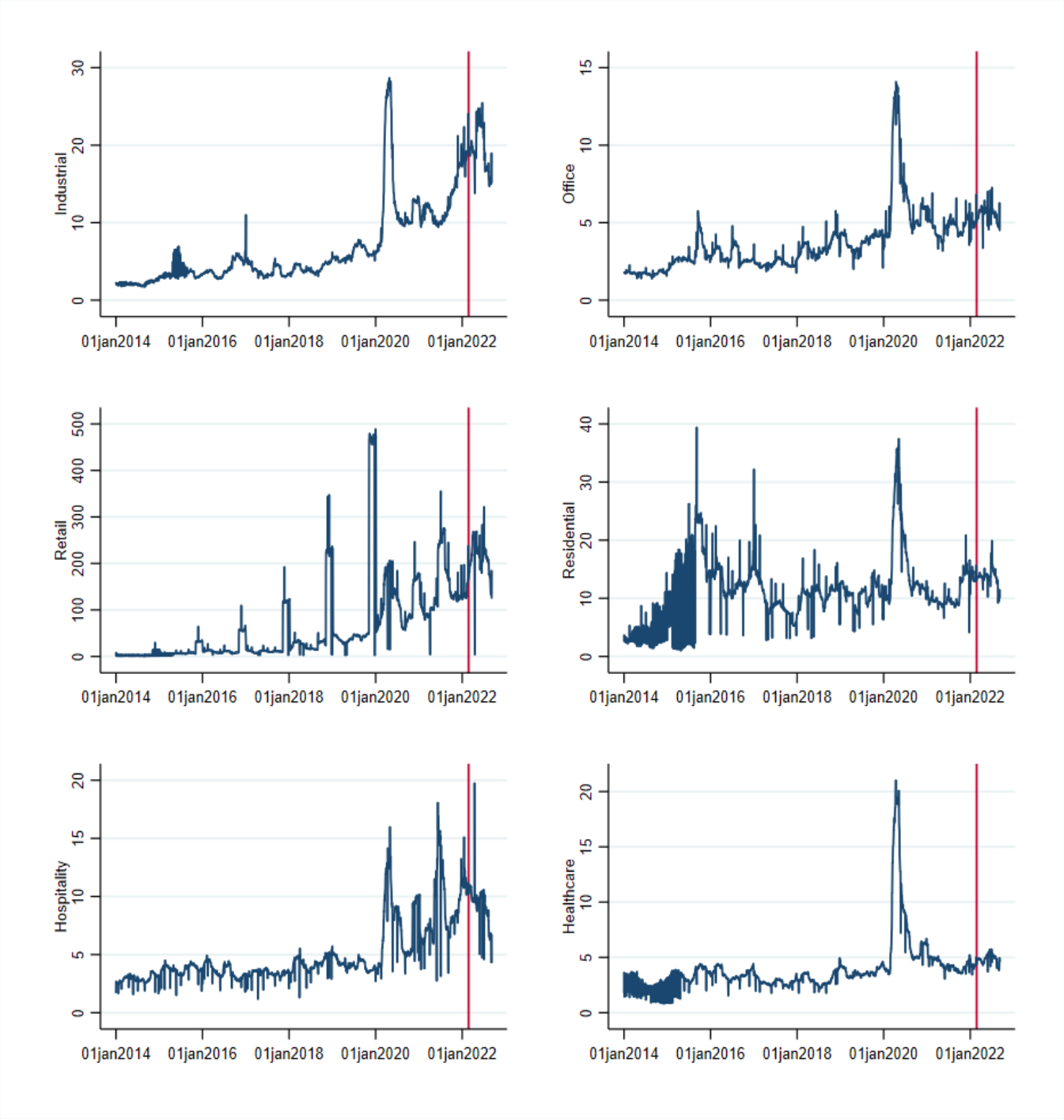


Figure 7: Excess Return Volatilities (Major Countries)

This figure depicts value-weighted portfolio excess return volatilities for eight major countries, including the U.S., Finland, Germany, Poland, Sweden, Switzerland, Ukraine, and the United Kingdom, from January 01, 2014, through September 02, 2022. The vertical line represents the date the war started (February 24, 2022).

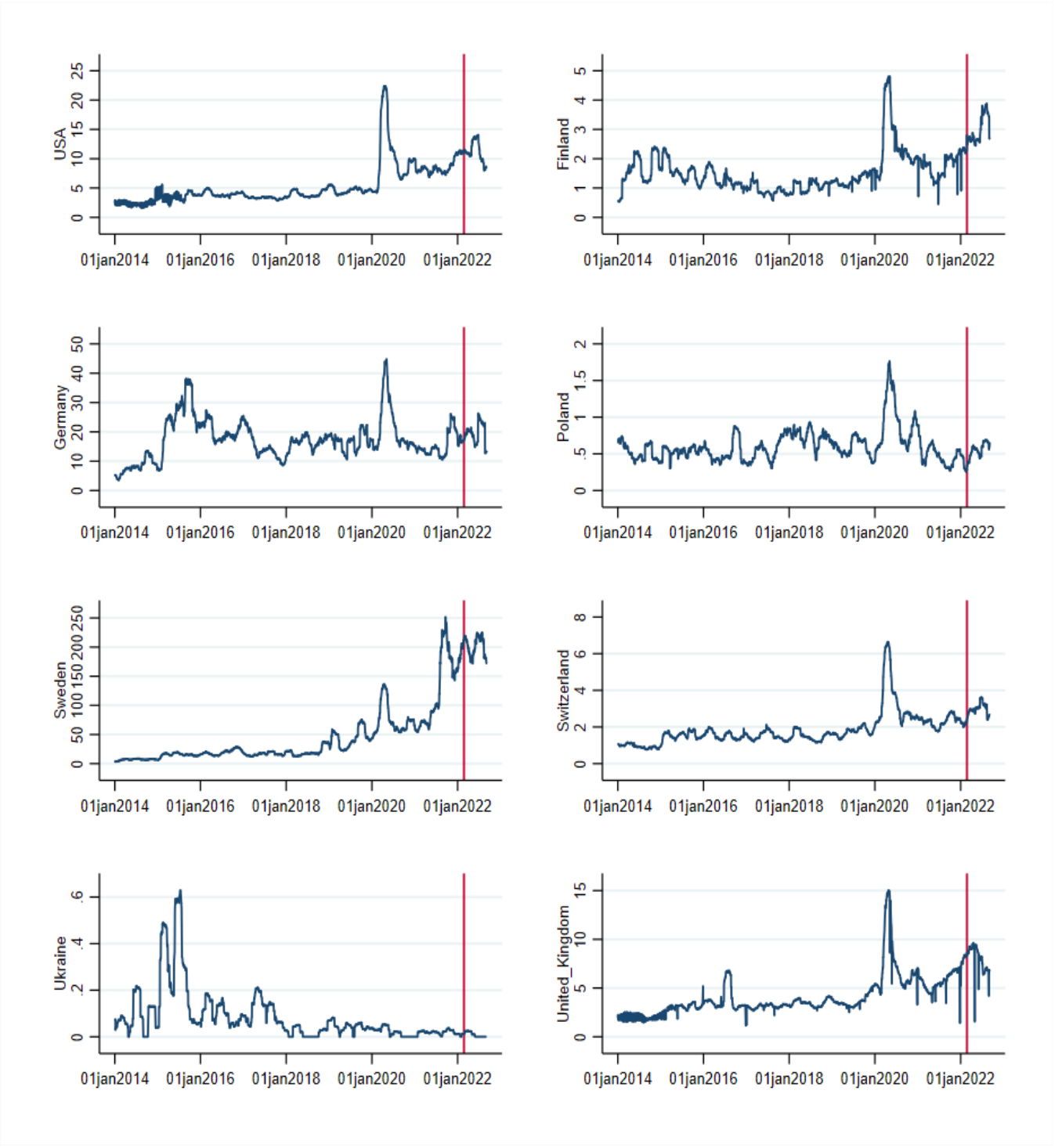
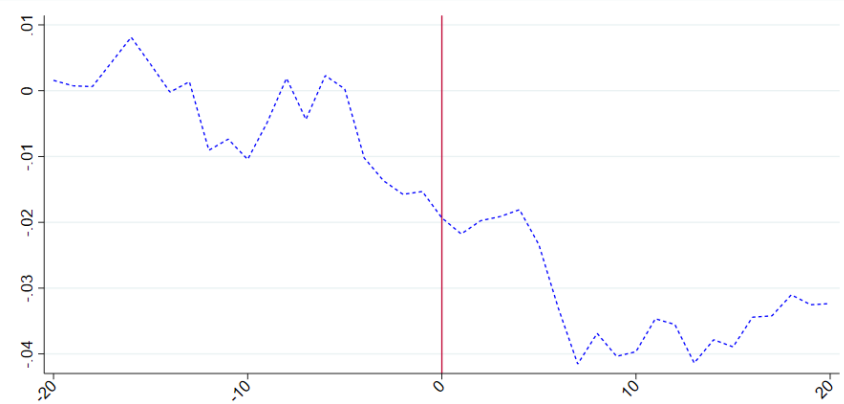


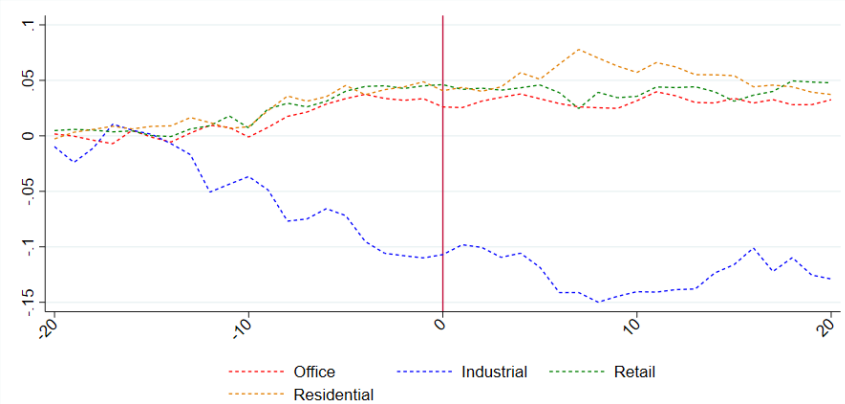
Figure 8: Market Reactions to the Russian Invasion of Ukraine

This figure displays the time-series trends in daily ARs from day -30 to day 30 relative to the event date (February 24, 2022). Panel A shows the ARs for all firms in our sample. Panel B (Panel C) depicts the ARs for firms of core (non-core) property types. Panel D shows the ARs for firms in four global regions. See Appendix 1 for variable descriptions.

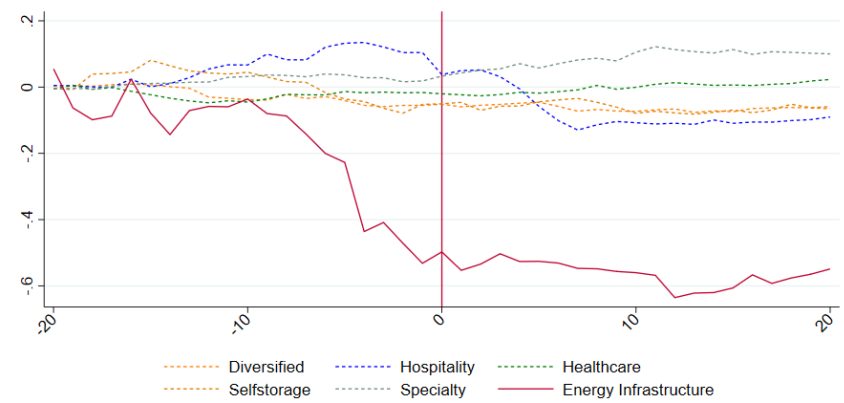
Panel A



Panel B



Panel C



Panel D

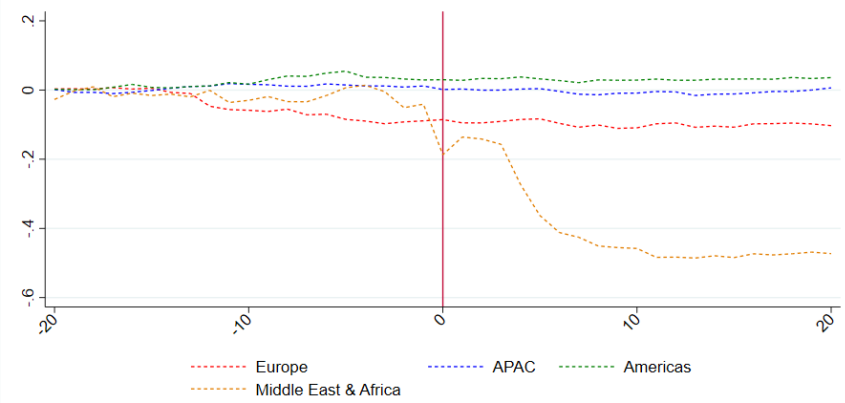
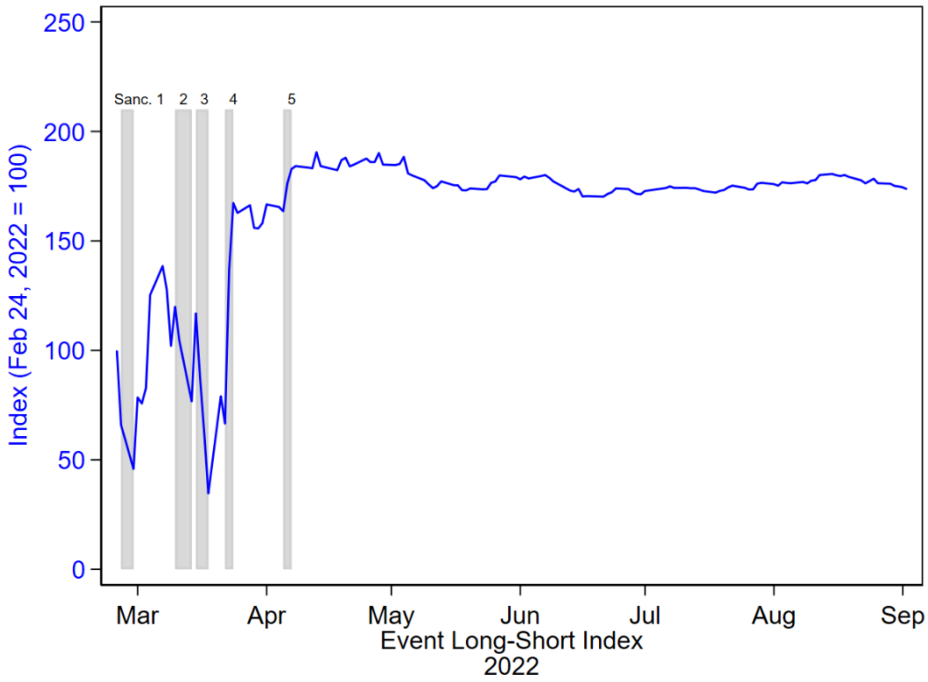


Figure 9: Event Long-Short Index

This figure shows the Event Long-Short Index from January 1, 2021, through September 2, 2022. The shaded areas in Panel A (Panel B) represent sanctions and peace talks, respectively.

Panel A



Panel B

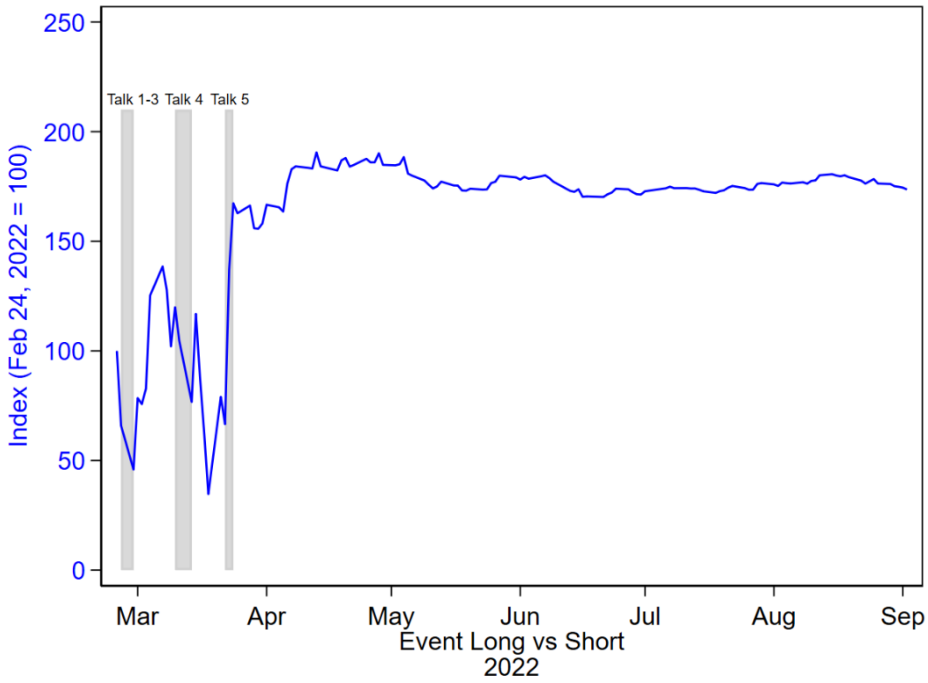


Table 1: Summary Statistics

Panel A: Proximity Premium Model

This table shows summary statistics (number of observations, mean, standard deviation, and 25th, 50th, and 75th percentiles) of key variables used in our analysis. Appendix 1 defines all variables and lists all data sources.

Variable Name	# Obs	Mean	SD	PCT25	Median	PCT75
Dependent variables						
R	667,528	0.06	16.16	-1.31	0.00	1.48
ER	667,528	0.06	16.08	-1.54	-0.02	1.55
SD(R)	667,528	0.05	0.15	0.02	0.03	0.04
SD(ER)	667,528	0.05	0.15	0.02	0.03	0.04
Property shares						
PropSHR (Russia)	667,528	0.36	5.30	0	0	0
PropSHR (USA)	667,528	52.95	47.96	0	79.13	100
PropSHR (Bulgaria)	667,528	0.30	2.73	0	0	0
PropSHR (Estonia)	667,528	0.12	1.86	0	0	0
PropSHR (Finland)	667,528	0.74	7.42	0	0	0
PropSHR (Germany)	667,528	6.15	20.58	0	0	0
PropSHR (Latvia)	667,528	0.07	1.42	0	0	0
PropSHR (Lithuania)	667,528	0.09	1.72	0	0	0
PropSHR (Poland)	667,528	1.12	7.51	0	0	0
PropSHR (Sweden)	667,528	3.60	17.71	0	0	0
PropSHR (Switzerland)	667,528	2.10	14.08	0	0	0
PropSHR (United Kingdom)	667,528	15.91	33.93	0	0	3.45
Control variables						
InstOwn	667,528	56.76	33.45	24.96	62.46	87.37
Size (raw)	667,528	1392.41	298.00	1306.07	1442.81	1547.75
MB	667,528	1.51	6.28	0.86	1.22	1.93
Pre-war returns	667,528	1.65	33.38	-11.03	0.51	12.90
Investment	667,528	13.14	41.46	-0.24	5.20	15.36
Profitability	667,528	6.38	5.31	4.30	6.59	8.92

Panel B: Event Study

Variable Name	# Obs	Mean	SD	PCT25	Median	PCT75
Property shares						
PropSHR (USA)	411	49.55	48.19	0	40.06	100
PropSHR (Bulgaria)	411	0.12	0.93	0	0	0
PropSHR (Estonia)	411	0.08	1.32	0	0	0
PropSHR (Finland)	411	0.86	7.46	0	0	0
PropSHR (Germany)	411	6.39	21.13	0	0	0
PropSHR (Latvia)	411	0.08	1.61	0	0	0
PropSHR (Lithuania)	411	0.10	1.93	0	0	0
PropSHR (Poland)	411	0.88	5.26	0	0	0
PropSHR (Russia)	411	0.72	7.49	0	0	0
PropSHR (Sweden)	411	3.17	16.14	0	0	0
PropSHR (Switzerland)	411	1.65	12.67	0	0	0
PropSHR (United_Kingdom)	411	15.26	33.62	0	0	4.35
Asset-level measures						
GRESB Vintage	411	2.11	3.46	0	0	3
Green Assets	411	0.02	0.10	0	0	0
Asset Age	411	25.61	17.17	15	25.27	31.13
Control variables						
InstOwn	411	51.80	34.09	19.98	51.16	85.05
Size (raw)	411	1383.08	367.65	1310.11	1451.41	1572.58
MB	411	1.66	2.14	0.71	1.09	1.84
Pre-war returns	411	-1.74	18.07	-8.37	-1.90	4.35
Investment	411	10.73	24.65	-0.70	4.15	14.67
Profitability	411	6.42	5.79	3.58	6.11	9.08

Table 2: Returns, Excess Returns, and Volatilities for 2014-2022

This table shows the panel regression results for the relationship between daily returns/buy-and-hold excess returns (volatilities) and property shares from January 2014 to September 2022. In columns (1) ((2)), we specify daily (excess) returns as the dependent variable. In columns (3) ((4)), we specify the logarithm of (excess) return volatilities as the dependent variable. PropSHR (*c*) is defined as the proportion of a firm's property portfolio allocated to country *c*. All independent variables are measured as of the end of the prior year. See Appendix 1 for variable descriptions. Fixed effects pertaining to a firm's property type focus, headquartered country, listed country, and year are included in the regressions. *p*-values are reported in parentheses.

	(1) R	(2) ER	(3) LOG(SD(R))	(4) LOG(SD(ER))
PropSHR (Russia)	-0.007	-0.007	0.005	0.003
	(0.003)	(0.005)	(0.983)	(0.363)
PropSHR (USA)	-0.002	-0.002	-0.000	-0.000
	(0.134)	(0.137)	(0.095)	(0.137)
PropSHR (Bulgaria)	-0.038	-0.041	-0.002	-0.002
	(0.145)	(0.158)	(0.042)	(0.046)
PropSHR (Estonia)	-0.021	-0.027	0.002	0.003
	(0.685)	(0.612)	(0.640)	(0.547)
PropSHR (Finland)	-0.015	-0.015	0.001	0.001
	(0.339)	(0.349)	(0.405)	(0.395)
PropSHR (Germany)	-0.004	-0.004	-0.000	-0.000
	(0.152)	(0.167)	(0.337)	(0.304)
PropSHR (Latvia)	-0.026	-0.033	-0.000	0.001
	(0.629)	(0.543)	(0.958)	(0.800)
PropSHR (Lithuania)	0.022	0.031	0.002	0.003
	(0.720)	(0.644)	(0.652)	(0.451)
PropSHR (Poland)	-0.032	-0.035	-0.002	-0.001
	(0.079)	(0.087)	(0.027)	(0.033)
PropSHR (Sweden)	-0.004	-0.004	-0.000	-0.000
	(0.309)	(0.411)	(0.302)	(0.257)
PropSHR (Switzerland)	-0.002	-0.002	-0.000	-0.000
	(0.231)	(0.254)	(0.311)	(0.198)
PropSHR (United_Kingdom)	-0.003	-0.003	-0.000	-0.000
	(0.129)	(0.132)	(0.181)	(0.167)
InstOwn	0.001	0.001	-0.000	-0.000
	(0.031)	(0.038)	(0.035)	(0.000)
Size	-0.000	-0.000	0.000	0.000
	(0.114)	(0.125)	(0.000)	(0.001)
MB	-0.001	-0.001	0.000	0.000
	(0.324)	(0.218)	(0.756)	(0.931)
Pre-war returns	0.000	0.000	0.000	0.000
	(0.422)	(0.418)	(0.000)	(0.000)
Investment	0.001	0.001	0.000	0.000
	(0.128)	(0.106)	(0.007)	(0.000)
Profitability	0.007	0.005	0.001	0.001
	(0.141)	(0.155)	(0.000)	(0.003)

Table 2 (continued)

	(1) R	(2) ER	(3) LOG(SD(R))	(4) LOG(SD(ER))
Crimea	0.586	0.058	-0.000	-0.000
	(0.006)	(0.759)	(0.636)	(0.693)
feb24	-2.723	-1.319	-0.001	0.000
	(0.403)	(0.477)	(0.089)	(0.954)
mar07	-9.464	-4.871	0.001	0.002
	(0.008)	(0.178)	(0.109)	(0.001)
may09	-12.775	-3.171	0.005	0.006
	(0.000)	(0.371)	(0.001)	(0.000)
may18	-2.393	1.820	0.005	0.006
	(0.484)	(0.357)	(0.021)	(0.003)
Constant	0.760	0.782	0.070	0.087
	(0.024)	(0.031)	(0.000)	(0.000)
Prop FEs	Yes	Yes	Yes	Yes
Country FEs	Yes	Yes	Yes	Yes
Exchange FEs	Yes	Yes	Yes	Yes
Year FEs	Yes	Yes	Yes	Yes
R-squared	0.001	0.001	0.367	0.331
# Obs	667,528	667,528	667,528	667,528

Table 3: Returns, Excess Returns, and Volatilities Due to the War in 2022

This table shows the panel regression results for the relationship between daily returns/excess returns (volatilities) and property shares from February 2022 to September 2022. In columns (1) ((2)), we specify daily (excess) returns as the dependent variable. In columns (3) ((4)), we specify the logarithm of (excess) return volatilities as the dependent variable, respectively. PropSHR (*c*) is defined as the proportion of a firm's property portfolio allocated to country *c*. All independent variables are measured as of the end of the prior year. See Appendix 1 for variable descriptions. Fixed effects pertaining to a firm's property type focus, headquartered country, and listed country are included in the regressions. *p*-values are reported in parentheses.

	(1) R	(2) ER	(3) LOG(SD(R))	(4) LOG(SD(ER))
PropSHR (Russia)	-0.006	-0.009	0.005	0.003
	(0.107)	(0.012)	(0.035)	(0.151)
PropSHR (USA)	0.000	-0.001	-0.001	-0.001
	(0.943)	(0.616)	(0.448)	(0.402)
PropSHR (Bulgaria)	-0.024	-0.028	-0.086	-0.086
	(0.602)	(0.479)	(0.022)	(0.010)
PropSHR (Estonia)	0.543	0.688	0.167	0.179
	(0.294)	(0.251)	(0.194)	(0.217)
PropSHR (Finland)	0.045	0.058	0.017	0.018
	(0.290)	(0.247)	(0.139)	(0.169)
PropSHR (Germany)	-0.002	-0.004	0.004	0.003
	(0.407)	(0.201)	(0.110)	(0.264)
PropSHR (Latvia)	-0.468	-0.247	0.077	0.107
	(0.005)	(0.002)	(0.384)	(0.241)
PropSHR (Lithuania)	0.026	0.073	-0.312	-0.308
	(0.834)	(0.498)	(0.001)	(0.001)
PropSHR (Poland)	0.007	-0.003	-0.000	-0.001
	(0.349)	(0.448)	(0.961)	(0.738)
PropSHR (Sweden)	-0.001	-0.003	0.003	0.003
	(0.914)	(0.799)	(0.488)	(0.589)
PropSHR (Switzerland)	0.007	0.004	-0.002	-0.003
	(0.136)	(0.090)	(0.265)	(0.109)
PropSHR (United_Kingdom)	-0.000	-0.002	-0.000	-0.000
	(0.880)	(0.452)	(0.998)	(0.918)
InstOwn	-0.000	0.000	-0.002	-0.003
	(0.759)	(0.986)	(0.208)	(0.043)
Size	-0.000	0.000	0.000	-0.000
	(0.948)	(0.587)	(0.197)	(0.878)
MB	-0.016	-0.010	0.033	0.028
	(0.215)	(0.202)	(0.000)	(0.000)
Pre-war returns	0.018	0.010	-0.003	-0.003
	(0.072)	(0.048)	(0.237)	(0.225)
Investment	-0.003	-0.002	0.003	0.002
	(0.125)	(0.067)	(0.001)	(0.001)
Profitability	-0.006	-0.000	0.003	0.004
	(0.382)	(0.821)	(0.567)	(0.436)

Table 3 (continued)

	(1) R	(2) ER	(3) LOG(SD(R))	(4) LOG(SD(ER))
feb24	-1.121	-0.155	-0.064	-0.027
	(0.367)	(0.663)	(0.000)	(0.062)
mar07	-2.925	-0.767	-0.010	-0.001
	(0.000)	(0.020)	(0.149)	(0.957)
may09	-4.730	-0.284	0.018	0.016
	(0.000)	(0.541)	(0.232)	(0.046)
may18	-1.872	0.013	0.029	0.025
	(0.095)	(0.925)	(0.243)	(0.060)
Constant	0.112	-0.262	1.641	1.860
	(0.838)	(0.590)	(0.000)	(0.000)
Prop FEs	Yes	Yes	Yes	Yes
Country FEs	Yes	Yes	Yes	Yes
Exchange FEs	Yes	Yes	Yes	Yes
R-squared	0.007	0.002	0.509	0.462
# Obs	55,341	55,341	55,341	55,341

Table 4: Market Reactions to the Russia-Ukraine Conflict

This table presents summary statistics for cumulative abnormal returns (CARs). Panel A presents CARs around the Russian invasion of Ukraine, based on six event windows, (-1,0), (0,0), (0,1), (-1,1), (-2,0), (-2,2), which represent, respectively, the one-day before, day-of, one-day ahead, three-day, two-day before, and five-day windows. Panels B-D show CARs around Russia's announcement of its "unfriendly" country list, the Moscow Victory Day Parade, and the 2014 Crimean Crisis, respectively.

Panel A: February 24 - Russian invasion of Ukraine

Window	# Firms	CAR	Patell	Patell Adj.	Boehmer	GenSign	Wilcox
[-1;0]	411	-0.34	-3.28	-1.30	-1.90	-1.79	-1.90
[0;0]	411	-0.40	-2.09	-0.83	-1.50	-2.41	-1.92
[0;1]	411	-0.64	-4.20	-1.42	-2.70	-2.41	-2.09
[-1;1]	411	-0.58	-2.34	-0.93	-1.20	-0.53	-0.59
[-2;0]	411	-0.55	-4.53	-1.79	-2.14	-3.19	-1.83
[-2;2]	411	-0.79	-3.70	-1.47	-1.61	-1.30	-0.60

Panel B: March 7 - Russia's "unfriendly" country list

Window	# Firms	CAR	Patell	Patell Adj.	Boehmer	GenSign	Wilcox
[-1;0]	411	-1.94	-10.04	-3.59	-4.41	-3.81	-5.25
[0;0]	411	-0.96	-6.10	-2.18	-3.38	-3.18	-3.90
[0;1]	411	-0.48	-2.06	-0.74	-1.07	-0.09	-0.28
[-1;1]	411	-1.47	-6.77	-2.42	-3.18	-1.00	-2.25
[-2;0]	411	-2.50	-10.99	-3.92	-4.70	-4.81	-5.78
[-2;2]	411	-2.23	-8.32	-2.97	-4.24	-3.46	-3.15

Panel C: May 9 - The Moscow Victory Day Parade

Window	# Firms	CAR	Patell	Patell Adj.	Boehmer	GenSign	Wilcox
[-1;0]	411	-0.61	-0.78	-0.30	-0.43	1.91	0.07
[0;0]	411	-0.57	-0.57	-0.21	-0.35	0.31	-0.37
[0;1]	411	-0.47	-0.61	-0.23	-0.32	1.21	0.39
[-1;1]	411	-0.49	-0.89	-0.34	-0.46	0.52	0.60
[-2;0]	411	-1.14	-1.99	-0.75	-0.98	0.72	-0.57
[-2;2]	411	-1.10	-2.32	-0.88	-1.04	-0.58	-0.57

Table 4 (continued)

Panel D: 2014 Crimean Crisis

Window	# Firms	CAR	Patell	Patell Adj.	Boehmer	GenSign	Wilcox
[-1;0]	284	-0.10	2.16	0.92	1.47	2.60	1.69
[0;0]	284	-0.15	2.02	0.86	2.02	1.96	2.19
[0;1]	284	-0.09	2.48	1.06	2.25	2.19	1.92
[-1;1]	284	-0.05	2.53	1.08	1.62	1.32	1.69
[-2;0]	284	-0.08	3.54	1.51	2.15	2.42	1.78
[-2;2]	284	-0.15	3.37	1.44	2.01	2.31	0.85

Table 5: Abnormal Returns and Property Shares Based on Different Event Windows

This table shows the panel regression results for the relationship between CARs and property shares, controlling for firm characteristics. In columns (1)-(5), we specify CARs based on one of the following five event windows as the dependent variable: (0,0), (0,1), (-1,1), (-2,2), and the intermediate (two-week) window. PropSHR (*c*) is defined as the proportion of a firm's property portfolio allocated to country *c*. All independent variables are measured as of the end of 2021. See Appendix 1 for variable descriptions. Fixed effects pertaining to a firm's property type focus, headquartered country, and listed country are included in the regressions. *p*-values are reported in parentheses.

CAR	(1) Feb-24-2022	(2) (0, +1)	(3) (-1 +1)	(4) (-2 +2)	(5) Feb-24 to Mar-14
PropSHR (Russia)	-0.143	-0.115	-0.107	-0.155	-0.005
	(0.000)	(0.000)	(0.007)	(0.000)	(0.000)
PropSHR (USA)	0.003	-0.009	-0.008	-0.034	0.000
	(0.858)	(0.642)	(0.722)	(0.264)	(0.853)
PropSHR (Bulgaria)	-0.584	-0.278	-0.120	0.054	0.010
	(0.166)	(0.508)	(0.858)	(0.948)	(0.410)
PropSHR (Estonia)	1.872	-0.076	-0.022	0.966	0.029
	(0.041)	(0.895)	(0.976)	(0.466)	(0.290)
PropSHR (Finland)	0.120	-0.038	0.035	0.106	0.003
	(0.092)	(0.522)	(0.593)	(0.231)	(0.129)
PropSHR (Germany)	-0.021	0.029	0.035	-0.003	-0.000
	(0.306)	(0.218)	(0.154)	(0.916)	(0.896)
PropSHR (Latvia)	0.000	-2.523	-5.222	-2.207	-0.114
	(1.000)	(0.317)	(0.045)	(0.256)	(0.000)
PropSHR (Lithuania)	-4.099	-4.911	-3.449	-6.111	-0.048
	(0.000)	(0.000)	(0.024)	(0.000)	(0.187)
PropSHR (Poland)	-0.072	0.027	0.085	0.067	0.000
	(0.287)	(0.641)	(0.337)	(0.405)	(0.868)
PropSHR (Sweden)	-0.026	0.019	-0.023	-0.063	-0.002
	(0.479)	(0.727)	(0.713)	(0.050)	(0.037)
PropSHR (Switzerland)	0.051	-0.011	-0.084	-0.124	0.000
	(0.088)	(0.830)	(0.090)	(0.009)	(0.915)
PropSHR (United_Kingdom)	-0.019	-0.002	-0.002	-0.014	-0.000
	(0.383)	(0.922)	(0.902)	(0.512)	(0.841)
InstOwn	0.017	0.008	0.003	0.013	0.000
	(0.101)	(0.499)	(0.821)	(0.524)	(0.893)
Size	-0.000	0.000	0.001	0.001	0.000
	(0.756)	(0.623)	(0.156)	(0.306)	(0.374)
MB	0.203	0.347	0.298	0.296	-0.001
	(0.015)	(0.078)	(0.108)	(0.002)	(0.632)

Table 5 (continued)

CAR	(1) Feb-24-2022	(2) (0, +1)	(3) (-1 +1)	(4) (-2 +2)	(5) Feb-24 to Mar-14
Pre-war returns	-0.061	0.001	0.009	-0.053	0.001
	(0.197)	(0.994)	(0.924)	(0.466)	(0.248)
Investment	-0.006	-0.029	-0.046	-0.047	-0.001
	(0.680)	(0.228)	(0.067)	(0.242)	(0.034)
Profitability	-0.023	-0.092	-0.104	-0.042	-0.001
	(0.730)	(0.503)	(0.421)	(0.597)	(0.761)
Constant	-0.272	-0.395	-0.985	-0.325	-0.006
	(0.859)	(0.761)	(0.484)	(0.853)	(0.879)
Prop FEs	Yes	Yes	Yes	Yes	Yes
Country FEs	Yes	Yes	Yes	Yes	Yes
Exchange FEs	Yes	Yes	Yes	Yes	Yes
R-squared	0.269	0.189	0.249	0.303	0.325
# Obs	411	411	411	411	411

Table 6: Abnormal Returns and Property Shares, Focus and Non-Focus Properties

This table shows the panel regression results for the relationship between CARs and property shares, controlling for firm characteristics. In columns (1)-(4), we specify CARs based on one of the following four event windows as the dependent variable: (0,0), (0,1), (-1,1), and (-2,2). *FOCUS* indicates a property of the same type as its holding firm's property type focus. PropSHR FOCUS (NON-FOCUS) (*c*) is defined as the proportion of a firm's focus (non-focus) properties allocated to country *c*. All independent variables are the same as those in Table 5 and are suppressed for brevity. See Appendix 1 for variable descriptions. Fixed effects pertaining to a firm's property type focus, headquartered country, and listed country are included in the regressions. *p*-values are reported in parentheses.

CAR	(1) Feb-24-2022	(2) (0, +1)	(3) (-1 +1)	(4) (-2 +2)
PropSHR FOCUS (Russia)	-0.414	-0.106	-0.217	-0.203
	(0.002)	(0.215)	(0.030)	(0.012)
PropSHR NON-FOCUS (Russia)	0.037	-0.120	0.080	-0.050
	(0.688)	(0.348)	(0.612)	(0.715)
PropSHR FOCUS (Other countries)	Yes	Yes	Yes	Yes
PropSHR NON-FOCUS (Other countries)	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes
Prop FEs	Yes	Yes	Yes	Yes
Country FEs	Yes	Yes	Yes	Yes
Exchange FEs	Yes	Yes	Yes	Yes
R-squared	0.288	0.209	0.269	0.311
# Obs	411	411	411	411

Table 7: Abnormal Returns and Asset Sustainability

This table shows the panel regression results for the relationship between CARs and asset sustainability, controlling for firm characteristics. In columns (1)-(12), we specify CARs based on one of the following four event windows as the dependent variable: (0,0), (0,1), (-1,1), and (-2,2). GRESB Vintage is the number of years since a firm first adopted GRESB reporting. Green Assets is the proportion of a firm's properties certified by any green building standard(s). All independent variables are the same as those in Table 5. See Appendix 1 for variable descriptions. Fixed effects pertaining to a firm's property type focus, headquartered country, and listed country are included in the regressions. *p*-values are reported in parentheses.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
CAR	Feb-24-2022			(0, +1)			(-1 +1)			(-2 +2)		
	Base	GRESB Vintage	Green Assets	Base	GRESB Vintage	Green Assets	Base	GRESB Vintage	Green Assets	Base	GRESB Vintage	Green Assets
Green		0.064	-2.608		0.084	1.827		0.108	2.528		0.113	3.081
		(0.020)	(0.132)		(0.089)	(0.220)		(0.060)	(0.022)		(0.154)	(0.054)
InstOwn	0.016	0.014	0.018	0.006	0.003	0.005	0.003	-0.001	0.001	0.010	0.005	0.008
	(0.108)	(0.155)	(0.078)	(0.262)	(0.502)	(0.325)	(0.634)	(0.835)	(0.811)	(0.148)	(0.505)	(0.206)
Size	0.001	0.000	0.001	0.001	0.001	0.001	0.002	0.001	0.002	0.002	0.002	0.002
	(0.629)	(0.740)	(0.634)	(0.151)	(0.316)	(0.155)	(0.017)	(0.031)	(0.015)	(0.070)	(0.100)	(0.063)
MB	0.199	0.198	0.187	0.342	0.341	0.350	0.302	0.301	0.313	0.338	0.337	0.352
	(0.003)	(0.004)	(0.007)	(0.000)	(0.000)	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Pre-war returns	-0.067	-0.068	-0.068	-0.000	-0.002	0.000	0.000	-0.002	0.001	-0.059	-0.061	-0.058
	(0.070)	(0.068)	(0.065)	(0.998)	(0.984)	(0.997)	(0.998)	(0.980)	(0.990)	(0.043)	(0.035)	(0.045)
Investment	-0.005	-0.003	-0.006	-0.030	-0.027	-0.029	-0.047	-0.045	-0.047	-0.046	-0.043	-0.045
	(0.564)	(0.696)	(0.507)	(0.049)	(0.064)	(0.057)	(0.009)	(0.012)	(0.010)	(0.091)	(0.110)	(0.096)
Profitability	-0.021	-0.018	-0.021	-0.083	-0.078	-0.083	-0.099	-0.092	-0.099	-0.044	-0.038	-0.045
	(0.745)	(0.789)	(0.753)	(0.513)	(0.537)	(0.510)	(0.458)	(0.483)	(0.452)	(0.670)	(0.711)	(0.659)
Constant	-1.747	-1.563	-1.709	-1.593	-1.352	-1.620	-2.002	-1.696	-2.039	-3.643	-3.320	-3.688
	(0.165)	(0.217)	(0.172)	(0.225)	(0.320)	(0.221)	(0.192)	(0.280)	(0.186)	(0.027)	(0.047)	(0.026)
Prop FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Exchange FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.229	0.231	0.231	0.185	0.186	0.186	0.234	0.235	0.234	0.282	0.283	0.283
# Obs	411	411	411	411	411	411	411	411	411	411	411	411

Table 8: Abnormal Returns and Asset Quality

This table shows the panel regression results for the relationship between CARs and asset quality, controlling for firm characteristics. In columns (1)-(8), we specify CARs based on one of the following four event windows as the dependent variable: (0,0), (0,1), (-1,1), and (-2,2). Asset Age is the average building age of all properties owned by a firm. All independent variables are the same as those in Table 5. See Appendix 1 for variable descriptions. Fixed effects pertaining to a firm's property type focus, headquartered country, and listed country are included in the regressions. *p*-values are reported in parentheses.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
CAR	Feb-24-2022		(0, +1)		(-1 +1)		(-2 +2)	
	Base	Asset Age	Base	Asset Age	Base	Asset Age	Base	Asset Age
Asset Age		-0.027		-0.026		-0.029		-0.015
		(0.033)		(0.101)		(0.049)		(0.072)
InstOwn	0.016	0.016	0.006	0.006	0.003	0.003	0.010	0.010
	(0.108)	(0.093)	(0.262)	(0.222)	(0.634)	(0.663)	(0.148)	(0.164)
Size	0.001	0.001	0.001	0.001	0.002	0.002	0.002	0.002
	(0.629)	(0.651)	(0.151)	(0.173)	(0.017)	(0.014)	(0.070)	(0.064)
MB	0.199	0.194	0.342	0.337	0.302	0.297	0.338	0.335
	(0.003)	(0.003)	(0.000)	(0.001)	(0.001)	(0.001)	(0.000)	(0.000)
Pre-war returns	-0.067	-0.067	-0.000	-0.000	0.000	0.000	-0.059	-0.059
	(0.070)	(0.067)	(0.998)	(1.000)	(0.998)	(0.996)	(0.043)	(0.047)
Investment	-0.005	-0.006	-0.030	-0.031	-0.047	-0.049	-0.046	-0.047
	(0.564)	(0.506)	(0.049)	(0.050)	(0.009)	(0.007)	(0.091)	(0.083)
Profitability	-0.021	-0.028	-0.083	-0.090	-0.099	-0.106	-0.044	-0.048
	(0.745)	(0.677)	(0.513)	(0.493)	(0.458)	(0.439)	(0.670)	(0.649)
Constant	-1.747	-0.937	-1.593	-0.809	-2.002	-1.141	-3.643	-3.188
	(0.165)	(0.516)	(0.225)	(0.614)	(0.192)	(0.508)	(0.027)	(0.050)
Prop FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Exchange FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.229	0.237	0.185	0.188	0.234	0.236	0.282	0.283
# Obs	411	411	411	411	411	411	411	411

Table 9: Association of Abnormal Returns Around the Russia-Ukraine Conflicts

This table shows the panel regression results for the association of the CARs around the Russian invasion of Ukraine and the 2014 Crimean Crisis, controlling for firm characteristics. In columns (1)-(4), we specify CARs based on one of the following four event windows as the dependent variable: (0,0), (0,1), (-1,1), and (-2,2). CAR (Crimea) is the CARs around the 2014 Crimean Crisis, based on the same event window as the dependent variable. PropSHR (*c*) is defined as the proportion of a firm's property portfolio allocated to country *c*. All independent variables are the same as those in Table 5. See Appendix 1 for variable descriptions. Fixed effects pertaining to a firm's property type focus, headquartered country, and listed country are included in the regressions. *p*-values are reported in parentheses.

	(1)	(2)	(3)	(4)
CAR	Feb-24-2022	(0, +1)	(-1 +1)	(-2 +2)
CAR (Crimea)	-2.816	-1.406	0.874	4.641
	(0.241)	(0.706)	(0.861)	(0.496)
PropSHR (Russia)	-0.132	-0.102	-0.090	-0.134
	(0.000)	(0.000)	(0.019)	(0.003)
PropSHR (USA)	0.022	0.004	-0.003	-0.027
	(0.096)	(0.862)	(0.907)	(0.540)
PropSHR (Bulgaria)	-0.406	0.267	0.478	0.608
	(0.252)	(0.418)	(0.629)	(0.672)
PropSHR (Estonia)	1.486	0.237	0.570	0.493
	(0.000)	(0.468)	(0.520)	(0.729)
PropSHR (Finland)	0.060	0.041	0.101	0.080
	(0.003)	(0.056)	(0.070)	(0.359)
PropSHR (Germany)	-0.060	-0.014	0.000	-0.019
	(0.044)	(0.447)	(0.991)	(0.463)
PropSHR (Latvia)	-0.545	-2.737	-4.597	-3.381
	(0.256)	(0.000)	(0.000)	(0.004)
PropSHR (Lithuania)	0.432	0.597	2.424	3.660
	(0.771)	(0.634)	(0.306)	(0.201)
PropSHR (Poland)	-0.185	-0.003	0.033	-0.006
	(0.034)	(0.955)	(0.728)	(0.962)
PropSHR (Sweden)	-0.152	0.008	-0.018	-0.153
	(0.000)	(0.797)	(0.713)	(0.012)
PropSHR (Switzerland)	-0.340	4.456	7.388	9.896
	(0.811)	(0.035)	(0.312)	(0.397)
PropSHR (United_Kingdom)	-0.027	-0.014	-0.003	-0.015
	(0.403)	(0.515)	(0.862)	(0.492)
Controls	Yes	Yes	Yes	Yes
Prop FEs	Yes	Yes	Yes	Yes
Country FEs	Yes	Yes	Yes	Yes
Exchange FEs	Yes	Yes	Yes	Yes
R-squared	0.527	0.389	0.457	0.420
# Obs	284	284	284	284

Appendix 1: Variable Definitions

Variable	Source	Definition
Abnormal returns		
CAR	S&P Global	The cumulative abnormal returns based on one of the following event windows, (0,0), (0,1), (-1,1), (-2,2), and the intermediate (two-week) window.
Property shares		
PropSHR	S&P Global	The proportion of a firm's property portfolio allocated to a particular country.
FOCUS	S&P Global	A dummy that indicates a property of the same type as its holding firm's property type focus.
Asset-level variables		
GRESB Vintage	S&P Global	The number of years since a firm first adopted GRESB reporting.
Green Assets	S&P Global	The proportion of a firm's properties certified by any green building standard(s), such as LEED and Energy Star.
Asset Age	S&P Global	The average building age of all properties owned by a firm.
Controls		
InstOwn	Thomson Reuters	The number of firm *i*'s outstanding shares held by institutional investors in 2021Q4 divided by the total number of firm *i*'s outstanding shares in 2021Q4.
Size	Compustat	The book value of assets.
MB	Compustat	The ratio of market equity to book equity.
Pre-war returns	S&P Global	Cumulative stock returns over the past three months (in percentage).
Investment	Compustat	The percentage growth rate in noncash assets.
Profitability	Compustat	the ratio of EBITDA to the book value of assets.
State-year variables		
σ_p		Property-type fixed effects
σ_c		Headquartered country fixed effects
σ_e		Listed country fixed effects