GEOECONOMIC FRAGMENTATION AND FOREIGN DIRECT INVESTMENT

Supply-chain disruptions and rising geopolitical tensions have brought the risks and potential benefits and costs of geoeconomic fragmentation to the center of the policy debate. This chapter studies how such fragmentation can reshape the geography of foreign direct investment (FDI) and, in turn, how FDI fragmentation can affect the global economy. The recent slowdown in FDI has been characterized by divergent patterns across host countries, with flows increasingly concentrated among geopolitically aligned countries, particularly in strategic sectors. Several emerging market and developing economies are highly vulnerable to FDI relocation, given their reliance on FDI from geopolitically distant countries. In the long term, FDI fragmentation arising from the emergence of geopolitical blocs can generate large output losses. These losses may be especially severe for emerging market and developing economies facing heightened restrictions from advanced economies, which are their major sources of FDI. Multilateral efforts to preserve global integration are the best way to reduce the large and widespread economic costs of FDI fragmentation. When multilateral agreements are not feasible, multilateral consultations and processes to mitigate the spillover effects of unilateral policies are required. In a more fragmented world, some countries could reduce their vulnerability by promoting private sector development, while others could take advantage of the diversion of investment flows to attract new FDI by undertaking structural reforms and improving infrastructure.

Introduction

Rising geopolitical tensions and the uneven distribution of the gains from globalization have contributed to increasing skepticism toward multilateralism and to the growing appeal of inward-looking policies (Colantone and Stanig 2018; Rodrik 2018; Autor

and others 2020; Pastor and Veronesi 2021). Brexit, trade tensions between the US and China, and Russia's invasion of Ukraine pose a challenge to international relations and could lead to policy-driven reversal of global economic integration, a process referred to as geoeconomic fragmentation. This process encompasses different channels, including trade, capital, and migration flows.[1] This chapter focuses on one specific channel—the fragmentation of foreign direct investment (FDI), which is cross-border investment through which foreign investors establish a stable and long-lasting influence over domestic enterprises.

A slowdown in globalization—often referred to as "slowbalization"—is not new. For most countries it dates to the aftermath of the global financial crisis (Antràs 2021; Baldwin 2022). A decrease in FDI has been particularly visible, with global FDI declining from 3.3 percent of GDP in the 2000s to 1.3 percent between 2018 and 2022 (Figure 4.1; see also UNCTAD 2022 for an overview of recent trends in FDI). While a range of factors have contributed to this protracted phase of slowbalization, the fragmentation of capital flows along geopolitical fault lines and the potential emergence of regional geopolitical blocs are novel elements that could have large negative spillovers to the global economy.

Firms and policymakers are increasingly looking at strategies for moving production processes to trusted countries with aligned political preferences to make supply chains less vulnerable to geopolitical tensions.[2]

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[1]Aiyar and others (2023) present signs of geoeconomic fragmentation along different dimensions (for example, trade, capital flows, and reassessments of geopolitical risk), analyze several channels through which such fragmentation could propagate through the global economy, and discuss how the rules-based multilateral system must adapt to the changing world. See the April 2023 *Global Financial Stability Report* for an analysis of the effects of geoeconomic fragmentation on non-FDI flows, with implications for financial stability and macro volatility.

[2]The term "reshoring" refers to a country's transfer of (part of the) global supply chain back home (or geographically closer to home in the case of "nearshoring"). "Friend-shoring" limits supply-chain networks and the sourcing of inputs to countries allied with the home country and trusted partners that share similar values. The chapter uses these terms in relation to the decision to relocate FDI (rather than to the more general decision of where to source inputs).

Figure 4.1. "Slowbalization"
(Percent of GDP)

Foreign direct investment sharply declined after the global financial crisis.

Source: IMF staff calculations.

Figure 4.2. Rising Geopolitical Tensions and Foreign Direct Investment Fragmentation
(Index; frequency of mentions of reshoring on right scale)

Recent years have seen increasing geopolitical risk and companies' interest in reshoring and friend-shoring.

Sources: Bailey, Strezhnev, and Voeten (2017); Hassan and others (2019); NL Analytics; and IMF staff calculations.
Note: The interest in reshoring measures the frequency of mentions of reshoring, friend-shoring, or near-shoring in firms' earnings calls.

A text-mining analysis of earnings call reports from a large sample of multinational corporations shows a sharp spike in firms' interest in reshoring and friend-shoring (Figure 4.2), occurring at the same time that the average geopolitical distance across country pairs started increasing. Recently, US Treasury Secretary Janet Yellen (2022) argued that rather than relying heavily on countries with which the US has geopolitical tensions, US firms should move toward friend-shoring of supply chains to a large number of trusted countries. In Europe, the French government has been urging the EU to accelerate production targets, weaken state aid rules, and develop a "Made in Europe" strategy to counter domestic production subsidies provided by the US Inflation Reduction Act (Tamma and Stolton 2023). In China, too, government directives aim to replace imported technology with local alternatives to reduce dependence on geopolitical rivals (*Bloomberg News* 2022). Rising interest in reshoring is a significant reversal of the division of production pursued through offshoring, driven predominantly by differences in labor and input costs (Feenstra 1998; Antràs and Yeaple 2014).

The importance of friend-shoring goes beyond just announcements and translates into investment-screening measures motivated by national security purposes (UNCTAD 2023). Recent large-scale policies implemented by major countries to strengthen domestic strategic manufacturing sectors suggest that a shift in cross-border capital flows is about to

take place. Most notable is a series of recent bills adopted against the backdrop of rising US-China trade tensions—such as the Creating Helpful Incentives to Produce Semiconductors (CHIPS) and Science Act and the Inflation Reduction Act in the US and the European Chips Act—that could affect multinational corporations' production and sourcing strategies, prompting efforts to reconfigure their supply-chain networks (Box 4.1).

This reconfiguration of supply chains could potentially strengthen domestic security and help maintain a technological advantage. It may also increase diversification, provided the existing supply of inputs is concentrated in a single or a small number of foreign suppliers, such that domestic and close-country sourcing would increase the number of available options. However, as most countries exhibit a marked degree of home bias in sourcing of inputs (see Chapter 4 of the April 2022 *World Economic Outlook*), in most cases reshoring or friend-shoring to existing partners will likely reduce diversification and make countries more vulnerable to macroeconomic shocks.

This chapter studies how geoeconomic fragmentation could affect the global economy through a shift in the geographic footprint of FDI. While a growing literature investigates the costs of geoeconomic

fragmentation through trade and technological decoupling,[3] existing work has not yet looked directly at FDI fragmentation. But this is likely to be a relevant channel through which the emergence of geopolitical blocs could have global spillovers. In fact, FDI accounts for a substantial share of domestic capital stock globally—about 12 percent, on average—and is generally associated with knowledge transfer to domestic firms and economic growth, especially in emerging market and developing economies (Alfaro and others 2004; Javorcik 2004; Kose and others 2009). A relocation of FDI closer to source countries could have direct negative effects on current host economies through lower capital and technological deepening, as firms expressing interest in reshoring and friend-shoring tend to be on average larger, more profitable, and more knowledge-intensive (Figure 4.3).

Against this backdrop, this chapter starts by looking for early signs of FDI fragmentation, using detailed bilateral investment-level data on FDI from 2003 to the end of 2022. It investigates two questions: (1) Is there any evidence of reallocation of FDI across countries, indicating that flows are becoming more fragmented? and (2) Do geopolitical factors contribute to explaining bilateral FDI flows, so that countries deepen their integration with friends and reduce their reliance on foes? The chapter develops a multidimensional index of countries' vulnerability to FDI relocation combining information on the geopolitical distance between source and host countries, share of strategic sector investment in total FDI inflows, and degree of market power enjoyed by the host country.

Next, the chapter turns to quantifying the potential costs of FDI fragmentation and their distribution across countries. To understand the channels through which a potential unwinding of FDI could affect host countries, the chapter empirically examines FDI spillovers, taking both macro- and micro-level approaches. An extensive literature on the economic effects of FDI on host countries does not deliver consistent results when simply looking at aggregate flows (Bénétrix, Pallan, and Panizza 2022). The chapter extends this literature by conducting a country-level analysis of the relationship between GDP growth and FDI separately for horizontal

[3]See, among others, Cerdeiro and others (2021); Eppinger and others (2021); Felbermayr, Mahlkow, and Sandkamp (2022); Giammetti and others (2022); Góes and Bekkers (2022); and Javorcik and others (2022). A related literature looks at the effects of Brexit and the 2018–19 US-China trade war; see Caliendo and Parro (2021) and Fajgelbaum and Khandelwal (2022) for an extensive review.

Figure 4.3. Interest in Reshoring and Firm Characteristics

Firms more likely to reshore are larger and more productive.
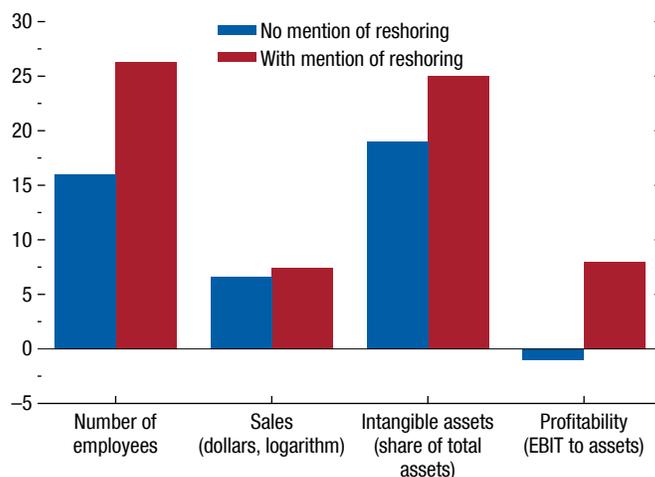
Sources: Compustat; Hassan and others (2019); NL Analytics; and IMF staff calculations.
Note: Simple averages across firms that mentioned or did not mention reshoring, friend-shoring, and near-shoring in earnings calls. Differences across groups are statistically significant. EBIT = earnings before interest and taxes.

and vertical investment, as the latter is more likely to be affected by geoeconomic fragmentation. A subsequent firm-level analysis combines investment-level FDI data with a large sample of cross-country firm-level surveys to identify potential spillovers to firm labor productivity within and across sectors along the value chain.

Finally, the chapter calibrates a number of illustrative hypothetical scenarios to provide a sense of the possible long-term economic implications of FDI fragmentation using a multiregion dynamic stochastic general equilibrium (DSGE) model. It employs scenarios to explore the distribution of costs and benefits across economies, including those from spillovers through external demand and the reallocation of production capacity. Fragmentation is modeled as a permanent rise in investment barriers between opposing geopolitical blocs centered on the two largest economies (China and the US), with economies pursuing a nonaligned path potentially facing heightened uncertainty.

The main conclusions from the chapter are as follows:

- The recent slowdown in FDI has been characterized by divergent patterns across host countries, particularly when considering investment in strategic sectors, like semiconductors. FDI flows are increasingly concentrated among countries that are geopolitically aligned. The role of geopolitical

alignment in driving the geographic footprint of FDI is particularly relevant for emerging market and developing economies and has increased since 2018, with the resurgence of trade tensions between the US and China. Thus, if geopolitical tensions were to increase and countries were to move farther apart along geopolitical fault lines, FDI is likely to become more concentrated within blocs of aligned countries. Efforts to preserve a multilateral dialogue are needed to keep FDI fragmentation from increasing.

- Analysis from a multidimensional index of vulnerability to FDI relocation suggests that, on average, emerging market and developing economies are more vulnerable to such relocation than advanced economies. This is mostly because of emerging market and developing economies' reliance on FDI from countries with which they are relatively unaligned geopolitically. Several large emerging markets, across different regions, show high vulnerabilities to relocation of FDI, indicating that the fragmentation scenario is not a risk only for a few countries. As better regulatory quality is associated with lower vulnerability, countries could mitigate their exposure to FDI relocation by introducing policies and regulations to promote private sector development.

- A further contraction in FDI and a shift in its geographic distribution would likely have large negative effects on host countries, through lower capital accumulation and technological deepening. The chapter finds that vertical FDI, more likely to be targeted by policies aimed at friend-shoring investment in strategic sectors, is associated with economic growth, not least because of its knowledge-intensive nature. The entry of multinational corporations also directly benefits domestic firms. In advanced economies, increased competition from foreign firms pushes domestic firms to become more productive. In emerging market and developing economies, domestic suppliers benefit from technology transfers and increased local demand for inputs from foreign firms in downstream sectors.

- Illustrative model-based scenarios suggest that FDI fragmentation—modeled as a permanent rise in cross-bloc barriers to importing investment inputs—could substantially reduce global output, by about 2 percent in the long term. Simulations of various hypothetical scenarios suggest that the losses are likely to be unevenly distributed, with emerging market and developing economies with reduced access to advanced economies particularly affected, through both lower capital formation and reduced

productivity gains. While the diversion of investment inputs could allow some economies to gain, such benefits could be significantly offset by spillovers from lower external demand. Alternate scenarios are used to highlight that nonaligned regions could have some negotiating power vis-à-vis the geopolitical blocs. However, uncertainty regarding their alignment could restrict their ability to attract investment. The estimated output losses highlight the importance of carefully balancing the strategic motivations behind reshoring and friend-shoring against economic costs to the countries themselves and to third parties, including through multilateral consultations to reduce uncertainty for bystanders.

Early Signs of FDI Fragmentation

Recent trends point to the emergence of FDI fragmentation. This chapter relies on investment-level data on new (greenfield) FDI from fDi Markets, which provides data on about 300,000 investments from the first quarter of 2003 to the fourth quarter of 2022. The richness of the data—which include information on the source and host countries and on the sector and purpose of the investment—allows for zooming in on specific regions, country pairs, and industries.[4] It also permits classification of certain sectors as "strategic": those for which policymakers may be particularly interested in relocation due to national and economic security interests.[5] Throughout the chapter, the number of greenfield foreign direct investments is used as the measure of FDI.[6]

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[4]As the data do not show divestment, the chapter studies the geographic footprint of new direct investments. Once aggregated at the host country–year level, the investment-level data are highly correlated with gross FDI inflows, and the distributions of the two show a large degree of overlap, as also shown by Toews and Vézina (2022). As data on mergers and acquisitions are not available from the same data source, the analysis is based exclusively on greenfield investments. New (greenfield) investments are more numerous than mergers and acquisitions, especially in emerging market and developing economies; are more highly correlated with aggregate data on FDI; and are less frequently concentrated in tax havens. To mitigate the risk that findings are affected by phantom FDI (Damgaard, Elkjaer, and Johannesen 2019), the robustness of the analysis is tested excluding FDI from and to international financial centers. More details are discussed in Online Annex 4.1. All online annexes are available at www.imf.org/en/Publications/WEO.

[5]The chapter defines strategic sectors at the three-digit industry level. More details are discussed in Online Annex 4.1.

[6]As investment values in the fDi Markets data set are often estimated, the chapter's main analysis relies on the number of investments; in the chapter, a change in FDI refers to a change in the number of greenfield foreign direct investments. Online Annex 4.1 shows that the main results are robust to the use of investment values.

Figure 4.4. Foreign Direct Investment Fragmentation
(Number of investments, four-quarter moving average, 2015:Q1 = 100)

Foreign direct investment flows to different regions are diverging, with China losing market share.
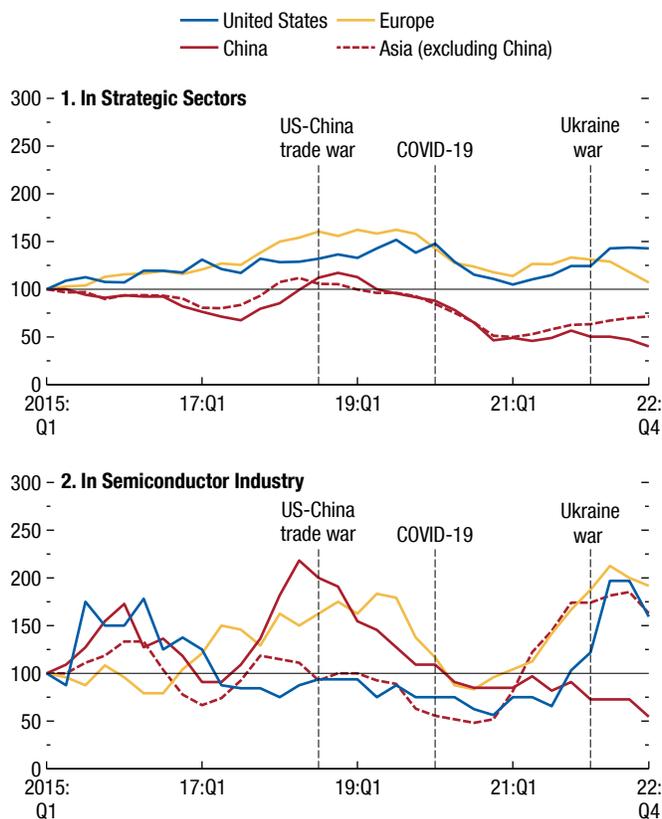
Sources: fDi Markets; and IMF staff calculations.
Note: Vertical lines indicate the start of US-China trade war, the start of the COVID-19 pandemic, and the start of the Ukraine war, respectively.

Figure 4.5. Foreign Direct Investment Reallocation across Regions, 2020:Q2–22:Q4 versus 2015:Q1–20:Q1
(Percentage point deviation from aggregate change)

The regional shift in foreign direct investment flows shows winners and losers.

Source regions	United States	Americas excl. US	Advanced Europe	Emerging Europe	Asia excl. China	China	Rest of the world
Rest of the world	26.4	7.1	5.3	11.4	–3.7	–24.7	18.6
China	–22.1	–6.9	–17.8	–31.3	–44.3		–31.9
Asia excl. China	–3.2	–8.7	–11.7	–2.4	–23.7	–49.2	–4.4
Emerging Europe	27.6	2.9	9.9	18.1	–22.3	13.9	–11.5
Advanced Europe	7.5	–11.7	9.3	–0.9	–9.8	–19.7	8.6
Americas excl. US	18.6	27.3	14.9	34.0	5.9	–13.3	27.6
United States		9.2	0.6	19.4	2.3	–40.6	21.6

Destination regions

Sources: fDi Markets; and IMF staff calculations.
Note: Figure shows deviation of regional foreign direct investment change from aggregate change (19.5 percent decline). Changes are computed using the number of greenfield foreign direct investments in 2020:Q2–22:Q4 and average number in 2015:Q1–20:Q1. Green (red) shading denotes positive (negative) numbers. Excl. = excluding.

Many factors likely contributed to the slowdown in FDI before the pandemic, such as increasing automation and other technological changes (Alonso and others 2022). Yet some recent patterns point to increased FDI fragmentation as geopolitical tensions and inward-looking policies have gained importance. The flow of strategic FDI to Asian countries started to decline in 2019 and has recovered only mildly in recent quarters. By contrast, flows of strategic investments to the US and Europe have proved more resilient. As a result, by the fourth quarter of 2022, a significant gap emerged between new investment directed to these regions, with strategic FDI to Europe about twice that going to Asian countries (Figure 4.4, panel 1). Fragmentation—and specifically the lack of recovery of FDI to China—is even more apparent for

foreign investment in R&D and in specific strategic industries, such as the semiconductor industry (Figure 4.4, panel 2), which both the US and the European Union have targeted with policies directed at strengthening domestic production and reducing the vulnerability from unaligned foreign suppliers.

These patterns are indicative of a more general process of reallocation of FDI flows across countries. FDI declined in the post-pandemic period from the second quarter of 2020 to the fourth quarter of 2022 by almost 20 percent compared to the post–global financial crisis pre-pandemic average. But this decline has been extremely uneven across regions, with the emergence of relative winners and losers as both source and host of FDI (Figure 4.5). Asia became less relevant both as a source and host, losing market share vis-à-vis almost all other regions. Notably, FDI to and from China declined by even more than the Asian average, although the persistent effect of the pandemic and prolonged lockdowns could also have contributed to the fall in foreign investment. In other regions, such as the US and emerging Europe, greenfield FDI declined less and, in some cases, even increased (for example, inflows to emerging Europe).

Figure 4.6. Change in Outward US Foreign Direct Investment, 2020:Q2–22:Q4 versus 2015:Q1–20:Q1
(Percentage point deviation from aggregate change)

US foreign direct investment partly shifted from less to more aligned countries.
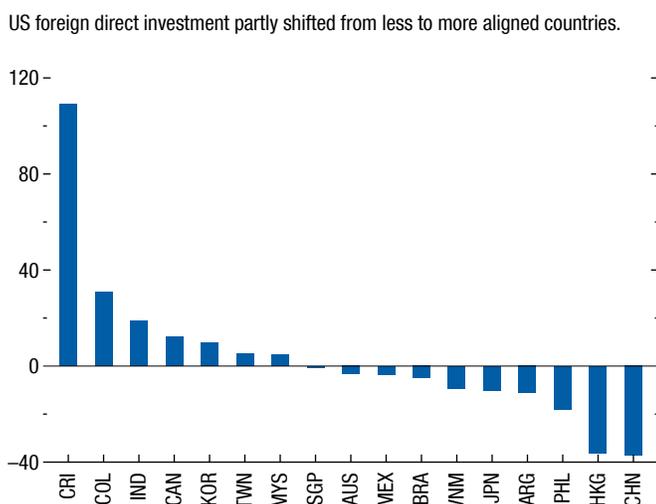
Sources: fDi Markets; and IMF staff calculations.
Note: Figure shows the deviation of outward US foreign direct investment change by destination from aggregate change (24 percent decline). Changes are computed using the number of greenfield foreign direct investments from the United States to Europe and Asia in 2020:Q4–22:Q2 and average number in 2015:Q1–20:Q1. Labels on the *x*-axis use International Organization for Standardization (ISO) country codes. "TWN" refers to "Taiwan Province of China."

Figure 4.7. Foreign Direct Investment between Geographically and Geopolitically Close Countries
(Percent)

The importance of geopolitical distance for foreign direct investment has increased.

Sources: Bailey, Strezhnev, and Voeten (2017); Centre d'études prospectives et d'informations internationales, Gravity database; fDi Markets; and IMF staff calculations.
Note: Figure shows the annual share of total foreign direct investments between country pairs that are similarly distant (that is, in same quintile of distance distribution), geopolitically and geographically, from the United States.

In regard to outward FDI from the US, the bottom row of Figure 4.5 shows that US FDI to China declined by much more than the average global decline. At the same time, US FDI to other regions—and particularly to emerging Europe—was more resilient. This shift in the composition of outward US FDI can be analyzed in detail, looking at differences between host economies (Figure 4.6). Among major Asian and European recipients of US FDI, some of the relative winners (for example, Canada, Korea) are politically closer to the US than the relative losers (for example, China, Vietnam). This suggests that geopolitical factors have driven part of the shift in FDI flows in recent years. The next section investigates this issue in detail.

FDI Is Becoming More Responsive to Geopolitical Factors

Rising geopolitical tensions are a key driver of FDI fragmentation, as bilateral FDI is increasingly concentrated among countries that share similar geopolitical views (Figure 4.7). This chapter measures geopolitical alignment between countries using the "ideal point distance" proposed by Bailey, Strezhnev, and Voeten (2017), which is based on the similarity

of voting patterns at the United Nations General Assembly.[7] As transportation costs and geographic frictions also influence FDI decisions (Alfaro and Chen 2018; Ramondo, Rodríguez-Clare, and Tintelnot 2015), it is informative to compare their roles with that of geopolitical alignment. The share of FDI among countries that are geopolitically aligned is larger than the share going to countries geographically close, suggesting that geopolitical preferences play a key role as a driver of FDI. In addition, the importance of geopolitical alignment has increased over the last decade,

[7]Recent analysis of geoeconomic fragmentation looks at recent votes, such as the UN General Assembly vote on Resolution ES-11/1 on aggression against Ukraine on March 2, 2022 (Chapter 3 of the October 2022 *Regional Economic Outlook: Asia and Pacific*; Javorcik and others 2022). However, this chapter looks at the role of geopolitical alignment over a longer period: the last 20 years. In this respect, the ideal point distance has the advantage of being comparable over time. Although the ideal point distance is widely used in political science and in economics, scholars have proposed alternative measures. The findings of the chapter are robust to the use of the *S* score used in the April 2023 *Global Financial Stability Report* and proposed by Signorino and Ritter (1999), who assign numeric values to voting behavior in the UN General Assembly and calculate the degree of disagreement between two countries by computing the sum of squared differences of these values.

and increased more steeply than the importance of geographic distance, especially for FDI in strategic sectors.

The role of geopolitical alignment is significant and economically relevant, particularly for emerging market and developing economies, in a gravity model that controls for other potential drivers of FDI flows. In the baseline specification, an increase in the ideal point distance from the first to the third quartile of its distribution (equivalent to moving the distance from that between Canada and Japan to that between Canada and Jordan) is associated with a decline in FDI between countries of about 17 percent. This average effect is much stronger when emerging market and developing economies are either a source or a host country. Moreover, since 2018, coincident with increasing trade tensions between China and the US, geopolitical factors have become more relevant to FDI flows. Finally, the analysis suggests that these factors matter more in regard to investments in strategic sectors (Figure 4.8). Thus, if countries move farther apart along geopolitical fault lines, FDI is likely to become more concentrated within blocs of geopolitically aligned countries. Moreover, fragmentation risks are not confined to FDI flows. Zooming in on non-FDI flows points out a sharp increase in countries' exposure to financial fragmentation risk, which could trigger a significant global reallocation of capital in response to a rise in geopolitical tensions (Box 4.2). Such tensions matter significantly for cross-border portfolio allocation and could cause a sudden reversal of cross-border capital flows, especially in emerging market and developing economies (see the April 2023 *Global Financial Stability Report*).

The findings reported in Figure 4.8 are based on a gravity model that takes bilateral FDI as the dependent variable and controls for standard push-and-pull factors, including a set of time-varying fixed effects for source and host countries (Kox and Rojas-Romagosa 2020).[8] To minimize the possibility that the coefficient

Figure 4.8. Gravity Model for Ideal Point Distance and Foreign Direct Investment
(Semielasticities)

Greater geopolitical distance is associated with less foreign direct investment, especially in EMDEs, in recent years and in strategic sectors.

Sources: Atlantic Council; Bailey, Strezhnev, and Voeten (2017); Centre d'études prospectives et d'informations internationales, Gravity database; fDi Markets; NL Analytics; and IMF staff calculations.
Note: Coefficients of ideal point distance are estimated from gravity model for number of foreign direct investments. See Online Annex 4.1 for details. AEs = advanced economies; EMDEs = emerging market and developing economies.

on the index of geopolitical distance captures the role of other factors that could drive FDI, the model is augmented to include measures of geographic, cultural, and institutional distance and a historical measure of colonial ties. As expected, the inclusion of these variables—which are indeed associated with bilateral FDI flows—reduces the size of the coefficient of the ideal point distance, which however remains statistically and economically significant. The findings are also robust to considering FDI in manufacturing or services separately; excluding financial centers or China; controlling for the announcement and implementation of bilateral trade barriers, for the volume of bilateral trade, and for exchange rate effects; measuring FDI by its size rather than the number of investments; and considering cross-border mergers and acquisitions rather than greenfield FDI. The methodology and the results are described in Online Annex 4.1.

Which Host Countries Are More Vulnerable to FDI Relocation?

To assess the exposure of the stock of FDI hosted by an economy to geoeconomic fragmentation, the

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[8]The analysis is based on estimating the following specification: $= f(\alpha IPD_{sdt-1} + \beta Gravity_{sd} + \tau_{st} + \upsilon_{dt}, \varepsilon_{sdt})$, where bilateral FDI flows (measured by the number of investments) from the source country s to the host country d in year t is a function of the lagged value of IPD (the ideal point distance) between countries d and s. As is standard in gravity models, the specification controls for the geographic distance between source and host countries and other standard gravity controls, and absorbs any time-varying unobservable push-and-pull factors, adding source country × year and host country × year fixed effects. These fixed effects would capture, for instance, business cycle dynamics that could push FDI outflows from a source country and attract inflows into a host country. As, by construction, most of the FDI_{sdt} cells are 0, the model is estimated using Poisson pseudo-maximum likelihood (Santos Silva and Tenreyro 2006). Standard errors are clustered at the country-pair level.

Figure 4.9. Vulnerability Index

Emerging market and developing economies tend to be more vulnerable to relocation of foreign direct investment than advanced economies.
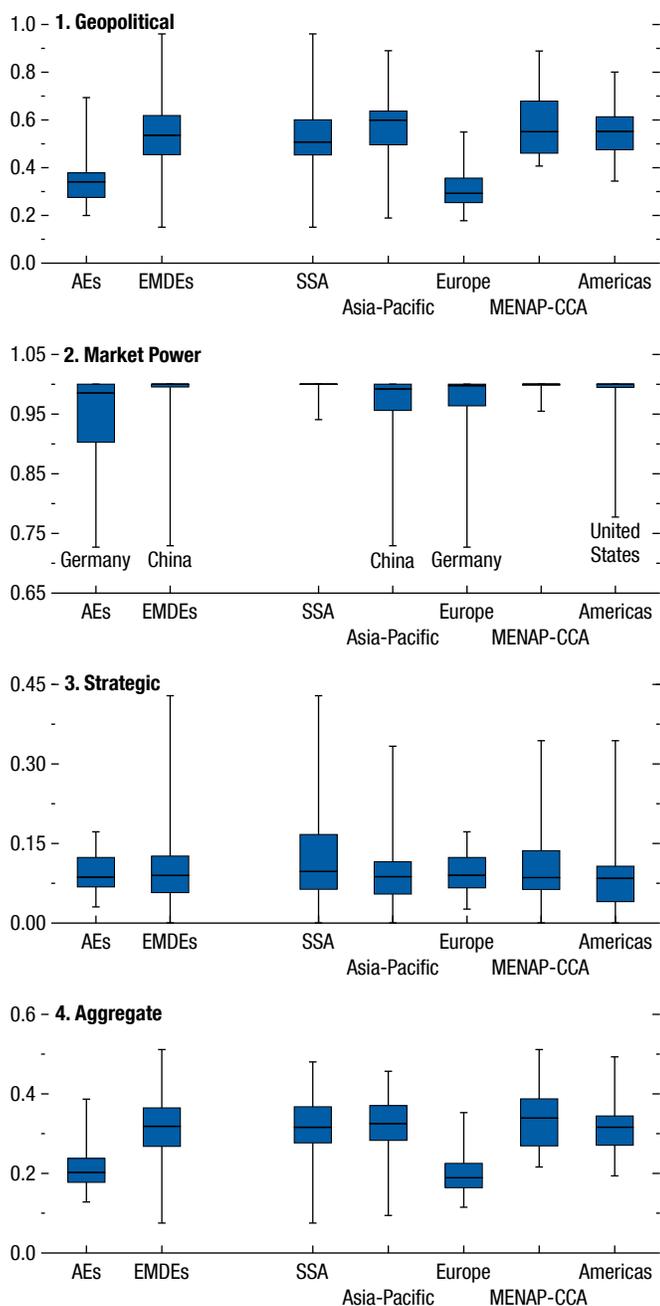
Sources: Atlantic Council; Bailey, Strezhnev, and Voeten (2017); fDi Markets; NL Analytics; Trade Data Monitor; and IMF staff calculations.
Note: Figure shows distribution of vulnerability index by income and regional groups, based on post-2009 foreign direct investment flows. AEs = advanced economies; EMDEs = emerging market and developing economies; MENAP-CCA = Middle East, North Africa, Afghanistan, Pakistan, Caucasus, and Central Asia; SSA = sub-Saharan Africa.

chapter develops a multidimensional index of vulnerability. It combines three subindices, based on three dimensions relevant to geoeconomic fragmentation: (1) the geopolitical distance between source and host countries, (2) the degree of market power that host countries have in each industry in which they receive FDI, and (3) the strategic component of the stock of FDI.

- The geopolitical index captures the idea that the greater the geopolitical distance between source and host countries, the greater the vulnerability to friend-shoring. The index is calculated for each host country by multiplying the share of investment from each source country by the geopolitical distance between host and source countries. Given that most countries receive much of their FDI from advanced economies and given that those economies are geopolitically closer to one another than to emerging market and developing economies, these economies are more geopolitically vulnerable than advanced economies (Figure 4.9, panel 1).

- Countries with high market shares in trade of a given sector may be less vulnerable to relocation pressures in that sector, as foreign investors may have fewer options for relocating investment. The index of market power captures this dimension by treating FDI in a particular sector as less vulnerable if the host country is among the top 10 exporters in that sector. By contrast, FDI in host countries that are not among the top 10 exporters in that sector is treated as fully vulnerable. Though the vast majority of economies show low levels of protection from market power, some large economies (for example, China, Germany, US) do enjoy some level of protection, being large exporters in many sectors (Figure 4.9, panel 2).

- The strategic index measures the share of inward FDI in strategic sectors. This dimension of vulnerability shows substantial overlap between advanced and emerging market and developing economies (Figure 4.9, panel 3).

The geopolitical and strategic dimensions of vulnerability are broadly uncorrelated and capture distinct aspects of countries' vulnerability to geoeconomic fragmentation (Figure 4.10). Whereas geopolitical vulnerability is concentrated among emerging market and developing economies—as shown by the disproportionate share of red squares in the figure

to the right of the vertical line denoting the median geopolitical index—many large advanced economies, including the US, Germany, and Korea, are in the top half of the distribution of strategic vulnerability. The cluster of countries particularly vulnerable along both dimensions includes some large emerging market economies, such as Brazil, China, and India, but also several other emerging market economies, suggesting that FDI fragmentation is likely to be an issue for a large set of countries.

The three subindices are combined to construct an aggregate index. The aggregate index adds the strategic and geopolitical dimensions, with the latter multiplied by the market power index. Multiplying the geopolitical dimension by the market power index—bounded between 0 and 1—allows for a dampening of the geopolitical vulnerability com-ponent. This captures the idea that multinationals that would like to move their investments out of geopolitically distant countries will find it more difficult to do so if the host country is a key player in the global market in that sector. The strategic dimension is added to the combined geopolitical and market power component, as it reflects the height-ened vulnerability of investments in specific sectors in all host countries, not only those that are geopo-litically distant, and such sectors are more likely to be targeted with reshoring policies, offsetting any protection from market power.[9] Overall, emerging market and developing economies are more vulnera-ble to FDI fragmentation than advanced economies, even if there is large variation in the distribution of the index and some overlap between advanced and emerging market economies (for instance, 14 percent of emerging market and developing economies have a vulnerability index lower than the median for advanced economies). The distribution across regions shows the better position of Europe, while all other regions show higher and similar levels of vulnerability (Figure 4.9, panel 4).

While the aggregate vulnerability index is intended to describe exposures of existing stocks to relocation as they stand, policy measures could help reduce future vulnerabilities. Beyond multilateral

Figure 4.10. Geopolitical Index and Strategic Index

Strategic and geopolitical indices capture distinct vulnerabilities.

Sources: Atlantic Council; Bailey, Strezhnev, and Voeten (2017); fDi Markets; NL Analytics; Trade Data Monitor; and IMF staff calculations.
Note: Data are based on post-2009 foreign direct investment flows. Horizontal line indicates the median value of strategic index, 0.09, and vertical line indicates the median value of geopolitical index, 0.5. Labels in the figure use International Organization for Standardization (ISO) country codes.

efforts to preserve cooperation, domestic policies could also help, allowing economies to mitigate some risks even in a geopolitically tense world. Figure 4.11 suggests that stronger regulatory quality tends to be associated with lower aggregate vulner-ability to relocation of FDI. Improved regulatory quality tends also to be associated with higher exports, which could offer protection against reloca-tion pressures.

FDI Spillovers to Host Countries

Besides direct effects on job creation and capital formation, inward FDI could have spillover effects on domestic firms through technology diffusion, backward and forward linkages, and productivity gains from increased competition.[10] When it comes to empirical results, however, the effects are mixed (Görg and Greenaway 2004; Bénétrix, Pallan, and Panizza 2022). Cross-country studies reveal that the effect of inward FDI is uneven and depends on host

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[9]Rather than simply combining a host country's scores for the three subindices, the aggregate index is built up from the sector–source country level, such that market power offsets geopolitical distance only for sectors in which the host economy is among the top 10 exporters. The methodology for constructing the vulnerability indices is discussed in Online Annex 4.2.

[10]Formal descriptions of each channel are developed in Rodríguez-Clare (1996) for backward and forward linkages, Glass and Saggi (1998) for the technology spillover effect, and Barba Navaretti and Venables (2004) for the pro-competitive effect. For a more skeptical view on the gains from financial integration, see Gourinchas and Jeanne (2006).

Figure 4.11. Vulnerability Index and Regulatory Quality

Higher regulatory quality is associated with lower vulnerabilities.
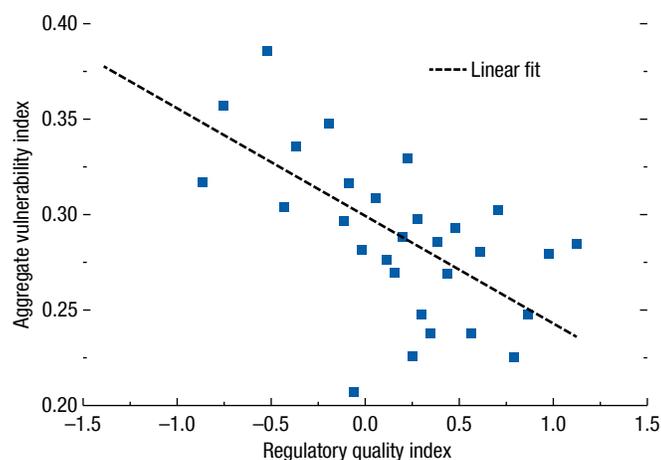
Sources: Atlantic Council; Bailey, Strezhnev, and Voeten (2017); fDi Markets; NL Analytics; Trade Data Monitor; World Bank, World Governance Indicators; and IMF staff calculations.
Note: Sample includes a cross section of 128 countries. The binned scatterplots are obtained from a regression of the aggregate vulnerability index against the regulatory quality index, controlling for the logarithm of real GDP, trade (percent of GDP), and foreign direct investment inflows (percent of GDP). All variables are averaged over 2010–19. The regressions give a coefficient of the regulatory quality index equal to –0.057 (p-value of 0.000).

countries' human capital (Borensztein, De Gregorio, and Lee 1998), institutional quality (Kose and others 2009), and financial development (Alfaro and others 2004). The lack of consistent findings may stem from FDI heterogeneity along the mode of entry, the type of investment, and the relationship between foreign and domestic firms. The evidence is generally more informative for specific types of FDI and spillovers along the value chain (Harrison and Rodríguez-Clare 2010). Hence, the analysis here explores two important dimensions: the distinction between horizontal and vertical FDI and differences in spillovers within and across industries.[11]

Horizontal versus Vertical FDI

Horizontal FDI refers to foreign firms entering a country to directly serve local markets. By contrast, vertical FDI takes place when foreign firms enter a country to produce inputs that will be supplied

[11]The interpretation of the results should take into account the potential endogeneity of FDI, which is in part addressed by using lagged values of FDI and including fixed effects (especially in the firm-level analysis).

to affiliated firms.[12] This distinction is particularly relevant in the context of geoeconomic fragmentation, given that vertical FDI is likely more exposed to FDI fragmentation risk than horizontal FDI. Higher trade barriers, for instance, would make horizontal FDI more attractive—as it could be a substitute for trade (Brainard 1997)—while making vertical FDI less attractive. Moreover, vertical FDI is often centered on advanced technology embodied in input production and thus is more likely to be the target of policies aimed at reshoring strategic production.

Vertical FDI is positively associated with economic growth, as it is concentrated among intermediate-goods producers that adopt more sophisticated (and skill-intensive) technology (Atalay, Hortaçsu, and Syverson 2014; Ramondo, Rappoport, and Ruhl 2016). This is not the case for horizontal FDI, more likely to be found among final-goods producers, which tend to transfer simple (and labor-intensive) assembly technology to host countries (Figure 4.12). These findings are obtained from cross-country growth regressions, which are estimated separately for countries more likely to receive vertical or horizontal FDI.[13]

Spillovers within and across Industries

The effects of the entry of a multinational corporation on domestic firms could be different depending on whether those firms are in the same sector or in other sectors—either upstream or downstream along the value chain. For instance, consider Toshiba setting up a chip-making plant in China. The Chinese chipmakers are directly affected by the entry of Toshiba (within-industry spillovers), as the increased competition can either provide local firms with a greater incentive to innovate, and thus to become more productive, or crowd out local firms by stealing

[12]The Samsung Electronics smartphone factory in India is an example of horizontal FDI, as most of its products are sold to Indian customers, whereas its semiconductor factory in Vietnam is an example of vertical FDI, as its products are sold mainly to Samsung's own affiliates worldwide. Other relatively minor types of FDI include export-platform FDI (for example, Volkswagen's plant in Mexico, which sells mostly to the US) and export-supporting FDI (for example, Toyota Financial Services USA, which offers US consumers financing options to facilitate export sales from Japan).
[13]This classification is based on detailed foreign subsidiary–level sales information from the Export-Import Bank of Korea. The estimation results are robust to alternative classifications based on parent and subsidiary firms' sector affiliations from Orbis. The methodology and the results are described in more detail in Online Annex 4.3.

Figure 4.12. Foreign Direct Investment and Growth: Horizontal versus Vertical
(Standardized coefficients)

Vertical foreign direct investment is associated with higher GDP growth in emerging market and developing economies.
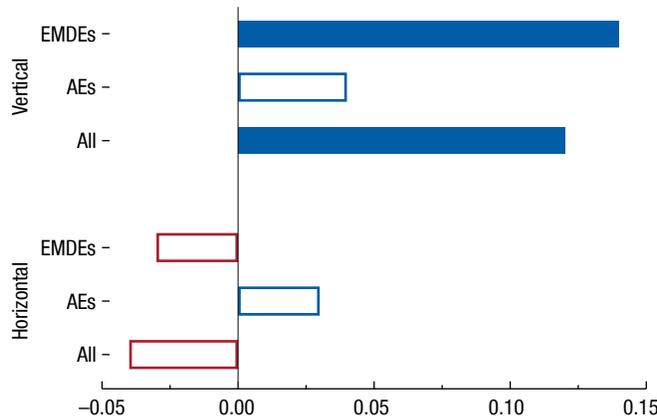
Sources: Export-Import Bank of Korea; and IMF staff calculations.
Note: Figure reports the standardized coefficients obtained from cross-country growth regression estimated separately for countries with horizontal foreign direct investment and those with vertical. Solid bars indicate statistical significance at 1 percent level. See Online Annex 4.3 for details. AEs = advanced economies; EMDEs = emerging market and developing economies.

Figure 4.13. Firm-Level Foreign Direct Investment Spillovers: within Industries versus across Industries
(Standardized coefficients)

Foreign direct investment spillovers take place within industries in advanced economies, while domestic suppliers benefit from foreign direct investment in emerging market and developing economies.

Sources: Eora Global Supply Chain Database; fDi Markets; World Bank Enterprise Survey; and IMF staff calculations.
Note: Figure reports the standardized coefficients obtained from firm-level regression of labor productivity growth as a function of foreign direct investment within and across industries. Solid bars indicate statistical significance at 1 percent level. See Online Annex 4.3 for details. AEs = advanced economies; EMDEs = emerging market and developing economies.

market share (Markusen and Venables 1999). At the same time, there are spillovers to other industries (cross-industry spillovers): Chinese silicon producers are also affected as they are big suppliers to the chip-making industry (backward linkages). Moreover, Chinese firms in the automobile industry will also be affected as they are heavy users of semiconductor chips (forward linkages).

Results based on a large sample of firm-level data from the World Bank Enterprise Surveys covering over 120,000 firms in 150 countries from 2006 to 2021 show positive spillovers to domestic firms in the same industry (Figure 4.13, top graph). Positive within-industry spillovers to firms' labor productivity are confined to advanced economies, where firms react to fiercer competition from multinational corporations by becoming more productive. In the case of cross-industry spillovers, domestic suppliers benefit from the entry of foreign firms in downstream sectors, as the latter may source inputs locally and increase local demand for inputs produced by domestic firms. Local suppliers may also benefit from learning by doing via direct contact with foreign buyers with better technology. These positive spillovers to domestic

suppliers are driven by FDI in emerging market and developing economies.[14] By contrast, there is no evidence of spillovers to domestic users, even in emerging market and developing economies. This could be because foreign firms in upstream sectors mostly sell abroad, implying limited scope for positive technology spillovers via direct contact with local buyers (Figure 4.13, bottom two graphs).

A Model-Based Quantification of the Costs of FDI Fragmentation

To investigate the long-term implications of potential FDI fragmentation, this section uses a multiregion DSGE model to explore possible scenarios.[15] The simulations focus on fragmentation of investment flows

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[14]These findings are consistent with those of Mercer-Blackman, Xiang, and Khan (2021) on a smaller sample covering mostly Asian countries.

[15]The analysis uses the IMF's Global Integrated Monetary and Fiscal Model, further elaborated in Online Annex 4.4. A detailed exposition of the model and its properties may be found in Kumhof and others (2010) and Anderson and others (2013).

arising from permanent barriers between geopolitical blocs, as well as heightened uncertainty about the geopolitical alignment of different regions. The analysis, and the various hypothetical scenarios, are intended to illustrate some of the key economic mechanisms likely to be at play and to provide a sense of overall output losses and the distribution of costs and benefits across economies, including those from spillovers through external demand and the reallocation of production capacity. The geopolitical coalitions considered are for analytical purposes only and are not intended to indicate alignment choices countries are likely to make.

The analysis focuses on two key roles of FDI: its contribution to capital formation in host economies and the transmission of technologies and productivity-enhancing management practices from advanced to emerging market and developing economies. The model does not have explicit foreign ownership of productive capital, and thus there is no direct mapping to FDI.[16] The bilateral cross-border flow of inputs into investment is instead used as a proxy, since similarly to reductions in FDI, barriers to the flow of such inputs directly reduce capital formation. The scenarios illustrate a 50 percent reduction of such flows. Alongside, empirical estimates of the correlation between FDI flows and labor productivity are used to discipline the associated productivity losses from a reduction in such flows. The analysis complements the literature, which has focused on the impact of fragmentation through trade and associated knowledge spillovers (Cerdeiro and others 2021; Eppinger and others 2021; Góes and Bekkers 2022; Javorcik and others 2022), although a full analysis of the interaction between different aspects of geoeconomic fragmentation is beyond the scope of this chapter. Box 4.3 discusses new evidence suggesting that the fragmentation of international trade as a result of geopolitical tensions could lead to lower output in most countries, with emerging market and developing economies more adversely affected than other country groups.

The simulations center on decoupling between the two largest economies—China and the US—which is likely to be the most economically consequential form of fragmentation. Although how other countries and regions might align themselves in such a decoupling remains unclear and will depend on a multitude of

factors (for example, strength of existing trade and financial links and national security considerations), scenario analysis is used to highlight the implications of different geopolitical-alignment choices for economic outcomes.

The model allows for up to eight regions. China, the EU+ (that is, the EU and Switzerland), and the US are assigned their own regions, as the policy choices of these economies are likely to shape global fragmentation scenarios. To illustrate the interaction between alignment choices and economic outcomes for emerging market and developing economies, including through investment diversion, a region is assigned to Latin America and the Caribbean and another to India and Indonesia, two representative Asian emerging market and developing economies with relatively neutral measures of geopolitical distance from the US and China. The remaining three regions comprise the rest of southeast Asia, other advanced economies (for example, Australia, Canada, Japan, UK), and the rest of the world (for example, central Asia, Middle East, Russia, sub-Saharan Africa).

While geopolitical-alignment choices are highly uncertain, to discipline the analysis, the chapter constructs a baseline hypothetical scenario for alignments using the ideal point distance. Relative distances from either the US or China, based on the latest ideal point distance data, are used to assign regions to geopolitical blocs aligned with either the US or China, or as nonaligned. Additional scenarios, focusing on different alignment choices for the EU+, India and Indonesia, and Latin America and the Caribbean, explore the interaction between geopolitical alignment and economic outcomes (Table 4.1). In reality, geopolitical alignments are not givens and likely require the balancing of multiple considerations (beyond the scope of this chapter) under frictions and uncertainty.

In the first scenario, in which the world splinters into a US-centered bloc and a China-centered bloc, and with both India and Indonesia and Latin America and the Caribbean remaining nonaligned, global output is about 1 percent lower after five years (relative to the no-fragmentation scenario). Global output losses increase as the impact on capital stocks and productivity from lower investment input flows cumulate, with long-term output lower by 2 percent (Figure 4.14). Output losses are generally larger in the emerging-market-dominated China bloc, as these regions face heightened barriers to the major sources of investments, namely, advanced economies. The losses

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[16]With a few exceptions (Arkolakis and others 2018; Reyes-Heroles, Traiberman, and Van Leemput 2020), multicountry trade models used in the literature tend to abstract from investment.

Table 4.1. Modeled Fragmentation Scenarios

Legend: US Bloc | China Bloc | Nonaligned

Model Region	GDP Share (Percent)	Two Blocs + Nonaligned EMDE Regions	Nonaligned EU+	Nonaligned EMDEs Join China Bloc	Nonaligned EMDEs Join US Bloc
United States	16.0	US Bloc	US Bloc	US Bloc	US Bloc
China	17.5	China Bloc	China Bloc	China Bloc	China Bloc
EU+	15.6	US Bloc	Nonaligned	US Bloc	US Bloc
Other AEs	13.8	US Bloc	US Bloc	US Bloc	US Bloc
India and Indonesia	9.6	Nonaligned	Nonaligned	China Bloc	US Bloc
Southeast Asia	4.0	China Bloc	China Bloc	China Bloc	China Bloc
LAC	6.5	Nonaligned	Nonaligned	China Bloc	US Bloc
ROW	17.0	China Bloc	China Bloc	China Bloc	China Bloc

Source: IMF staff compilation.
Note: AEs = advanced economies; EMDEs = emerging market and developing economies; EU+ = European Union and Switzerland; LAC = Latin America and the Caribbean; ROW = rest of the world.

are also nonnegligible for the US bloc, however, driven by some members' strong links to China (such as Japan and Korea in the other advanced economies region and Germany in the EU+ region).

For the nonaligned economies, the impact depends on the outcome of two competing channels. On the one hand, the substantial reduction in global activity reduces external demand, weighing on net exports and investment. On the other hand, these regions also benefit from the diversion of investment flows, which—if sufficiently large—could boost investment and output. The importance of the second channel increases with the ease with which investment goods from different regions can be substituted for one another by the importing region. In the benchmark assumption for the elasticity of substitution across source regions of investment inputs, the first channel dominates, and the nonaligned regions experience a small drop in output (Figure 4.14, darker bars). Alongside the benchmark case, an alternative case uses a higher elasticity of substitution (double in value). In the alternative case, higher diversion yields a small net increase in investment and output (Figure 4.14, lighter bars).[17]

In reality, a geoeconomically fragmented world might entail substantial policy uncertainty for economies that try to remain open to both geopolitical blocs. Rather than having their nonaligned status accepted, these economies may need to walk a narrow path amid pressures from both sides, with the attendant risk of falling out with one bloc or the other. This type of policy uncertainty, in which investors perceive a risk that current policy stances toward that economy could shift radically in the future, can act as an economically meaningful barrier to trade and investment, as documented in the literature (for example, Handley and Limão 2022). While the exact degree of such uncertainty in a hypothetical fragmented future is impossible to pin down, a case involving a high level of uncertainty—in which investors in both blocs perceive a 50 percent chance that the nonaligned region will fall in with the opposing bloc over the long term—is a natural analytical complement to the baseline no-uncertainty scenario already discussed.[18] Specifically, investors behave as if investment input flows to (from) these regions face half the barriers faced by regions in the opposing bloc. As shown in Figure 4.15, losses are significantly amplified for nonaligned regions under such uncertainty, as they face reduced inflows from both blocs, with some negative spillovers to other regions as well.

Alternative alignment choices highlight their significant impact on outcomes. For example, a world in which the EU+ remains nonaligned entails significantly lower costs for both itself and the China bloc economies. However, the EU+ might face heavy costs if such a policy approach significantly raises the possibility of barriers between itself and the US—due to greater uncertainty about its future alignment (Figure 4.16, panel 1). Under the baseline, the two nonaligned regions generally tend to be

[17]Similar to the cases of India and Indonesia and Latin America and the Caribbean, losses are significantly lower for other regions, such as southeast Asia, if they are also nonaligned, as shown in additional simulations in Online Annex 4.4.

[18]The scenario illustrates the case with India and Indonesia and the Latin America and Caribbean regions remaining nonaligned indefinitely, but with investors perceiving a risk they will pick a side in the future (and therefore face the associated barriers). Alongside the 50–50 scenario presented here, Online Annex 4.4 discusses a range of possible levels of uncertainty.

Figure 4.14. Impact of Investment Flow Barriers on GDP
(Percent deviation from no-fragmentation scenario)

Fragmentation could lower global output by up to 2 percent.
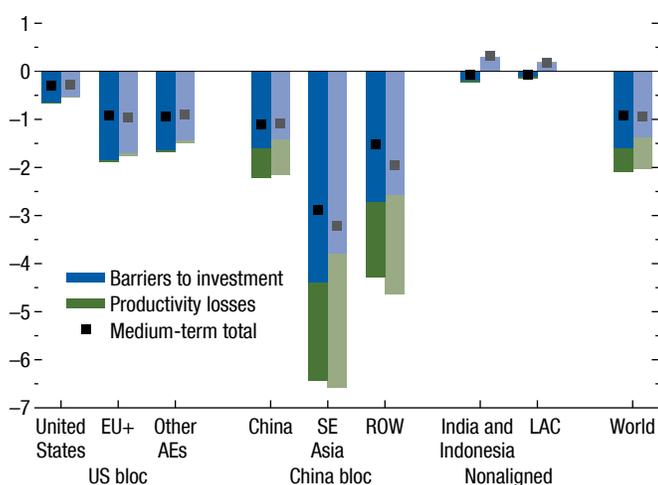
Source: IMF staff calculations.
Note: Baseline fragmentation scenario represents barriers generating 50 percent decline in investment input flows between China and US blocs, with no barriers with two nonaligned regions (India and Indonesia and Latin America and the Caribbean). Darker bars denote scenario with lower elasticity of substitution (1.5) between foreign sources of investment inputs. Lighter bars denote scenario with higher elasticity of substitution (3.0) between foreign sources of investment inputs and thus a greater role for diversion.
AEs = advanced economies; EU+ = European Union and Switzerland; LAC = Latin America and the Caribbean; ROW = rest of the world; SE = Southeast.

Figure 4.15. Long-Term GDP Losses, with Uncertainty for Nonaligned Economies
(Percent deviation from no-fragmentation scenario)

Policy uncertainty could amplify losses for nonaligned economies.

Source: IMF staff calculations.
Note: Darker bars denote scenario with lower elasticity of substitution (1.5) between foreign sources of investment inputs. Lighter bars denote scenario with higher elasticity of substitution (3.0) between foreign sources of investment inputs and thus a greater role for diversion. AEs = advanced economies; EU+ = European Union and Switzerland; LAC = Latin America and the Caribbean; ROW = rest of the world; SE = Southeast.

worse off when aligning with either bloc, as opposed to remaining open to both. However, given that the advanced-economy-dominated US bloc is the major source of investment flows, they are better off joining this bloc if forced to choose, especially if they were to face uncertainty otherwise (Figure 4.16, panel 2).

Blocs' incentive to attract emerging market and developing economies might give nonaligned regions some bargaining power but could also generate the type of damaging uncertainty that reduces investment (Figure 4.17). Unsurprisingly, existing bloc members would gain when their bloc attracts the nonaligned regions and lose when nonaligned regions join the opposing bloc. The gain to the existing bloc members could outweigh the losses to the joining regions, suggesting some scope for transfers to implement such an outcome. Potential transfers could take several forms, including favorable trade and investment treatment or fiscal measures to encourage friend-shoring to target economies.[19]

[19]For example, see the announcement that the US will support investment in India by the largest US solar manufacturer (Sharma 2022).

The opposing bloc would likely want to avoid such an outcome. In reality, alignment choices are likely to be dependent on multiple considerations and subject to coordination frictions, further underscoring the uncertainty that could itself weigh on investment.

Policy Implications

The findings of this chapter contribute to understanding how fragmentation pressures may already be affecting investment flows across economies, as well as the long-term implications for the global economy if such pressures lead to a substantial relocation of FDI. Vulnerabilities to FDI fragmentation are broadly shared across many emerging market and developing economies, and advanced economies are not immune, particularly those with significant FDI stocks in strategic sectors. As vulnerabilities can also extend to non-FDI flows (see the April 2023 *Global Financial Stability Report*), a rise in political tensions could trigger large reallocation of capital flows at the global level, with effects particularly pronounced for emerging market and developing economies. The chapter's analysis

Figure 4.16. Impact on GDP for Bloc Members: Tripolar World and Nonaligned Joining Blocs
(Percent deviation from no-fragmentation scenario)

Remaining nonaligned with certainty tends to limit losses.

1. Impact of Nonaligned EU+, with and without Uncertainty

EU+ in US bloc
EU+ nonaligned, with uncertainty
EU+ nonaligned, no uncertainty

2. Impact of Nonaligned Joining Blocs

Cross-bloc investment barriers
Uncertainty for nonaligned
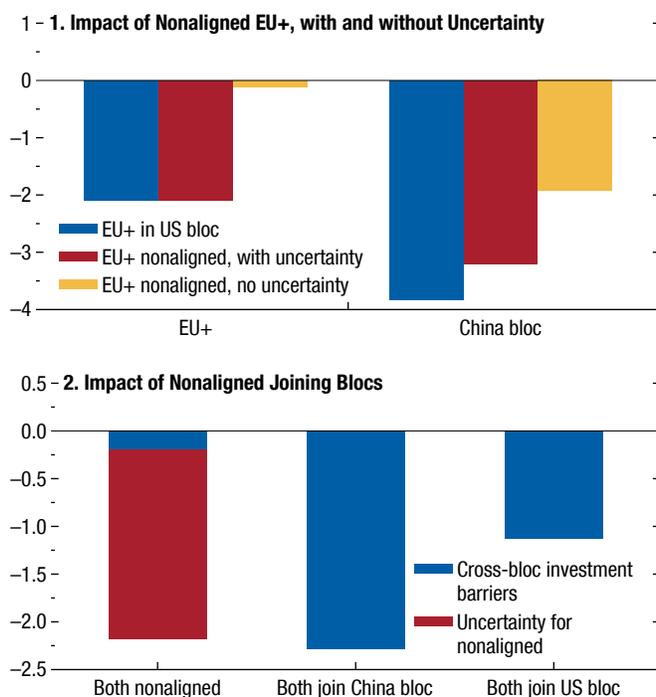
Source: IMF staff calculations.
Note: EU+ = European Union and Switzerland.

Figure 4.17. Impact on GDP for Bloc Members: Nonaligned Joining Blocs
(Percent deviation from nonaligned scenario with uncertainty)

Blocs have incentives to attract nonaligned regions and discourage nonaligned from joining the opposing bloc.

China bloc
US bloc
China bloc, with new members
US bloc, with new members
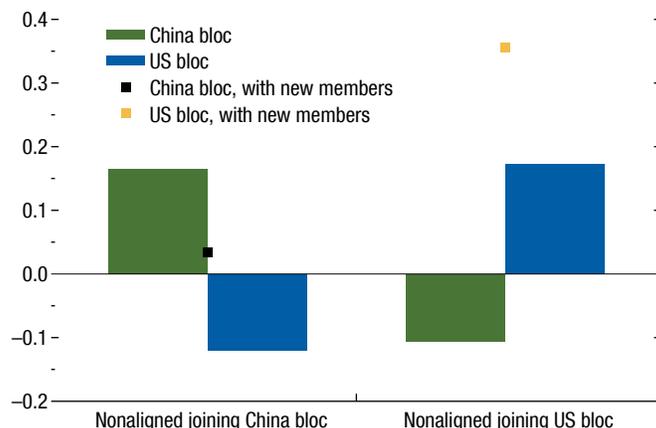
Source: IMF staff calculations.
Note: The nonaligned include India and Indonesia and Latin America and the Caribbean.

suggests that a fragmented global economy is likely to be a poorer one. While there may be relative—and possibly absolute—winners from diversion, such gains are subject to substantial uncertainty.

The chapter does not attempt to measure the success of the policies driving geoeconomic fragmentation in meeting the objectives often ascribed to them, such as enhancing national security or maintaining a technological advantage over rival countries, especially in strategic sectors. Instead, its analysis highlights that the pursuit of these objectives entails large economic costs, not just for a country's rivals and (possibly) other nonaligned countries, but also for the country itself and countries aligned with it. These costs need to be considered carefully.

In regard to policies, the large and widespread economic costs from strategic decoupling provide a rationale for a robust defense of global integration, at a time when several actors are advocating more barriers and inward-looking policies. For instance, increasing

diversification in international sourcing of inputs away from domestic sources can make supply chains more resilient to shocks (see Chapter 4 of the April 2022 *World Economic Outlook*), without imposing costs on the world economy. At the same time, the current rules-based multilateral system must adapt to the changing world economy and should be complemented by credible "guardrails" to mitigate global spillovers and by domestic policies targeted at those adversely affected by global integration (Aiyar and others 2023).

As policy uncertainty amplifies losses from fragmentation, especially for nonaligned countries, effort should be devoted to minimizing such uncertainty. Improving information sharing through multilateral dialogue would support this goal. In particular, the development of a framework for international consultations (for instance, on the use of subsidies to provide incentives for reshoring or friend-shoring of FDI) could help identify unintended consequences. It could also mitigate cross-border spillovers by reducing uncertainty and promoting transparency on policy options.

Finally, in a more geopolitically tense world, countries can reduce their vulnerability to FDI relocation by implementing policies and regulations to promote private sector development. Moreover, a more

fragmented world in which large economies implement policies to promote friend-shoring of FDI could be an opportunity for some countries to benefit from diversion of investment flows by attracting new FDI. Measures that can increase countries' attractiveness as investment destinations include undertaking structural reforms (Campos and Kinoshita 2010), establishing investment promotion agencies to reduce information asymmetries and ease bureaucratic procedures (Harding and Javorcik 2011; Crescenzi, Di Cataldo, and Giua 2021), and improving infrastructure (Chen and Lin 2020).

Box 4.1. Rising Trade Tensions

This box provides a summary and timeline of recent events behind US-China trade tensions, one of the major drivers behind the rising risk of geoeconomic fragmentation.

China's accession to the World Trade Organization (WTO) in 2001, following its ambitious economic reforms of the 1990s, was a pivotal milestone, with world trade volumes almost doubling since then and China becoming the world's top exporter and second-largest economy. However, trade tensions have been growing over the subsequent years as China's rapid export growth has affected segments

The author of this box is JaeBin Ahn.

of European and US industry. As China's economic reforms slowed and even reversed, major trading partners became increasingly concerned by the economic role of the state in domestic and export markets, including technology transfer practices and the footprint of state-owned enterprises with an international presence. The inability of WTO members to agree on reforms in these and other sensitive areas has exacerbated trade tensions (Aiyar and others 2023).

The US imposition of tariffs against China in July 2018 triggered an immediate Chinese response and was followed by rounds of back-and-forth escalations (Figure 4.1.1). The Phase One trade agreement

Figure 4.1.1. A Timeline of US-China Trade Tensions

US imposes 25% tariff on $34 billion in Chinese imports

US-China trade war resumes, with Huawei added to entity list and additional 25% tariff on $200 billion in Chinese imports

US Treasury designates China a currency manipulator

Tariff wars undone, with exemptions/bans

| Jul.–Sep. 2018 | Dec. 2018 | May 2019 | Aug. 2019 | Jan. 2020 | Feb.–Sep. 2020 |

Truce in trade war

Phase One trade agreement

25% tariff retaliation on $34 billion in US imports

25% tariff retaliation on $60 billion in US imports

Biden administration's official statement to keep tariffs on China in place

Extended ban on investments in Chinese companies with ties to the Chinese military

President Biden signs Creating Helpful Incentives to Produce Semiconductors and Science Act, and Inflation Reduction Act

Indo-Pacific Economic Framework for Prosperity launched with a dozen partners

New export controls prohibiting sales of advanced chips and chip-making technology to China

| Jan.–Feb. 2021 | Sep. 2021 | Jan. 2022 | May 2022 | Aug. 2022 | Oct. 2022 | Dec. 2022 |

Sanctions imposed on 28 former Trump administration officials

World Trade Organization rules against the US in Section 232 tariffs on steel and aluminum and Hong Kong SAR labeling disputes

World Trade Organization authorizes China to impose compensatory tariffs after US refusal to adjust antisubsidy duties inconsistent with World Trade Organization

Sources: China and US authorities; World Trade Organization; and IMF staff compilation.

Box 4.1 *(continued)*

between the two countries, signed in early 2020, helped avert further escalation but did little to reverse the increase in trade restrictions. Tensions have subsequently widened to a new technological front, with the US explicitly aiming to hinder China's advancement in sectors such as semiconductors and green energy equipment. For example, the US has imposed export controls to restrict China's access to advanced computing and semiconductor items. The Creating Helpful Incentives to Produce Semiconductors (CHIPS) and Science Act and the Inflation Reduction Act (IRA) aim to advance US global leadership in key technologies by imposing high domestic-content requirements. Meanwhile, because of the ongoing US blockage of WTO Appellate Body appointments, most

disputes are being left unresolved, undercutting the value of trade rules.

Recent initiatives, and the uncertainties surrounding them, have the potential to reshape global value chains along geopolitical lines and have already begun to affect production and sourcing strategies. For example, the proposed US Chip 4 alliance with three key Asian economies seeks to set up a semiconductor industry supply chain independent of China. Other major economies are also reacting as the case for more active, inward-looking regional industrial policies gains prominence. For example, the EU's proposed European Chips Act aims to boost the bloc's semiconductor industry to 20 percent of global production capacity by 2030, with more than €43 billion in investments.

Box 4.2. Balance Sheet Exposure to Fragmentation Risk

This box complements the analysis in the chapter by constructing a new measure of financial exposure to fragmentation risk, defined as the stock of non–foreign direct investment (FDI) foreign assets (liabilities) invested in (borrowed from) countries with diverging geopolitical views, for major advanced and emerging market economies.

Cross-border non-FDI financial linkages are constructed using IMF Coordinated Portfolio Investment Survey (CPIS) statistics and Bank for International Settlements Locational Banking Statistics. Since a large share of positions in the CPIS are booked to financial centers, bilateral portfolio holdings are first reallocated to their proper source and host countries following Coppola and others (2021). Bank and portfolio investments are then aggregated to derive bilateral foreign assets and liabilities for 38 countries during 2001–21 whose GDP accounts for 86 percent of world GDP. These positions are combined with bilateral measures of political proximity as captured by the ideal point distance, normalized into a continuous variable that takes the value 1 for the politically closest country and 0 for the most distant country. Bilateral holdings are then weighted by the political proximity index to generate a politically discounted measure of foreign assets and liabilities. The exposure to fragmentation is defined as the difference between undiscounted positions and their politically weighted counterparts and captures the stock of assets (or liabilities) that could be at risk in a fragmentation scenario.

Exposures are large and have roughly doubled over the past 20 years. While gross foreign investment positions (assets plus liabilities) as a share of GDP have more than doubled since 2001, politically weighted positions have not grown as fast, suggesting that capital has been increasingly invested in (borrowed from) countries with political views that are further apart (Figure 4.2.1, panel 1). This is particularly the case for advanced economies, but it is also the case for emerging markets. Exposures vary significantly across the Group of Twenty (G20) (Figure 4.2.1, panel 2). They

The authors of this box are Ariadne Checo de Los Santos, Rui Mano, and Damien Puy, with assistance from Fujie Wang. Online Annex 4.5 reports details about the empirical analysis, additional results, and robustness checks.

Figure 4.2.1. Gross Exposures to Fragmentation, Assets and Liabilities
(Percent of GDP, unless noted otherwise)
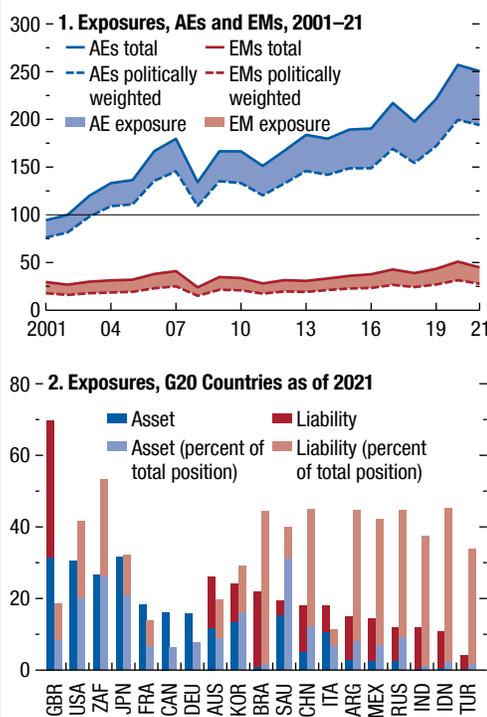
Sources: Bailey, Strezhnev, and Voeten (2017); Bank for International Settlements; IMF Coordinated Portfolio Investments Statistics Survey; and IMF staff calculations.
Note: Gross positions are aggregated by country group and divided by sum of each group's respective GDP. See Online Annex 4.5 for details on country group composition. Economy labels in the figure use International Organization for Standardization (ISO) country codes. AEs = advanced economies; EMs = emerging market economies; G20 = Group of Twenty.

are concentrated on the asset side in advanced economies and on the liability side in emerging markets. In aggregate, exposures have now reached 42 percent of GDP, or 24 percent of all non-FDI cross-border holdings. Therefore, a rise in political tensions could trigger a significant reallocation of capital at the global level, although exposures vary significantly across the G20 (see Online Annex 4.5).

Box 4.3. Geopolitical Tensions, Supply Chains, and Trade

This box presents new evidence that trade fragmentation could lower output for most countries, especially for emerging market and developing economies. To assess countries' exposure to geoeconomic fragmentation in trade, the box estimates the impact of geopolitical alignment on sector-level bilateral trade data for 189 countries (in 10 broad manufacturing sectors) using structural gravity regressions. These estimates show that divergences in individual countries' geopolitical alignment act as a barrier to trade. This effect is concentrated in some sectors, notably food, but also in transportation equipment and other manufacturing, which account for a large share of foreign direct investment (FDI)–intensive global value chain trade (Figure 4.3.1).

These estimates are used to calibrate a multicountry, multisector general equilibrium trade model to gauge the macroeconomic impact of a fragmentation scenario defined as an increase in alignment among countries within the US, China, and nonaligned blocs, which reduces the alignment across the blocs, and a doubling of the estimated sensitivity of trade barriers to geopolitical alignment. Countries are assigned to blocs based on whether their current geopolitical treaties are stronger with the US, stronger with China, or equally strong with both.[1] Three main factors drive countries' exposure to geoeconomic fragmentation: (1) *economy size:* a given rise in trade barriers is more damaging to smaller economies (in terms of population and GDP), which tend to rely more on international trade; (2) *comparative advantage:* fragmentation has a greater effect on countries that import in sectors with trade barriers more sensitive to geopolitical alignment; and (3) *geoeconomic alignment:* fragmentation is more damaging, for a given bloc membership, to countries that are not closely aligned with either of the world's two major economies.

While geoeconomic fragmentation leads to income losses for most countries, it hurts emerging market and

The authors of this box are Shushanik Hakobyan, Sergii Meleshchuk, and Robert Zymek. For details on data, estimation methodology, and modeling, see Hakobyan, Meleshchuk, and Zymek (2023).

[1]Unlike in this box, the nonaligned regions in the chapter text do not face increasing barriers with respect to the two blocs, particularly in the case in which there is no uncertainty regarding their alignment.

Figure 4.3.1. Impact of One-Standard-Deviation Decrease in Geopolitical Alignment on Tariff-Equivalent Trade Barrier
(Log change)
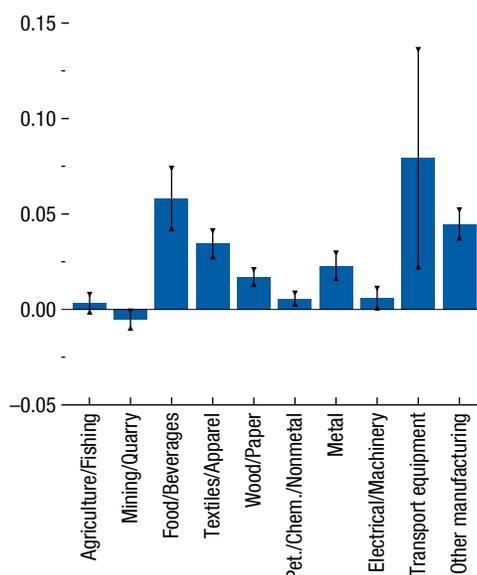
Sources: Alliance Treaty Obligations and Provisions (ATOP) project; Caliendo and Parro (2015) project; Eora Global Supply Chain Database; and IMF staff calculations.
Note: Bars show estimates from sector-level gravity regressions on 2017–19 average trade values, with importer and exporter fixed effects, geography, cultural ties, and economic agreements controlled for. Geopolitical alignment is measured by the foreign-treaty *s*-score from ATOP (Leeds and others 2002). A one-standard-deviation decrease in geopolitical alignment corresponds roughly to the difference between two average North Atlantic Treaty Organization members and two average nonmembers. Pet./Chem./Nonmetal = petroleum, chemical, and nonmetal minerals.

developing economies more than advanced economies. For the median emerging market economy in Africa and central Asia, real income losses due to geoeconomic fragmentation are more than twice as large as for the median advanced economy (Figure 4.3.2). This is primarily because these regions comprise many emerging market and developing economies that are small in economic size and relatively unaligned with major geopolitical blocs.

Box 4.3 *(continued)*

Figure 4.3.2. Change in Real Per Capita Income Due to Fragmentation
(Percent)
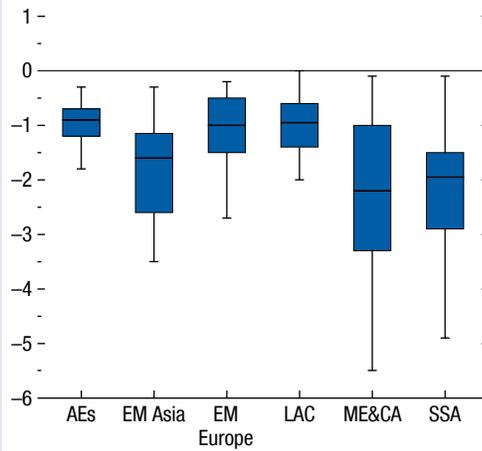
Source: IMF staff calculations.
Note: The figure shows the distribution of outcomes based on baseline fragmentation scenario in Hakobyan, Meleshchuk, and Zymek (2023), where the horizontal lines stand for the medians, the box represents the 25th and 75th percentiles, and the whiskers represent the extremes, excluding outliers. AEs = advanced economies; EM = emerging and developing; LAC = Latin America and the Caribbean; ME&CA = Middle East and Central Asia; SSA = sub-Saharan Africa.

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