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# Germany's Foreign Direct Investment in Times of Geopolitical Fragmentation

Kevin Fletcher, Veronika Grimm, Thilo Kroeger, Aiko Mineshima, Christian Ochsner, Andrea F. Presbitero, Paul Schmidt-Engelbertz, and Jing Zhou

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**Prepared by Kevin Fletcher, Veronika Grimm, Thilo Kroeger, Aiko Mineshima, Christian Ochsner, Andrea F. Presbitero, Paul Schmidt-Engelbertz, and Jing Zhou\***

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**ABSTRACT:** Global geopolitical tensions have risen in recent years, and European energy prices have been volatile following Russia's invasion of Ukraine. Some analysts have suggested that these shifting conditions may significantly affect FDI both to and from Germany. To shed light on this issue and other factors affecting German FDI, we leverage two detailed and complementary FDI datasets to explore recent trends in German FDI and how it is affected by geopolitical tensions and energy prices. In doing so, we also develop a new measure of geopolitical alignment. Our main findings include the following: (i) the post-pandemic recovery in Germany's inward and outward FDI has been weaker than in the US or the rest of the European Union (EU27) as a whole; (ii) Germany's outward FDI linkages with geopolitically distant countries have been weakening since the Global Financial Crisis; (iii) the relationship between Germany's outward FDI and geopolitical distance has become more pronounced over the last six years; (iv) Germany's outward FDI to China-Russia-bloc countries is more sensitive to recent geopolitical developments compared with that to US-bloc countries; and (v) Germany's outward FDI in energy-intensive sectors decreases as destination countries' energy costs increase, but energy costs do not appear to have a statistically significant effect on outward FDI in non-energy-intensive sectors.

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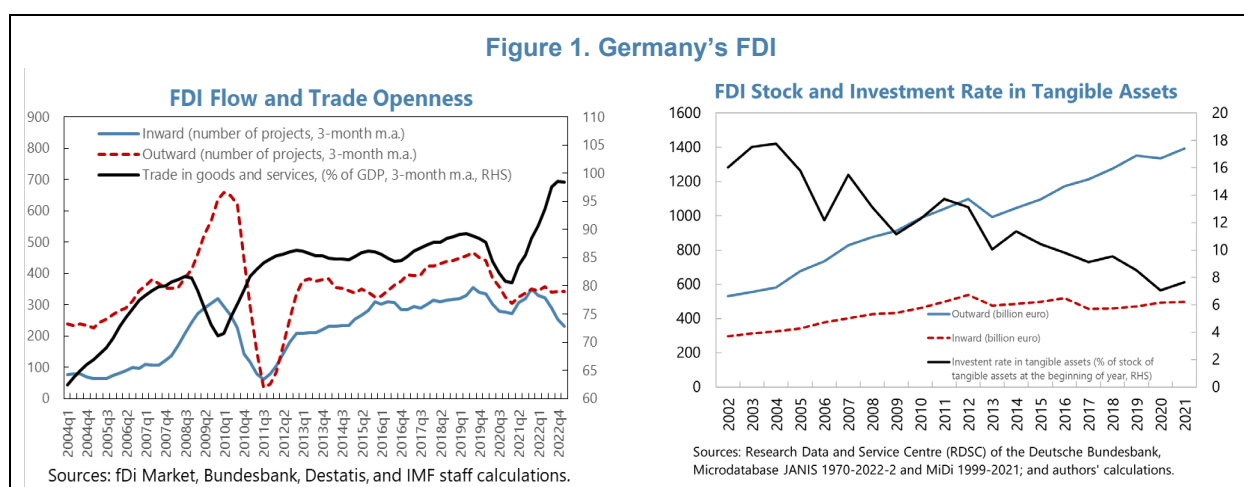
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# 1. Introduction

Germany's inward and outward foreign direct investment (FDI) followed the globalization of trade on an upward trend during the first decade of this century. As a highly developed and export-oriented economy, Germany has benefited from FDI. Through outward FDI, German firms gained access to new markets and expanded their customer base globally (Buch et al. 2005, Deutsche Bank 2005, Arnold and Hussinger 2010). German firms also increased their access to valuable resources (e.g., raw materials and energy sources; Agarwal et al. 1991)<sup>1</sup>, improved cost efficiency by setting up operations in countries with lower production costs (Becker et al. 2005; Becker et al. 2013), and perhaps diversified risks. Meanwhile, inward FDI helped Germany expand jobs and investment, increase technology transfers, and boost exports.



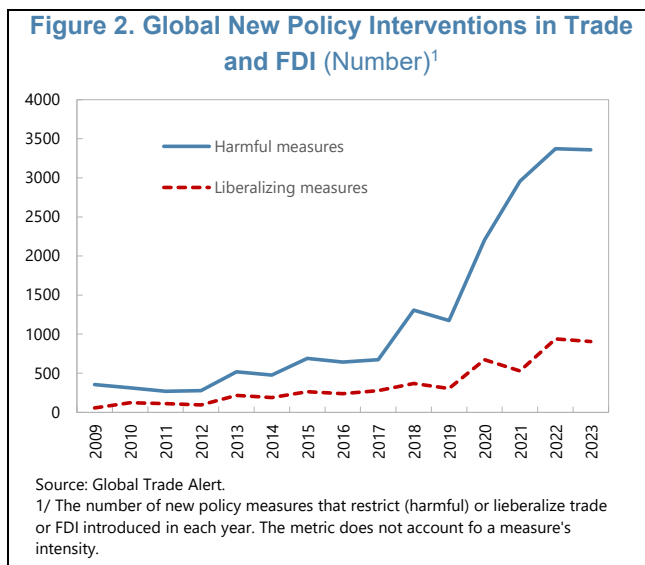
Germany's FDI flows eased, however, during the European Debt Crisis (2010–13) and again during the COVID-19 pandemic and Russia's war in Ukraine. Such shifts are not unique to Germany, but rather a worldwide phenomenon (IMF 2023). One force behind the recent fall in FDI was temporary supply-chain disruptions due to pandemic-related containment measures. In addition, catch-up in labor costs in key production locations, especially China, may have reduced cost-efficiency incentives for outward FDI. Like other countries facing rapid population aging, German industry has also had increasing difficulties in attracting qualified workers in recent years, putting a strain on domestic production and affecting Germany's attractiveness as an investment location (GCEE 2022, 2023).

Two additional factors have gained particular attention in recent years. First, recent European FDI decisions may have been affected by the surge in European energy prices following Russia's invasion of Ukraine. Second, rising geopolitical tensions among major powers have also contributed to increasing geoeconomic fragmentation—as evidenced by the rise in the number of new policy measures that restrict trade or FDI (Figure 2). Rising tensions and geoeconomic fragmentation have in turn increased economic risks along various dimensions that could affect FDI location decisions. Geopolitical fragmentation<sup>2</sup> is also contributing to increased use of industrial policy—such as China's "Made in China 2025," the EU's European Chips Act, and

<sup>1</sup> fDi Markets data contains 31 FDI projects abroad in the extraction in the energy or mineral sectors by German firms.

<sup>2</sup> *Geopolitical fragmentation* refers to the division of the world into smaller political units, whereas *geoeconomic fragmentation* refers to the division of the global economy into economic blocs. While these concepts are related, geopolitical fragmentation may not always fully coincide with geoeconomic fragmentation (e.g., blocs may cooperate on economic issues but not on political issues).

the US's Inflation Reduction Act (Juhász et al. 2023; Evenett et al. 2023)—policies that might further affect FDI location decisions (GCEE 2022, 2023). Increased geopolitical fragmentation (and associated industrial policies) could also be a factor behind the recent global easing of FDI flows. However, this slowdown could be temporary if it is merely caused by the time lag between reducing activity in locations that become more insecure and initiating activities in locations that become more desirable for diversification of input and raw material sources, production locations, and sales markets. Against this background, the development of both outward and inward FDI and its relationship to geopolitical fragmentation is getting increasing attention in the public and policy debate (IMF 2023; Aiyar et al. 2023; Alfaro and Chor 2023; WTO 2023).



**To help shed light on these issues, this paper studies shifts in German FDI over the last two decades and key factors underlying these shifts.** Our primary focus is to examine the sensitivity of Germany's outward FDI to (i) global geopolitical fragmentation and geopolitical risk; and (ii) destination countries' energy prices. To answer these questions, we employ two detailed, complementary datasets on FDI—one from fDi Markets data and one from the Bundesbank's Microdatabase Direct Investment (MiDi).

**The rest of this paper is structured as follows:** In Section 2, we briefly summarize key findings from previous studies on related issues and explain how our paper adds to this literature. In Section 3, we describe the key data used in our analysis. In Section 4, we use this data to explore key trends in Germany's inward and outward FDI over the last two decades through the lenses of key geopolitical events (e.g., Russia's annexation of Crimea), destination countries' political relationships with Germany, and the type of industry (e.g., strategic sectors vs. non-strategic sectors, energy-intensive vs. non-energy-intensive). In Section 5, we apply a structural gravity framework for FDI (e.g., Kleinert and Toubal 2010) in combination with factor analyses to analyze breaks in trends and driving factors of Germany's outward FDI such as country characteristics, geographical and geopolitical distance, and energy cost differentials. Section 6 concludes by summarizing key findings.

## 2. Related Literature

**Our paper, which is the first to analyze the differential impact of geopolitical tensions on German FDI to destination countries of varying geopolitical distance, builds on several strands of literature.** The first strand of studies analyzes the importance of FDI for growth, especially through productivity gains via knowledge spillovers (e.g., Javorcik 2004, Görg and Strobl 2001, Görg and Greenaway 2004, Keller 2021). The second, and rapidly growing, strand of studies analyzes the economic impact of geopolitical tensions. Most of the literature on the drivers of FDI stresses the role played by geography and by common historical and cultural

traits (see Blonigen and Piger 2014 for a review).<sup>3</sup> Some studies also show that better diplomatic and political relations are associated with more FDI flows across countries—see, for instance, Desbordes (2010) on the U.S., Li et al. (2018) on China, and Desbordes and Vicard (2009) on a sample of advanced and emerging economies. Kesternich and Schnitzer (2010) are one of the first studies that investigate how multinational firms choose the capital structure of their foreign affiliates in response to political risk. More recently, and closer to our analysis, Aiyar et al. (2024) use data on more than 300,000 greenfield FDI between 2003 and 2022 from fDi Markets to estimate a gravity model, which shows an economically significant role for geopolitical alignment in driving the geographical footprint of bilateral investments, even when controlling for standard push and pull factors driving FDI flows. They also find that geopolitical factors have become more relevant since 2018, with the resurgence of trade tensions between the U.S. and China. We contribute to this literature by explicitly examining the interaction of geopolitical alignment and geopolitical tensions in shaping FDI flows. Moreover, we introduce a new measure for geopolitical alignment. The third strand comprises studies that focus on Germany's economic development in the context of international economic relations, in particular over 2000–23 (e.g., Fadinger et al. 2023; Hünnekes et al. 2023) and German FDI (Buch et al. 2005, Buch and Lipponer 2007, Krautheim 2013, Buch et al. 2010). Finally, our paper also relates to the strand of studies on the impact of Russia's war in Ukraine (e.g., Ari et al. 2022, Pescatori and Stuermer 2022) and the impact of energy prices on firms' outward FDI (e.g., Garsous et al. 2020, OECD 2021). This literature tends to find that relative energy prices (i.e., the difference between domestic and foreign energy prices) matter in deciding on where to invest.

### 3. Data and Background Statistics

#### FDI

**Our main source of bilateral FDI flows is proprietary data on bilateral FDI from fDi Markets, which covers the period after Russia's invasion of Ukraine.** fDi Markets is a service by the Financial Times that tracks new physical projects and expansions of existing investments that create new jobs and capital investment.<sup>4</sup> The data are collected primarily from publicly available sources (e.g., media sources, industry organizations, investment promotion agency newswires) and report investment-level information for over 300,000 FDI instances between January 2003 and March 2023; more than 45,000 of those are either sourced from or destined to Germany. Each investment project identified is cross-referenced against multiple sources, with a primary focus on direct company sources. For each investment, we know the source and destination countries, as well as the sector, activity (e.g., business services, sales, R&D), type (new investment or expansion), volume (in USD), and number of jobs created. The volume of capital investment and associated jobs are often estimated rather than based on directly reported data. For that reason, most of our analysis is based on count data. This choice is also supported by the high correlation between the count and volume of bilateral investment, as illustrated with the same data by Aiyar et al. (2024). The same authors also update the

<sup>3</sup> There is also an extensive literature showing that geopolitical preferences matter for trade (Fuchs and Klann 2013; Fisman et al. 2022), capital flows (Knill et al. 2012; Kempf et al. 2022), the allocation of bilateral aid (Alesina and Dollar 2000, Faye and Niehaus (2012), and multilateral lending (Barro Lee 2005, Vreeland and Dreher 2014). Analyzing the impact of the US-China trade war, started in 2018, Fajgelbaum and Khandelwal (2022) conclude that US consumers of imported goods have borne the brunt of the tariffs through higher prices and that the trade war has lowered aggregate real income in both the US and China, although not by large magnitudes relative to GDP. Jakubik and Ruta (2023) look at the interplay between rising uncertainty and geopolitical tensions and find that trade with "friends" increases while trade with rivals declines relative to neutral countries when trade policy uncertainty is high.

<sup>4</sup> fDi Markets does not track mergers and acquisitions and other international equity investments, investment projects that do not create new jobs, or companies that establish a foreign subsidiary without a physical company presence.



data quality analysis done by Toews and Vézina (2022) and show that the investment-level data, once aggregated at the destination country-year level, mimic aggregate trends from official balance of payments data, as published by the IMF World Economic Outlook database. Finally, the reliability of fDi Markets data is demonstrated by the fact that they serve as underlying data for global greenfield FDI reported in the World Investment Report by UNCTAD.

**We consider as “strategic” those sectors for which policymakers may be particularly interested in de-risking due to national and economic security interests.** In line with Aiyar et al. (2023), we define strategic sectors at the 3-digit level by combining data on earnings calls from NL Analytics (Hassan et al. 2019) with a classification proposed by the [Atlantic Council](#). Specifically, the following sectors proposed by the Atlantic Council as strategic are mapped into the 3-digit industry classification based on ISIC Revision 4: semiconductors, telecommunications and 5G infrastructure, equipment needed for the green transition, pharmaceutical ingredients, and strategic and critical minerals. Additionally, amongst the manufacturing and mining sectors, we also include in the group of strategic sectors the 3-digit industry groups that fall in the top-3 deciles of mentions of terms related to reshoring, nearshoring, or friend-shoring (with or without the hyphen) over the total number of sentences in the earnings call in companies' earnings calls between 2017–22. We also exclude the manufacture of textiles, even if it falls in the top-3 deciles of reshoring terms mentions, because the sector is not highly linked to national security, located at the downstream of value chains, or difficult to substitute.

**We complement fDi Markets data with the Bundesbank's Microdatabase Direct Investment (MiDi).** The MiDi data are based on officially collected data on direct investments of German firms in foreign countries or of foreign-owned firms in Germany (Blank et al. 2020).<sup>5</sup> The data cover the period of 2002–21.<sup>6</sup> The unit of observation is any investment relation—direct or indirect through an investment chain, including information on ultimate owners of German companies investing abroad. Thus, the data contain information on immediate and final owners of German companies. The data cover the universe of inward and outward FDI stock relations considered as relevant by the German Foreign Trade and Payments Regulation, i.e., for outward FDI, any company or private person that owns at least 10 percent of shares or voting rights in a foreign company whose balance sheet exceeds EUR3 million; while for inward FDI, all investment relations for German firms whose balance sheet exceeds EUR3 million and at least 10 percent of shares or voting rights are owned by a single foreign company or individual or a group where all group members have the same economic interest.<sup>7</sup> The data contain information on investment size as well as basic balance sheet information on the foreign counterparts, such as source/destination country, sector of economic activity, turnover, the number of employees, total of assets and structure thereof, etc. The data offer information on the economic sector of the German company and sector of economic activity.<sup>8</sup>

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<sup>5</sup> The legal framework is the “German Foreign Trade and Payments Regulation” (Aussenwirtschaftsverordnung).

<sup>6</sup> While data coverage starts in 2001, the coverage is not satisfactory in the first one to two years. Therefore, most results resort to the period over 2003-2021.

<sup>7</sup> For more information see Blank et al. (2020) and Friedrich et al. (2021).

<sup>8</sup> The data can further be merged to other datasets of the Bundesbank's data and research service center such as the Janis datasets, which contains extensive balance sheet information on German firms (Becker et al. 2023).

**Table 1 summarizes key statistics of German FDI averaged over 2002–21 from the MiDi data.** In total, we observe 10,931 German firms that engage in FDI, the majority of which are engaged in the EU<sup>9</sup> (about 41 percent) followed by the US (14 percent). These firms are invested in 25,638 foreign-affiliated firms with an annual total turnover of EUR2.4 trillion and about 6.6 million employees. The total stock of investment averages EUR985 billion over the time period. EUR28 billion of net new investments are undertaken per year during this period on average.

	German active MNEs	Affiliates	Affiliate turnover	Employees in affiliates	Stock of Investment	Flow of FDI	
<b>Number</b>	10,931	25,638	...	6,621,112	...	...	
<b>Billion euro</b>	...	...	2,417	...	985	28	
<b>Share in total</b>	<b>Americas (excl. US)</b>	8%	7%	6%	9%	6%	8%
	<b>China</b>	8%	6%	8%	8%	4%	12%
	<b>EU27<sup>/1</sup></b>	41%	52%	46%	45%	53%	40%
	<b>East Asia and Pacific</b>	8%	8%	8%	7%	7%	10%
	<b>Russia</b>	3%	2%	2%	3%	2%	3%
	<b>US</b>	14%	10%	19%	13%	19%	16%
	<b>Others</b>	18%	15%	10%	15%	10%	11%

Note: "EU27" comprises the current 27 EU members throughout the period of 2002-21: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Poland, Portugal, Romania, Slovak Republic, Slovenia, Spain, and Sweden.

## Geopolitical Distance

We use two different measures of geopolitical distance in our analyses, the Ideal Point Distance (IPD) of Germany to other countries' UN voting behavior and an alternative measure based on bilateral arms transfer data.

The Ideal Point Distance (IPD) proposed by Bailey and others (2017) measures geopolitical distance based on the voting behavior in the United Nations General Assembly (UNGA). The political science and political economy literature uses different measures to map the observed voting pattern of countries into

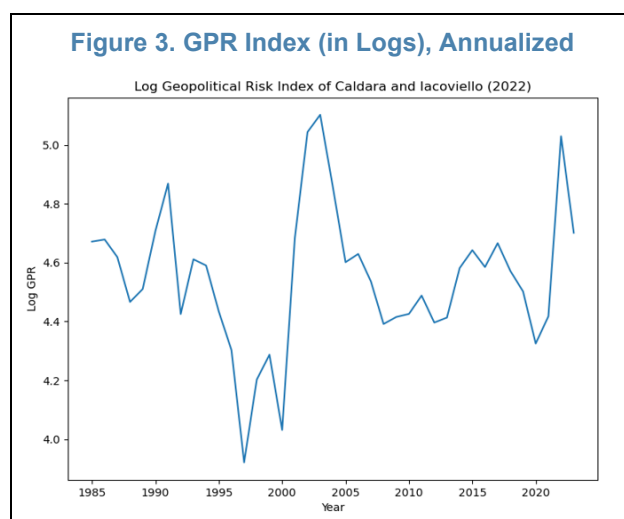
<sup>9</sup> Throughout this paper, "the EU" is defined to comprise the current 27 members and is time-invariant: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Poland, Portugal, Romania, Slovak Republic, Slovenia, Spain, and Sweden.

bilateral geopolitical distance measures (see, for example, Gartzke 1998; Signorino and Ritter 1999; Häge 2011; and Bailey and others 2017). Our analysis relies on the ideal point distance, which—compared to other widely-used indicators—has the key advantage of identifying substantive changes in state voting preferences at the UNGA, irrespective of changes in the agenda of the topics discussed in the UNGA over time.<sup>10</sup> The IPD is available from 1946 to 2022 and varies across country pairs and over time. We use the distance of Germany to other countries' voting behavior.

**As an alternative measure to gauge geopolitical distance, we use the bilateral arms transfer data constructed by the Stockholm International Peace Research Institute (SIPRI).** SIPRI's data is given in terms of “trend-indicator values (TIV),” which are calculated from the known unit production costs of a core set of weapons and are intended to measure the magnitude of military resources transferred rather than their financial value. This allows for better comparability across time and countries. The data ranges from 1950 to 2022; however, we focus only on the period after the fall of the Soviet Union. Moreover, we specifically focus on the exports of the top 10 arms-supplying countries since 1991, which cover around 90 percent of TIV of global arms exports over this period. These are, in order of the size of arms exports, the US, Russia, France, Germany, the UK, China, Italy, the Netherlands, Israel, and Spain. For our convenience, we refer to China and Russia as the ‘China-Russia’ bloc and to the other eight countries as the ‘US-led’ bloc (the grouping of these ten countries is fixed). The metric of interest is, for each country, the proportion of total arms imports that it received from exporters associated with each of these blocs. For some of our analyses, we group the remaining countries into these two blocs. Specifically, if the proportion of arms imported from either of the blocs exceeds two-thirds over the period of 2013–2022, that country is assigned to that bloc. If imports from neither bloc exceed this threshold, the country is deemed to be part of the “unaligned” bloc.

## Geopolitical Risk

**To study how increased global geopolitical tensions may affect Germany's relative FDI flows to geopolitically closer vs. more distant countries, we need an index measuring the level of aggregate geopolitical tensions.** For this, we use the Geopolitical Risk Index (GPR) by Caldara and Iacoviello (2022). Starting in 1985, it tallies the share of news articles reporting on adverse geopolitical events each month in 10 English-language newspapers: the Chicago Tribune, the Daily Telegraph, the Financial Times, The Globe and Mail, The Guardian, the Los Angeles Times, The New York Times, USA Today, The Wall Street Journal, and The Washington Post. To match the frequency of the geopolitical distance measures, we



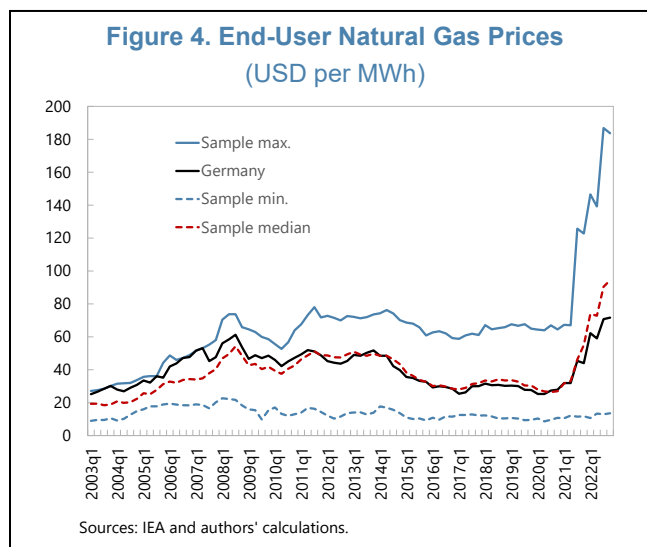
<sup>10</sup> By contrast, simple measures of affinity/agreement of voting patterns are less suited to make over-time comparison as two countries may change their alignment from one year to the next because of changes in the topics which are discussed in the Assembly. See Bailey and others (2017) for more details on the measurement and the estimation of the IPD. In related work aimed at estimating the role of geopolitical distance on bilateral FDI flows, Aiyar et al. (2024) show that results are generally robust to alternative measures, such as those proposed by Signorino and Ritter (1999) and Häge (2011).

aggregate the index by year. Examples of adverse geopolitical events include acts of war, military buildups, and verbal threats. The index shows a clear decrease of geopolitical tensions at the end of the Cold War and then spikes for several years starting September 11, 2001 and during the wars in Afghanistan and Iraq before relaxing again. It then rises once more with Russia's annexation of Crimea in 2014, stays elevated during the election of US President Trump and the subsequent trade war between the US and China, and finally increases sharply in response to Russia's invasion of Ukraine in early 2022.

## Energy Price

**To analyze the impact of energy prices in destination countries on German firms' choice of where to invest, we use end-user natural gas prices from the International Energy Agency (IEA)**

**Prices dataset.** When deciding on where to invest, end-user energy prices, rather than wholesale prices, matter for firms. The IEA offers quarterly data on end-user energy prices for industry, which reflect all the associated taxes and fees, for 38 countries.<sup>11</sup> During the early 2000s, Germany's end-user gas prices were relatively high—above the sample median—which then eased in the mid-2010s and moved around the median through 2020. Following Russia's invasion of Ukraine in early 2021, end-user gas prices rose, especially in Europe, leading Germany's end-user gas prices to rise by 125 percent between Q1 2021 and Q4 2022.



## 4. German FDI over the Last Two Decades

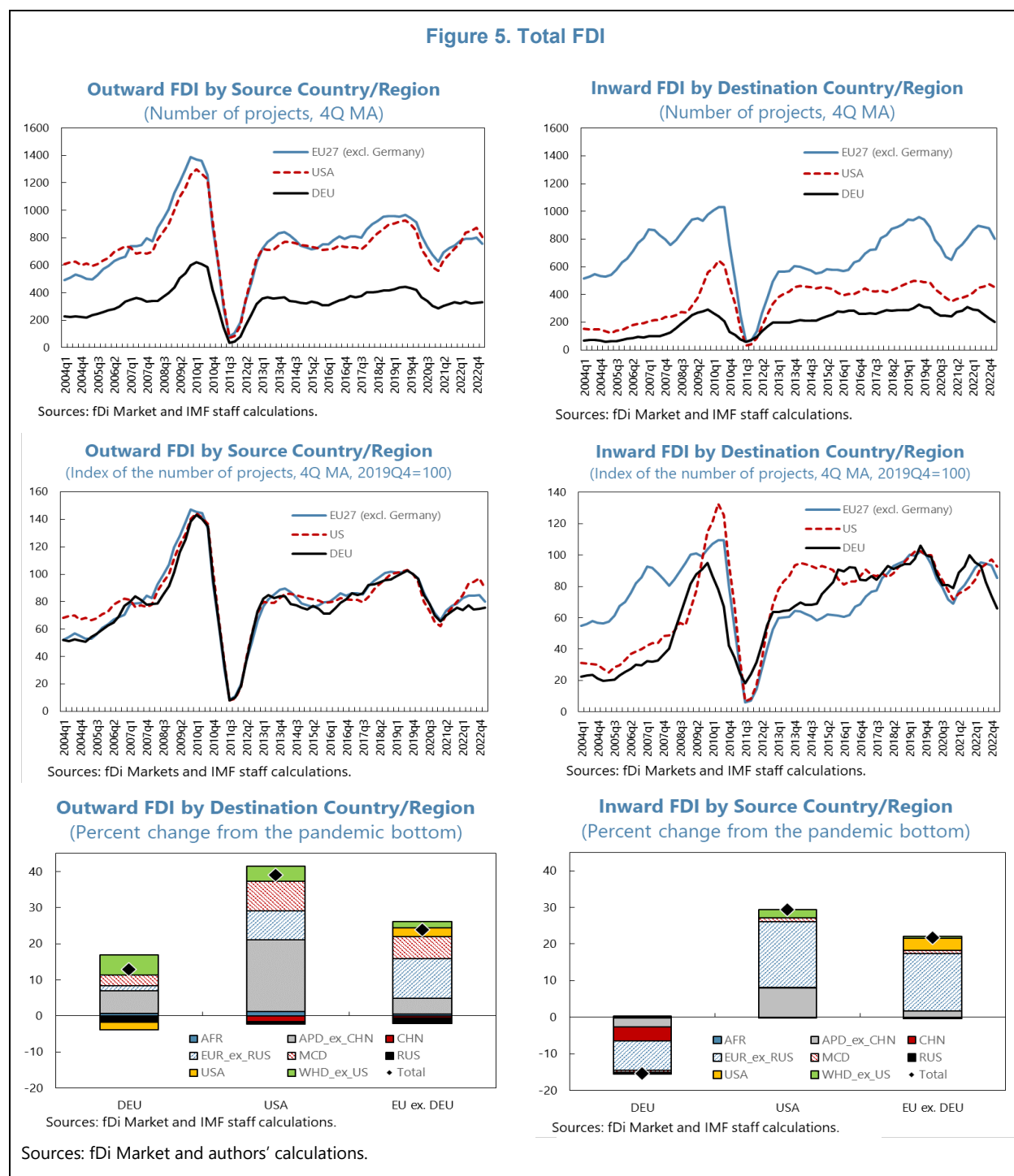
### Overview

**Historically, FDI has been broadly comoving among Germany, the rest of the EU, and the US, but the recovery of German FDI since the pandemic has been weaker than for other countries.** The world saw a surge in FDI in the years running up to the Global Financial Crisis (GFC)/European Debt Crisis (EDC), on the back of deepening globalization (e.g., liberalization of capital flows, reduction of trade restrictions) and greater integration of large emerging economies (e.g., China, India, and Brazil) into value chains. After a sharp decline following the GFC/EDC, FDI activities remained below the pre-GFC/EDC peak. Following another downturn during the COVID-19 pandemic, the strength of FDI recovery has differed across regions. For example, the US's outward FDI returned close to pre-pandemic level by end-2022 while Germany's outward FDI remains about 25 percent below pre-pandemic levels. Since the pandemic bottom, the recovery in Germany's outward FDI to the rest of the EU, Middle East and Central Asia, and the US has been weaker than the rest of the EU's

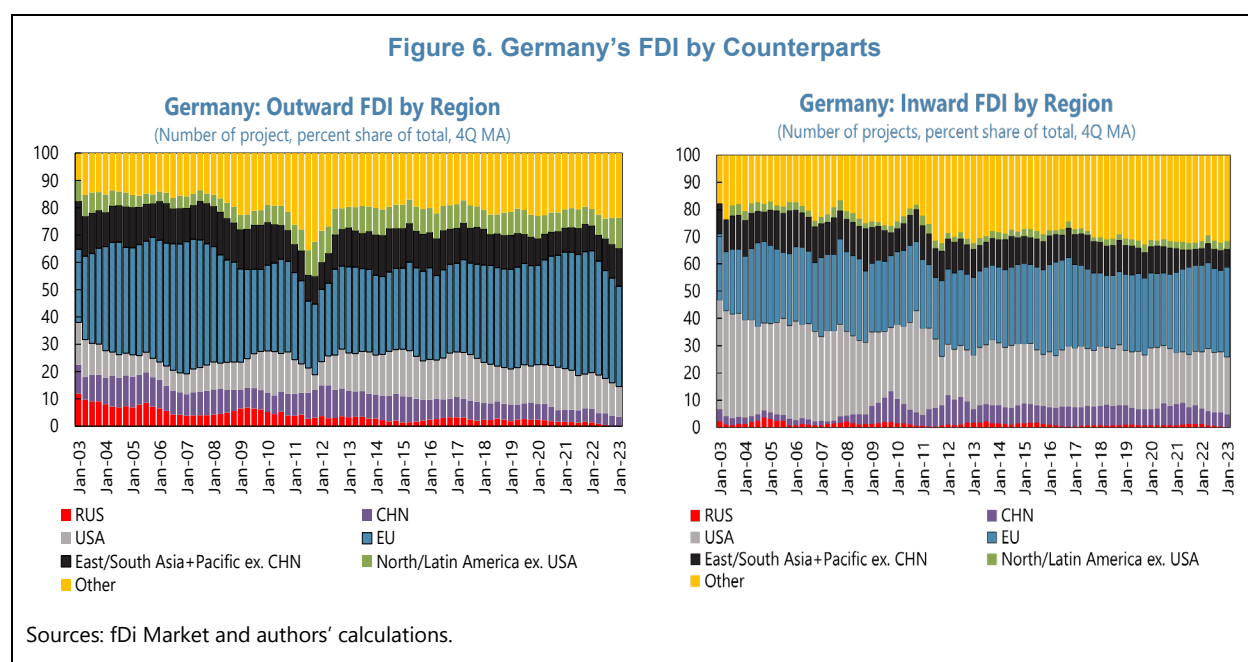
<sup>11</sup> Australia, Austria, Belgium, Canada, Chile, Colombia, Costa Rica, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Israel, Italy, Japan, Korea, Latvia, Lithuania, Luxembourg, Mexico, Netherlands, New Zealand, Norway, Poland, Portugal, Slovak Republic, Slovenia, Spain, Sweden, Switzerland, Türkiye, the UK, and the US.

outward FDI into these regions. Following a temporary increase, inward FDI to Germany declined to levels below the pandemic bottom, driven by a decline in FDI from the rest of the EU and China. Germany's relatively weak FDI activities may reflect its weaker economic recovery from the pandemic, as well as its greater exposure to the energy-price shock from Russia's war against Ukraine. It is also possible that German firms are taking a wait-and-see approach when restarting their FDI activities following the pandemic amid rising geopolitical tensions.

Figure 5. Total FDI



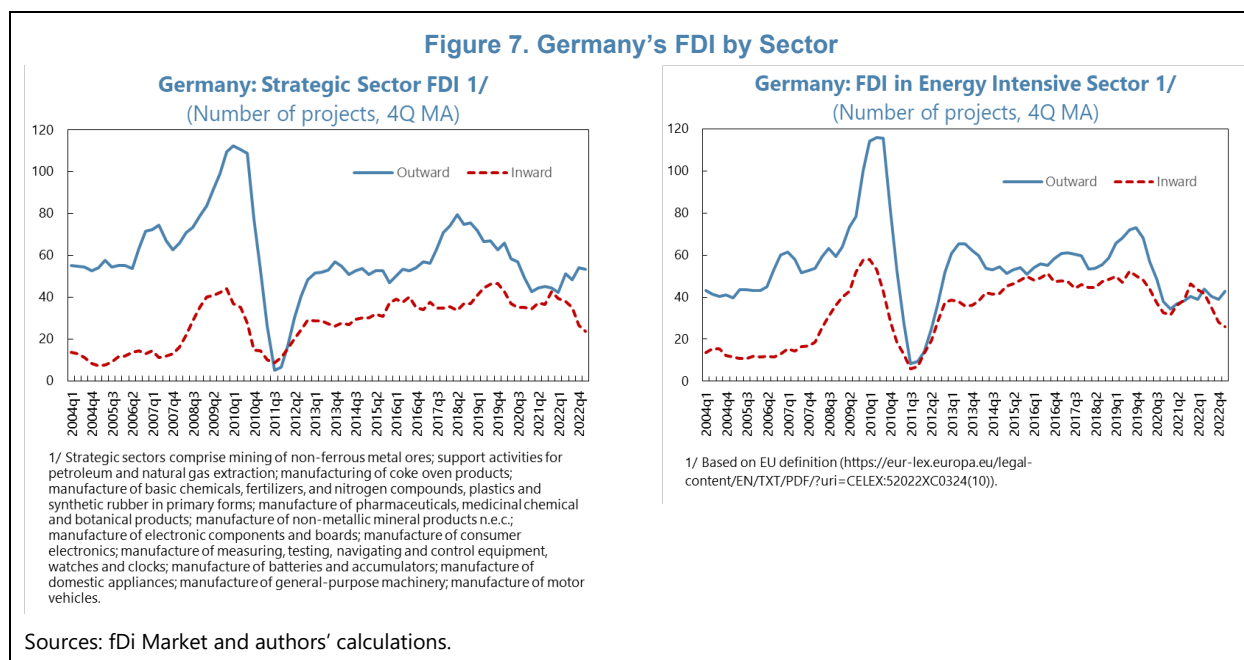
**Germany's FDI linkages with Russia and China have weakened.** Historically, around 30–40 percent of Germany's FDI goes to other EU27 members; the share peaked around 45 percent in 2021–22 then declined to below 40 percent by Q1 2023. The share of Germany's outward FDI to Russia has declined over the last decade, reaching zero by mid-2022, while that to China also declined from 10 percent in 2014–15 to 3 percent by Q1 2023. Additionally, the share of the US declined from around 15 percent in 2020–21 to 10 percent by Q1 2023. Meanwhile, the share of East and South Asia (excluding China) and North and Latin America (excluding the US) has risen. Regarding inward FDI to Germany, the share of FDI originating in Russia reached zero by mid-2022. The share of China and remaining East and South Asia has also declined moderately—3 percentage points each—since 2020. Looking at a longer time horizon, the share of the US has declined from around 40 percent in total in the early 2000s to 25 percent in 2023, which was offset by the rise in the share of FDI originating in the EU and the rest of the world.<sup>12</sup>



**Inward FDI in strategic and energy-intensive sectors has been decreasing since 2022.** While it is too early to draw strong conclusions, a tightening of screening requirements for inward FDI and enhanced EU-wide cooperation since 2020 may have played a role in reducing inward FDI in strategic sectors. In addition, inward FDI in energy-intensive sectors was likely adversely affected by a surge in energy prices in Germany (Dutch TTF gas prices were 4 times higher than US Henry Hub gas prices in 2021, and Dutch TTF gas prices rose by 269 percent in Q3 2022 compared to the 2021 average, while US Henry Hub gas prices rose by 113 percent during the same periods). Meanwhile, outward FDI in strategic sectors has been recovering from the pandemic bottom while outward FDI in energy-intensive sectors has remained flat.

<sup>12</sup> For complementing figures on the stock of FDI and investment vs. disinvestment flows for both outward and inward FDI from the MiDi data see Annex I.

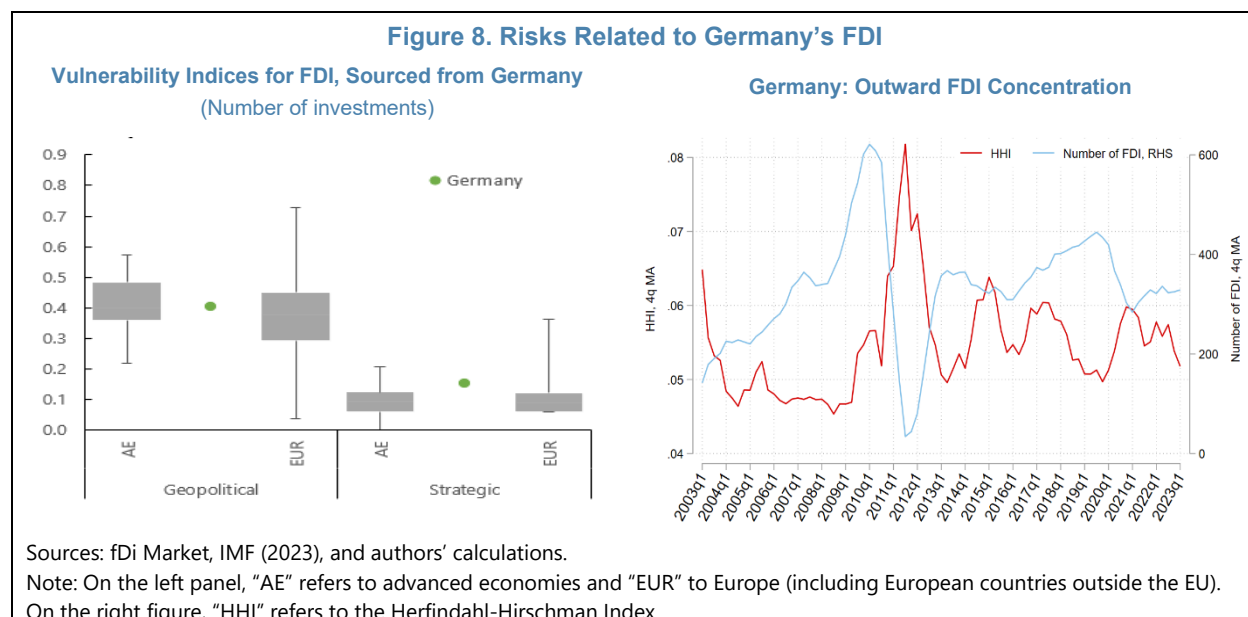




**While the declining geographic concentration in outward FDI helps Germany enhance its resilience to geopolitical fragmentation, Germany faces some fragmentation risk from its relatively high share of outward FDI in strategic sectors.** To assess which countries are more exposed to risks arising from heightening geopolitical tensions, the IMF (2023) developed country-level multi-dimensional indices of vulnerability to FDI fragmentation pressures.<sup>13</sup> For our analysis, we use two of these indices: the geopolitical vulnerability index and the strategic vulnerability index. The geopolitical vulnerability index is calculated for each source country by multiplying the share of investment to each host country by the geopolitical distance between source and host countries. This index captures the idea that the greater the geopolitical distance between source and host countries, the higher the possibility that the source country's foreign investment becomes stranded assets if the fragmentation risk materializes. Meanwhile, the strategic vulnerability index is calculated for each source country by taking the share of the cumulative number of outward FDI projects in strategic sectors over 2010-2019 in total outward FDI projects over the same period. The index captures the idea that source countries may be particularly interested in relocating investment in strategic sectors for national or economic security reasons than non-strategic sectors. The left chart in Figure 8 shows that Germany's exposure to geopolitical risks is in line with other advanced economies and with European countries. However, the strategic index shows that the share of outward FDI in strategic sectors is above the averages for other advanced economies and European countries.

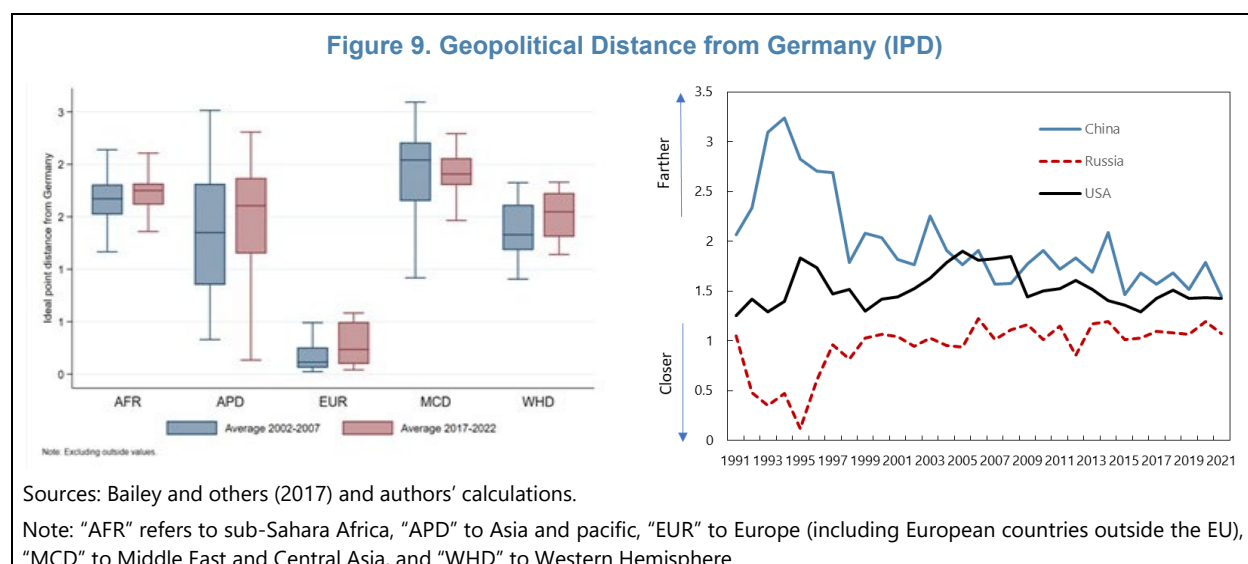
**The pace of Germany's outward FDI appears to affect its geographic concentration.** The right chart in Figure 8 shows that the geographic concentration of Germany's outward FDI (flows) has generally been negatively correlated with the number of FDI projects (i.e., geographic concentration tends to intensify when the number of projects decreases). In the last few years, the concentration has declined moderately despite a relatively unchanged number of projects, possibly reflecting increased de-risking efforts.

<sup>13</sup> See IMF (2023) for details on how the index and its sub-components are constructed.



## Germany's FDI and Geopolitical Distance

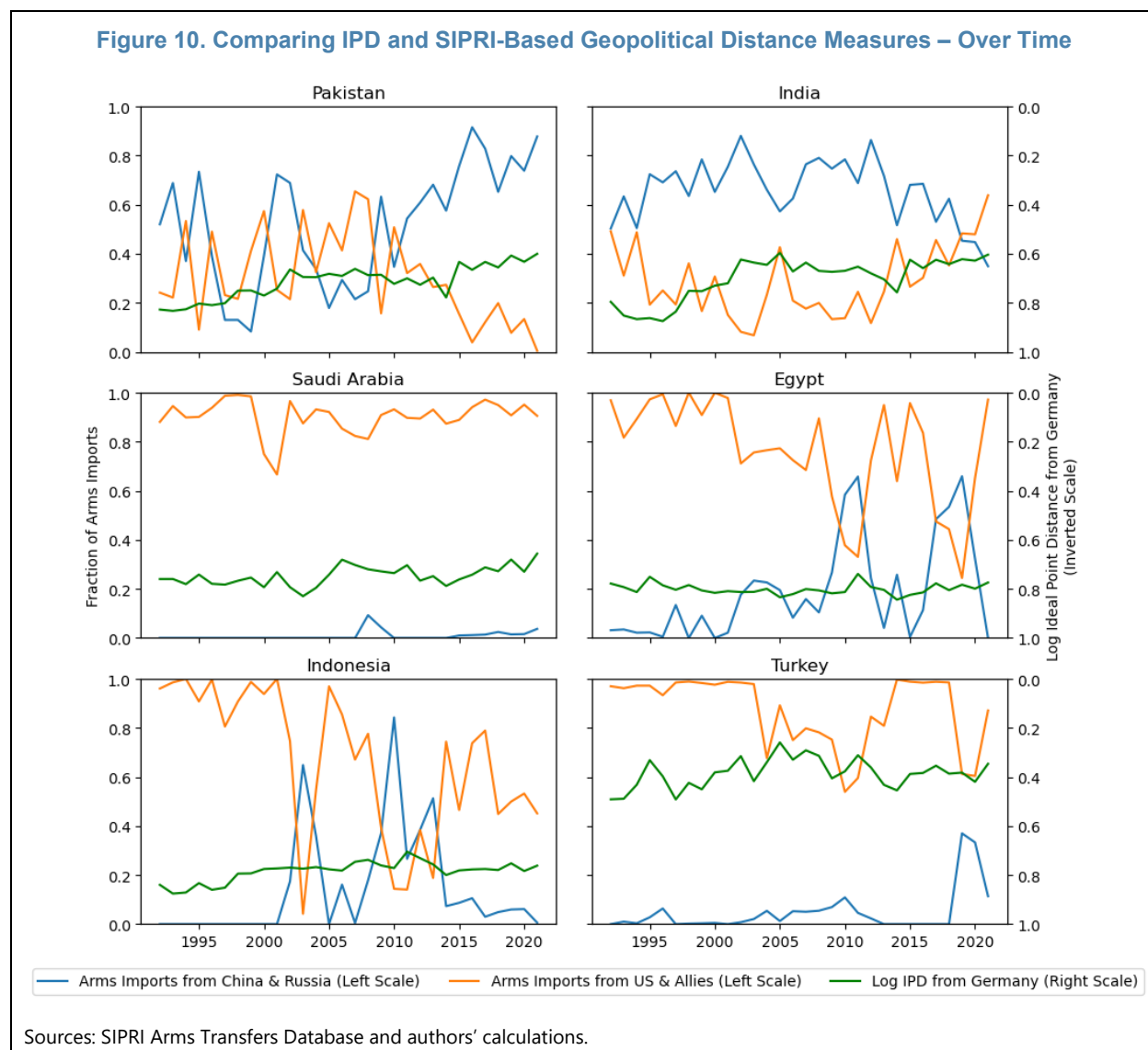
The IPD measure of UNGA voting behavior indicates that Germany tends to be geopolitically close to other European countries, while the distance is the greatest with Middle Eastern countries (Figure 9; see Annex II for a detailed list). On average, Germany's distance from countries in Asia and the Americas is similar and is less than Germany's average distance from countries in Africa or the Middle East. Since the mid-1990s, the distance from China has narrowed considerably while the distance from Russia widened. The distance from the US has been rather stable over time. However, the IPD may not accurately capture movements in Germany's geopolitical closeness to Russia, as the IPD identifies the US as geopolitically farther from Germany than Russia is from Germany and does not pick up the significant deterioration in relations between Germany and Russia following Russia's invasion of Ukraine.



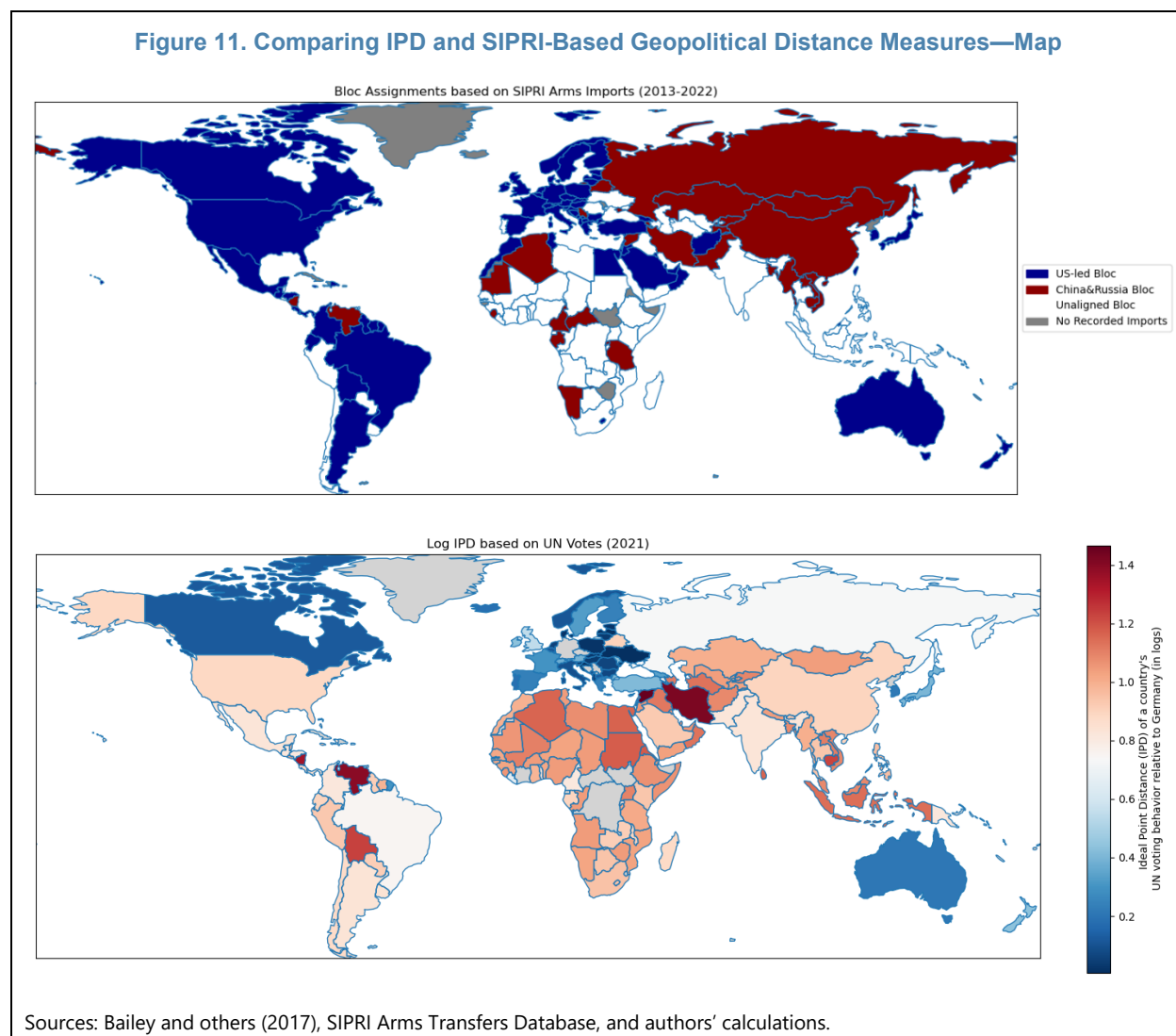


The SIPRI-based geopolitical distance measure generally confirms a similar set of countries that are close to or distant from Germany as the IPD measure, while it also identifies several prominent “unaligned” countries. Not surprisingly, Europe and other G7 countries are in the same bloc as Germany. In addition, while the IPD identifies Russia as geopolitically closer to Germany than the US, the SIPRI-based measure, by construction, classifies the US as a close ally to Germany while Russia is in the opposite bloc. The SIPRI-based measure also identifies several prominent “unaligned” countries, most notably India and South Africa (Figure 11). It also classifies many countries in the Middle East that, while having domestic political systems that are very different to that of the US, are in fact close geopolitical allies of the US. It also detects changing relationships much faster, such as Pakistan’s rapprochement to China or shifts in Turkey’s relationship with Russia (Figure 10).

Figure 10. Comparing IPD and SIPRI-Based Geopolitical Distance Measures – Over Time

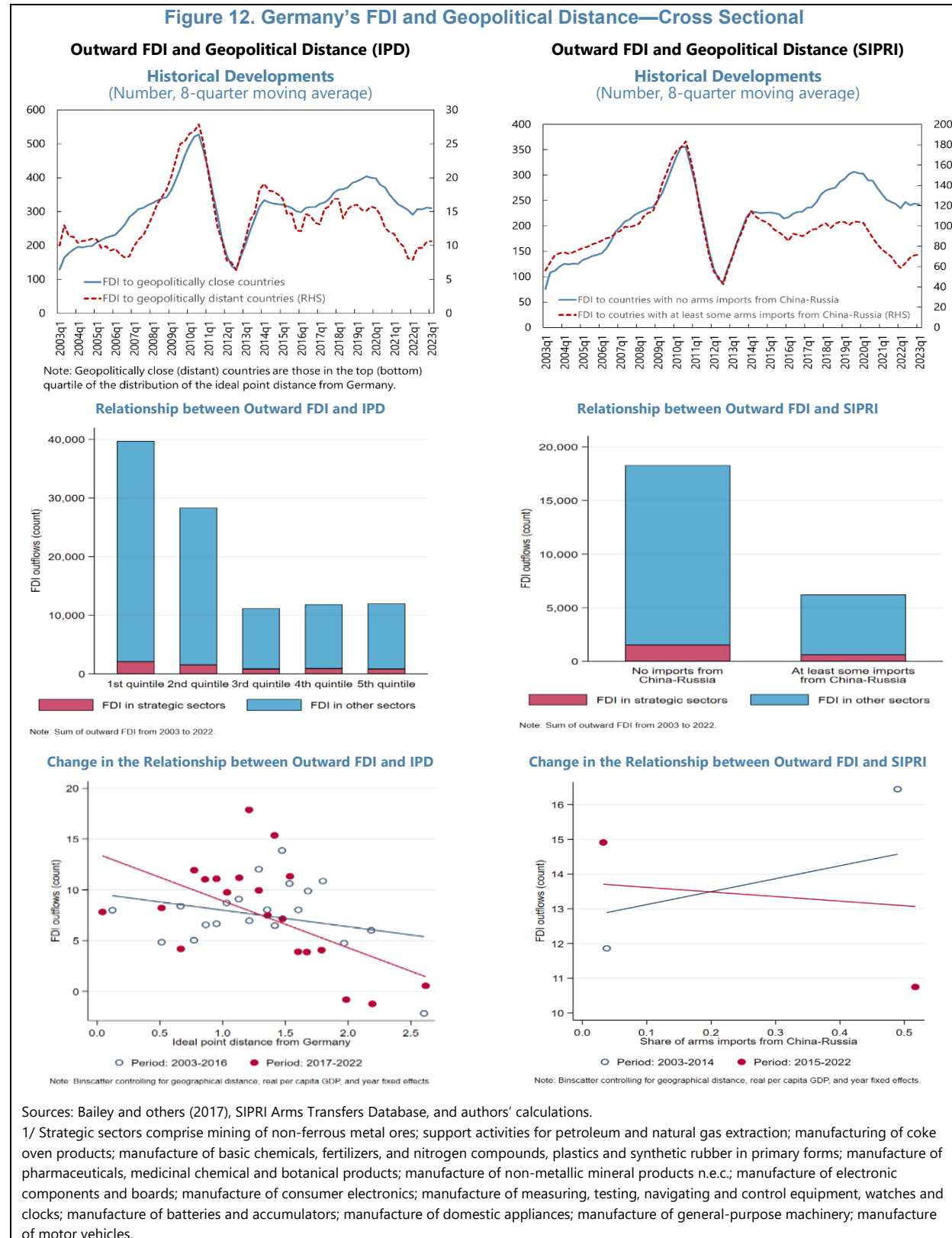


Sources: SIPRI Arms Transfers Database and authors’ calculations.



**Countries that are geopolitically close to Germany tend to receive more FDI from Germany, and the relationship between FDI and geopolitical distance has strengthened over the last six years.** Germany's FDI ties with geopolitically close countries increased until 2018 (Figure 12). Thereafter, outward FDI to geopolitically close countries declined while inward FDI stagnated at a high level and declined only recently. FDI both to and from geopolitically distant countries has declined since 2015 (top panels). Over the last two decades, about two-thirds of Germany's total FDI went to countries in the closest quintile, which largely comprise EEA members and most G7 countries except the United States (bottom left). FDI in strategic sectors is broadly equally distributed across the closest three quintiles, but less so among countries in the remaining quintiles. The negative correlation between Germany's outward FDI and its geopolitical distance has intensified during the period 2017–22 compared to the period 2003–16 (bottom right panel).

Figure 12. Germany's FDI and Geopolitical Distance—Cross Sectional



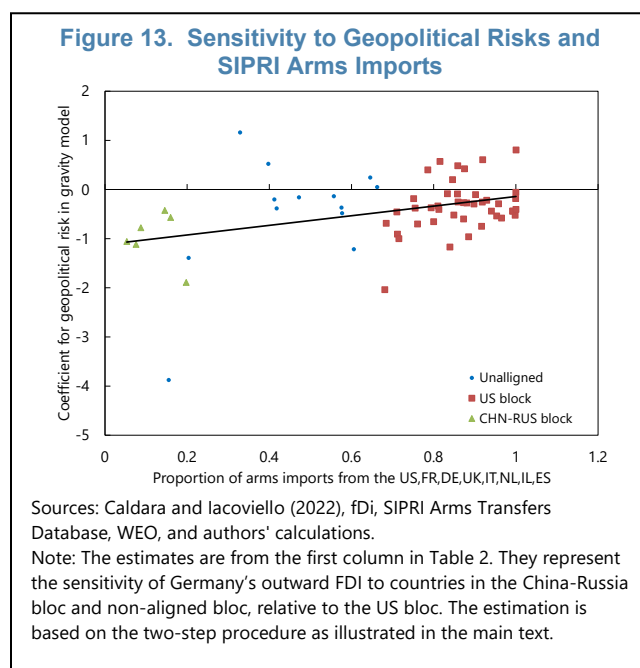
## 5. Econometric Analysis

### Effects of Geopolitical Distance and Geopolitical Risk on Germany's Outward FDI

As shown in Figure 3, geopolitical tensions have risen sharply in the last decade, particularly following Russia's annexation of Crimea in 2014 and its invasion of Ukraine in early 2022. In 2010, global tensions were low, and it appears unlikely that geopolitical distance was a decisive factor in firms' investment decisions abroad. However, as tensions have risen, it seems likely that geopolitical distance has become a much more important factor. For example, as shown in Figure 7, German FDI flows to Russia have disappeared entirely (due to sanctions but the trend has become clear before the invasion of Ukraine) and FDI to China has also decreased. In a riskier world, relationships with geopolitically distant countries can quickly deteriorate, making it highly risky for firms to invest in these countries. This makes it very plausible that FDI has become more sensitive to geopolitical distance as aggregate geopolitical risk has risen. Moreover, we would expect this sensitivity to be negative for geopolitically distant countries and positive for Germany's allies.

We follow a two-step regression approach to analyze if a shift in global political risk affects Germany's outward FDI to geopolitically distant countries more than that to geopolitically closer countries.

First, we regress the number of Germany's outward FDI projects to the destination country on the log of the geopolitical risk index (GPR) of Caldara and Iacoviello (2022), controlling for the log of GDP of Germany and that of the destination country. As the dependent variable is count data, we use a Poisson pseudo-maximum likelihood (PPML) estimator. The coefficient on the GPR,  $\beta_i$ , captures the sensitivity of country  $i$ 's FDI inflows from Germany to the GPR: i.e., if  $\beta_i < 0$  ( $\beta_i > 0$ ), it implies that German firms reduce (increase) their investment into country  $i$  when geopolitical risks become higher. Intuitively, we expect flows to close allies of Germany to benefit from global geopolitical risk at the expense of flows to geopolitically distant countries, as German firms increasingly refrain from investing in countries they view as geopolitically unsafe.

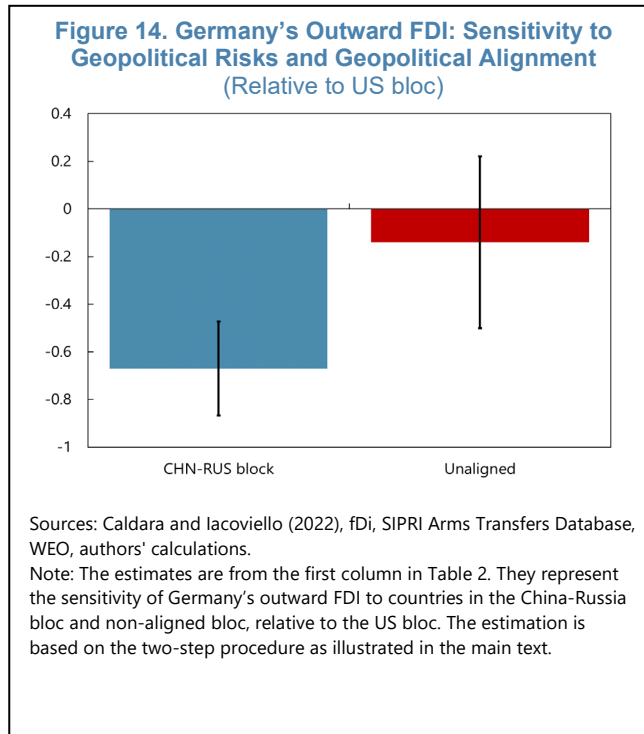


Step 1: country-specific gravity model of number of Germany's outward FDI to each destination country  $i$

$$FDI_{it} = \alpha_i + \beta_i \ln GPR_t + \gamma_1 \ln GDP_{it} + \gamma_2 \ln GDP_{DEU,t} + \epsilon_{it}$$

In the second regression, we test this relationship in the cross section: Do FDI flows to geopolitically distant countries react negatively to an increase in geopolitical risk (GPR)? We regress each country's  $\beta_i$  on their geopolitical distance to Germany. We find that the coefficient of geopolitical distance on  $\beta_i$  is indeed negative (Table 2, columns (1) and (2))—meaning that a higher distance implies a higher sensitivity to

geopolitical risks, i.e., falling FDI when geopolitical risks are high. The results indicate that a 10 percent increase in GPR<sup>14</sup> is associated with an additional decrease in Germany's outward FDI projects in the CHN-RUS bloc by about 7 compared with the decline in Germany's outward FDI projects in the US bloc, while the decline in Germany's FDI projects into the unaligned bloc (relative to the decline to the US bloc) is not statistically significantly different from zero (Figure 14). We also use the share of arms imports received from the US and US allies in column (3) and find the coefficient to be positive, again implying that German FDI flows to countries that obtain a lower share of their arms from US-allied producers are more sensitive to geopolitical risks. This shows that German firms reduce FDI flows to geopolitically distant countries when geopolitical tensions are high. This is robust across both measures of geopolitical distance: blocs formed through SIPRI arms imports and the UN Voting IPD of Bailey et al. (2017).



Step 2: regress the sensitivity to geopolitical risk (GPR) on geopolitical alignment based on arms imports.

$$\beta_i = \alpha + \lambda \text{Geopolitical alignment}_i + \eta_i$$

**Lastly, we re-express the two-step regression as a panel gravity regression with an interaction variable between GPR and geopolitical distance.** This, while putting stricter restrictions on the gravity model parameters  $\gamma_1$  and  $\gamma_2$ , allows us to include quarter fixed effects and to directly account for the uncertainty of estimating the exposures to GPR when comparing them across countries.

Panel Regression: we regress FDI flows to country  $i$  on the interaction of GPR and  $i$ 's geopolitical distance from Germany using the PPML method:

$$FDI_{it} = \alpha_i + \beta \ln GPR_t \times \text{Geopolitical alignment}_i + \zeta \ln GPR_t + \gamma_1 \ln GDP_{it} + \gamma_2 \ln GDP_{DEU,t} + \epsilon_{it}$$

**As already shown in the two-step regression specification, Germany's FDI to China-Russia-bloc countries remains more sensitive to geopolitical risks compared with that to US-bloc countries.** In the panel regression, this is demonstrated by the significantly negative coefficient of the interaction term of *ChinaRussia\_bloc*  $\times$   $\ln GPR_t$  or the significantly positive coefficient of the interaction term of *share of arm imports from US and US allies*  $\times$   $\ln GPR_t$  in columns (4) and (5), respectively. The regression results also indicate that Germany's outward FDI is associated more with Germany's GDP growth than destination countries' growth; a one percent increase in Germany's GDP growth is associated with about one

<sup>14</sup> Note that GPR increased by 92 percent in 2022—when geopolitical tensions rose amid Russia's invasion of Ukraine—from 2021.

more German outward FDI project per quarter, *ceteris paribus*, while the association with recipient countries' growth is not statistically significant. We also present results of an alternative specification that controls for time-varying variables other than  $\ln GDP_{it}$  by including quarter fixed-effects in the panel regression (we thus drop  $\ln GPR_t$  and  $\ln GDP_{DEU,t}$ ). In this case, the coefficients for the interaction term remain significant (columns (6) and (7)). We also repeat the analysis with the MiDi data for the period 2002–21, which broadly confirms the results. In particular, the stock of FDI in countries of the China-Russia bloc reacts stronger to increasing geopolitical risk than the stock of FDI in countries assigned to the US bloc (cf. Table 5 in Annex IV).<sup>15</sup>

**Table 2. Germany Outward FDI and Geopolitical Alignment**

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	DEU outward FDI sensitivity to geopolitical risk	DEU outward FDI sensitivity to geopolitical risk	DEU outward FDI sensitivity to geopolitical risk	DEU outward FDI	DEU outward FDI	DEU outward FDI	DEU outward FDI
log geopolitical risk				-0.4214*** (0.053)	-0.6237*** (0.077)		
ChinaRussia_bloc × log geopolitical risk				-0.1547* (0.085)		-0.1668** (0.078)	
Unaligned × log geopolitical risk				0.0446 (0.108)		0.0443 (0.110)	
log real gdp, destination				-0.2967 (0.193)	-0.3062 (0.190)	-0.4975** (0.196)	-0.5031*** (0.195)
log real gdp, DEU				1.2342* (0.735)	1.2622* (0.734)		
ChinaRussia_bloc	-0.6752*** (0.197)						
Unaligned	-0.1458 (0.360)						
Average ipd		-0.2938** (0.137)					
Share of arm imports from US and US allies			0.9790** (0.470)				
Share of arm imports from US and US allies × log geopolitical risk					0.2750** (0.120)		0.2903*** (0.112)
Observations	64	62	62	5,042	4,880	5,042	4,880
R-squared	0.093	0.092	0.137				
Regression Specifications	2-step	2-step	2-step	1-step	1-step	1-step	1-step
Quarter FE				N	N	Y	Y
Standard errors in parentheses							
*** p<0.01, ** p<0.05, * p<0.1							

## Effects of Energy Prices on Germany's Outward FDI

Germany's outward FDI in energy-intensive sectors has lagged behind FDI in other sectors during the post-pandemic era, prompting the question of whether natural gas prices in destination countries are affecting German firms' choice of where to invest. Natural gas prices are important for some key sectors in Germany, such as chemicals, and surged in 2022 following Russia's invasion of Ukraine. Our empirical strategy is to explore the gas intensity across sectors—if gas prices do play a role in German firms' outward FDI decisions, it would affect the FDI in gas-intensive sectors more than the rest. To formalize the idea, we run the following regression at a quarterly frequency using the PPML method:

$$FDI_{sijt} = \beta_1 \mathbb{1}_{P_{ct} > median} + \beta_2 \mathbb{1}_{P_{ct} > median} \times \mathbb{1}_{s=gas-intensive} + \gamma \ln GPR_t \times Geopolitical\ alignment_i + \gamma_1 \ln GDP_{it} + \lambda_{sjt} + \lambda_{scj} + \epsilon_{sijt}$$

<sup>15</sup> For brevity, results from the MiDi data are not shown but are available upon request (e.g., FDI flows and counts of new FDI by destination country). Due to fewer observations because of the annual frequency and a shorter period of observation, some results differ.

The dependent variable is the number of outward FDI from Germany to sector  $s$  (aggregated to two groups—gas-intensive and non-gas-intensive, based on the definition by the German Statistical Office<sup>16</sup>) in destination country  $c$  in income group  $j$  (advanced, emerging, or low income, based on the IMF definition<sup>17</sup>) in quarter  $t$ . The key variable of interest is whether the industrial gas price in country  $c$  is higher than the median of all country-specific gas prices—denoted by  $\mathbb{1}_{p_{ct}>\text{median}}$ —interacted with a dummy variable indicating if the sector is gas-intensive—denoted by  $\mathbb{1}_{s=\text{gas-intensive}}$ . If the high gas price in the destination would discourage Germany from investing, then the coefficient  $\beta_2$  is expected to be negative and statistically significant. The set of control variables include sector-income-group-specific time fixed effects denoted by  $\lambda_{sjt}$ , which absorb any common time-varying factors at the sectoral level for a given income group.<sup>18</sup> Sector-country fixed effects would absorb any time invariant factors that vary across sectors and countries and could drive the allocation of outward German investment. In addition, we control for the logarithm of the destination country's real GDP.

**We find that higher gas prices in a destination country are negatively associated with Germany's FDI in energy-intensive sectors in that country.** As shown in Table 3 below, the coefficient for the interaction term between the high gas price dummy and the energy-intensive sector dummy is negatively significant (column (1)). When we split the sample into gas-intensive and non-energy intensive observations (column (2) and (3)), we see more clearly that high gas prices only affect Germany's FDI in energy-intensive sectors. Moreover, we find that Germany's FDI in energy-intensive sectors is particularly sensitive to the geopolitical alignment of the destination country, as shown by the large and significantly positive coefficient on the interaction term between arms imports and geopolitical risk in column (3). Given that gas prices have been relatively stable before the pandemic, we also test whether the results are robust to restricting our sample to pre-pandemic observations (column (4)) and find that gas price's impact remains significantly higher for energy-intensive sectors than for the rest.

**Table 3. Germany Outward FDI and Energy Price in Destination Countries**

VARIABLES	(1) DEU outward FDI	(2) DEU outward FDI	(3) DEU outward FDI	(4) DEU outward FDI
High gas price dummy, lag	-0.0802 (0.063)	-0.1456** (0.066)	-0.0812 (0.063)	-0.1118* (0.062)
High gas price dummy, lag × energy-intensive sector dummy	-0.0832** (0.041)			-0.0707* (0.042)
Share of arm imports from US and US allies × log geopolitical risk	0.4834 (0.700)	2.2890** (0.973)	0.3006 (0.686)	-0.5527 (1.097)
log real gdp, destination	-0.2815 (0.884)	0.6544 (0.571)	-0.3677 (0.931)	0.1822 (0.907)
Observations	2,137	609	1,528	1,747
Quarter FE	Y	Y	Y	Y
Destination country income group × energy-intensive × quarter FE	Y	Y	Y	Y
Destination country FE	Y	Y	Y	Y
Sample	All	Energy intensive	Non energy intensive	pre COVID
Test lagged gas price for energy-intensive (p-value)	0.0125			0.0040
Robust standard errors in parentheses				
*** p<0.01, ** p<0.05, * p<0.1				

<sup>16</sup> <https://www.destatis.de/DE/Themen/Branchen-Unternehmen/Industrie-Verarbeitendes-Gewerbe/produktionsindex-energieintensive-branchen.html>

<sup>17</sup> [https://www.imf.org/external/datamapper/Metadata\\_Apr2023.xlsx](https://www.imf.org/external/datamapper/Metadata_Apr2023.xlsx)

<sup>18</sup> Given that the sum of sector-income-group-specific time fixed effects at each quarter is equivalent to putting quarter fixed effects, they would also represent any time varying factors for Germany that is common to every destination country, such as GDP growth in Germany.

## 6. Conclusions

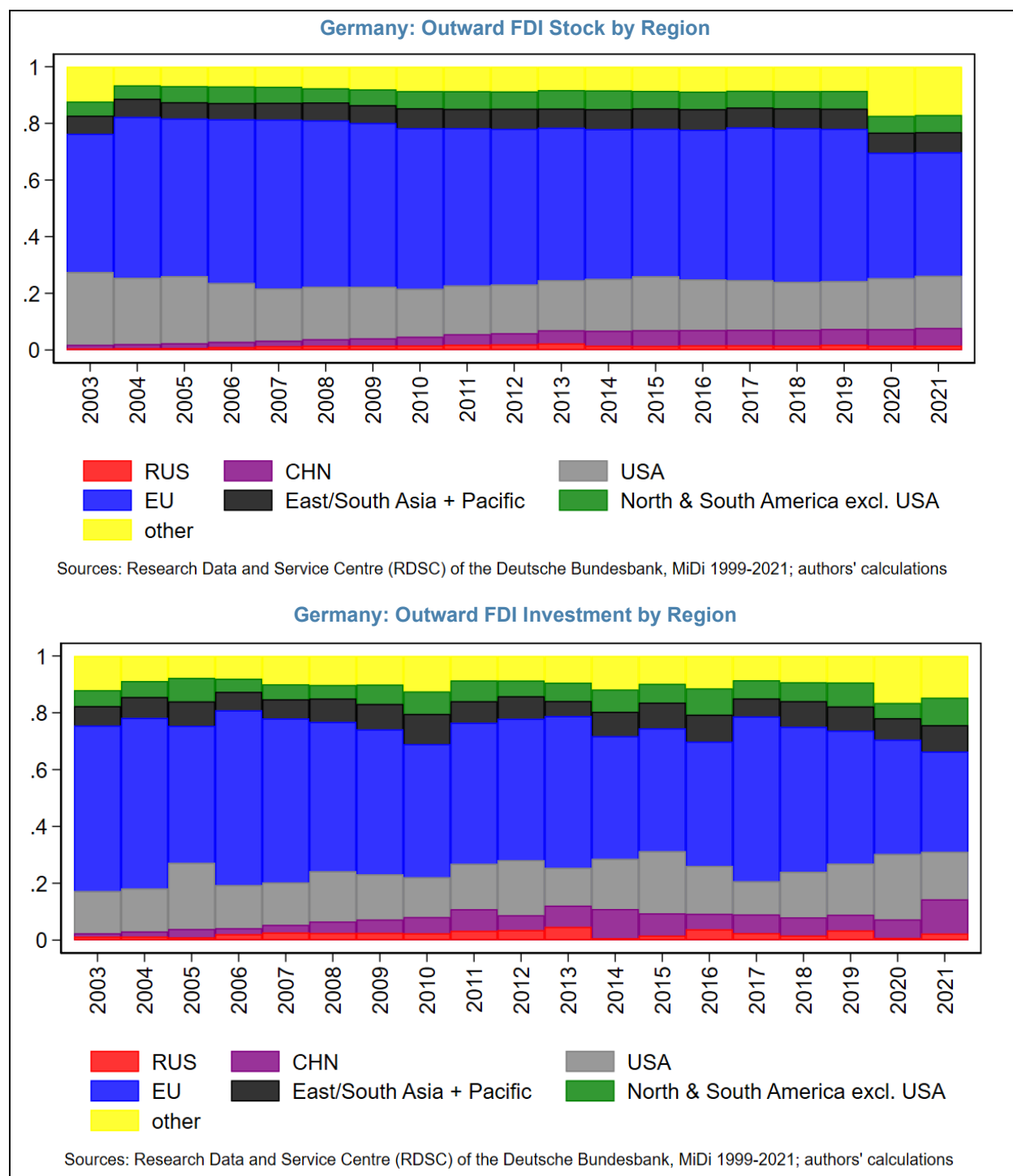
**Germany's inward and outward FDI have seen a weaker post-pandemic recovery than the FDI of the US or the average for the rest of the EU.** Germany's FDI in the strategic and energy-intensive sectors has indeed been declining during the last several quarters. As of Q1 2023, Germany's outward and inward FDI remain about 25 and 35 percent below pre-pandemic levels, respectively. Germany's relatively weak FDI activities may reflect its weaker economic recovery from the pandemic, as well as its greater exposure to the energy-price shock from Russia's war against Ukraine. It is also possible that German firms are taking a wait-and-see approach to restarting their FDI activities following the pandemic amid rising geopolitical tensions among large economic blocs.

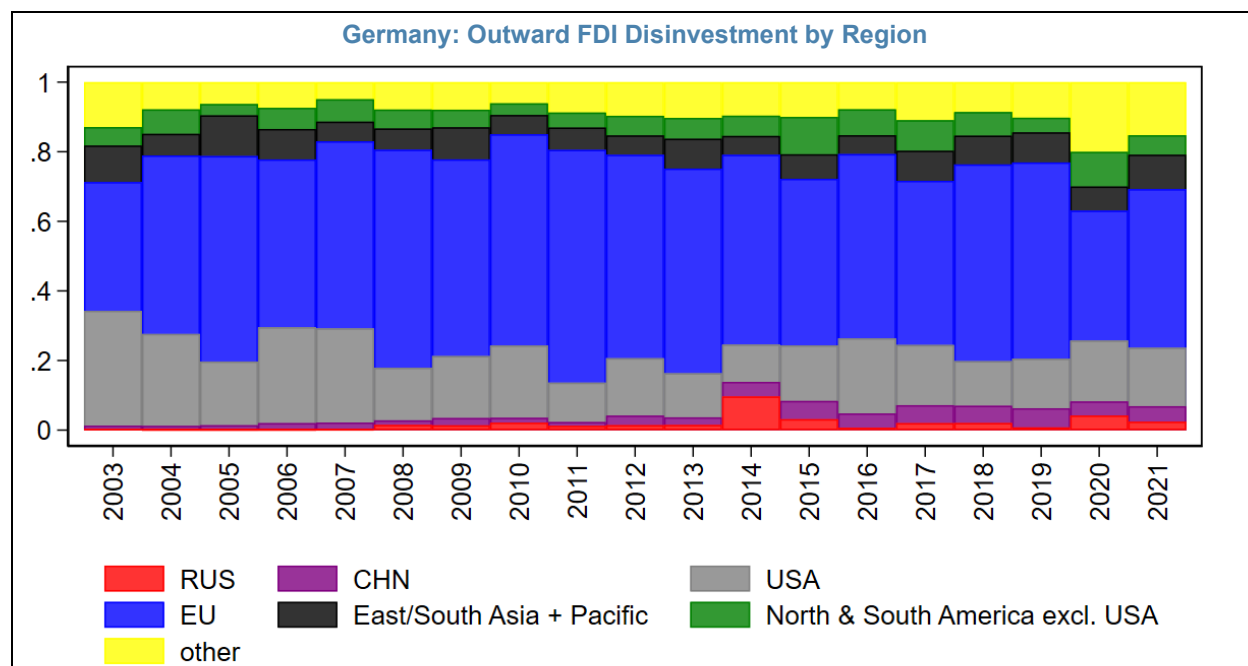
**Germany's FDI linkages with geopolitically distant countries have been weakening since the Global Financial Crisis, and the relationship between FDI and geopolitical distance has strengthened since the beginning of the Trump administration.** Over the last two decades, about two-thirds of Germany's total FDI went to the closest quintile of countries, which is largely composed of EEA members and most G7 countries, except for the US. FDI in strategic sectors is broadly equally distributed across the closest three quintile countries, but less among countries in the remaining quintiles. Germany's FDI linkages with geopolitically close countries have increased while those with geopolitically distant countries have declined since 2015. The negative correlation between Germany's outward FDI and its geopolitical distance has intensified during the period 2017–22 compared to the period 2003–16.

**Our regression analyses find that: (i) Germany's FDI flows to China-Russia-bloc countries are more sensitive to geopolitical risks than flows to US-bloc countries; and (ii) Germany's FDI in energy-intensive sectors decreases as destination countries' energy costs increase.**

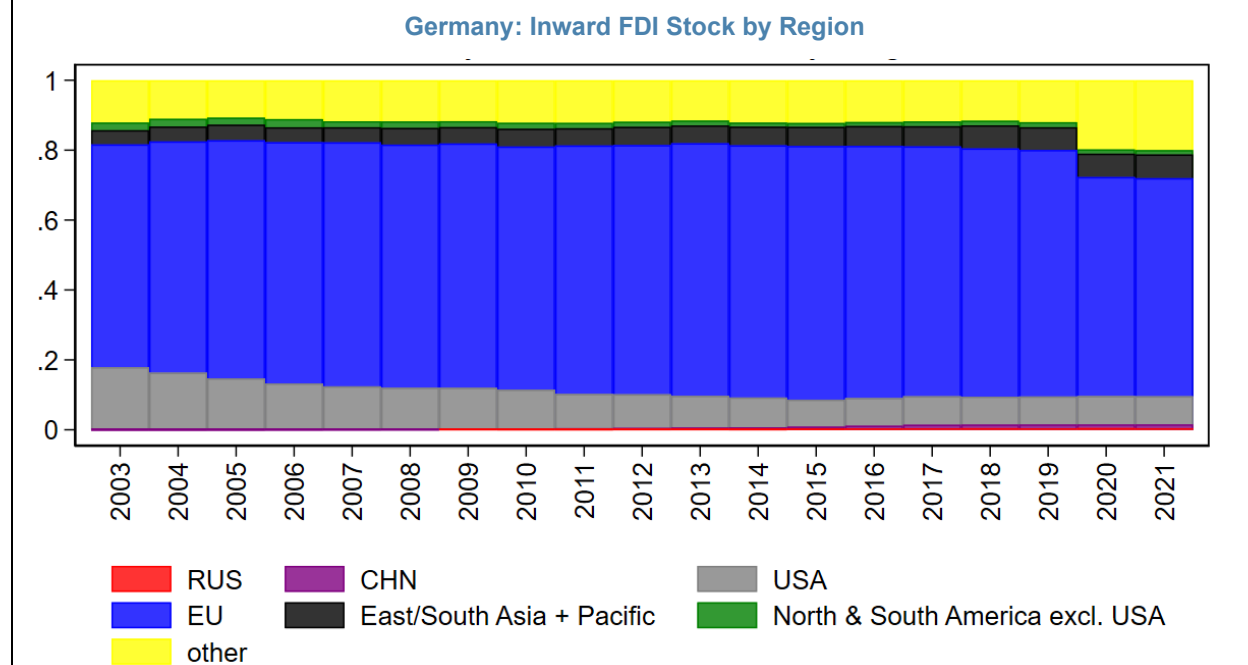


## Annex I. FDI Stock and Investment vs. Disinvestment by Region (MiDi data)



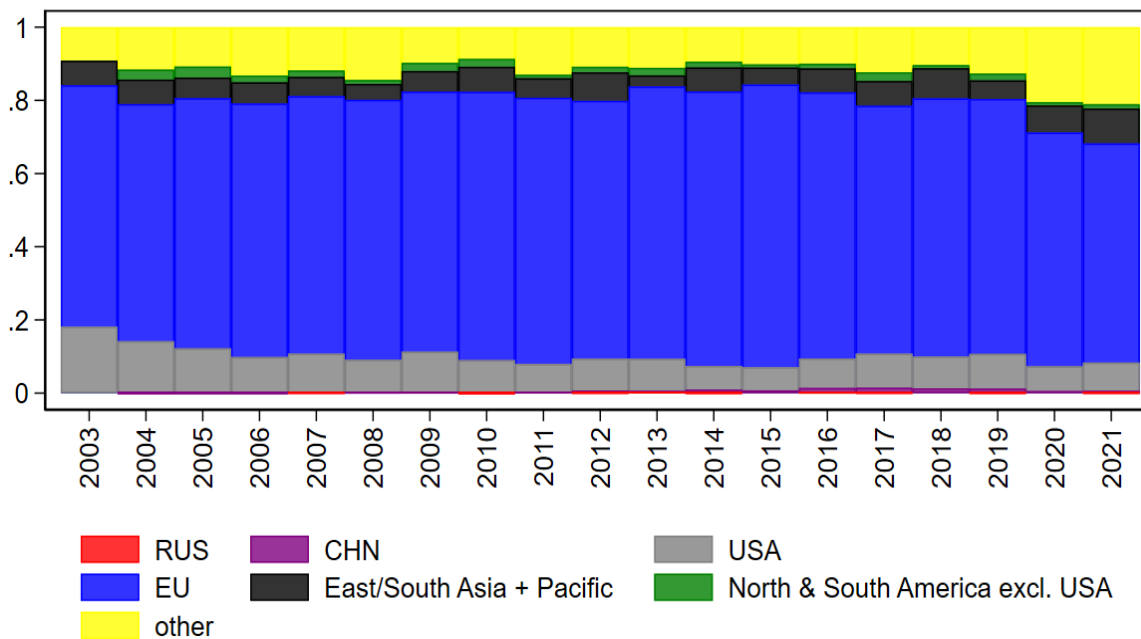


Sources: Research Data and Service Centre (RDSC) of the Deutsche Bundesbank, MiDi 1999-2021; authors' calculations



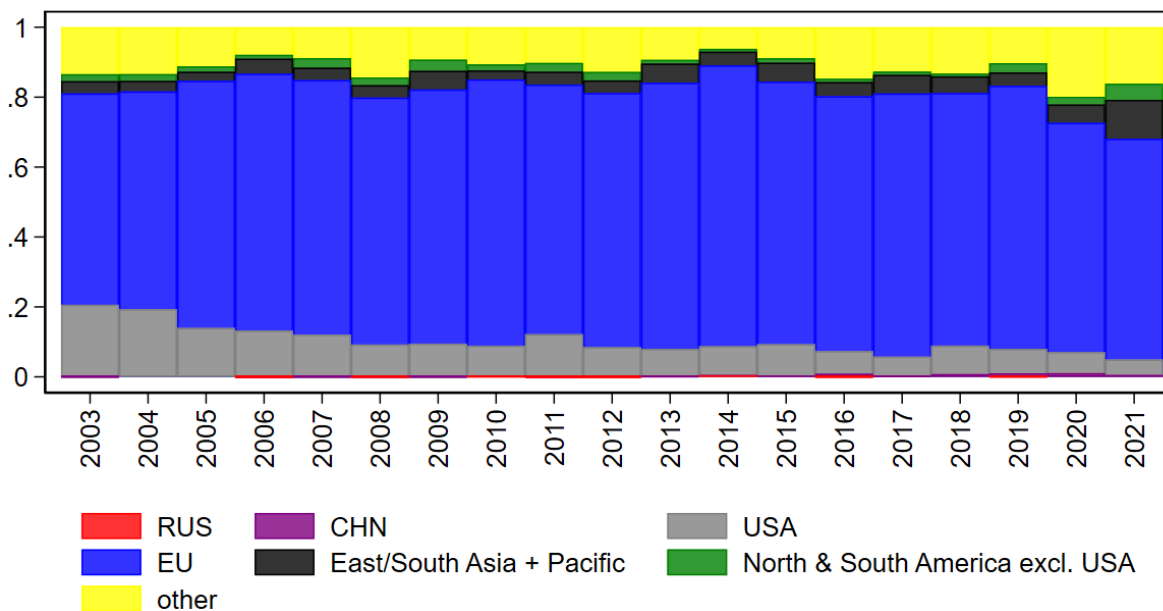
Sources: Research Data and Service Centre (RDSC) of the Deutsche Bundesbank, MiDi 1999-2021; authors' calculations

Germany: Inward FDI Investment by Region



Sources: Research Data and Service Centre (RDSC) of the Deutsche Bundesbank. MiDi 1999-2021: authors' calculations

Germany: Inward FDI Disinvestment by Region



Sources: Research Data and Service Centre (RDSC) of the Deutsche Bundesbank, MiDi 1999-2021; authors' calculations

# Annex II. IPD-Based Geopolitical Distance



## Annex III. Results Behind the Binned Scatterplot

Dependent variable	FDI (count)				FDI (USD billion)			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Geopolitical distance (lagged)	-2.4824*		-1.5986	-4.4740***	-54.2092		-19.7496	-130.2129*
	(1.396)		(1.418)	(1.582)	(64.749)		(70.343)	(68.057)
Geopolitical distance (lagged) x Pre 2017		-1.4827				-8.7340		
		(1.425)				(71.392)		
Geopolitical distance (lagged) x Post 2017		-4.8630***				-162.4946**		
		(1.660)				(71.585)		
Geographical distance	-2.1370	-2.1198	-2.2651	-1.8070	-48.5157	-47.7350	-43.4545	-59.3341
	(1.867)	(1.865)	(1.663)	(2.396)	(89.718)	(89.615)	(79.793)	(116.211)
Real GDP per capita (logs, lagged)	4.0137**	3.9888**	3.6678**	4.8059**	182.2050**	181.0716**	168.9356**	212.9064**
	(1.866)	(1.863)	(1.711)	(2.266)	(79.462)	(79.279)	(73.878)	(95.079)
Observations	3,566	3,566	2,488	1,078	3,566	3,566	2,488	1,078
R-squared	0.112	0.114	0.102	0.136	0.056	0.057	0.049	0.078
Year FE	Y	Y	Y	Y	Y	Y	Y	Y
Country FE	N	N	N	N	N	N	N	N
Period	2002-22	2002-22	2002-16	2017-22	2002-22	2002-22	2002-16	2017-22

Robust standard errors in parentheses (linear regressions)  
 \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

## Annex IV. Results from MiDi Data

Germany Outward FDI stocks and Geopolitical Alignment							
Dependent variable: log(FDI stock in mn USD)	China-Russia block	Unaligned block	US block	full sample			
log(GDP), destination	.375***	.705***	.939***	2.699***	2.559***	2.699***	2.579***
	-0.02	-0.033	-0.012	-0.046	-0.066	-0.044	-0.062
log(GDP p.c.), destination	.607***	0.056	.276***				
	-0.035	-0.068	-0.018				
log(exports), DEU to destination	.002***	.001***	.0002***				
	-0.0002	-0.0002	0				
log(GPR)	-.642***	0.11	.134***	0.239	-0.432		
	-0.067	-0.069	-0.017	-0.758	-0.936		
China/Russia block indicator X log(GPR)				-.292***		-.278***	
				-0.062		-0.06	
Unaligned indicator X log(GPR)				-.345***		-.358***	
				-0.055		-0.053	
ln(GDP), DEU				3.117***	4.59***		
				-0.899	-1.107		
Share of arms imports from US and allies X log(GPR)					.532***		.520***
					-0.062		-0.058
Observations	364	477	2220	2959	1826	2959	1826
Regression specification	2-step	2-step	2-step	1-step	1-step	1-step	1-step

Sources: Research Data and Service Centre (RDSC) of the Deutsche Bundesbank, MiDi 1999-2021; and authors' calculations.

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# PUBLICATIONS

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