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Do international investment and trade flows show any signs of fragmentation?

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Abstract

This paper utilizes available aggregate country-level data, as well as bilateral trade and investment data, to identify signs of fragmentation in trade and investment patterns among ten major trading countries or regional trading blocks. We compare the trade and investment trends in the years during the US-China trade war and increase in geopolitical tensions (2018–2021) against the years preceding the trade war (2014–2017). Our analysis generally corroborates findings in the existing literature. Bilateral flows between the US and China have been damaged, but there is little evidence of wider fragmentation or that the world is splitting into competing spheres. Even focusing on technology-intensive manufactures that are increasingly subject to trade restrictions, we find no evidence of broad fragmentation. Our analysis does reveal, however, shifts in global trade and FDI, particularly towards Central and Eastern Europe (CEE) and ASEAN countries. This may reflect a partial reshuffling of global value chains that is a natural outcome of favorable developments in these regions, as well as rising production costs in China. Such shifts do not necessarily reflect global fragmentation driven by geoeconomics factors.

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1. Introduction

Tensions between the US and China escalated during the Trump administration. A full-on trade war broke out in 2018 with both countries imposing punitive trade tariffs on each other. Measures to decouple[1] the two mega-economies continue to this day, with further increases in tensions on multiple fronts. The US, for example, is currently focused on setting restrictions on technology exports to China, while China seeks to boost support to its domestic industries, particularly in the high-tech sector. The US has also introduced a new set of industrial policies.

These superpower trade frictions have become a global issue. Many speak of fragmentation of the entire world economy and deglobalization of trade was a top theme at the 2023 World Economic Forum in Davos, Switzerland. This breakup implies that the rest of the world can be compelled to take sides with China or the US, or alternatively form trading blocs of their own. In this paper, we define this process of weakening economic interdependence between a wider set of countries as fragmentation. Fragmenting policies have been on the rise in recent years as the amount of trade and investment barriers has increased on many fronts. While China continues to enjoy support from many developing and emerging economies, most advanced economies tend to side with the US. As shown by Pew surveys, public views of China have deteriorated rapidly in almost all advanced economies. China's confrontational wolf warrior diplomacy, lack of interest in open investigation into the origins of the Covid-19 virus, as well as political support for Russia since its war of aggression on Ukraine, have spoiled relations with most advanced economies. Moreover, China under Xi has become more autocratic, with the state increasing its role in the economy. These trends are highly disconcerting for trading partners in advanced economies.

Given the abrupt need to cut trade ties with another autocracy, Russia, in the wake of its unprovoked attack on Ukraine, many advanced economies have reassessed their relations with China and their China trade dependencies. In March 2023, the president of the European Commission Ursula von der Leyen called for *de-risking* of economic ties with China and industrial policy moved to the forefront of the EU agenda. Today, it is not uncommon for EU politicians to speak of the need to "near-shore" or "friend-shore" critical production. Moreover, Japan and South Korea have recently started to grant benefits to domestic companies that re-shore their production. Global companies also seem to be adjusting their production and supply chains to decrease political risks, minimize trade costs, and maximize benefits. Many large multinational companies have announced plans to shift at least some their production from China to other countries. Many international companies that have remained in China have adopted an "in China, for China" strategy, whereby their subsidiaries primarily serve the Chinese domestic market.

Despite all these measures and discussion, evidence of actual fragmentation is scarce. Global trade has continued to grow at about the same pace as it has since the global financial crisis. Moreover, global foreign direct investment (FDI) flows have been quite stable since 2010 if one overlooks the record years 2015 and 2016 and the temporary decline in 2020 due to the Covid-19 pandemic. Antràs (2020) finds little evidence in the data to suggest de-globalization. A recent IMF policy paper on fragmentation (Aiyar et al., 2023) also notes that "there are few clear signs of fragmentation in the trade data yet (outside of sanctioned countries and entities)."

But is it truly so that there are no fragmentation patterns in the data? To take a fresh look at the global trade and FDI data, we construct ten country blocs to form a clearer picture and look at trends

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[1] In this note, the term *decoupling* refers to economic distancing of China and the United States. *Fragmentation* is used to describe the broader process of nations either taking sides in US-China competition or forming alternative trading blocs.

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in trade and FDI inflows.[2] We split the data into two periods: the pre-trade war period of 2014–2017 and the trade war period of 2018–2021. We compare these periods to identify changes in global FDI and trade flows after the raising of trade and investment barriers. In addition, we estimate a simple regression to see how much past bilateral FDI inflows can explain variation in future trade.

Our findings overall suggest that the bilateral flows between the US and China during the trade war period were severely affected. We also find that China's exports of high-skill and tech-intensive manufactures have decreased relative to the average to the US and its closest allies in Asia (Japan, South Korea, and Australia; JKA hereinafter), which is in line with the imposed high-tech trade restrictions. Apart from these, we find little evidence of wider fragmentation or a world dividing into competing spheres.

We find a notable increase in global trade in the case of Central and Eastern Europe (CEE) and ASEAN countries that may reflect a reshuffling of global value chains. CEE, JKA, and UK have invested relatively more in India, where FDI inflows are mostly related to production outsourcing. On the other hand, the broad increase of FDI flows to ASEAN countries could indicate an increased willingness to move production chains away from China. Lastly, the bilateral investment data show signs of increased investment between like-minded regions.

The next section provides a short literature review. We then discuss trends in international direct investment flows. Section 4 examines bilateral trade flow trends between country blocs. Section 5 offers a simple regression to see how earlier bilateral FDI flows might correlate with future trade flows. Section 6 concludes.

2. Literature review

The decoupling between the US and China has spurred a raft of studies on bilateral relations and domestic economic impacts. The paucity of research on fragmentation of global trade and FDI, in contrast, may simply reflect the lack of any hard evidence as studies by Antràs (2020) and Aiyar et al. (2023) point out. Moreover, the DHL Global Connectedness Index report (DHL, 2023), which looks at global trade, capital, information, and people flows, finds little evidence of a wider fracturing of the world economy into rival blocs despite the decline in flow between the US and China. Research on global value chains have found that the production chains tend to be regional. The regionalization or domestication of value chains has increased in Asia (see WTO, 2019 or Simola, 2021).

Fajgelbaum et al. (2021) study at a product level the implications of US and Chinese bilateral tariffs for trade with the rest of the world. They find that bystander countries, on average, increased their exports of goods under extra-tariffs to the US, saw little change in their exports to China, and increased their exports to the rest of the world. They note that emerging economies such as Vietnam, Thailand, Korea, and Mexico have benefitted from the trade war through increased exports. Similarly, the analysis conducted in Peterson Institute for International Economics (Bown 2023) suggests that, indeed, US imports of goods under trade-war tariffs clearly decreased from China and increased from elsewhere. They note that total US imports from China continue to grow, but only due to a rapid growth in imports of items not subject to trade-war tariffs. Thus, the evidence for decoupling is mixed.

Advanced economies increased screening of FDI flows over the past decade due to security concerns (see e.g. UNCTAD, 2023 or Bauerle, Danzman, and Meunier, 2021). Increased screening

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[2] We consider four individual countries: United States, China, India, and United Kingdom. Our six multi-country trade blocs are: the euro area, Latin America, Africa, ASEAN countries, Central and Eastern Europe CEE (Poland, Romania, Bulgaria, Ukraine, Hungary, and Czechia), as well as JKA, which consists of the US's closest allies in Asia (Japan, South Korea, and Australia). See Table 1.

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in advanced economies could impact global FDI flows. As Garcia-Herrero (2022) notes, however, it is difficult to disentangle the impact of increased constraints on the FDI flows from the lack of demand. Indeed, screening may account for some of the pull-back on global M&A deals in recent years (Dechert LLP, 2022).
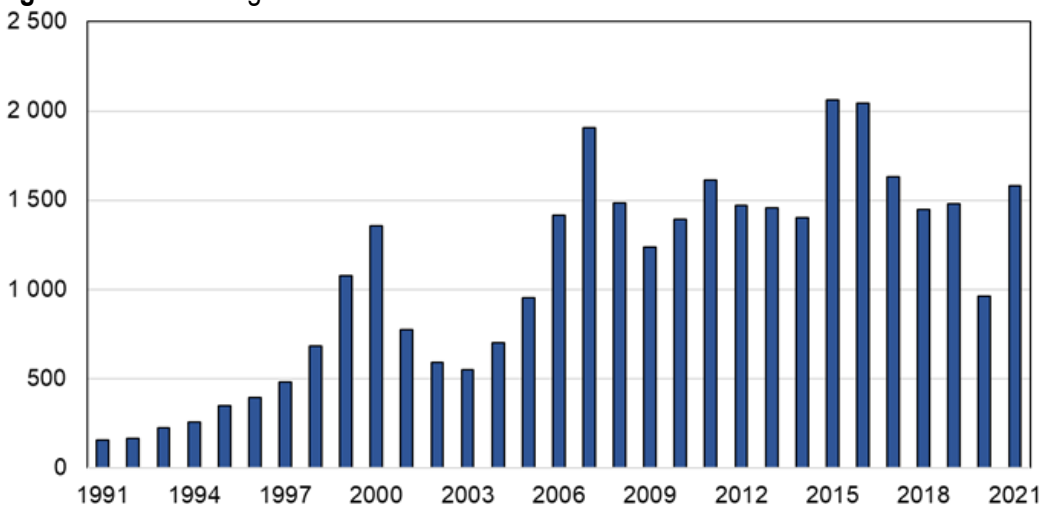
The April edition of the IMF's World Economic Outlook (IMF, 2023) includes a chapter on fragmentation of global greenfield FDI flows. The writers note that the number of Chinese greenfield investments, inward and outward, has decreased considerably in recent years and possibly is an early sign of fragmentation. Moreover, the IMF suggests that greenfield investment flows have recently concentrated on "like-minded" countries, i.e. countries that mimic China's voting behavior in the UN. It is more likely, however, that China's greenfield FDI investment was heavily impacted by the country's strict zero-covid policies, which made cross-border travel extremely difficult in 2020–2022.

The relation of FDI and trade has been on research agenda for decades, and there is no lack of studies on the subject. Country studies suggest that the relation is unclear. Some papers find that FDI inflows in emerging economies increase exports (e.g. Babatunde, 2017; Kutan and Vukcic, 2007; Rahmaddi and Ichihashi, 2013; and Mijiyawa, 2017). Others suggest that causality seem to be from exports to FDI (Ahmed et al., 2023). Some papers find that the relationship varies between countries and may be non-existent (Hsiao and Hsiao, 2006; Tekin, 2012). Many papers consider whether FDI and trade are complements or substitutes. A few recent papers, most notably Carrill-Caccia and Pavlova (2018), suggest that the FDI and trade seem to be complements rather than substitutes.

3. International investment and trade flows

We start this section by considering aggregate foreign direct investment (FDI) inflows by country. While global FDI flows have decreased from their highs in 2015–2016 (Figure 1), there is vast variation across countries and regions. We next use country level FDI data to examine how investment and trade flows have changed in recent years. Are countries that have been able to attract relatively more FDI inflows better off in terms of increased exports? Lastly, we look at bilateral investments by region to examine the source and destination regions of direct investments. Have these dynamics changed in recent years, and can we detect any signs of fragmentation in FDI?

Figure 1. Global foreign direct investment flows
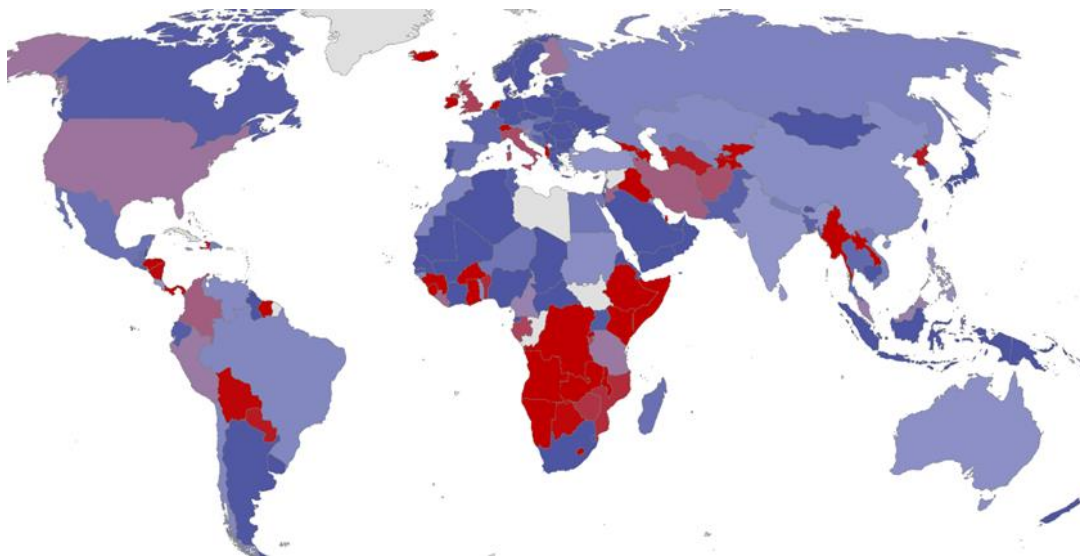

Source: UNCTAD.

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3.1 Aggregate FDI flows by country and region

In this section, we use annual country-level FDI data from UNCTAD in USD for 2014–2021. Our sample covers 198 countries and regions for which data is available. We compare the FDI inflows before (2014–2017) escalation of the US-China trade war and after (2018–2021). We calculate the FDI inflow by country relative to the previous year's FDI stock and average these for both periods.[3] For 138 of the countries in our sample, FDI inflows relative to FDI stock in 2018–2021 were smaller than in 2014–2017. UNCTAD statistics show that global FDI flows over the period decreased by 23 %.

Figure 2 depicts the change in the ratio of FDI inflow$_t$ to stock$_{t-1}$ for all countries between our two observation periods. Deep red indicates that the FDI inflows the country received in 2018–2021 were significantly lower than in 2014–2017. Purple indicates that the drop was roughly in line with the global average. Countries showing blue received more inward FDI in 2018–2021 than in the previous period. Global average in the sample (drop in average FDI inflow$_t$/FDI stock$_{t-1}$ between the two periods) is -2.94. In other words, on average, in 2014–2017 countries received FDI inflows amounting to 6.74 % of the previous year's FDI stock, but in 2018–2021 FDI inflows amounted to only 3.80 % of the previous FDI stock.

IMF Balance of Payments (BoP) figures also provide a rich source of country-level foreign direct investment data, including data on direct investment liabilities in financial account in USD for 156 countries, as well as their direct investment liabilities positions. In the IMF data, the drop in total FDI flows between 2014–2017 and 2018–2021 is larger than in the UCTAD data (-54 %). Figure A1 in the Appendix shows a map similar to that of Figure 2, but uses the IMF balance of payments and international investment position FDI data. The global average in the IMF data sample is -3.71.

Figure 2. Annual FDI inflow average in 2018–2021 compared to 2014–2017 relative to FDI stock

Sources: UNCTAD and BOFIT.
Average annual FDI inflows from UNCTAD for period 2018–2021 is compared to average inflow in 2014–2017. Both are scaled by past year's average FDI stock.

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[3] The data show FDI inflows are persistently negative for many countries. OECD (2023) attributes this to i) disinvestment in assets ii) parent borrowing money from its affiliate or the affiliate paying off a loan from its direct investor or iii) reinvested earnings are negative, where e.g. the affiliate loses money or the dividends paid out to the direct investor are greater than the income recorded. The presence of negative values rules out the possibility of calculating country-level growth rates.

In any case, both datasets give relatively similar pictures. Southeast Asia, Central and Eastern Europe, as well as Canada attracted more investments during the trade war period than before. China, India, and Australia also outperformed the global average. The US and UK experienced a drop in investment flows. Latin America and Africa had mixed experiences. Some countries, especially in Northern Africa (and South Africa), did well in the trade-war period, while others fared poorly. A few countries in Europe (most notably Luxembourg, Netherlands, and Switzerland) experienced large and negative FDI flows that makes the comparison between two periods less meaningful. This is likely because many countries have attracted foreign companies based on tax and other benefits, and large transfers between affiliations and the parent distort the FDI data. This is more prominent in the IMF BoP data than in the UNCTAD data. In section 3.3, we take a closer look at the source and destination regions of direct investments.

3.2 Comparing FDI and trade flows

In addition to investment data, we use the IMF BoP statistics data on goods and services exports. To measure goods and services exports, we use the current account credit accounts in USD for each country. Like in section 3.1, we compare the average annual exports in 2018–2021 to exports in 2014–2017. Exports in both periods are scaled by the country's GDP in 2014–2021 to make the figures comparable across countries. Unlike FDI flows, aggregate exports in our sample increased by 14 % between the two periods. There were only 24 countries in our sample with lower average exports in 2018–2021 than in 2014–2017. Relative to GDP, the change in the global average in our sample between the periods was +4.60.

Table 1. Regional blocks

| Region	Africa	ASEAN	CEE	China	Euro area	India	JKA	LatAm	UK	USA
Countries included	All 54 African countries	Brunei Cambodia Indonesia Laos Malaysia Myanmar Philippines Singapore Thailand Timor-Leste Vietnam	Bulgaria Czech Republic Hungary Poland Romania Ukraine	China	All 19 euro area countries	India	Japan S. Korea Australia	All 42 Central and South American countries	UK	USA

We divide our sample of countries into ten trade blocks (Table 1) and examine the performances of these aggregated areas. Table 2 summarizes the investment and trade flow performance between the trade-war era (2018–2021) and earlier period (2014–2017). For the aggregated regions, we simply sum country-level investment and export data. The color-scale ranking applied to region ranges from best-performing (dark green) to worst-performing (dark red). Several interesting patterns emerge. First, Central and Eastern European (CEE) and ASEAN countries seem to do very well in all metrics. This is also the case for China. At the other extreme, the UK (due to Brexit and not directly related to decoupling) and the USA do poorly. Japan, South Korea, and Australia (JKA) perform well in terms of FDI, but not so well in with respect to trade. On the other hand, Euro area does quite well in trade, but not so well in terms of attracting investment. It is likely that the negative FDI inflows for some euro area countries especially in the IMF data affect these findings.

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Table 2. Summary of the trade and investment data by region

	FDI: UNCTAD		FDI: IMF BoP		TRADE: IMF BoP CA	
	Change in pp.	Growth, %	Change in pp. (relative to sample average)	Growth, %	Change in pp.	Growth, %
Euro area	0.00	-10.6	-1.70	-64.4	0.64	-0.6
Africa	2.40	33.9	1.48	29.2	-5.02	-5.7
LatAm	-0.43	5.1	0.93	32.5	-3.73	0.2
ASEAN	1.61	23.9	2.08	43.0	5.92	7.1
JKA	1.13	17.0	2.15	45.2	-4.42	-3.9
India	-0.12	21.9	0.55	42.6	-2.81	6.7
CEE	4.85	87.5	7.79	136.3	7.17	10.8
USA	-0.77	-15.9	0.28	9.0	-5.76	-5.3
China	0.29	19.3	4.16	69.9	-3.17	6.2
UK	-1.78	-26.1	-2.05	-18.9	-4.19	-6.3

Sources: UNCTAD, IMF and BOFIT.

Figure 3. Correlation between FDI and trade measure by country
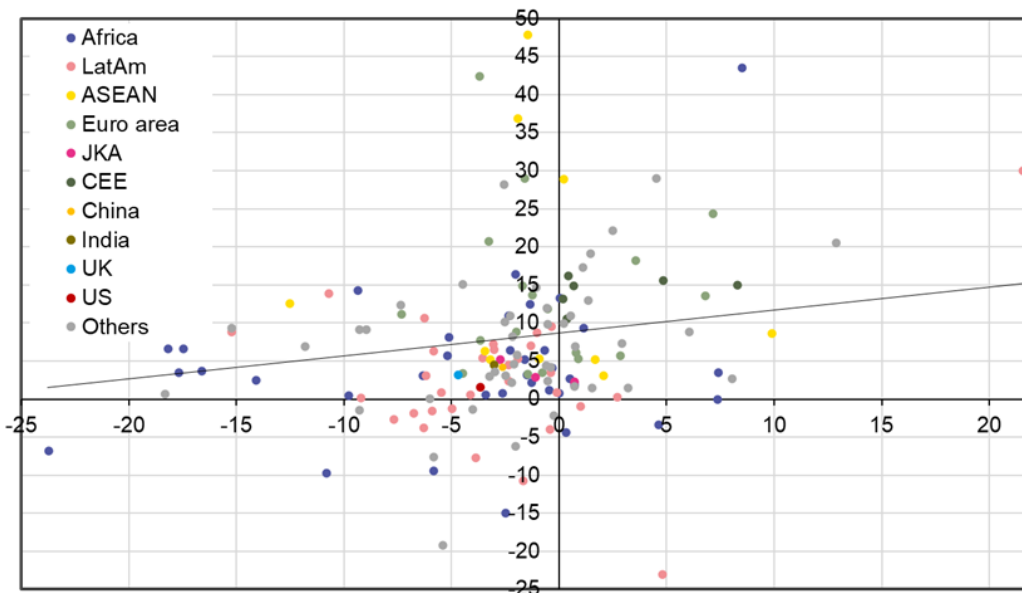
Sources: UNCTAD, IMF and BOFIT.

The x-axis depicts the change in average annual FDI inflows relative to last year's FDI stock between periods 2018–2021 and 2014–2017. The y-axis shows the change in average annual exports between periods 2018–2021 and 2014–2017 scaled by the country's average GDP in 2014–2021.

To see whether the change in FDI inflows is correlated with overall export performance, we compare these measures by country. Figure 3 shows our measure of the change in FDI inflows between the two time periods relative FDI stock in the x-axis and the change in export flows between the periods relative to GDP in the y-axis. Regions are marked with different colors. Even though there is a somewhat positive correlation between investment and trade flows, the slope of the fitted trendline in the figure is close to zero. Therefore, we cannot see any strong contemporaneous correlation between the change in FDI and export flows. However, the investment-trade dynamics likely have a lag and could also vary across regions. We consider these possibilities in section 5.

3.3 Bilateral regional investments

Having discussed aggregate FDI inflows by region in the previous sections, we now analyze how investment patterns from one region to another may have changed. Drawing on the data for bilateral country-level inward investment positions cross-classified by counterpart economies in USD from the IMF's Coordinated Direct Investment Survey (CDIS), we take the inward pre-trade-war investment positions (stocks) in 2017 and compare them to the most recent available data (2021). We aggregate the country-level data by region by summing together all bilateral investment positions. The data are presented in Table A1 in the Appendix.[4]

The global FDI stock in our sample (summing all ten regions) was USD 25.19 trillion in 2021, a 12.5 % increase from 2017. Only the euro-area and African outward investments to the regions in our sample were lower in 2021 than in 2017. The following table shows the change in regional bilateral FDI stock relative to average (absolute changes are presented in Table A3 in the Appendix). For example, US investment stock in China in 2021 was up by 5 % from 2017, but still 7.6 percentage points lower than the sample average.

Table 3. Bilateral investment positions: percentage point deviation from the sample mean (change in FDI positions between 2017 and 2021). Sample mean 12.5 %

To:	US	China	UK	India	Africa	Euro area	LatAm	ASEAN	JP, KR, AU	CEE	Total
Investment from USA		-7.6	-12.1	-58.7	111.5	13.8	33.8	2.6	26.2	101.4	**13.0**
Investment from China	12.3		4.3	-21.6	-2.5	13.1	43.9	40.0	17.2	699.9	**27.4**
Investment from UK	105.6	98.6		21.0	317.7	-0.4	144.8	108.1	71.8	313.9	**45.9**
Investment from India	35.7	252.6	4.6		24.5	46.6	221.4	74.3	-1.2	-3.1	**31.6**
Investment from Africa	0.8	-11.6	-37.3	-2.5		5.6	0.2	-36.0	-14.3	-42.4	1.8	**-13.4**
Investment from Euro area	12.4	33.3	-13.1	-47.5	268.5	-19.8	-55.5	24.8	7.3	128.6	**-12.7**
Investment from LatAm	-3.4	-30.6	-20.8	-76.0	-94.4	-16.9	-11.6	211.9	-13.2	-40.0	**-12.1**
Investment from ASEAN	46.4	30.8	25.7	8.2	-31.3	13.3	32.3	8.3	11.1	9.6	**22.2**
Investment from JP, KR, A	-13.2	6.5	11.3	22.2	12.0	-20.4	-22.5	33.3	16.2	-14.1	**-2.8**
Investment from CEE	-146.2	60.3	23.9	166.9	-0.9	-5.0	2.9	636.0	65.5	22.0	**-3.1**
Total	**21.0**	**17.3**	**-10.7**	**-6.1**	**47.8**	**-10.3**	**-8.6**	**26.8**	**18.7**	**98.1**	**0**

Sources: IMF Coordinated Investment Survey and BOFIT.

The table reveals several interesting patterns. First, all regions except Africa increased their investments in ASEAN countries. The relative change was biggest for the Central and Eastern European (CEE) countries, which had a very low starting position in 2017. In dollar terms, China and then the euro area most increased their investment positions in ASEAN countries (see data in Table A1). CEE attracted more investment from almost all regions (except for Latin America and Japan, South Korea, and Australia). In 2017 Chinese investment in CEE were low that explains the strong percentage change (again, see Table A1). Secondly, the US experienced biggest nominal increase in their inward direct investment position, where majority of the increase came from the euro area and UK. In addition, US investments to euro area increased significantly. Japan, Korea and Australia experienced a large increase in their foreign direct investment position as well, the bulk of which came from the US. Thirdly, also investments to and from China grew, mostly coming from ASEAN

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[4] Accounting for bilateral foreign direct investment is cumbersome to say the least. A large share of global FDI occurs via third countries due to e.g. tax or subsidy benefits or practicality reasons. Many countries record only the first leg of the FDI flow, and not the ultimate recipient country. The same is true for accounting the incoming FDIs. Even if the data is cross classified by counterpart economies, it still cannot sufficiently account the ultimate destination or source country. For example, Indian investment position in Africa is surprisingly large. However, 99.6 % of all Indian investments in Africa in 2021 went to Mauritius, apparently a very popular country from which to transmit further Indian investments globally.

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and euro area. Only India experienced a slight decrease in Chinese investments from 2017 to 2021. Chinese investments especially to Latin America, as well as Japan, Korea and Australia and ASEAN increased in nominal terms (and to CEE in relative terms). Lastly, Africa, the euro area, India, and Latin America showed some mixed results in terms of regional investments. Africa attracted more investments from Europe, India from ASEAN and UK and Latin America from China, UK and ASEAN. Euro area investment within the region (from one Euro area country to another) dropped significantly. This phenomenon is driven by the changes in the investment positions of tax havens such as Ireland, Luxembourg, and Netherlands. Large swings in their bilateral investment positions are not uncommon.

Overall, the bilateral investment data show some signs of increased investment between like-minded regions. Investment flows between the euro area and US increased significantly. The US also invested in Japan, Korea and Australia. Latin America attracted more investment from China, ASEAN, and the UK (and to a lesser extent from the US), while euro area investment in the region decreased. CEE as well as Africa may have benefitted from moving investments closer to Europe. ASEAN got more investments practically from all over the world, that may reflect the attractiveness of the region as well as willingness to divert investments away from China.

4. Bilateral trade flows

We continue our analysis by looking at bilateral trade flows between the previously defined 10 country blocks: United States, euro area, United Kingdom, China, India, Latin America, ASEAN, Africa, JKA(Japan, South Korea, and Australia, and CEE (Hungary, Poland, Bulgaria, Romania, Ukraine, and Czechia). We draw our figures on annual bilateral import flows from the UN Comtrade database as imports better capture countries of origin than exports. Based on import flows, we calculate exports as mirror statistics. Statistics include trade flows also within blocks: trade between countries in euro area, Latin America, ASEAN, Africa, JKA and CEE (see Table 4.) Bilateral trade flows were downloaded from the United Nations Conference on Trade and Development database (UnctadStat).

4.1 Total merchandise trade

Overall, the sum of total bilateral exports for the first four years of the US-China trade war (2018–2021) was 14.6 % higher than the sum of total bilateral exports four pre-trade-war years (2014–2017). The following table shows bilateral trade flows as a percentage point deviation from this one sample mean. It shows which bilateral flows increased or decreased the most relative to mean growth.[5]

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[5] Absolute values of bilateral exports in USD billion are provided in Table A2 in the Appendix for both the pre-trade-war and trade-war periods. Absolute changes between the two periods are presented in Table A4.

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Table 4. Bilateral trade flows: percentage point deviation from the sample mean (change in exports between 2014–2017 and 2018–2021). Sample mean 14.6 %

| To:	USA	China	UK	India	Africa	Euro area	Lat.Am	ASEAN	JP, KR, AU	CEE	TOTAL
Export from USA		-14.8	-7.8	36.6	-23.0	-0.9	-9.2	5.8	5.9	26.6	-3.8
Export from China	-12.7		5.3	6.3	0.2	9.0	4.7	26.3	0.9	45.9	2.8
Export from UK	-10.0	-3.0		2.8	-30.9	-16.3	-24.5	1.5	-15.7	-13.2	-14.8
Export from India	14.1	34.0	-13.3		-0.9	6.3	3.0	19.0	3.8	-4.9	8.8
Export from Africa	-9.0	3.1	-21.6	-5.9	-4.8	-7.9	-36.9	19.6	-16.6	-7.9	-6.3
Export from euro area	5.3	13.8	-20.5	-8.0	-19.4	0.9	-13.5	-2.2	-0.8	-5.9	-2.4
Export from Latin America	-4.5	40.5	-11.7	-25.6	-25.3	-11.0	-17.3	-6.6	3.6	-4.0	-2.8
Export from ASEAN	33.6	35.0	-8.5	7.5	-21.0	5.9	11.1	0.6	-4.3	12.3	12.0
Export from JP,KR,AU	-8.2	6.6	-7.2	2.2	-35.0	-5.1	-19.9	2.5	-7.6	9.7	-1.7
Export from CEE	14.6	49.6	-10.4	-5.6	-6.2	9.4	9.8	20.3	4.9	10.5	9.4
TOTAL	-1.6	11.0	-14.8	2.0	-13.5	0.8	-8.7	8.1	-1.4	0.9	0.0

Sources: UNCTADStats and BOFIT.

Bilateral trade flows have increased most between the United States and CEE, the United States and India, China and CEE, China and ASEAN, as well as ASEAN and CEE. Overall, the winners in international trade during 2018–2021 were ASEAN, CEE, and India. These two blocks and India increased their exports to the rest of the sample by significantly larger margins than trade increased on average. This may reflect a shift in global manufacturing value chains to these developing countries that previously went largely to China. The big losers, on the other hand, were the UK and Africa. While increased trade obstacles resulting from Brexit are likely the biggest cause of the UK's poor performance, Africa's problems are wider and more complex. They include the inability to industrialize and add value to abundant natural resources, as well as failure to address the structural challenges of persistent current and fiscal deficits and debt vulnerability.

China has been an important export destination to many countries as it has increased its imports the most during 2018–2021. Apart from the US and UK, all other countries have increased their exports to China at above-average growth rates. This result clearly reflects two major changes in international trade after 2017: the US-China trade war and the UK's withdrawal from the European Union.

The bilateral trade flows of China and United States have increased at a much slower pace than on average between all country blocks. Moreover, Brexit has had major implications for the UK's overall economic situation, foreign investment, and trade. Only UK's imports from China and its exports to India have increased slightly above the sample mean growth. UK exports to Africa, the euro area, Latin America and JKA, as well as UK imports from Africa and the euro area, decreased after 2017.

Apart from the US-China trade war and Brexit, it is hard to see any other signs of fragmentation. To drill down a bit further, we continue with a chart showing the contribution of different country blocks to the growth in each other's exports between 2014–2017 and 2018–2021.

Figure 4. Contribution to change in exports from pre-trade-war to trade-war periods
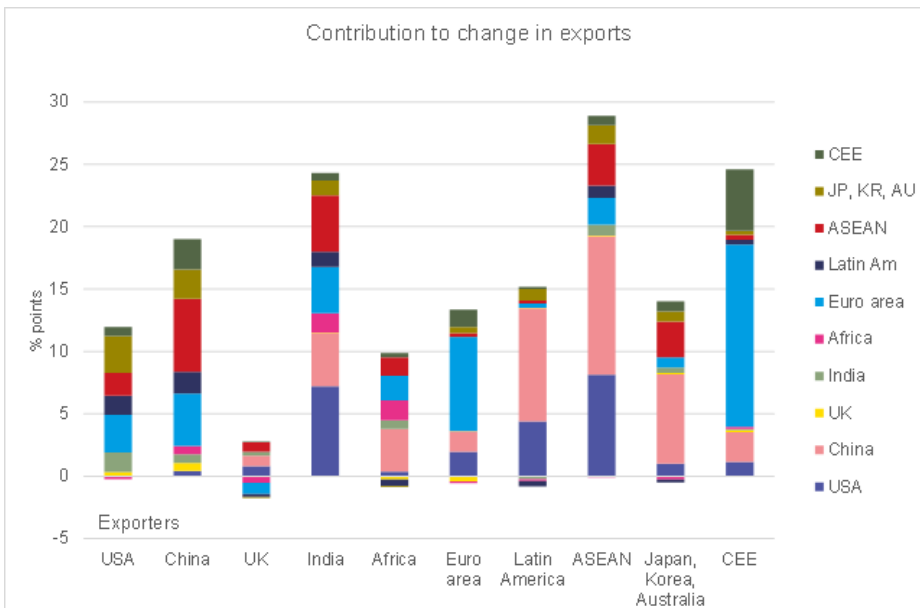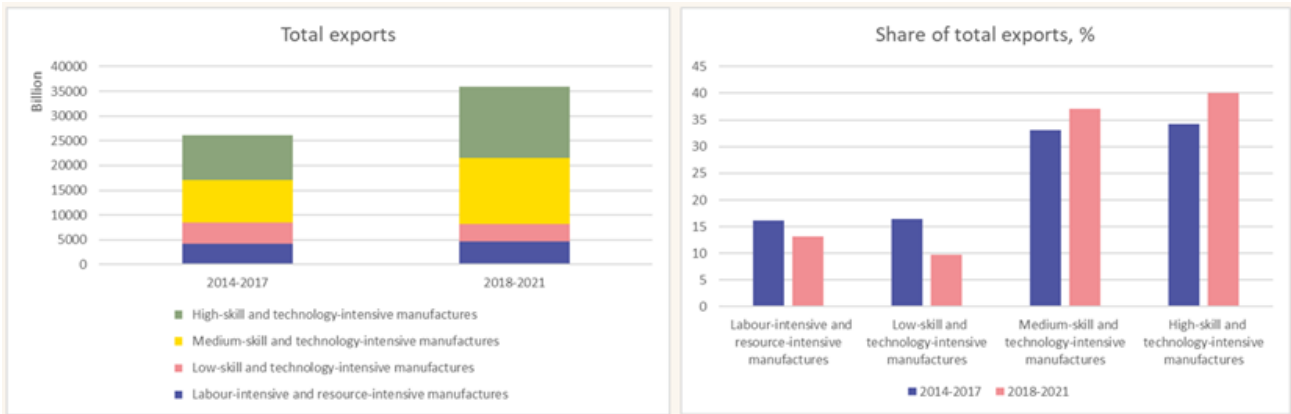

Sources: UNCTADStats and BOFIT.

With a notable exceptions of the US, euro area and CEE, the chart reinforces the view that China is important to many countries in their export development. The US plays a big role in trade for Latin America, ASEAN, and India. ASEAN is important for China, India, and JKA. The euro area is most important to its own member states and CEE.

Apart from the apparent slower growth of bilateral trade flows between the US and China, there is overall little evidence in the data of a wider fragmentation or world splitting into competing spheres. For most countries and country blocks, the contributions of different export markets are rather evenly distributed. Perhaps those that are relatively most dependent on China as an export market are Latin America and JKA. For those, China's contribution of total export growth is more than half.

4.2 High-skill and tech-intensive manufactures

Not all merchandise exports are the same. One way to distinguish between different types of manufacturing trade is to group manufactures based on their labor or technology intensity. In UN Comtrade, we find four well-suited categories of manufactures: 1) labor- and resource-intensive (e.g. leather, wood, paper, fabrics, clothing, footwear), 2) low-skill and tech-intensive (e.g. motorcycles, ships, office supplies, iron and steel bars), 3) medium-skill and tech-intensive (e.g. household equipment, apparatus for electrical circuits, steam turbines, engines, motor vehicles), and 4) high-skill and technology-intensive (e.g. electronics, parts and components, medicaments, fertilizers, chemicals, optical instruments).

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Figure 5. Trade share of higher-skill and tech-intensive manufactures has increased between country blocks

Sources: UNCTADStats and BOFIT.

The trade share of high-skill and technology-intensive manufactures increased markedly after 2017. By country blocks, we see that the US, JKA, and the UK lost the most export market share in all four categories of manufactures between 2014–2017 and 2018–2021. In contrast, ASEAN and CEE gained export share in all categories. The export share of China increased most for medium- and low-skill technology-intensive manufactures, whereas the export share of labor-intensive and resource manufactures decreased. Somewhat surprisingly, the euro area maintained its highest export share in high-skill technologies. Africa and India also increased their export shares in technology-intensive manufactures, although they remained quite modest.

Figure 6. Export shares of medium-skill and high-skill technology-intensive manufactures
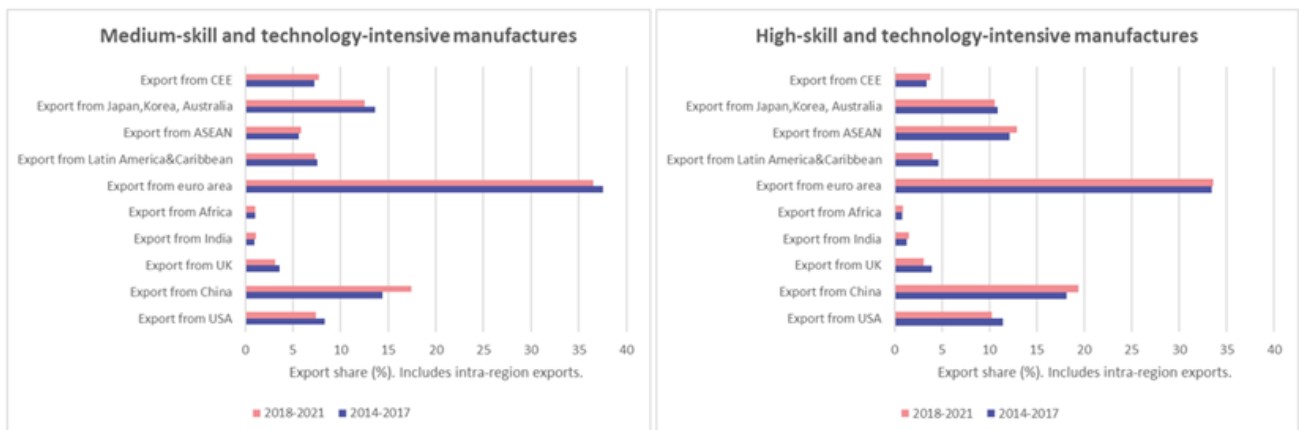
Sources: UNCTADStats and BOFIT.

Next, let's zoom into medium- and high-skill tech-intensive manufactures, as these would be the commodity groups that are currently targeted with different kind of export bans and other trade barriers. Within our sample of countries, the exports of medium-skill and technology-intensive manufactures has increased by 54 % between the pre-trade-war and trade-war years. For high-skill and technology-intensive manufactures, the increase in exports was even higher, 60.8 %. The

following two tables show the bilateral trade flows for these two categories of manufactures as a percentage point deviation from the respective sample means.[6]

For medium-skill and technology intensive manufactures, exports from China and India have increased the most relative to the average. ASEAN and CEE also have above-average increases in their exports. Above-average performers in imports were CEE, India, the euro area, China, and the US.

For high-skill manufactures, the biggest winners in exports were India, CEE, and Africa, although the export shares of India and Africa remained minimal. China, ASEAN, and the euro area also increased their exports more than the average. High-skill manufacture imports increased most in India, CEE, ASEAN, and China.

China's exports of medium-skill technology manufactures increased more than the average to all other country blocks considered. Exports of high-skill technology manufactures, however, decreased relative to the average to the US and US's closest allies in Asia (Japan, South Korea, and Australia), even if they increased generally. This could reflect increased trade disputes especially related to higher-skill technology products. As high-tech imports from China were more subdued, the US increased its imports relatively more from CEE and the ASEAN countries.

Table 5. Bilateral trade flows in medium-skill and tech-intensive manufactures: percentage point deviation from the sample mean (change in exports between 2014–2017 and 2018–2021). Sample mean 54 %

To:	USA	China	UK	India	Africa	Euro area	Lat.Am	ASEAN	JP, KR, AU	CEE	TOTAL
Export from USA		-19.6	-27.8	-6.9	-22.3	-3.0	-27.0	-9.4	-10.6	10.3	**-18.2**
Export from China	19.7		32.6	25.1	13.3	45.4	37.8	44.3	24.5	92.2	**32.3**
Export from UK	-11.3	-31.5		-25.6	-42.9	-19.2	-33.7	-21.7	-25.1	-13.5	**-20.4**
Export from India	98.8	62.5	-14.4		8.8	12.5	-9.6	24.8	36.5	75.4	**29.2**
Export from Africa	-53.0	91.0	38.1	1.0	-38.3	23.3	24.8	-37.7	-27.3	47.3	**-2.4**
Export from euro area	-9.7	16.7	-31.5	-7.2	-23.2	-0.1	-17.1	-13.0	-5.0	6.9	**-4.2**
Export from Latin America	0.2	-24.7	-57.2	0.8	-42.6	25.0	-37.5	-19.3	32.4	4.4	**-5.9**
Export from ASEAN	59.3	17.3	-8.7	29.2	-4.5	10.2	-15.1	-15.5	0.3	54.3	**6.1**
Export from JP,KR, AU	-14.8	-2.3	-23.8	2.1	-36.2	-0.1	-34.7	-22.9	-15.8	53.7	**-12.6**
Export from CEE	-0.7	4.7	-24.6	-10.5	5.0	12.8	1.2	9.7	-27.7	24.7	**10.4**
TOTAL	**1.5**	**2.6**	**-22.5**	**8.7**	**-14.9**	**5.1**	**-17.7**	**0.9**	**0.8**	**17.5**	**0.0**

Sources: UNCTADStats and BOFIT.

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[6] Absolute changes in bilateral trade between the two periods can be found in the Appendix. Table A5 presents medium-skill manufactures and Table A6 shows high-skill and technology-intensive manufactures.

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Table 6. Bilateral trade flows in high-skill and tech-intensive manufactures: percentage point deviation from the sample mean (change in exports between 2014–2017 and 2018–2021). Sample mean 60.8 %

To:	USA	China	UK	India	Africa	Euro area	Lat.Am	ASEAN	JP, KR, AU	CEE	TOTAL
Export from USA		7.6	-32.7	13.4	-18.3	-15.4	-21.4	-19.8	-19.7	48.7	**-16.0**
Export from China	-9.8		27.9	18.7	12.9	13.8	30.8	52.9	-8.6	43.1	**11.4**
Export from UK	-42.2	-10.0		-21.2	-52.8	-30.7	-41.8	-33.4	-33.6	-33.5	**-34.0**
Export from India	14.6	136.6	-12.4		7.8	26.6	50.6	29.2	19.2	5.0	**25.7**
Export from Africa	22.4	156.7	-20.4	71.3	-13.1	0.4	233.9	-22.6	-27.5	36.1	**14.5**
Export from euro area	19.6	32.3	-31.0	35.6	-17.6	-1.0	-14.5	-11.4	-2.6	13.0	**0.7**
Export from Latin America	-17.2	-35.2	-14.4	-14.5	-18.2	-3.3	-38.2	-54.0	8.3	8.6	**-20.9**
Export from ASEAN	40.5	27.4	-30.2	28.7	-31.7	-12.1	0.8	-1.7	1.5	43.5	**9.9**
Export from JP,KR, AU	-10.2	-6.0	-24.3	-1.6	-1.3	-3.8	-42.3	15.1	-24.3	56.9	**-4.7**
Export from CEE	43.1	52.5	-5.8	42.3	-26.8	21.5	1.2	10.1	3.4	29.1	**20.8**
TOTAL	**0.0**	**11.0**	**-23.1**	**20.3**	**-10.5**	**-1.8**	**-11.8**	**12.5**	**-9.5**	**19.6**	**0.0**

Sources: UNCTADStats and BOFIT.

We draw three main conclusions from the bilateral trade data. First, trade between China and the United States has been severely affected by the trade war that started with the imposition of punitive bilateral import tariffs in 2018. Second, Brexit has had a deteriorating impact of the UK's bilateral trade flows. Apart from these, however, the data fail to reveal concrete signs of wider fragmentation, friend-shoring, or near-shoring.

In more detail, we observe that CEE, ASEAN, and India have all increased exports well above the average pace. This could also reflect a shift in global value chains to certain developing countries. On the other hand, these shifts would quite plausibly occurred without a trade war as wage levels in China continue to rise and thereby incentivize agents to move imports to other developing countries. The biggest losers in global trade development seem to be the UK, Latin America, and Africa.

Largest increases in bilateral trade flows (imports + exports) in the trade-war period are between the US and ASEAN, US and India, US and CEE countries, as well as between China and CEE, China and ASEAN, and China and Latin America. The increase in the direct bilateral trade (imports + exports) between US and China, however, has been tiny (+1.4 % between pre-war and trade-war periods), which could indicate that they have either relocated some of their supply chains or simply re-routed some of their imports through other countries.

Finally, the share of high-skill and technology-intensive manufactures in global manufacturing trade has increased markedly. For these manufactures, CEE, ASEAN, China, India, and Africa have increased their export shares more than average (although the market shares of India and Africa remain extremely small). For high-skill technology manufactures, China's exports have been most subdued to the US and its closest allies in Asia, which could reflect increased trade disputes and barriers related to these types of goods. Apart from this particular change, there are no other obvious signs of the world breaking into competitive spheres even among these technology-intensive goods. Naturally, it may take several years still for such a trend to become apparent.

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5. Do past FDI flows correlate with future trade flows?

To assess whether bilateral foreign direct investment is correlated with future trade flows and whether it varies across countries, we utilize a panel of bilateral investment and trade flows.[7] Specifically, we have collected for all our 10 country blocks their bilateral FDI stocks and the annual value of bilateral imports from the other country blocks. Again, exports are derived as mirror statistics to better account for the countries of origin.[8]

Following Carril-Caccia and Pavlova (2018), FDI and trade can be correlated in many ways, starting with the traditional view that FDI and exports act as substitutes. That is, firms invest directly in a country to avoid such things as trade-related costs (here FDI and trade would be negatively correlated or there would be no correlation at all). Multinational companies can also seek efficiency gains by locating their production and source their inputs (here FDI would be positively correlated with imports *and* exports). Next, firms can invest in such areas as the wholesale and retail sector to serve as a tool for enhancing market penetration of exports (here FDI would be positively correlated with exports). Finally, firms can invest abroad to supply the host country and third counties directly with their products (here FDI would be positively correlated with host country's exports and negatively correlated or not correlated at all with bilateral trade flows).

We take log transformations of both dollar-valued FDI stocks and import flows and further a three-year cumulative average of the FDI stock as the data includes some big annual variations. Our starting point is examination of scatter diagrams for any correlations between past FDI and bilateral trade. Figure 7 presents the one-year lagged value of cumulative 3-year average of the FDI stock to each country bloc from all others (x-axis) with the annual trade (y-axis). Observations are colored by FDI destination countries. Each observation presents the inward average FDI stock to any specific country at time t-1 and its exports (imports) from (to) the FDI source country in the left-(right-)hand side panel. These figures help us assess whether FDI to a specific region increases trade with the FDI source country.

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[7] Again, bilateral trade flows are downloaded from the UNCTAD Stats Database. Bilateral FDI stocks are derived from the IMF's Coordinated Direct Investment Survey (CDIS). We use the inward direct investment positions in USD by reporting economy that is cross classified by counterpart economies. In calculating the regional aggregates, all missing or classified observations are treated as zeros.

[8] As we want to include lags of FDI, we expand our dataset to include annual observations for 2009–2021. As any combination of two country blocs can form two pairings (e.g. the FDI flows from the US to China and the FDI flows from China to the US), we have for FDI, exports and imports altogether 1,250 country pair-year observations each.

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Figure 7. FDI stocks to destination countries and the related future bilateral trade
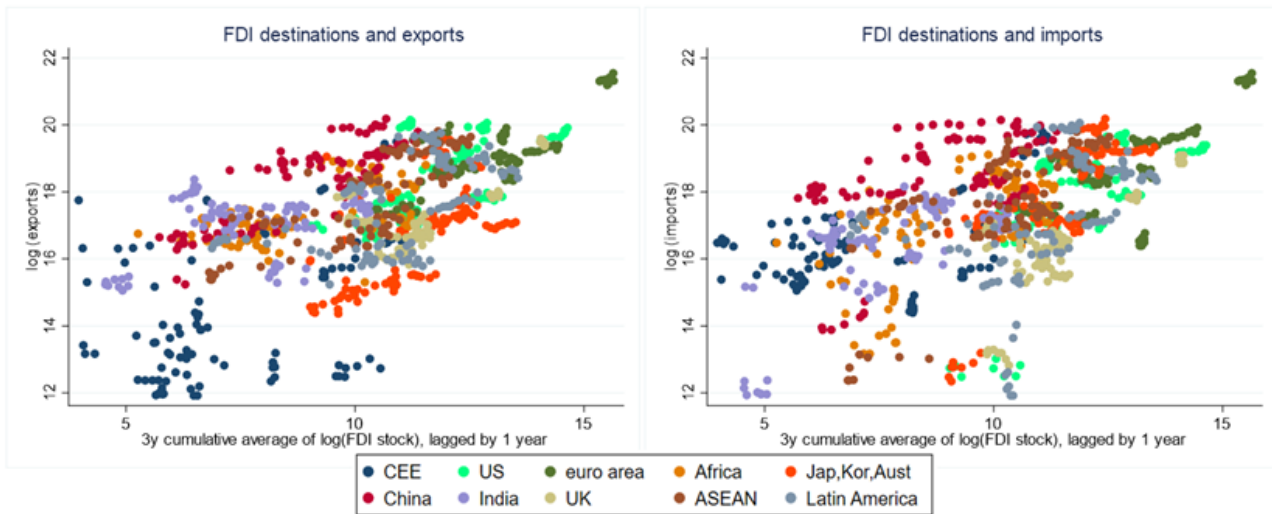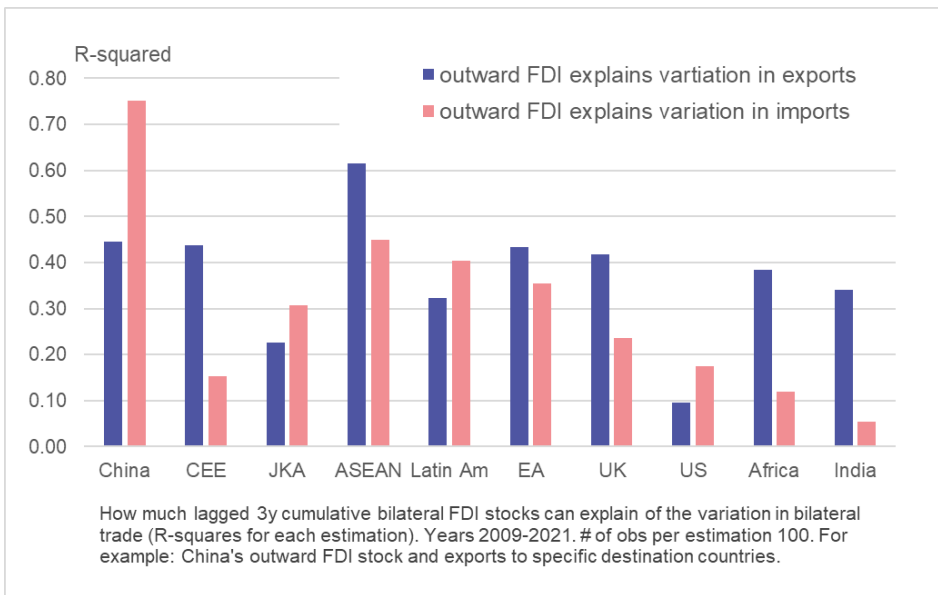

Sources: IMF, UNCTAD, and BOFIT.

Both figures show that seems to be a positive correlation on average between past FDI and future bilateral trade overall and that the effect is rather similar for both exports and imports. The correlation coefficient for the full dataset is 0.62 for exports and 0.55 for imports.

Some differences appear across countries. For exports, the correlation is above mean for China, ASEAN countries and the euro area. For these country blocks, more FDI inflows in the past are associated with more exports to the investing countries. Smallest correlations are detected for CEE countries, India, and Africa. For imports, the correlation is well above mean for Japan, South Korea and Australia, ASEAN countries, and the UK. For these, past FDI inflows are associated with more imports from the investing countries. Smallest correlations are for Latin America and CEE countries.

As additional analysis, we perform a simple estimation of how much past FDI can explain of the variation in future bilateral trade and whether there are differences between country blocs. For each country block, we separately estimate a simple linear regression, where bilateral exports (or imports) at time t are explained by the 3-year cumulative average of the respective bilateral FDI stock at time t-1. We control nothing else to see the simple linear relation between past investment and trade. Each estimation has 100 observations.[9] Ultimately, we only report the R-square values from the OLS-regressions to see how much of the variation in bilateral trade can be explained by lagged FDI at the country level. Figure 8 presents the initial estimation results based by FDI source countries.

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[9] Summary statistics are provided in Table A7 in the Appendix.

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Figure 8. How much do FDI explain variations in future trade? Results based on FDI source countries

How much lagged 3y cumulative bilateral FDI stocks can explain of the variation in bilateral trade (R-squares for each estimation). Years 2009-2021. # of obs per estimation 100. For example: China's outward FDI stock and exports to specific destination countries.

Sources: IMF, UNCTAD, and BOFIT.

For China, ASEAN countries and the euro area, their past FDI explain a large part of their imports (pink columns) as well as exports (blue columns). China's outward FDI to any other country can explain 75 % of the future variation of its imports from that specific country, and over 40 % of the future variation of its exports to that country. For ASEAN economies, their outward bilateral investments explain around 60 % of their future exports and over 40 % of their future imports. For euro area, the share for exports is a little more than 40 % while that of imports is somewhat smaller. Overall, these countries seem to make investments abroad for outsourcing purposes (primary motive for FDI is seeking efficiency gains).

For CEE, UK, Africa and India, the share of variance past FDI is able to explain is much larger for exports than it is in imports. Investments by these countries could thus be more related to enhancing market penetration of exports.

For the US, outward FDI can hardly explain any of the future variation of bilateral trade, so that US investments seem to be made mostly to directly serve foreign markets or avoid trade-related costs.

Next, we look at the results from the perspective of FDI destination countries. Figure 9 shows what where inflows of past investments are mostly related to bilateral trade.

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Figure 9. How much do FDI flows explain variations in future trade? Results based on FDI destination countries

How much lagged 3y cumulative bilateral FDI stocks can explain of the variation in bilateral trade (R-squares for each estimation). Years 2009-2021. # of obs per estimation 100. For example: China's inward FDI stock and imports from specific source countries.
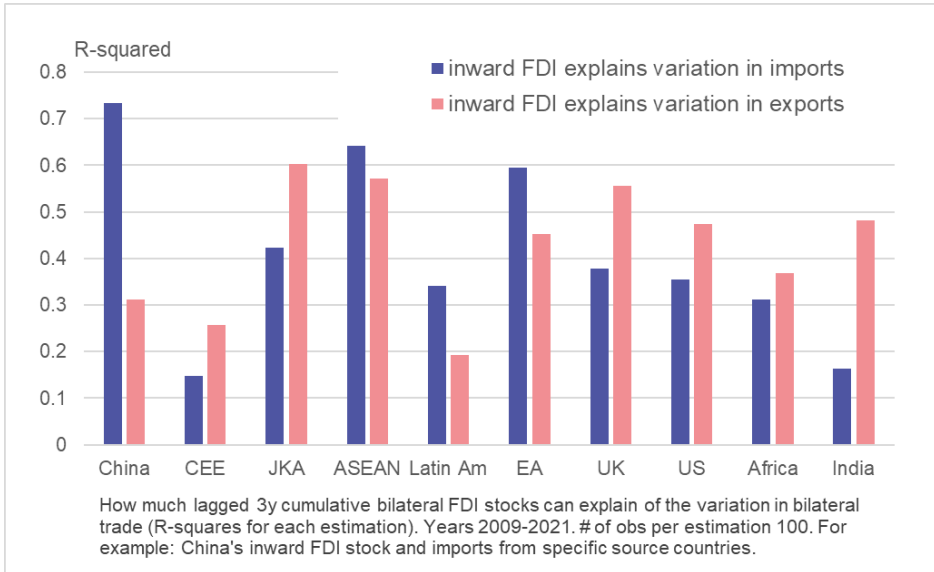
Sources: IMF, UNCTAD, and BOFIT.

We see that past FDI to ASEAN countries can explain the vast amount of both its exports (55 %) and imports (65 %). This indicates that investments in these countries are mostly related to production outsourcing and enlarging production chains. This same pattern at somewhat smaller scale can also be detected for JKA and the euro area. For India and the UK, past FDI better explain the variation in their exports back to FDI source countries than imports from them, a finding that could also be related to outsourcing motives.

For China on the other hand, past FDI can explain almost 75 % the variation in China's imports from the investor country, but the share for China's exports is small. This points to the motive of enhancing market access for exports, whereby countries invest in China to gain market access.

Past FDI do not explain the variation in trade of CEE or Latin America. This could mean that investment flows to these countries are primarily focused on providing domestic supplies in the host country and other countries directly or as part of a strategy to circumvent trade-related barriers.

6. Conclusions

This analysis of the global investment and trade flows before and during the current US-China trade war corroborates the basic finding in the existing literature that even with harms to bilateral flows between the US and China, there is little evidence of a wider fragmentation in trade or a world splitting into competing spheres, even with respect to technology-intensive manufactures.

We see some shift in global trade especially to Central and Eastern Europe (CEE) and ASEAN countries, which may reflect a partial reshuffling of global value chains. US bilateral trade has increased relatively most with CEE, ASEAN, and India (at the expense of China, Africa, and the UK), whereas China's bilateral trade had increased relatively most with CEE, ASEAN, and Latin America (at the expense of the US). However, it is plausible that shift would have taken place even without the trade war and merely reflects increasing labor and production costs in China.

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Analyzing the relationship between bilateral FDI and trade flows shows us that outward FDI has different purposes in different countries. Further, based on the development of bilateral FDI flows since the start of the current trade war, we note that CEE, JKA (Japan, South Korea, and Australia), and the UK have invested relatively in India, where FDI inflows are mostly related to production outsourcing. On the other hand, especially increased FDI to ASEAN originates widely from other regions, which could be a further indicator of increased willingness to divert production chains away from China. Lastly, bilateral investment data show signs of increased investment between like-minded regions.

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References

Ahmed, Sayed Farrukh, A.K.M. Mohsin, and Syed Far Abid Hossain (2023). "Relationship between FDI Inflows and Export Performance: An Empirical Investigation by Considering Structural Breaks," *Economies*, 11: 73.

Aiyar, Shekhar, Jiaqian Chen, Christian Ebeke, Roberto Garcia-Saltos, Tryggvi Gudmundsson, Anna Ilyina, Alvar Kangur, and others (2023). "Geoeconomic Fragmentation and the Future of Multilateralism." IMF Staff Discussion Note 2023/001, International Monetary Fund, Washington, DC. https://www.imf.org/en/Publications/Staff-Discussion-Notes/Issues/2023/01/11/Geo-Economic-Fragmentation-and-the-Future-of-Multilateralism-527266

Antràs, Pol (2020). "De-Globalisation? Global Value Chains in the Post-COVID-19 Age," NBER Working Papers 28115, National Bureau of Economic Research, Inc.

Babatunde, Musibau Adetunji (2017). "Foreign direct investment and export performance in Nigeria: a disaggregated analysis," *International Journal of Sustainable Economy*, Inderscience Enterprises Ltd, 9(2): 142-158.

Bauerle Danzman, Sarah and Sophie Meunier (2021). "The Big Screen: Mapping the Diffusion of Foreign Investment Screening Mechanisms." Posted August 28, 2021 and available at https://ssrn.com/abstract=3913248 or http://dx.doi.org/10.2139/ssrn.3913248

Bolhuis, Marijn and Chen, Jiaqian and Kett, Benjamin (2023), Fragmentation in Global Trade: Accounting for Commodities, IMF Working Paper No. 2023/073, Available at https://ssrn.com/abstract=4410556 or http://dx.doi.org/10.5089/9798400239205.001

Bown, Chad P. (2023). "US imports from China are both decoupling and reaching new highs. Here's how." PIIE charts, https://www.piie.com/research/piie-charts/us-imports-china-are-both-decoupling-and-reaching-new-highs-heres-how

Carril-Caccia, Federico and Elena Pavlova (2018). "Foreign direct investment and its drivers: A global and EU perspective," *Economic Bulletin Articles*, European Central Bank, vol. 4.

Dechert LLP (2022). "The Evolving Global Foreign Direct Investment and National Security Review Landscape," Whitepaper, May 2022.

DHL (2023), 2022 Global Connectedness Index Report, https://www.dhl.com/global-en/delivered/globalization/global-connectedness-index.html#parsysPath_download_box_copy_co

Fajgelbaum, Pablo David, Pinelopi Koujianou Goldberg, Patrick Kennedy, Amit Kumar Khandelwal, and Daria Taglioni (2021, revised 2023). "The US-China Trade War and Global Reallocations," NBER Working Paper Series, Working Paper 29562, https://www.nber.org/system/files/working_papers/w29562/w29562.pdf

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Do international investment and trade flows show any signs of fragmentation?

Garcia-Herrero, Alicia (2022). "Slowbalisation in the Context of US-China Decoupling," *Intereconomics: Review of European Economic Policy*, Springer, ZBW-Leibniz Information Centre for Economics, Centre for European Policy Studies (CEPS), 57(6): 352-358, November.

Hsiao, Frank S.T., and Mei-Chu W. Hsiao (2006). "FDI, Exports, and GDP in East and Southeast Asia – Panel Data versus Time-Series Causality Analyses," *Journal of Asian Economics*, 17(6): 1082-1106, available at https://ssrn.com/abstract=1835965

IMF (2023), World Economic Outlook 2023, Chapter 4, "Geoeconomic Fragmentation and Foreign Direct Investment," International Monetary Fund, Washington, DC. https://www.imf.org/en/Publications/WEO/Issues/2023/04/11/world-economic-outlook-april-2023

Kutan, Ali, and Goran Vukšić (2007). "Foreign direct investment and export performance: Empirical evidence," *Comparative Economic Studies*, 49: 430-45.

Mijiyawa, Abdoul G. (2017). "Does Foreign Direct Investment Promote Exports? Evidence from African Countries," *The World Economy*, Wiley Blackwell, 40(9): 1934-1957, September.

OECD (2023). "Foreign direct investment statistics: Explanatory notes," available at https://www.oecd.org/daf/inv/FDI-statistics-explanatory-notes.pdf

Rahmaddi, Rudy, and Masaru Ichihashi (2013). "The role of foreign direct investment in Indonesia's manufacturing exports," *Bulletin of Indonesian Economic Studies*, Taylor & Francis Journals, 49(3): 329-354, December.

Simola, Heli (2021). "The impact of Covid-19 on global value chains," BOFIT Policy Brief 2/2021.

Tekin Barış Rıfat (2012). "Economic growth, exports and foreign direct investment in least developed countries: A panel granger causality analysis," *Economic Modelling*, 29: 868-878.

United Nations Conference on Trade and Development (UNCTAD) (2023). "The Evolution of FDI Screening Mechanisms: Key Trends and Features." Investment Policy Monitor 25, UNCTAD, Geneva. https://unctad.org/publication/evolution-fdi-screening-mechanisms-key-trends-and-features

WTO (2019). "Recent patterns of global production and GVC participation," *Global Value Chain Development Report 2019*, pp. 9-43.

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Appendix

Table A1. Bilateral inward FDI positions: stocks by region in 2017 and 2021 (USD billion)

| | To region | | | | | | | | | |
	Africa	ASEA	CEE	China	Euro area	India	JKA	LatAm	UK	US
From					2017					
Africa	78.79	44.27	0.85	17.76	157.79	27.57	22.35	86.69	108.41	86.15
ASEAN	35.01	255.93	0.41	71.41	231.27	22.17	273.06	249.63	85.22	305.17
CEE	2.56	1.39	18.08	1.39	637.10	0.10	12.04	29.80	28.15	13.99
China	36.98	122.72	0.64		179.00	0.68	246.27	349.34	21.78	72.20
Euro area	41.21	151.19	45.40	42.56	6,428.21	7.45	217.00	894.59	1,419.3	2,198.2
India	80.13	56.09	0.39	0.50	81.47		60.13	2.08	68.68	73.27
JKA	2.45	72.42	3.60	37.56	206.67	0.74	136.08	41.46	99.03	239.21
LatAm	2.49	4.55	0.48	5.03	696.82	1.93	50.12	166.80	75.18	384.49
UK	3.77	13.66	0.80	3.10	728.80	10.77	79.53	71.81		379.27
US	4.45	29.39	21.47	36.45	1,724.67	5.48	620.07	120.28	510.59	
Total	287.9	751.6	92.1	215.8	11,071.8	76.9	1,716.7	2,012.5	2,416.4	3,751.9
From					2021					
Africa	93.04	43.49	0.97	17.91	177.80	30.33	15.65	66.27	81.54	97.65
ASEAN	28.42	309.13	0.50	102.34	290.81	26.74	337.60	361.44	117.78	484.97
CEE	2.86	10.39	24.32	2.41	684.99	0.27	21.43	34.40	38.39	-4.72
China	40.68	187.19	5.16		224.82	0.62	319.46	546.41	25.43	90.12
Euro area	157.00	207.59	109.45	62.04	5,957.82	4.84	259.91	509.90	1 411.1	2,746.3
India	109.77	104.78	0.43	1.83	129.64		66.90	6.95	80.41	108.61
JKA	3.05	105.59	3.54	44.69	190.34	0.99	175.18	37.31	122.63	237.63
LatAm	0.45	14.76	0.35	4.12	665.99	0.71	49.78	168.23	68.91	419.57
UK	16.22	30.15	3.40	6.55	817.23	14.38	146.57	184.73		827.06
US	9.97	33.84	45.92	38.25	2,177.59	2.95	860.29	175.98	512.43	
Total	461.5	1,046.9	194.0	280.1	11,317.0	81.8	2,252.8	2,091.6	2,458.6	5,007.2

Sources: IMF Coordinated Investment Survey and BOFIT.

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Table A2. Bilateral trade flows: sum of exports by region in 2014–2017 and in 2018–2021 (USD billion)

	To region									
	Africa	ASEAN	CEE	China	Euro area	India	JKA	LatAm	UK	US
From					2014–2017					
Africa	289.3	62.5	93.7	318.5	535.7	139.9	86.4	58.9	74.7	124.0
ASEA	102.2	1,064.4	121.0	835.0	485.9	178.8	747.3	174.1	69.0	637.4
CEE	57.5	21.8	407.4	58.9	1,277.4	16.3	37.5	33.5	110.0	79.7
China	358.1	929.5	228.5		1,318.4	261.4	1.215.5	703.0	246.6	1,997.4
EA	564.2	344.3	2,384.3	730.9	6,906.1	151.4	537.3	472.0	1,198.6	1,358.8
India	99.5	99.4	54.1	57.8	144.7		54.1	57.6	37.8	191.9
JpKrAu	97.8	850.7	161.5	1,655.5	461.0	136.2	649.1	272.2	88.6	879.9
LatAm	79.0	109.6	72.7	458.6	406.3	96.7	217.2	689.6	43.0	1,719.7
UK	51.1	51.0	54.4	83.7	683.0	21.4	72.3	36.8		223.5
US	121.6	341.6	57.1	598.3	894.5	93.8	675.4	1,302.8	232.6	
Total	1,820.3	3,875.0	3,634.8	5,346.0	13,112.9	1,095.9	4,691.0	3,800.6	2,126.4	7,212.3
From					2018–2021					
Africa	317.6	83.9	99.9	374.6	571.2	152.1	84.6	45.8	69.5	130.8
ASEA	95.6	1,225.3	153.6	1 248.8	585.4	218.2	824.1	218.8	73.2	944.5
CEE	62.3	29.4	509.5	96.7	1,583.7	17.7	44.8	41.7	114.5	103.0
China	410.8	1,309.5	366.7		1,628.8	315.9	1,403.0	838.3	295.6	2,034.4
EA	536.8	386.8	2,590.9	938.3	7 971.6	161.4	611.3	476.9	1,127.0	1,628.6
India	113.1	132.8	59.4	85.9	174.9		64.1	67.7	38.3	246.9
JKA	77.8	996.0	200.8	2,005.9	504.4	159.1	694.1	257.6	95.1	935.4
LatAm	70.5	118.3	80.4	711.3	420.5	86.0	217.2	670.5	44.3	1,891.9
UK	45.7	59.2	55.1	93.3	671.3	25.1	72.3	33.2		233.7
US	11.4	411.2	80.6	597.1	1,016.9	1 41.7	675.4	1,371.9	248.3	
Total	1,838.7	4,752.4	4,196.9	6,710.1	15,128.7	1,277.2	4,691.0	4,022.2	2,120.8	8,149.2

Sources: UNCTADStats and BOFIT.

Table A3. Bilateral investment positions: change in bilateral FDI positions between 2017 and 2021 (%)

To:	US	China	UK	India	Africa	Euro area	LatAm	ASEAN	JP, KR, AU	CEE	Total
Investment from USA		4.9	0.4	-46.3	124.0	26.3	46.3	15.1	38.7	113.9	25.5
Investment from China	24.8		16.8	-9.1	10.0	25.6	56.4	52.5	29.7	712.3	39.8
Investment from UK	118.1	111.1		33.5	330.2	12.1	157.3	120.6	84.3	326.4	58.4
Investment from India	48.2	265.1	17.1		37.0	59.1	233.9	86.8	11.3	9.3	44.1
Investment from Africa	13.3	0.8	-24.8	10.0	18.1	12.7	-23.6	-1.8	-30.0	14.3	-0.9
Investment from Euro area	24.9	45.8	-0.6	-35.0	280.9	-7.3	-43.0	37.3	19.8	141.1	-0.2
Investment from LatAm	9.1	-18.2	-8.3	-63.5	-81.9	-4.4	0.9	224.4	-0.7	-27.5	0.4
Investment from ASEAN	58.9	43.3	38.2	20.7	-18.8	25.7	44.8	20.8	23.6	22.1	34.7
Investment from JP, KR, AU	-0.7	19.0	23.8	34.7	24.5	-7.9	-10.0	45.8	28.7	-1.6	9.7
Investment from CEE	-133.7	72.8	36.4	179.4	11.6	7.5	15.4	648.5	77.9	34.5	9.4
Total	33.5	29.8	1.7	6.4	60.3	2.2	3.9	39.3	31.2	110.6	12.5

Sources: IMF Coordinated Investment Survey and BOFIT.

Table A4. Bilateral trade flows: change in bilateral exports between 2014–2017 and 2018–2021 (%)

To:	USA	China	UK	India	Africa	Euro area	Latin Am	ASEAN	JpKrAu	CEE	TOTAL
Export from USA		-0.2	6.7	51.1	-8.4	13.7	5.3	20.4	20.5	41.2	10.7
Export from China	1.9		19.9	20.9	14.7	23.5	19.2	40.9	15.4	60.5	17.3
Export from UK	4.5	11.5		17.4	-16.3	-1.7	-10.0	16.1	-1.2	1.3	-0.2
Export from India	28.7	48.6	1.3		13.7	20.8	17.6	33.5	18.3	9.7	23.3
Export from Africa	5.5	17.6	-7.0	8.7	9.8	6.6	-22.3	34.2	-2.0	6.6	8.2
Export from euro area	19.9	28.4	-6.0	6.6	-4.9	15.4	1.0	12.3	13.8	8.7	12.2
Export from Latin America	10.0	55.1	2.9	-11.1	-10.8	3.5	-2.8	8.0	18.1	10.6	11.7
Export from ASEAN	48.2	49.6	6.1	22.0	-6.4	20.5	25.6	15.1	10.3	26.9	26.6
Export from JP,KR, AU	6.3	21.2	7.4	16.8	-20.5	9.4	-5.4	17.1	6.9	24.3	12.8
Export from CEE	29.2	64.2	4.2	8.9	8.3	24.0	24.3	34.8	19.4	25.1	24.0
TOTAL	13.0	25.5	-0.3	16.5	1.0	15.4	5.8	22.6	13.2	15.5	14.6

Sources: UNCTADStats and BOFIT.

Table A5. Bilateral trade flows: change in bilateral medium-skill and technology-intensive exports between 2014–2017 and 2018–2021 (%)

To:	USA	China	UK	India	Africa	Euro area	Lat.Am	ASEAN	JP, KR, AU	CEE	TOTAL
Export from USA		34.5	26.3	47.2	31.7	51.1	27.0	44.6	43.4	64.3	35.9
Export from China	73.8		86.7	79.2	67.4	99.4	91.9	98.3	78.5	146.3	86.3
Export from UK	42.7	22.6		28.4	11.1	34.9	20.4	32.3	28.9	40.5	33.6
Export from India	152.8	116.6	39.7		62.8	66.6	44.5	78.9	90.5	129.4	83.2
Export from Africa	1.1	145.1	92.2	55.0	15.8	77.3	78.9	16.3	26.7	101.4	51.6
Export from euro area	44.3	70.7	22.6	46.8	30.8	53.9	37.0	41.0	49.1	61.0	49.9
Export from Latin America	54.3	29.3	-3.2	54.8	11.5	79.1	16.5	34.7	86.5	58.5	48.1
Export from ASEAN	113.3	71.4	45.3	83.2	49.5	64.2	38.9	38.6	54.3	108.3	60.1
Export from JP,KR, AU	39.3	51.8	30.3	56.1	17.8	54.0	19.4	31.1	38.2	107.7	41.5
Export from CEE	53.3	58.7	29.4	43.5	59.1	66.8	55.3	63.8	26.4	78.8	64.4
TOTAL	55.6	56.6	31.5	62.7	39.2	59.2	36.3	55.0	54.9	71.5	54.0

Sources: UNCTADStats and BOFIT.

Table A6. Bilateral trade flows: change in bilateral high-skill and technology-intensive exports between 2014–2017 and 2018–2021 (%)

To:	USA	China	UK	India	Africa	Euro area	Lat.Am	ASEAN	Jap, Kor, Aus	CEE	TOTAL
Export from USA		68.3	28.0	74.1	42.4	45.3	39.3	40.9	41.1	109.4	44.8
Export from China	50.9		88.6	79.5	73.6	74.5	91.6	113.6	52.1	103.9	72.1
Export from UK	18.5	50.8		39.5	7.9	30.0	18.9	27.3	27.1	27.3	26.8
Export from India	75.3	197.3	48.3		68.5	87.3	111.3	89.9	79.9	65.7	86.5
Export from Africa	83.1	217.4	40.3	132.0	47.6	61.2	294.7	38.1	33.2	96.8	75.2
Export from euro area	80.4	93.1	29.7	96.4	43.1	59.7	46.2	49.4	58.2	73.7	61.4
Export from Latin America	43.5	25.5	46.3	46.2	42.5	57.4	22.6	6.7	69.1	69.4	39.8
Export from ASEAN	101.2	88.1	30.5	89.4	29.0	48.6	61.5	59.0	62.2	104.3	70.6
Export from JP,KR, AU	50.5	54.7	36.4	59.1	59.4	56.9	18.5	75.9	36.4	117.6	56.0
Export from CEE	103.8	113.2	55.0	103.1	34.0	82.2	61.9	70.8	64.1	89.8	81.5
TOTAL	60.7	71.8	37.6	81.0	50.2	59.0	49.0	73.3	51.2	80.3	60.7

Sources: UNCTADStats and BOFIT.

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Table A7. Summary statistics of bilateral variables used in estimations in Section 5

BY FDI Destination					BY FDI Source			
ASEAN								
Variable	Mean	Std.Dev.	Min	Max	Mean	Std.Dev.	Min	Max
Log (exports)	17.724	1.312	15.140	19.814	17.712	1.615	12.373	19.795
Log (imports)	17.712	1.615	12.373	19.795	17.711	1.307	15.140	19.814
Log(FDI), 3y cum	10.270	1.533	6.817	12.594	10.962	1.996	4.052	13.004
Africa								
Variable	Mean	Std.Dev.	Min	Max	Mean	Std.Dev.	Min	Max
Log (exports)	17.236	0.797	15.304	18.913	16.969	1.410	13.167	19.112
Log (imports)	16.992	1.404	13.167	19.112	17.291	0.791	15.887	18.913
Log(FDI), 3y cum	9.084	1.655	5.261	12.026	10.086	1.877	3.965	12.077
CEE								
Variable	Mean	Std.Dev.	Min	Max	Mean	Std.Dev.	Min	Max
Log (exports)	14.858	2.105	11.919	19.519	16.401	1.305	14.391	19.911
Log (imports)	16.438	1.283	14.391	19.911	14.784	2.032	11.919	19.519
Log(FDI), 3y cum	7.488	2.082	3.965	11.351	8.864	2.285	4.547	13.369
China								
Variable	Mean	Std.Dev.	Min	Max	Mean	Std.Dev.	Min	Max
Log (exports)	18.132	1.293	14.856	20.183	18.421	1.403	13.884	20.149
Log (imports)	18.421	1.403	13.884	20.149	18.178	1.207	15.740	20.183
Log(FDI), 3y cum	8.878	1.621	5.728	11.460	10.334	2.218	6.019	13.053
Euro area								
Variable	Mean	Std.Dev.	Min	Max	Mean	Std.Dev.	Min	Max
Log (exports)	19.025	0.997	17.076	21.546	18.790	1.214	16.395	21.546
Log (imports)	18.790	1.214	16.395	21.546	19.066	0.963	17.208	21.546
Log(FDI), 3y cum	12.872	1.274	10.442	15.647	12.013	2.233	6.873	15.647
India								
Variable	Mean	Std.Dev.	Min	Max	Mean	Std.Dev.	Min	Max
Log (exports)	16.973	0.933	14.856	19.011	16.364	1.390	11.933	18.160
Log (imports)	16.364	1.390	11.933	18.160	16.947	0.906	14.856	18.373
Log(FDI), 3y cum	7.838	1.653	4.547	10.338	9.395	2.123	5.624	11.583
Japan, South Korea, Australia								
Variable	Mean	Std.Dev.	Min	Max	Mean	Std.Dev.	Min	Max
Log (exports)	16.838	1.480	14.365	19.569	17.845	1.666	12.345	20.183
Log (imports)	17.845	1.666	12.345	20.183	16.829	1.452	14.365	19.569
Log(FDI), 3y cum	11.331	1.209	9.012	13.602	10.183	1.870	6.381	12.405
Latin America								
Variable	Mean	Std.Dev.	Min	Max	Mean	Std.Dev.	Min	Max
Log (exports)	17.637	1.341	15.050	19.758	17.311	1.793	11.919	20.061
Log (imports)	17.311	1.793	11.919	20.061	17.653	1.322	15.050	19.758
Log(FDI), 3y cum	11.141	1.585	6.874	13.557	9.658	2.506	4.972	13.450
UK								
Variable	Mean	Std.Dev.	Min	Max	Mean	Std.Dev.	Min	Max
Log (exports)	17.259	1.001	15.826	19.592	16.473	1.377	12.821	19.193
Log (imports)	16.473	1.377	12.821	19.193	17.254	0.997	15.826	19.592
Log(FDI), 3y cum	11.470	1.300	9.606	14.153	9.943	2.354	5.150	13.591
US								
Variable	Mean	Std.Dev.	Min	Max	Mean	Std.Dev.	Min	Max
Log (exports)	18.549	1.174	15.884	20.149	17.755	1.671	12.479	19.758
Log (imports)	17.755	1.671	12.479	19.758	18.582	1.142	15.884	20.149
Log(FDI), 3y cum	12.019	1.309	9.043	14.735	10.930	2.090	7.286	14.498

Number of observations in estimations for each country 100.
Sources: UNCTADStat, IMF Coordinated Investor Survey, and BOFIT.

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Figure A1. Annual FDI inflow average in 2018–2021 compared to 2014–2017 relative to FDI stock using IMF data
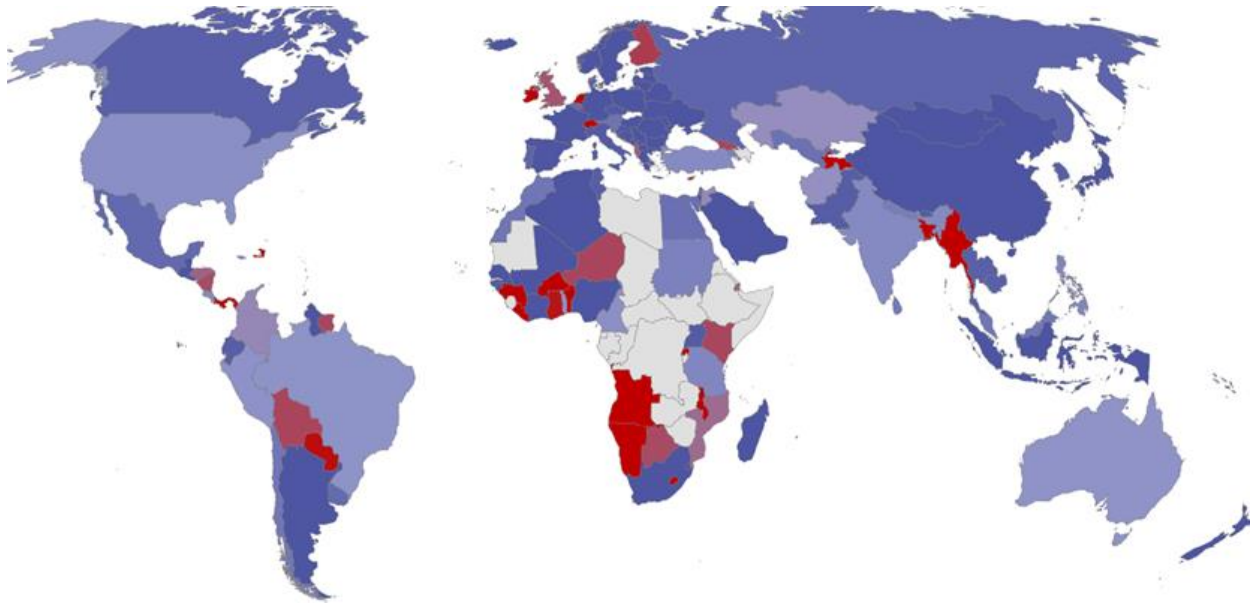
Source: IMF and BOFIT.

Average annual FDI inflows from IMF country-level balance of payments (BoP) statistics for the period 2018–2021 are compared to the average inflows in 2014–2017. FDI flows for each year are scaled by each country's previous year's FDI liabilities according to the IMF's International Investment Position (IIP) Statistics.

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