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# The Impact of the Belt and Road Initiative on Foreign Direct Investment from China, the United States, and Major Investor Countries

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# The Impact of the Belt and Road Initiative on Foreign Direct Investment from China, the United States, and Major Investor Countries*

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**Abstract**

This paper investigates the impact of the Belt and Road Initiative (BRI) on foreign direct investment (FDI) from China and other major source countries, such as the United States (US), France, and Japan, by applying staggered difference-in-differences (DID) event study estimations to a gravity model. In addition to estimations using country-pair fixed effects, we estimate models with source and host country-year fixed effects to control for the effect through changes in any host country attribute due to the BRI, such as infrastructure, and highlight the effect through changes in bilateral relationships. We find that FDI from China, Hong Kong SAR, the US, Switzerland, Japan, and France to BRI countries increased in the post-BRI period, whereas FDI from the United Kingdom (UK), the Netherlands, and Luxembourg decreased. After controlling for country-year fixed effects, there remains a post-BRI upward trend in FDI from the US, Switzerland, and France and a downward trend in FDI from the UK, the Netherlands, and Luxembourg. These findings suggest that FDI from non-China countries to BRI countries can be affected by their bilateral relationships. For example, the US may have invested more in BRI countries to strategically compete with China in those locations, whereas France and Switzerland may have done so because of investment cooperation with China in Africa.

**Keywords:** Belt and Road Initiative, foreign direct investment, gravity models, staggered DID, event study

**JEL Codes:** F21, F35, F50

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# 1 Introduction

In 2013, China initiated a new framework called the Belt and Road Initiative (BRI) to promote regional economic development. The BRI originally aimed to develop transport infrastructure from China through West Asia to Europe. However, it soon expanded to South Asia, Southeast Asia, Africa, and the rest of the world and became engaged in the development of other types of infrastructure, such as information and communication technology (ICT), energy, and mining (Huang, 2016). For example, in 2013, or the initial year of the BRI, the share of energy projects in total BRI engagement was 52 percent, whereas the share of transport projects was 17 percent. In 2023, the share of energy projects had declined to 31 percent, and the shares of transport and mining projects were 16 and 21 percent, respectively. By 2023, 150 countries had signed memorandums of understanding (MOUs) for the BRI, and the cumulative engagement for BRI-related investments exceeded 1 trillion US dollars (Nedopil, 2024). The BRI countries include most low- and middle-income countries, with several exceptions such as India, Bhutan, Brazil, and Mexico, and some developed countries, most of which are East European countries, except Portugal. Other developed countries, such as the United States (US), most West European countries, Japan, and Australia, have not yet signed an MOU for the BRI.

Although the development of energy and transport infrastructure is crucial, the BRI is also supposed to strengthen economic ties between China and participating countries, including trade and foreign direct investment (FDI) (Nugent and Lu, 2021; Nedopil, 2024). By applying difference-in-differences (DID) estimations to gravity models, several studies have indeed shown that participating in the BRI has a positive effect on the level of Chinese FDI in the partner country (Du and Zhang, 2018; Kang et al., 2018; Yu et al., 2019; Shao, 2020; Nugent and Lu, 2021). These studies find that Chinese FDI in BRI countries has increased more significantly than that in other developing countries. However, the effect of the BRI is heterogeneous. For example, participating in the BRI is negatively correlated with Chinese investment in advanced economies (Yu et al., 2019).

In addition to FDI from China, the BRI may influence FDI from other countries through changes in the characteristics of the host country and bilateral relationships between the host and source countries. For example, infrastructure development due to the BRI could encourage FDI inflows regardless of the source country (Donaubauer et al., 2016). Productivity growth in the host country due to BRI projects may also attract FDI from any country (Carr et al., 2001). In addition, participation in the BRI signals closer political alignment with China because China intends to assert greater international influence through the BRI (Huang, 2016). Therefore, bilateral relationships between BRI countries and non-China source countries may change and affect FDI, particularly when the source countries compete or, conversely, cooperate with China. However, whether participation in the BRI influences FDI from countries other than China has not been studied in the literature. Moreover, the literature does not fully examine the mechanisms behind the effect of the BRI, particularly failing to distinguish between

effects through changes in host country characteristics, such as infrastructure, and changes in bilateral relationships due to strategic competition and investment cooperation with China.

Furthermore, the current literature relies on DID estimations that assume a single timing of the treatment. For example, Du and Zhang (2018), Kang et al. (2018), Yu et al. (2019), and Nugent and Lu (2021) assume that all countries that signed an MOU for the BRI participated in the BRI in 2013 when President Xi Jinping first announced the BRI. In other words, these studies assume that all BRI member countries participated in the BRI in a particular period and thus compare FDI from China between the pre- and post-participation periods. However, in practice, countries began to participate in the BRI in different periods, as we will show in detail later. Therefore, estimations assuming the single timing of the treatment may lead to biased results. In addition, the recently growing literature on staggered DID argues that two-way fixed effect DID estimations can be biased when the treatment effect is heterogeneous across treated periods (Sun and Abraham, 2021; Roth et al., 2023; Callaway and Sant'Anna, 2021; Goodman-Bacon, 2021).

This paper makes a novel contribution to the literature by filling these gaps. First, in addition to examining the effect of the BRI on FDI from China to BRI countries, we also estimate the effect of the BRI on FDI from major source countries, such as the US, the United Kingdom (UK), France, Germany, and Japan, some of which compete with China in economic and political relationships with BRI countries, while others are more cooperative with China. Second, we distinguish between the BRI effect through changes in host country characteristics and bilateral relationships by comparing the results from estimations with and without country-year fixed effects. The effect estimated in the specifications using country-year fixed effects that control for any time-varying host country attribute, such as the level of infrastructure and productivity, can be interpreted as the effect through changes in bilateral relationships. Finally, we use an event study model of staggered DID developed by Sun and Abraham (2021) that accounts for heterogeneous effects to more accurately estimate how membership in the BRI affects FDI from China and the three countries over time.

The results indicate that FDI from China, Hong Kong SAR, the US, Switzerland, Japan, and France to BRI countries has increased in the post-BRI period, whereas FDI from the UK, the Netherlands, and Luxembourg has decreased. After controlling for host country-year fixed effects, the post-BRI upward trend in FDI from the US, Switzerland, and France and the downward trend in FDI from the UK, the Netherlands, and Luxembourg remain, whereas the positive effect on FDI from Japan disappears. These findings suggest that changes in bilateral relationships are an important determinant of FDI to BRI countries. We presume that the US invests more in BRI countries to strategically compete with China, whereas French and Swiss firms cooperate with Chinese firms in investment projects in BRI countries supported by policies. In contrast, the UK has possibly reduced its FDI in BRI countries to mitigate the risks of supply chains, as BRI countries are strongly linked with China. FDI from Japan to BRI

countries is most likely affected by host country characteristics rather than bilateral relationships.

## 2 Related Literature

There is thick literature on FDI particularly related to China (Hayakawa et al., 2020; Li et al., 2021, among many others). One strand of the literature examines the relationship between the BRI and FDI and involves both ex ante and ex post evaluations. For ex ante evaluation, World Bank (2019) and Chen and Lin (2020) quantified the potential impact of the BRI on participating countries' ability to attract FDI. For example, the World Bank (2019) estimated that the proposed BRI transport network is expected to lead to a 5 percent increase in total FDI inflows to BRI countries. By region, the potential FDI-promotion effect of the proposed BRI transport network is the largest for BRI countries in Sub-Saharan Africa (7.5 percent), followed by Central Asia (7.3), East Asia and the Pacific (6.3), South Asia (5.2), Europe (3.7), and the Middle East and North Africa (3.4). By income group, the potential FDI-promotion effects are 7.6 percent for low-income, 6 percent for lower-middle-income, 5 percent for upper-middle-income, and 3.8 percent for high-income BRI countries.

The ex post analyses, which are more relevant to this paper, focus primarily on the direct effect on outward FDI from China via DID estimations. Overall, prior evidence suggests that BRI membership promotes Chinese outward FDI inflows to its member country. However, the BRI's FDI-promotion effects are substantially heterogeneous in terms of firm, sector, and host country characteristics, and the results are inconclusive among studies.

Du and Zhang (2018) adopted a gravity model with three-dimensional panel data covering 7 source countries (Australia, Canada, China, Japan, Singapore, the UK, and the US) and 127 host countries from 2011 to 2015. In their study, the host countries listed on the BRI plan are defined as the treatment group, whereas the period after the announcement of the BRI in 2013 is set as the post-treatment period. They find that BRI countries received greater Chinese merger and acquisition investments as a result of the BRI announcement than non-BRI countries did relative to the other source countries. They also find that the BRI's FDI-promotion effects are more strongly associated with continental BRI countries and nonstate-owned enterprises.

Analyzing panel data covering 216 host countries and regions from 2010 to 2015, Kang et al. (2018) found that the BRI has increased Chinese FDI outflows to BRI countries, driven mainly by maritime silk-road countries; these findings are in contrast to Du and Zhang (2018). However, the matching-DID estimation provides no evidence of the BRI's FDI-promotion effects, casting doubts on the infrastructure- and institution-based strategies of the BRI.

By analyzing panel data covering 132 host countries from 2000 to 2015, Yu et al. (2019) found evidence of the BRI's FDI-promotion effects for 57 countries that participated in the Belt and Road Forum in

2017 but not for 65 countries listed in the BRI blueprint. They argued that the results might reflect the significance of the host country's willingness to participate in the BRI. Shao (2020) analyzed 1139 outward FDI transactions by Chinese firms across 84 host countries from 2005 to 2017, finding evidence of the BRI's FDI-promotion effects, which are stronger for low-risk countries than for high-risk countries.

Nugent and Lu (2021) applied a triple DID to three-dimensional panel data covering 35 sectors across 152 host countries from 2009 to 2018. After controlling for country-, sector-, and year-fixed effects, they found that the BRI has decreased Chinese FDI outflows to its member countries. However, Chinese FDI outflows to both overcapacity- and pollution-related sectors have significantly increased as a result of the BRI, suggesting that Chinese firms have been motivated to make FDI investments in BRI countries for the sake of alleviating China's own overcapacity and pollution problems. However, unlike the current study, Nugent and Lu (2021) used only country-pair and year fixed effects and did not incorporate source and host country-year fixed effects; this additional approach enables us to examine the mechanism of the BRI effect.

# 3 Data

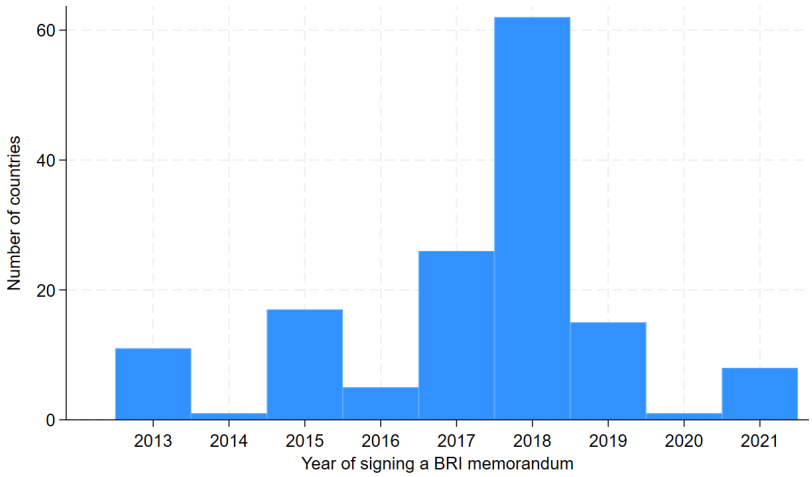
We employ bilateral FDI data taken from the International Monetary Fund's Coordinated Direct Investment Survey, which contains data ranging from 2009 to 2021 (International Monetary Fund, 2023). This dataset is made up of both outward FDI positions reported by the source country and inward FDI positions reported by the receiving country.[1] The amount of bilateral FDI from one country to another used in this study is given primarily by the outward FDI reported by the source country; however, in cases where outward FDI is unavailable, the above-mentioned amount is determined by the inward FDI reported by the host country. All the data are denominated in nominal US dollars. We create a balanced panel for the 2009-2021 period. As a result, the number of country pairs in the benchmark estimation is 8,784, whereas the number of observations for the 13-year period is 114,192.

This paper defines BRI members as nations that have signed an MOU with China to cooperate with the BRI. For a list of BRI member countries and which year those countries joined the initiative, we use the Green Finance & Development Center's dataset, which contains join dates for 148 countries, up to 2022 (Nedopil Wang, 2022).

Figure 1 illustrates the distribution of the years in which a BRI memorandum was signed. Although 146 countries signed a BRI MOU between 2013 and 2021 in total, the years of participation in the BRI substantially vary. This figure highlights the inappropriateness of the single treatment year for participation in the BRI, as used in previous studies (Du and Zhang, 2018; Yu et al., 2019), and the need for an estimation model that accounts for multiple treatment periods.

[1]Our FDI data cover all industries, because the IMF data do not disaggregate FDI at the industry or sector level. OECD's FDI data include industry-level FDI but cover mostly OECD member countries.

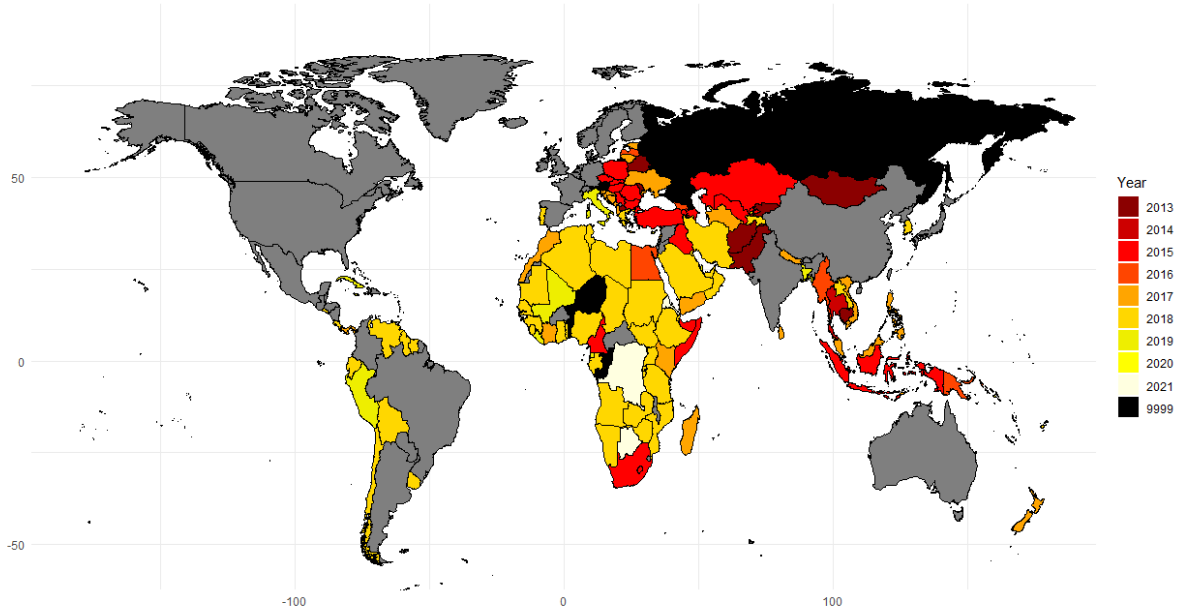
Figure 1: Distribution of years of signing a BRI memorandum.




Source: Nedopil Wang (2022).

In addition, Figure 2 shows the geographic distribution of the BRI countries by the year in which they signed a BRI MOU. This map clearly shows that the timing of the treatment (singing to a BRI MOU) is closely related to the distance from China, emphasizing the importance of controlling for country-pair fixed effects.

Figure 2: Map of the year of signing a BRI memorandum by country.




Source: Nedopil Wang (2022). Notes: 9999 indicates that the year of signing a BRI memorandum is not available for the country. Countries in gray have not yet signed a BRI memorandum.

The first part of Table 1 summarizes FDI positions in the balanced panel. Because the amount of

bilateral FDI can be negative when previous investments are withdrawn, the empirical model described in the following section uses the inverse hyperbolic sign of FDI. The third row of the table indicates that in 26 percent of country-pair observations, the host country has already signed a BRI MOU. The lower rows show summary statistics for variables at the country level to control for source and host country-year attributes, such as nominal GDP, real GDP per capita, and indices of infrastructure development and governance, taken from the World Bank's World Development Indicators. Our measures of infrastructure development include the number of broadband subscribers and total rail lines in kilometers, whereas the level of governance is measured by the z-score normalized indices of corruption and rule of law. A higher value of the index of corruption indicates a lower level of corruption. In addition, the last row summarizes the level of democracy measured by the average of the core democracy indices of V-Dem Institute (2023), ranging from 0 to 1 with a higher value indicating a higher level of democracy, used in heterogeneity analysis.

Table 1: Summary Statistics

| | N | Mean | S.D. | Min | Max |
|---|---|---|---|---|---|
| Bilateral FDI (million $) | 114,192 | 3,423 | 30,270 | -31,892 | 1.55e+06 |
| Inverse hyperbolic sine of FDI | 114,192 | 2.461 | 3.609 | -11.06 | 14.95 |
| Dummy for host country's participation in BRI | 114,192 | 0.264 | 0.441 | 0 | 1 |
| Nominal GDP (billion $) | 2,357 | 426.2 | 1,717 | 0.0281 | 23,315 |
| – in logs | 2,357 | 24.32 | 2.349 | 17.15 | 30.78 |
| Real GDP per capita (PPP, thousand $) | 2,357 | 24.86 | 25.67 | 0.861 | 173.9 |
| – in logs | 2,357 | 9.551 | 1.162 | 6.758 | 12.07 |
| Number of Broadband subscribers (per 100) | 2,357 | 12.87 | 13.57 | 0.000 | 77.12 |
| – in logs | 2,357 | 1.204 | 2.376 | -7.825 | 4.345 |
| Rail lines (km) | 884 | 11.61 | 25.22 | 0.230 | 194.4 |
| – in logs | 884 | 8.220 | 1.422 | 5.439 | 12.18 |
| Index of corruption | 2,357 | 0.018 | 0.982 | -1.798 | 2.435 |
| Index of rule of law | 2,357 | 0.026 | 0.957 | -2.406 | 2.125 |
| Index of democracy | 2,077 | 0.438 | 0.237 | 0.049 | 0.863 |

Source: International Monetary Fund (2023), Nedopil Wang (2022), World Bank (2024), V-Dem Institute (2023).

It is noted that, although Hong Kong is a Special Administrative Region (SAR) of China, China (or more precisely, mainland China) and Hong Kong SAR are defined as distinguished entities in our sample for the following three reasons. First, in all the data sources used in this study, i.e., the IMF's Coordinated Direct Investment Survey, the World Bank's World Development Indicators, and the V-Dem data, China and Hong Kong SAR are distinguished. Accordingly, in these datasets, the attributes of China and Hong Kong SAR, including GDP and measures of infrastructure and governance, are different from each other, possibly because of differences in political and economic systems between the two. Second, as explained in detail later, attributes of a country/region influence FDI from and to the country/region. Therefore, the differences in country/region-level attributes between China and Hong

Kong SAR may result in different FDI inflows and outflows between the two. Finally, many existing studies of the effect of the BRI on FDI, such as Du and Zhang (2018) and Kang et al. (2018), distinguish between China and Hong Kong SAR. Therefore, our distinction between China and Hong Kong SAR can be justified. However, we also confirm the robustness of our results from this distinction by using an alternative sample where Hong Kong SAR is integrated into China, as explained in Section 5.1.

# 4 Empirical Methodology

## 4.1 Conceptual framework

There are several possible channels through which the BRI promotes FDI inflows. First, the main objective of the BRI is to construct transport and information and communication technology (ICT) infrastructure in the host countries to strengthen China's economic ties with them (Liu et al., 2020). Such infrastructure development can not only increase the efficiency of economic activities in host countries but also facilitate FDI inflows (Cheng and Kwan, 2000; Khadaroo and Seetanah, 2010). Through this infrastructure channel, the BRI by China may encourage FDI from countries other than China if the infrastructure developed by China is available to any foreign-owned firm.

Second, such infrastructure development may further promote economic growth, as evidenced for railroads (Donaldson, 2018), ICT infrastructure (Czernich et al., 2011), and transport infrastructure, particularly in BRI partner countries (Wang et al., 2020). In addition to infrastructure development, the BRI is often associated with technology transfer to partner countries (Qi et al., 2019; Chen, 2024). Because numerous studies on determinants of FDI have shown that the market size and productivity of the host country are important factors of FDI inflows (Carr et al., 2001; Faeth, 2009; Markusen and Venables, 1998), the BRI is likely to increase FDI inflows from China, as well as other countries, to BRI partner countries through increases in market size and productivity.

In addition to affecting the above-mentioned channels through changes in host country-specific characteristics, the BRI may affect FDI through changes in the bilateral relationships between the source and host countries. There are several sources of these changes. First, as China has become an economic and technology superpower and strengthened economic and political ties with other countries through the BRI and other measures, the US-China rivalry has been fueled (Li, 2021; Banerjee and Dutta, 2023). Accordingly, the US has implemented several policy measures to compete with China and promote infrastructure development in low- and middle-income countries, particularly in BRI countries, including the Blue Dot Network (BDN) and the Better Utilization of Investment Leading to Development (BUILD) initiatives. Furthermore, together with other G7 countries (Canada, France, Germany, Italy, Japan and the UK), the US started the Build Back Better World (B3W) initiative in 2021, which aimed to mobilize the private sector to invest in infrastructure (Savoy and McKeown, 2022). This strategic competition

with China may promote FDI from the US and other G7 countries to BRI countries. For example, President Biden of the US visited Angola in December, 2024 and initiated a 1,344-kilometer railway project together with other G7 countries in order to compete with China that already invested heavily in Angola's railways (Soy, 2024).

Second, source countries of FDI do not necessarily compete with China; rather, they often cooperate with China. Notably, by 2019, 19 countries, including Italy, France, Japan, the Netherlands, Switzerland, and the UK (but not the US), had signed MOUs with China for third-party market cooperation, i.e., cooperation in investment projects in third-party countries (Zhang, 2019; Xu, 2022; Yun et al., 2024). In addition, private firms located outside of China have signed MOUs with Chinese firms for joint investment in third countries. For example, the China General Nuclear Power Group (CGN) Europe Energy signed an MOU with EDF Energies Nouvelles and InnoSun of France for clean-energy investment in Africa. In line with the MOU signed between Japan and China, the Itochu Corporation of Japan, the CITIC of China, and the Chia Tai Group of Thailand are jointly engaged in high-speed railway projects in Thailand (Zhang, 2019). These agreements between China and these countries may promote FDI from non-China countries to BRI countries.

Finally, although these channels above promote FDI in BRI countries, there can be adverse effects of the BRI. It is now well known that global supply chains are vulnerable to foreign economic shocks that may arise due to natural disasters and geopolitical issues (Alfaro and Chor, 2023; Inoue and Todo, 2023). Therefore, many countries are now implementing policies for onshoring (relocating production facilities to the domestic economy) and friendshoring (to like-minded countries), including the CHIPS and Science Act of the US, the European CHIPS Act of the European Union, and the Economic Security Promotion Act of Japan, which reduce trade and investment with non-like-minded countries to minimize the risk of disruptions of supply chains with these countries (Todo and Inoue, 2021). Private efforts to mitigate these risks should have a negative effect on FDI from countries that strategically compete with China for BRI countries. Therefore, the effect of the BRI on FDI from the US and other Western countries through changes in their relationships with BRI countries can be either positive or negative, depending on the importance of each of these three channels.

## 4.2 Empirical model

Our empirical model starts by applying a simple DID model to a gravity model of FDI to examine the effect of BRI membership on bilateral FDI from China, the US, Japan, and other major investor countries. Specifically, we estimate the effect of participating in the BRI on FDI from various countries via the following specification:

$$\text{arcsinh}(FDI_{ijt}) = \lambda_{ij} + \lambda_t + \sum_c \beta_c D_i^c D_{jt} + \epsilon_{ijt}, \tag{1}$$

where arcsinh($FDI_{ijt}$) is the inverse hyperbolic sine of FDI from country $i$ to country $j$ in year $t$ ($FDI_{ijt}$) defined by the following:

$$\text{arcsinh}(FDI_{ijt}) = \ln\left(FDI_{ijt} + \sqrt{1 + FDI_{ijt}^2}\right). \tag{2}$$

$\lambda_{ij}$ and $\lambda_t$ are fixed effects at the country pair and year levels, respectively. The country-pair fixed effects account for time-invariant and country-pair specific factors of bilateral FDI, such as geographic, cultural, and linguistic distance and historical relationships between the two countries, whereas year fixed effects capture unobservable global effects in each year, such as shocks by global booms, recessions, and pandemics. $D_i^c$ is a dummy variable that takes a value of one if source country $i$ is country $c \in$ {China, US, Japan,...}, whereas $D_{jt}$ is equal to one if host country $j$ is a partner country of the BRI in year $t$.

The key coefficient, $\beta_c$, indicates the effect of a country's participation in the BRI on FDI from country $c$. To provide a clear understanding of the interpretation of the coefficient, let us differentiate equation (1) with respect to $D_{ijt}^c \equiv D_i^c D_{jt}$, using equation (2) and omitting the subscript $ijt$ for simplicity:

$$\beta_c = \frac{d\text{arcsinh}(FDI)}{dD^c} = \frac{d\text{arcsinh}(FDI)}{dFDI}\frac{dFDI}{dD^c} = \frac{1}{\sqrt{1+FDI^2}}\frac{dFDI}{dD^c}. \tag{3}$$

Rewriting equation 3, we obtain the following:

$$\frac{dFDI/FDI}{dD^c} = \frac{\sqrt{1+FDI^2}}{FDI}\beta_c. \tag{4}$$

Because $FDI_{ijt}$ in our data is expressed in million US dollars and thus is usually substantially larger than one (the mean is 813.7, as shown in Table 1), $\sqrt{1+FDI^2}$ is approximately equal to $FDI$ in most cases. Assuming this, we obtain the following from equation (4):

$$\frac{dFDI/FDI}{dD^c} \approx \beta_c. \tag{5}$$

Equation (5) indicates that $\beta_c$ can be interpreted as the effect of participation in the BRI on the rate of change in FDI inflows from country $c$.

We now expand the simple DID model to a DID event study estimation to estimate the dynamics of the effect on FDI from various countries via the following specification:

$$\text{arcsinh}(FDI_{ijt}) = \lambda_{ij} + \lambda_t + \sum_c \sum_l \beta_{cl} D_i^c D_{jt}^l + \epsilon_{ijt}, \tag{6}$$

where $D_i^c$ is a dummy variable that takes a value of one if source country $i$ is country $c \in$ {China, US, Japan,...} as defined before, and $D_{jt}^l$ is equal to one if recipient country $j$ participates in the BRI in

year $t-l$ and the current year is $t$ where $l \in$ {..., -3, -2, 0, 1, 2, 3, ...} and zero otherwise. The set for $l$ excludes -1, meaning that we use one year before participation as the reference period. The coefficient $\beta_{cl}$ indicates the effect of a host country's participation in the BRI on FDI from country $c$ $l$ years after participation. Variables $\lambda_{ij}$ and $\lambda_t$ represent fixed effects at the country pair and year levels, respectively.

The recently growing literature on staggered DID finds that standard DID estimations using equations such as equation (6), which ignore the heterogeneity of the treatment effect across cohorts that are treated in different periods, are most likely to be biased (Callaway and Sant'Anna, 2021; Goodman-Bacon, 2021; Roth et al., 2023; Sun and Abraham, 2021). In our study, treatment periods, or years of participation in the BRI, are heterogeneous, as shown in Figure 1. Moreover, the effect of participation in the BRI is likely to be heterogeneous depending on the year of participation. For example, its effect on FDI in earlier participants may be greater than its effect on FDI in later participants because China may have targeted countries for the BRI in the order of potential accessibility for its investment.

Therefore, we further use the staggered-DID event study estimator developed by Sun and Abraham (2021), which incorporates heterogeneous treatment effects across treatment periods and is robust to heterogeneity. In this method, the treatment effect is first estimated for the cohort treated in each period for each relative period before or after the treatment. These coefficients are then aggregated over cohorts as a weighted sum, where the weights are based on the share of each cohort in the total number of treated observations, allowing the coefficients to be more interpretable.

Specifically, our staggered DID event study estimations rely on the following equation, which is based on Sun and Abraham (2021):

$$\text{arcsinh}(FDI_{ijt}) = \lambda_{ij} + \lambda_t + \sum_c \sum_{e=2013}^{2021} \sum_l \beta_{cel} D_j^e D_i^c D_{jt}^l + \epsilon_{ijt}, \tag{7}$$

where $c$ is a set of source countries of FDI, $c \in$ {China, US, Japan,...}, and $D_j^e$ is a dummy variable that indicates the cohort of recipient country $j$ and takes a value of one if country $j$ participates in the BRI in year $e$. As defined previously in equations (1) and (6), $D_i^c$ is a dummy variable that takes a value of one if source country $i$ is country $c$, and $D_{jt}^l$ is equal to one if recipient country $j$ participates in the BRI in year $t-l$ and the current year is $t$ where $l \in$ {..., -3, -2, 0, 1, 2, 3, ...} and zero otherwise. Variables $\lambda_{ij}$ and $\lambda_t$ represent fixed effects at the country pair and year levels, respectively.

In equation (7), $\beta_{cel}$ indicates the effect of a country's participation in the BRI in year $e$ on FDI from country $c$ to the country $l$ years after participation. After the above model is estimated, the $\beta_{cel}$ coefficients are aggregated by $c$ and $l$ across different $e$s, using the weights developed by Sun and Abraham (2021):

$$\beta_{cl}^{SA} = \sum_{e=2013}^{2021} \omega_e^{SA} \beta_{cel} \tag{8}$$

where $w_e^{SA}$ represents the weights for cohort $e$. The weighted coefficient $\beta_{cl}^{SA}$ indicates the effect of

participation in the BRI on FDI from country $c$ $l$ years after participation averaged over different timings of participation. Standard errors clustered at the country-pair level are used to address possible correlation between error terms within the same country-pair across time. Throughout this study, we employ standard errors clustered at the country-pair level.

In addition, we make the following three modifications to make the estimations feasible and to satisfy the parallel-trend assumption. First, when we incorporate the effect on FDI from all source countries into the estimation (i.e., $c \in \{\text{all source countries}\}$ in equation [7]), we find that the computation is infeasible. Even if we choose the top 30 source countries, the computation takes a tremendous amount of time. To avoid computational complexity, we focus on the effects on FDI from the top 10 source countries, i.e., China, the US, the Netherlands, Luxembourg, the UK, Germany, France, Hong Kong SAR, Japan, and Switzerland. We experiment with other sets of 10 countries, for example, six countries that show a positive effect in the simple DID (Figure A1 in the Appendix) and some additional major source countries, such as the US, the UK, Germany, and Japan, and obtain similar results (Figures A11, A12, and A13).

Second, when we estimate equation (7), we find that the pre-treatment parallel trend is not satisfied for FDI from most of the 10 countries, as shown in Figure A2 in the Appendix. In particular, the coefficients $\beta_{cl}^{SA}$ in equation (8) tend to be negative before the treatment and positive after the treatment, increasing over time. To control for the increasing time trend, we incorporate the nominal GDP of the source and host countries in logs as control variables into equation (7).

Another possible specification is to utilize $\text{arcsinh}\frac{FDI_{ijt}}{GDP_{it}GDP_{jt}}$ as the outcome variable and not to control for GDP of the two countries. However, we experimented with this specification and found that the pre-treatment trend is downward and not parallel for many countries. This is most likely because the use of $\text{arcsinh}\frac{FDI_{ijt}}{GDP_{it}GDP_{jt}}$ is too restrictive, compared with the specification where $\text{arcsinh}(FDI)$ is the outcome variable and the logs of GDP of the two countries are control variables. Therefore, this study employs the latter specification.

Finally, we further assume that each treatment is given one year before signing an MOU for the BRI to account for potential anticipation effects. This assumption can be justified because the effect of the BRI on FDI inflows to partner countries may emerge several years before signing an MOU for the BRI. For example, although Indonesia signed an MOU for the BRI with China in 2015 (Figure 2), large investments in the nickel industry started in 2014, one year before signing the MOU (Tritto, 2022).

### 4.3 Mechanism Analysis

As discussed in Section 4.1, participating in the BRI can affect FDI not only from China but also from other countries through several channels, i.e., changes in host country-specific factors, such as transport and ICT infrastructure; market size, productivity, and governance; and country pair-specific factors, such

as bilateral relationships between the source and host countries. To distinguish between the effects of the BRI through these different channels and examine the mechanism behind the BRI effect, we further estimate specifications other than equation (7).

First, to highlight the first four channels, i.e., infrastructure, market size, productivity, and governance, we incorporate measures of the four for the source and host countries as independent variables in equation (7):

$$\text{arcsinh}(FDI_{ijt}) = \theta_s X_{it} + \theta_h X_{jt} + \lambda_{ij} + \lambda_t + \sum_c \sum_{e=2013}^{2021} \sum_l \tilde{\beta}_{cel} D_j^e D_i^c D_{jt}^l + \epsilon_{ijt}, \tag{9}$$

where $X_{it}$ is the vector of the four measures for country $i$ in year $t$. In this equation, $\tilde{\beta}_{cel}$ does not reflect the effect of the BRI on FDI from country $c$ through changes in the four factors while including the effect through other source and host country-specific factors not represented by the four and bilateral factors, such as strategic competition, third-party cooperation, and risk mitigation.

To choose country-level covariates $X$, we estimate the effect of the BRI on possible measures, such as nominal GDP, purchasing-power-parity (PPP)-adjusted real GDP per capita, the number of broadband subscribers, total rail lines (in logs), and the indices of corruption and rule of law (Section 3). Specifically, we apply the simple DID estimations described in equation (1) to country-level data via the following equation:

$$Y_{it} = \lambda_i + \lambda_t + \beta_l D_{it} + \epsilon_{it}, \tag{10}$$

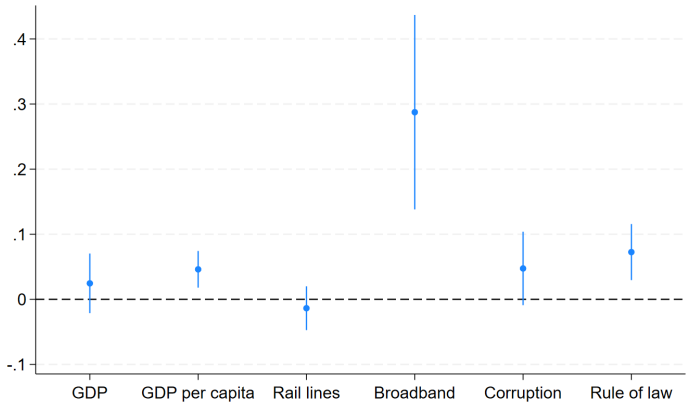
where $Y_{it}$ is one of the four attributes of country $i$ in year $t$, and $D_{it}$ is equal to one if country $i$ participates in the BRI in year $t$ and zero otherwise. Figure 3 shows that participation in the BRI has a positive and significant effect on real GDP per capita (a measure of productivity), the number of broadband subscribers (ICT infrastructure), and the rule of law index. The results from the staggered DID estimation shown in Figure A3 in the Appendix are similar to those from the simple DID. Accordingly, we employ these three variables that are found to be improved by the BRI, as wella s nominal GDP, a standard factor of FDI, as the covariates in equation (9).

In alternative specifications, we incorporate source country-year and host country-year fixed effects that capture any unobservable time-varying attribute of each of the two countries and thus are often included in recent gravity models (Baltagi et al., 2014; Greaney and Kiyota, 2020):

$$\text{arcsinh}(FDI_{ijt}) = \lambda_{ij} + \lambda_{it} + \lambda_{jt} + \sum_c \sum_{e=2013}^{2021} \sum_l \tilde{\tilde{\beta}}_{cel} D_j^e D_i^c D_{jt}^l + \epsilon_{ijt}. \tag{11}$$

In this equation, the effect of the BRI on FDI through any host country-specific factor caused by the BRI is absorbed in $\lambda_{jt}$. Therefore, $\tilde{\tilde{\beta}}_{cel}$ reflects a change in FDI from country $c$ through country pair-specific factors, including bilateral relationships, due to the host country's participation in the BRI. By

Figure 3: Effect of the BRI on various attributes of the host country




Notes: This figure shows the average treatment effect and its 95-percent confidence interval estimated from a simple DID, assuming that the treatment is given one year before signing an MOU. The outcome variables on the horizontal axis from left to right indicate nominal GDP (log), real GDP per capita (PPP, log), total rail lines (km, log), the number of broadband subscribers (log), the index of less corruption, and the index of rule of law. All outcome variables are taken from the World Development Indicators of the World Bank.

comparing $\beta_{cel}$, $\tilde{\beta}_{cel}$, and $\tilde{\tilde{\beta}}_{cel}$, we can infer channels of the effect of the BRI on FDI from each source country.

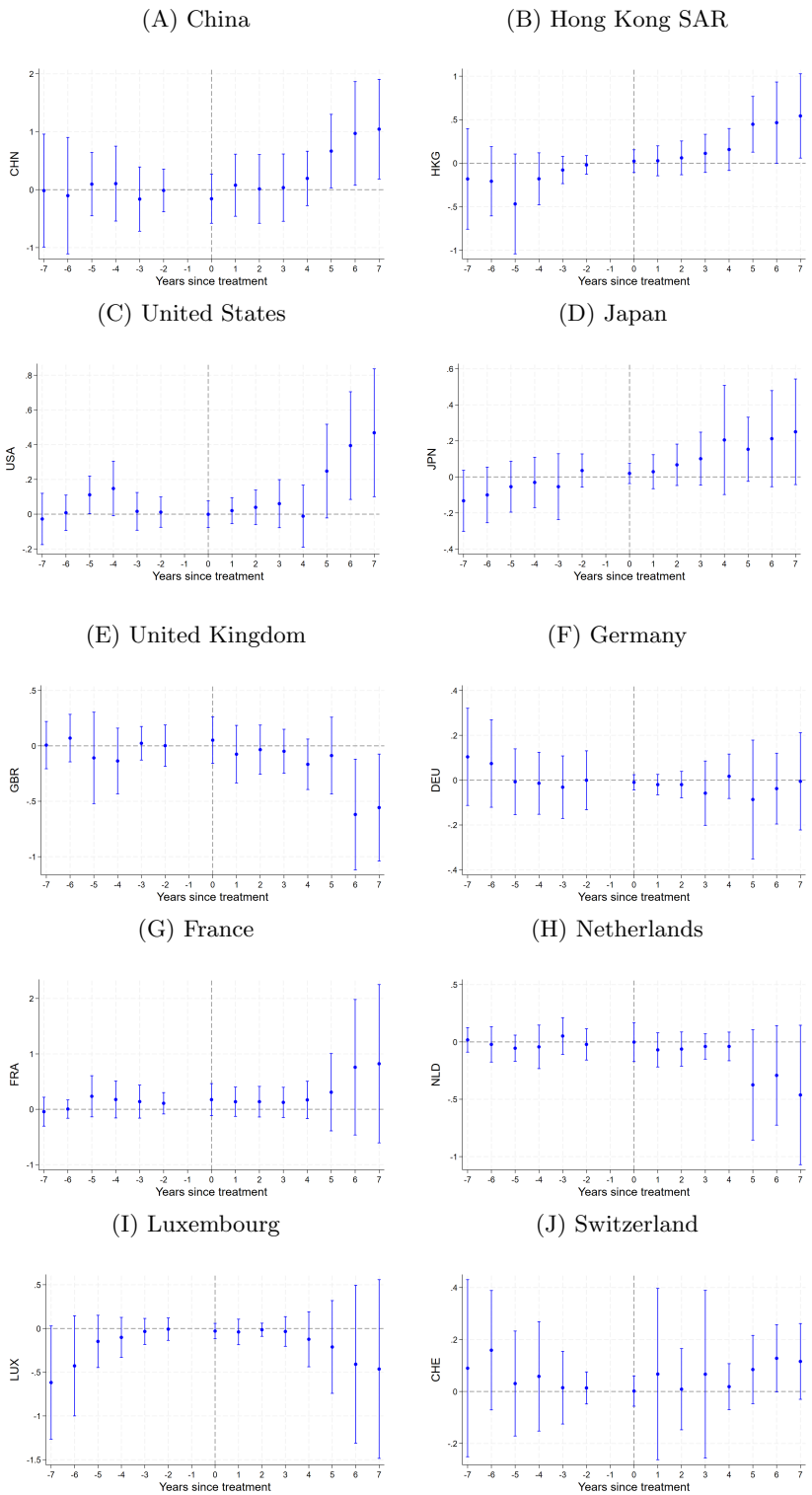
# 5 Results

## 5.1 Benchmark results from staggered DID

To examine the dynamic effect of the BRI on FDI, we apply the staggered DID event study estimation of Sun and Abraham (2021) to equation (7); i.e., we assume heterogeneity of the effect across cohorts. The dynamic effects of the BRI on FDI from each of the top 10 source countries estimated from the staggered DID event study estimations with the amendments above are shown in each panel of Figure 4. We show the effect of the BRI from seven years before the treatment to seven years after the treatment because the number of treated observations out of this time range is small, leading to large estimated standard errors. In all panels, the effect of the BRI on FDI in the pre-treatment period is statistically insignificant and shows no clear trend. Panels (A), (B), (C), and (J) indicate that the average effect of participating in the BRI on FDI from China, Hong Kong SAR, the US, and Switzerland, respectively, to BRI partners is positive and significant at the 5-percent level 4–6 years after participation. In Panels (D) and (G), we find a positive effect of the BRI on FDI from Japan and France, respectively, although the effect is not significant at the 5-percent level. In contrast, Panels (E), (H), and (I) find a negative and significant effect on FDI from the UK and a negative but insignificant effect on FDI from the Netherlands and Luxembourg. The effect on FDI from Germany (Panel [F]) is insignificant and shows no clear trend. The size of the BRI effect on FDI from some countries is quite large. For example, FDI from China

to BRI partner countries almost doubled 5–6 years after the countries signed an MOU. FDI from Hong Kong SAR and the US increased by approximately 40–60 percent on average because of the BRI.

Figure 4: Staggered DID effect of the BRI on FDI inflows from the top 10 source countries: Controlling for GDP of source and host countries and country-pair and year fixed effects




Notes: These figures show the average treatment effect on FDI from the top 10 source countries, using the staggered DID estimation of Sun and Abraham (2021) and assuming that the treatment is given one year before signing an MOU. The reference year where the effect is set to zero is one year before the treatment. Standard errors are clustered at the country-pair level. Each vertical line shows the confidence interval at the 95% level.

To check the robustness of the results, we experiment with an alternative samples in which Hong Kong SAR is integrated into mainland China, as argued in Section 3. In the alternative sample, China's FDI is defined as the sum of the FDI of China and Hong Kong SAR, whereas the measures of governance for China are used for the integrated entity. In addition, in the baseline estimations, we treated participation in the BRI as the treatment and thus FDI to China and Hong Kong SAR as control observations. This may have biased our baseline results because FDI to China and Hong Kong SAR may be intrinsically different from FDI to other non-BRI countries. Therefore, we also check the robustness of the baseline results by dropping country-pairs for which the host country is either China or Hong Kong SAR. The results from the two alternative samples are shown in Appendix Figures A4 and A5, confirming the baseline results.

In addition, we estimate the DID event study model represented by equation (6) that does not assume heterogeneity in the BRI effect across cohorts (participation years) to examine possible differences from the staggered DID estimation and show the results in Figure A6 in the Appendix. We find that although the overall trends of the point estimates for each source country are not very different between the results of the two methods, their statistical significance often differs. For example, while the post-treatment effect of the BRI on FDI from China and Hong Kong SAR is positive and significant in both models, the significantly positive and negative effect on FDI from the US and the UK, respectively, in the staggered DID estimation becomes insignificant in the event study DID. This difference can be explained by substantial heterogeneity in the BRI effect across cohorts found in the staggered DID analysis, justifying the use of the staggered DID in this study.

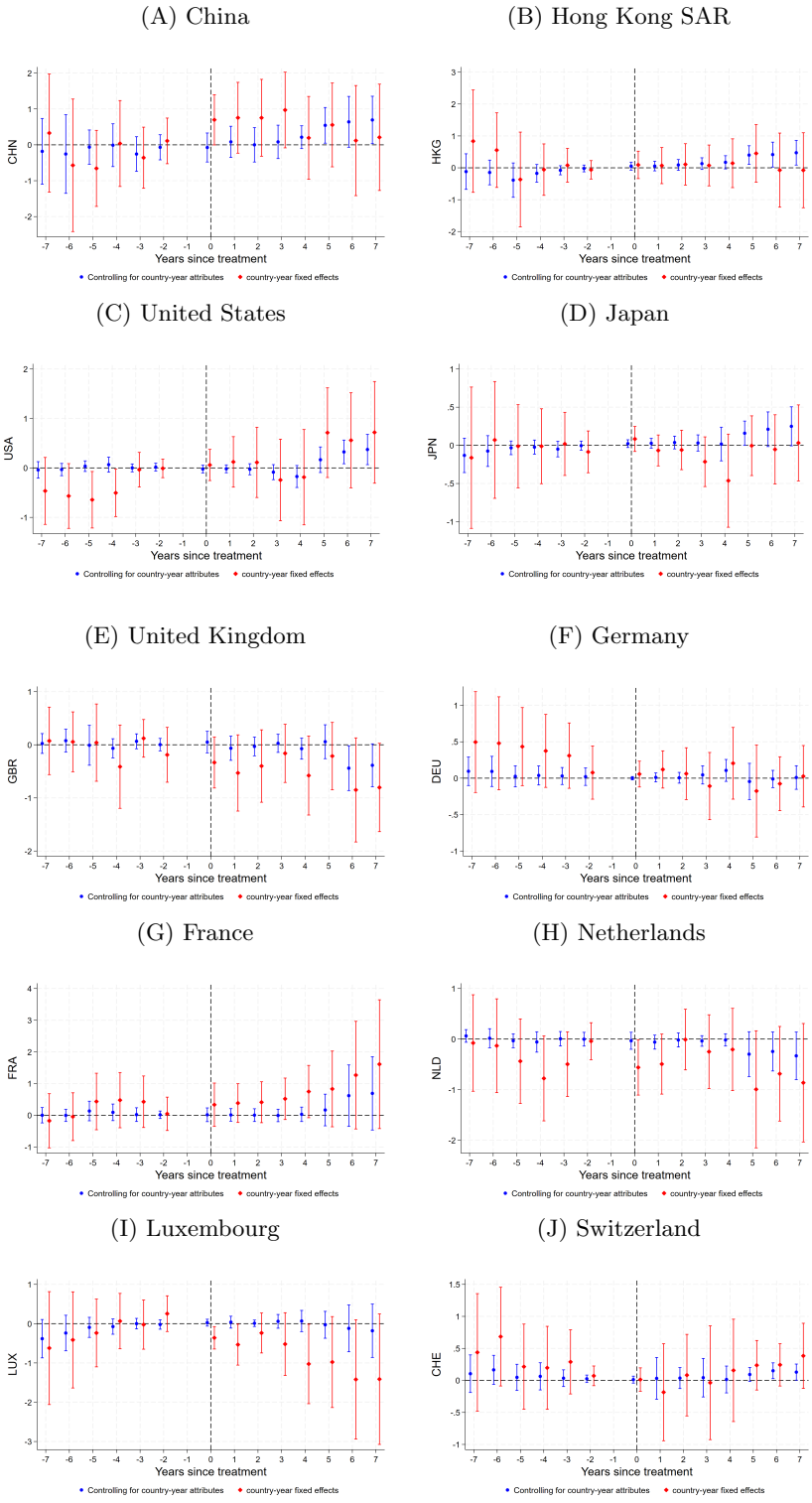
## 5.2 Mechanisms

As we discussed in Sections 4.1 and 4.3, FDI in BRI countries may increase because of the improvements in productivity, infrastructure, and governance shown in Figures 3 and A3. To test if these are the channels of the BRI effect on FDI, we incorporate measures of these channels, i.e., real GDP per capita in logs, the number of broadband subscribers in logs, and the index of rule of law of the host country, into the estimation, as shown in equation (9).

The blue dots and lines in Panels (A)-(D) and (J) of Figure 5 indicate that signing an MOU for the BRI has a positive and significant effect on FDI from China, Hong Kong SAR, the US, Japan, and Switzerland, even after controlling for those potential factors of FDI, whereas Panel (E) shows a negative effect on FDI from the UK. FDI from other countries is not significantly affected by the BRI. In short, the positive and negative effects of the BRI on FDI from some of the top 10 countries remain when we additionally control for the measures of productivity, infrastructure, and governance. Therefore, we conclude that the BRI promotes FDI from China, Hong Kong SAR, the US, Japan, and Switzerland not through the improvement of these measures in the host countries but because of other uncontrolled

factors.

Figure 5: Staggered DID effect of the BRI on FDI inflows from the top 10 selected source countries: Controlling for source and host country-year attributes or fixed effects




Notes: These figures show the average treatment effect on FDI from the top 10 source countries, using the staggered DID estimation of Sun and Abraham (2021) and assuming that the treatment is given one year before signing an MOU. The blue (red) dots and lines indicate results obtained by controlling for source and host country-year attributes (fixed effects). The reference year where the effect is set to zero is one year before the treatment. Standard errors are clustered at the country-pair level. Each vertical line shows the confidence interval at the 95% level.

Thus, we further employ source and host country-year fixed effects in the estimation (equation [11]) to control for any country-year specific factor that is not controlled for in the previous estimations (equation 9). The results shown by red dots and lines in Figure 5 demonstrate that the effect of the BRI on FDI from any country is insignificant at the 5-percent level after controlling for source and host country-year fixed effects. However, when we focus on the overall trends of point estimates after the treatment, leaving the statistical significance aside, several notable findings emerge. First, the average coefficient of FDI from China is positive and weakly significant from 0 to 3 years after the treatment (the $p$ value is 5.1 percent for the year of the treatment and 7.1 percent 3 years later), implying that FDI from China may increase for at least a few years because of changes in bilateral relationships due to the BRI. Second, we find an upward trend in FDI from the US, Switzerland, and France and a downward trend in FDI from the UK, Luxembourg, and the Netherlands several years after participating in the BRI. Moreover, the absolute values of the point estimates in the post-treatment periods are larger for the US, France, Switzerland, the UK, the Netherlands, and Luxembourg when country-year fixed effects are controlled for (red dots) than when only country-year attributes are (blue), whereas this tendency is the opposite for Japan.

These findings provide evidence that a country signing an MOU for the BRI affects the level of FDI in the BRI country because of changes in bilateral relationships with the source country, in addition to improvements in infrastructure, productivity, market size, and governance in the BRI country. The direction of the effect varies depending on how the bilateral relationship is affected by the BRI through the three channels outlined in Section 4.1, namely, strategic competition with China, investment cooperation with China, and the mitigation of risks of supply chains with countries friendly to China. By the total effect and its possible reasons, countries can be categorized into the following four types.

First, the positive effect on FDI from the US, which has signed no MOU with China for third-party market cooperation (Zhang, 2019), implies that US firms increase investment in BRI countries by following the policy support of the US government to strategically compete with China in BRI countries, such as BDN, BUILD, and B3W (Savoy and McKeown, 2022), as explained in Section 4.1. Although the US government also encourages friendshoring to like-minded countries (Todo and Inoue, 2021) and thus may discourage investment in countries closely linked with China, the positive effect through strategic competition is more likely to surpass the negative effect through risk mitigation.

Second, FDI from France and Switzerland to BRI countries has increased because the governments and private firms of both countries have signed several MOUs with China for third-party market cooperation and conducted investment jointly with China in BRI countries, particularly in Africa (Zhang, 2019). Notably, France is engaged in cooperation with China most extensively among European countries (Yun et al., 2024; Xu, 2022). For example, Alstom France and China Water Conservancy and Hydro Power Group cooperate for hydropower projects in Uganda, Ghana, and Cote d'Ivoire. Additionally, the

CMA CGM of France and the MSC Cruises of Switzerland collaborate with Hunan Road & Bridge for an infrastructure project in Benin (Yun et al., 2024). These examples support the positive effect of the BRI on FDI from the two countries.

Third, FDI from three other European countries, namely, the UK, the Netherlands, and Luxembourg, shows a downward trend in FDI in BRI countries. Although the UK and the Netherlands have signed an MOU with China for third-party market cooperation (Zhang, 2019), they take a cautious approach to address China. For example, the UK government's view of China and its BRI shifted from positive to substantially negative in 2019, formally stating "systemic challenges" from China as the reason for this shift Ashbee (2024). The Dutch government published "The Netherlands-China: A New Balance" in 2019 to emphasize cautious engagement with China, particularly in critical economic sectors (Brancaccio, 2024). Therefore, these countries may account for the geopolitical risks of supply chains with unfriendly BRI countries more seriously than others do.

Finally, FDI from Japan or Germany does not show an upward or downward trend after controlling for country-year fixed effects, implying that the positive effect through third-party market cooperation and the negative effect through minimizing supply chains with unfriendly BRI countries cancel each other out. Although Japan has signed an MOU with China for third-party cooperation, practical cooperation between the two is reported to have faced challenges because of political interference and potential economic risks in BRI countries (Su et al., 2020; Zhang, 2021). Although many German companies, including Siemens and GAUFF, have collaborated with Chinese companies, the German government has not signed an MOU with China for third-party market cooperation (Yun et al., 2024). These observations are in line with the lack of a positive effect of the BRI on FDI. We observe a positive and significant effect of the BRI on FRI from Japan when we control for attributes of the host country (blue dots and lines in Panel [D] of Figure 5). The different results between estimations using country attributes and country-year fixed effects suggest that FDI from Japan to BRI countries is seen as increasing because of changes in attributes of the host country that are not explicitly controlled for by our measures of productivity, ICT infrastructure, and governance, such as improvements in transport infrastructure and systems for investment.

### 5.3 Heterogeneity across democracy levels

Next, we examine possible heterogeneity in the effect of the BRI on FDI inflows. In particular, we are interested in heterogeneity across different levels of democracy of host countries because the BRI has targeted autocratic countries more than democratic countries. As Table 2 shows, approximately two-thirds of BRI partner countries are autocratic countries, defined by the average of the seven core indices of democracy (ranging from 0–1) in the V-Dem dataset. One reason for the bias toward autocratic countries is that because China itself is autocratic (its democracy index was 0.094 in 2009 and 0.068 in 2021), China

prefers to be linked with autocratic countries. In contrast, democratic countries, such as the US and Japan, are hesitant to sign an MOU for the BRI with China. Another reason is that level of democracy is positively correlated with income level, except for some oil-producing countries, such as Qatar and Saudi Arabia (Figure A7 in the Appendix). Thus, poor and autocratic countries are more willing than rich and democratic countries to sign an MOU for the BRI, which may promote infrastructure development and FDI from China. Because of the systematic differences between democratic and autocratic countries, the impact of the BRI on FDI inflows may differ between the two types. Therefore, we divide the sample into two subsamples, namely, one consisting of countries with an average democracy level of 0.5 or higher in 2009 and the other consisting of other countries; then, we conduct the same staggered DID event study analysis via equation (7).

Table 2: Number of BRI and non-BRI countries by democracy levels

| | Autocratic countries | Democratic countries | Total |
|---|---|---|---|
| BRI countries | 93 | 52 | 145 |
| Non-BRI countries | 15 | 52 | 69 |
| Total | 108 | 106 | 214 |

Notes: Democratic countries are defined as those whose democracy index in 2009 taken from V-Dem was smaller than 0.5 (the index ranges from 0 [most autocratic] to 1 [most democratic]). BRI countries are defined as those which signed an MOU for the BRI with China during the 2009 2021 period.

We focus on the results for FDI from the US and Japan shown in Figure 6 because the effects on FDI from the two countries to democratic and autocratic countries are quite different from each other, whereas the difference is unclear for the other top 10 source countries, as presented in Figure A8 in the Appendix. In each panel of the figure, the blue points and lines indicate the effects of FDI on democratic countries, whereas the red points and lines represent autocratic countries. Panels (A1) and (A2) of Figure 6 indicate that the effect of the BRI on FDI from the US and Japan to autocratic countries is positive and significant 5–6 years after their participation, whereas the effect on FDI from the two countries to democratic countries is not significant at any significance level or does not show any upward trend in the post-BRI period. In addition, the point estimates are substantially larger for the effect on FDI in autocratic countries than in democratic countries.

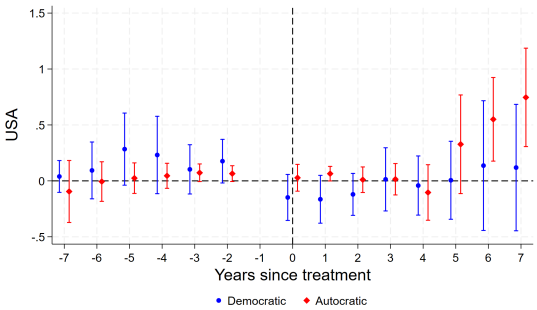
As in Section 5.1, we incorporate into the set of control variables, i.e., measures of productivity (real GDP per capita), infrastructure (the number of broadband subscribers), and governance (the index of rule of law), to highlight the effect of the BRI on FDI inflows not through improvements in these factors (equation [9]). Panels (B1) and (B2) of Figure 6 illustrate that the effect of FDI from the US and Japan is essentially the same as that shown in Figure 6, suggesting that the effect of the BRI on FDI from these two countries to autocratic countries is not necessarily driven through improvements in productivity, infrastructure, or governance, as found in Section 5.1.

Furthermore, when we incorporate source and host country-year fixed effects into the estimation

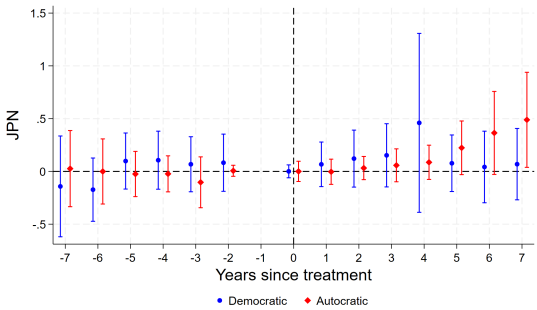
Figure 6: Staggered DID effect of the BRI on FDI from the US and Japan to democratic and autocratic countries

(A) Controlling for GDP of source and host countries and country-pair and year fixed effects

(A1) From the US

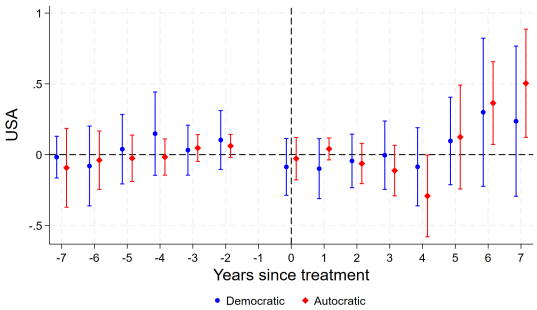



(A2) From Japan

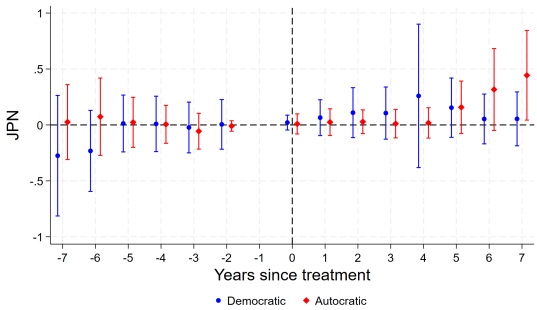



(B) Controlling for attributes of source and host countries

(B1) From the US

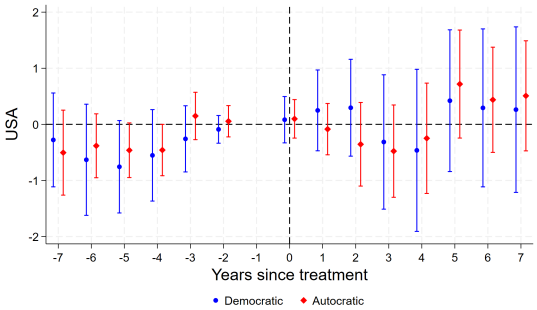



(B2) From Japan

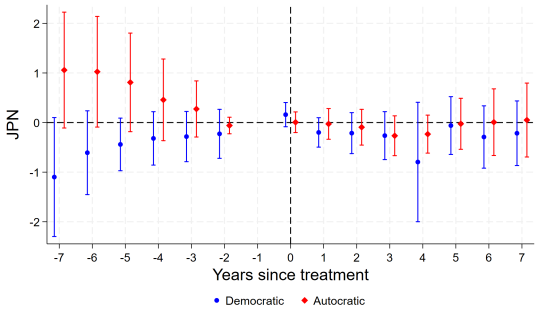



(C) Controlling for country-pair and country-year fixed effects

(C1) From the US




(C2) From Japan




Notes: These figures show the average treatment effect on FDI from the US and Japan to democratic (blue dots and lines) and autocratic countries (red), using the staggered DID estimation of Sun and Abraham (2021) and assuming that each treatment is given one year before signing an MOU. The reference year is one year before the treatment. Standard errors are clustered at the country-pair level. Each vertical line shows the confidence interval at the 95% level. Democratic countries are defined by countries whose average democracy score (0–1) of V-Dem was 0.5 or higher in 2009. The results for the other top 10 source countries are provided in Figures A8, A9, and A10 in the Appendix.

(equation [11]), we find no significant effect of the BRI on FDI from any country to either democratic or autocratic countries (Panels [C1] and [C2] of Figure 6). However, the point estimate of the effect on

FDI from the US to autocratic countries 5–7 years after the treatment is positive and larger than that to democratic countries, although the difference is not statistically significant.

These findings are in line with our interpretation outlined in Section 5.2 that the US invests in BRI countries to strategically compete with China. Because autocratic BRI countries are more likely to strengthen their economic and political ties with China than democratic BRI countries, the US is mobilized to invest in autocratic countries more.

In contrast, the effect on FDI from Japan is close to zero and not different between democratic and autocratic countries. Therefore, the positive effect on FDI from Japan to autocratic countries found in Panel (B) of Figure 6 may be the result of changes in the characteristics of host countries due to the BRI, which are controlled for by country-year fixed effects in Panel (C) of Figure 6. This conclusion is also consistent with our previous conclusion from the comparison between the blue and red dots and lines in Figure 5.

# 6 Conclusion

This paper investigates the impact of the Belt and Road Initiative (BRI) on foreign direct investment (FDI) from China and other top 10 source countries, including the United States, the United Kingdom, Germany, and Japan, to BRI countries. We apply staggered difference-in-differences (DID) event study estimations to a gravity model. Our contributes to the literature are threefold. First, we estimate the effect of the BRI on FDI from countries other than China. Second, to highlight the mechanisms of the BRI effect on FDI from non-China countries, we distinguish between the effects of the BRI through changes in the characteristics of the host country and changes in the bilateral relationships between the source and host countries by utilizing country attributes and fixed effects at various levels. Changes in host country characteristics include improvements in productivity and infrastructure, whereas bilateral relationships are affected by strategic competition and investment cooperation with China and the mitigation of risks in supply chains with BRI countries closely linked with China. Finally, we examine the heterogeneous effects of the BRI on FDI in democratic and autocratic countries.

Our results using country-pair and year fixed effects show that signing an MOU for the BRI with China significantly affects FDI from China and Hong Kong SAR to BRI countries, which is consistent with results from the literature. We also find a positive and significant effect of the BRI on FDI from the US and Switzerland and a negative and significant effect on FDI from the UK several years after participating in the BRI. We observe an upward trend of FDI from Japan and France and a downward trend of FDI from the Netherlands and Luxembourg in the post-BRI period, although these effects are not statistically significant. We further control for source and host country fixed effects and still observe an upward post-BRI trend in FDI from the US, Switzerland, and France and a downward trend in FDI

from the UK, the Netherlands, and Luxembourg. Country-year fixed effects represent effects through changes in any characteristic of the host country due to the BRI, including market size, productivity, infrastructure, and governance. Therefore, these results from estimations with country-year fixed effects imply that changes in bilateral relationships due to the BRI have affected FDI from some non-China countries.

From anecdotal evidence of policies and business practices, we conclude that the US has increased its FDI in BRI countries to strategically compete with China over the economic and political presence there. France and Switzerland have done so because of their active cooperation with China in private investment in BRI countries, particularly in Africa. By contrast, the UK and the Netherlands, which have taken a cautious approach to relationships with China, have decreased their FDI in BRI countries, possibly to reduce the risk of supply chains with countries close to China. While FDI from Japan to the BRI has increased, this is possibly because of changes in host country characteristics rather than changes in bilateral relationships.

Furthermore, when we distinguish between subsamples depending on whether the host country was initially democratic or autocratic, we find that FDI from the US to autocratic BRI countries has increased more than FDI to democratic countries has not. This finding confirms our conclusion that the US has increased its FDI in BRI countries because of strategic competition with China.

Finally, we note several caveats of this paper. First, although our estimations using source and host country-year fixed effects show an upward or downward trend in FDI from several source countries after participating in the BRI, the effect is often insignificant at the 5-percent level because of large standard errors, suggesting substantial heterogeneity in the BRI effect. Although we examine heterogeneity depending on the level of democracy, there could be other sources of heterogeneity. Examining heterogeneity more deeply may reveal more significant effects of the BRI. Second, our analysis reveals that changes in bilateral relationships have affected FDI from non-China countries to BRI countries and suggests different reasons for such changes, i.e., strategic competition, investment cooperation, and the mitigation of supply chain risk, on the basis of anecdotal evidence. However, quantitative analysis could provide clearer evidence for the mechanism for each country. Finally, this study does not consider spillover effects, i.e., a possible negative effect of a host country's participation in the BRI on FDI in non-BRI countries due to diversion from non-BRI countries to BRI countries. Therefore, the estimated effect of the BRI in this study should be interpreted as the net effect of the BRI, i.e., the pure effect of the BRI on FDI from a source country to a BRI country minus the average spillover effect on FDI from the source country to non-BRI countries. We leave these issues for future research.

# References


Alfaro, L., Chor, D., 2023. Global supply chains: The looming "great reallocation". NBER Working Paper, No. 31661, National Bureau of Economic Research.

Ashbee, E., 2024. The united kingdom, the belt and road initiative, and policy amalgams. Asia Europe Journal 22, 1–21.

Baltagi, B. H., Egger, P. H., Pfaffermayr, M., 2014. Panel data gravity models of international trade. CESifo Working Paper Series, No. 4616, Center for Economic Studies, ifo Institute.

Banerjee, S., Dutta, A., 2023. The United States and China: The Strategic Competition and Response, pp. 46–62. Routledge.

Brancaccio, L., 2024. China-Netherlands Relations: Bilateral Trade and Investments Overview. China Briefing, https://www.china-briefing.com/news/china-netherlands-relations-bilateral-trade-and-investments-overview/.

Callaway, B., Sant'Anna, P. H., 2021. Difference-in-differences with multiple time periods. Journal of econometrics 225(2), 200–230.

Carr, D. L., Markusen, J. R., Maskus, K. E., 2001. Estimating the knowledge-capital model of the multinational enterprise. American Economic Review 91(3), 693–708.

Chen, M. X., Lin, C., 2020. Geographic connectivity and cross-border investment: The belts, roads and skies. Journal of Development Economics 146, 102469.

Chen, Y., 2024. Technology transfer on the belt and road: Pathways for structural transformation in ethiopia's standard gauge railways. The European Journal of Development Research pp. 1–27.

Cheng, L. K., Kwan, Y. K., 2000. What are the determinants of the location of foreign direct investment? the Chinese experience. Journal of International Economics 51(2), 379–400.

Czernich, N., Falck, O., Kretschmer, T., Woessmann, L., 2011. Broadband infrastructure and economic growth. The Economic Journal 121(552), 505–532.

Donaldson, D., 2018. Railroads of the Raj: Estimating the impact of transportation infrastructure. American Economic Review 108(4-5), 899–934.

Donaubauer, J., Meyer, B., Nunnenkamp, P., 2016. Aid, infrastructure, and FDI: Assessing the transmission channel with a new index of infrastructure. World Development 78, 230–245.

Du, J., Zhang, Y., 2018. Does one belt one road initiative promote chinese overseas direct investment? China Economic Review 47, 189–205.

Faeth, I., 2009. Determinants of foreign direct investment–a tale of nine theoretical models. Journal of Economic surveys 23(1), 165–196.

Goodman-Bacon, A., 2021. Difference-in-differences with variation in treatment timing. Journal of Econometrics 225(2), 254–277.

Greaney, T. M., Kiyota, K., 2020. The gravity model and trade in intermediate inputs. World Economy 43(8), 2034–2049.

Hayakawa, K., Mukunoki, H., Yang, C.-h., 2020. Liberalization for services fdi and export quality: Evidence from china. Journal of the Japanese and International Economies 55, 101060.

Huang, Y., 2016. Understanding China's Belt & Road initiative: motivation, framework and assessment. China Economic Review 40, 314–321.

Inoue, H., Todo, Y., 2023. Disruption of international trade and its propagation through firm-level domestic supply chains: A case of japan. PLOS ONE 18(11), e0294574.

International Monetary Fund, 2023. Coordinated Direct Investment Survey (CDIS). Data Set.

Kang, L., Peng, F., Zhu, Y., Pan, A., 2018. Harmony in diversity: Can the One Belt One Road Initiative promote China's outward foreign direct investment? Sustainability 10, 3264.

Khadaroo, A., Seetanah, B., 2010. Transport infrastructure and foreign direct investment. Journal of International Development: The Journal of the Development Studies Association 22(1), 103–123.

Li, M., 2021. The BRI: fuelling strategic rivalry between China and the United States, pp. 416–425. Edward Elgar Publishing.

Li, Y., Yang, M., Zhu, L., 2021. Fdi, export sophistication, and quality upgrading: Evidence from china's wto accession. Japan and the World Economy 59, 101086.

Liu, Z., Schindler, S., Liu, W., 2020. Demystifying Chinese overseas investment in infrastructure: Port development, the Belt and Road Initiative and regional development. Journal of Transport Geography 87, 102812.

Markusen, J. R., Venables, A. J., 1998. Multinational firms and the new trade theory. Journal of International Economics 46(2), 183–203.

Nedopil, C., 2024. China belt and road initiative (BRI) investment report 2023. Griffith Asia Institute, Griffith University, https://www.griffith.edu.au/__data/assets/pdf_file/0033/1910697/Nedopil-2024-China-Belt-Road-Initiative-Investment-report.pdf.

Nedopil Wang, C., 2022. China belt and road initiative (BRI) investment report 2021. Green Finance & Development Center, Fanhai International School of Finance, Fudan University, https://greenfdc.org/wp-content/uploads/2022/02/Nedopil-2022_BRI-Investment-Report-2021.pdf.

Nugent, J. B., Lu, J., 2021. China's outward foreign direct investment in the Belt and Road initiative: What are the motives for Chinese firms to invest? China Economic Review 68, 101628.

Qi, S.-Z., Peng, H.-R., Zhang, Y.-J., 2019. Energy intensity convergence in belt and road initiative (BRI) countries: what role does China-BRI trade play? Journal of Cleaner Production 239, 118022.

Roth, J., Sant'Anna, P. H., Bilinski, A., Poe, J., 2023. What's trending in difference-in-differences? a synthesis of the recent econometrics literature. Journal of Econometrics .

Savoy, C. M., McKeown, S., 2022. Opportunities for increased multilateral engagement with B3W. Center for Strategic and International Studies, https://www.jstor.org/stable/pdf/resrep41412.pdf.

Shao, X., 2020. Chinese OFDI responses to the B&R initiative: Evidence from a quasi-natural experiment. China Economic Review 61, 101435.

Soy, A., 2024. Biden's Angola visit aims to showcase his attempts to rival China. BBC, December 3, 2024, https://www.bbc.com/news/articles/cpq9jyv827do.

Su, E., Xue, J., Xu, Y., 2020. Third-party market cooperation between China and Japan in ASEAN under "the Belt and Road" initiative: background, opportunities and challenges. Annual Review of Economics, Nagasaki University 36, 67–81.

Sun, L., Abraham, S., 2021. Estimating dynamic treatment effects in event studies with heterogeneous treatment effects. Journal of Econometrics 225(2), 175–199.

Todo, Y., Inoue, H., 2021. Geographic diversification of the supply chains of japanese firms. Asian Economic Policy Review 16(2), 304–322.

Tritto, A., 2022. How Indonesia Used Chinese Industrial Investments to Turn Nickel into the New Gold. Carnegie Endowment for International Peace.

V-Dem Institute, 2023. V-Dem [Country-Year/Country-Date] Dataset v13. Varieties of Democracy (V-Dem) Project.

Wang, C., Lim, M. K., Zhang, X., Zhao, L., Lee, P. T.-W., 2020. Railway and road infrastructure in the Belt and Road Initiative countries: Estimating the impact of transport infrastructure on economic growth. Transportation Research Part A: Policy and Practice 134, 288–307.

World Bank, 2019. Belt and Road Economics: Opportunities and Risks of Transport Corridors. International Bank for Reconstruction and Development/The World Bank.

World Bank, 2024. World Development Indicators. https://databank.worldbank.org/source/world-development-indicators.

Xu, X., 2022. Third-Party Market Cooperation, pp. 317–320. Routledge.

Yu, S., Qian, X., Liu, T., 2019. Belt and road initiative and Chinese firms' outward foreign direct investment. Emerging Markets Review 41, 100629.

Yun, H., Zhiqin, S., Lida, F., Qiyan, Y., Haohan, C., 2024. Everybody wins? chinese perceptions on Europe-China third-party market cooperation in Africa. Asia Europe Journal 22, 1–21.

Zhang, M., 2021. Sino-Japanese" third-market" cooperation: Policy challenges and case studies in Southeast Asia. The Journal of East Asian Affairs 34(1), 81–106.

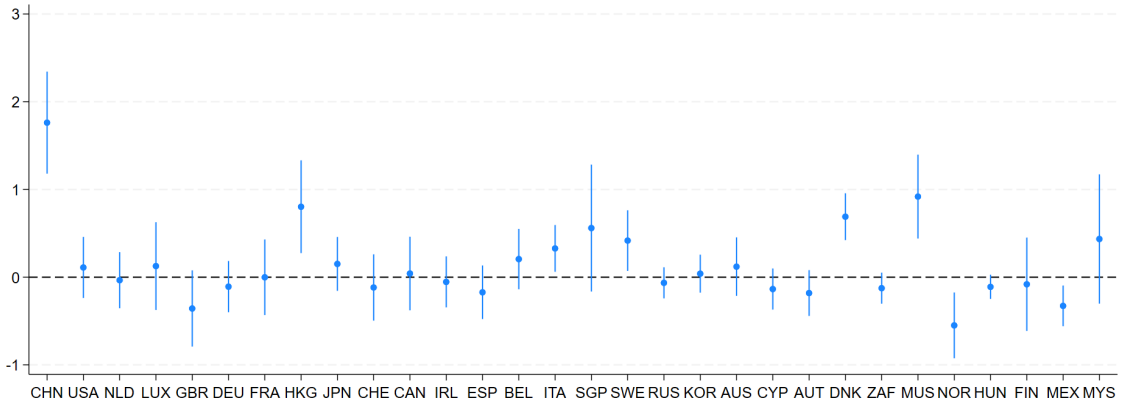
Zhang, Y., 2019. Third-party market cooperation under the belt and road initiative: Progress, challenges, and recommendations. China International Strategy Review 1(2), 310–329.

# The Impact of the Belt and Road Initiative on Foreign Direct Investment from China, the United States, and Major Investor Countries

**Yasuyuki Todo, Shuhei Nishitateno, and Sean Brown**

## Online Appendix

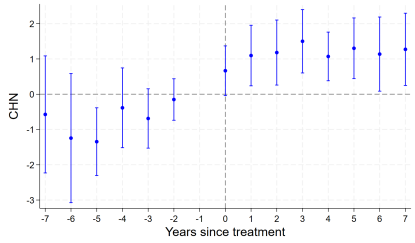
Figure A1: DID effect of the BRI on FDI inflows from the top 30 source countries: Simple DID



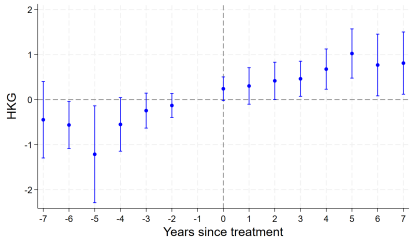

Notes: These figures show the average treatment effect on FDI from the top 10 source countries, using simple DID estimation and assuming that the treatment is given one year before signing an MOU. The reference year is one year before the treatment. Standard errors are clustered at the country-pair level. Each vertical line shows the confidence interval at the 95% level. The country names for each code on the horizontal axis are as follows: China (CHN), the US (USA), the Netherlands (NLD), Luxembourg (LUX), the UK (GBR), Germany (DEU), France (FRA), Hong Kong SAR (HKG), Japan (JPN), Switzerland (CHE), Canada (CAN), Ireland (IRL), Spain (ESP), Belgium (BEL), Italy (ITA), Singapore (SGP), Sweden, (SWE), Russia (RUS), South Korea (KOR), Australia (AUS), Cyprus (CYP), Austria (AUT), Denmark (DNK), South Africa (ZAF), Mauritius (MUS), Norway (NOR), Hungary (HUN), Finland (FIN), Mexico (MEX), and Malaysia (MYS). Countries are ordered by the total amount of FDI outflows, except for China, i.e., the tenth largest investor country, which is placed first because of its importance in the study.

Figure A2: Staggered DID effect of the BRI on FDI inflows from the top 10 source countries: Controlling for only country-pair and year fixed effects

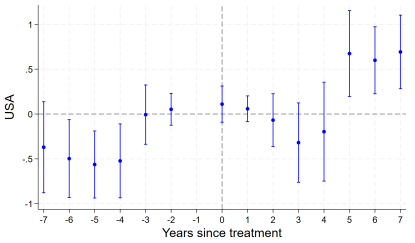
(A) China



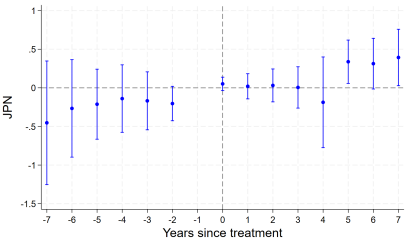

(B) Hong Kong SAR



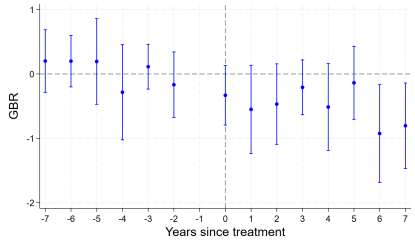

(C) United States



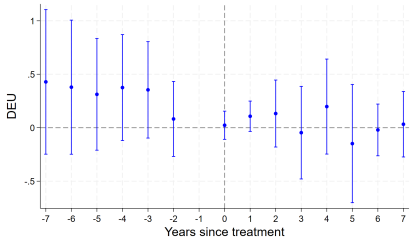

(D) Japan



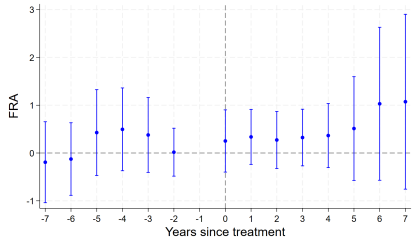

(E) United Kingdom



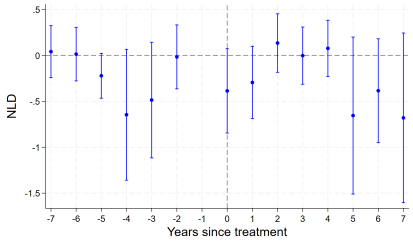

(F) Germany



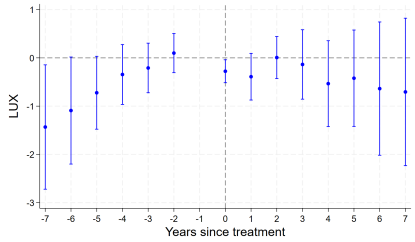

(G) France



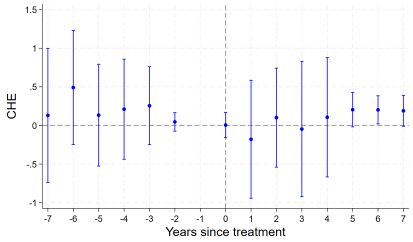

(H) Netherlands




(I) Luxembourg



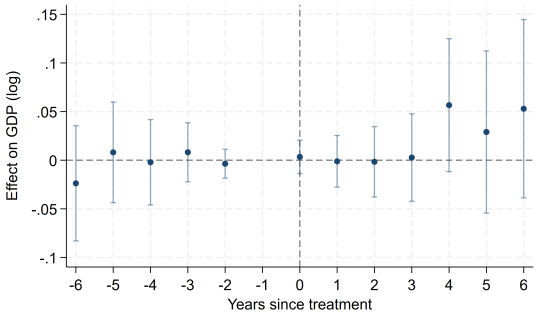

(J) Switzerland



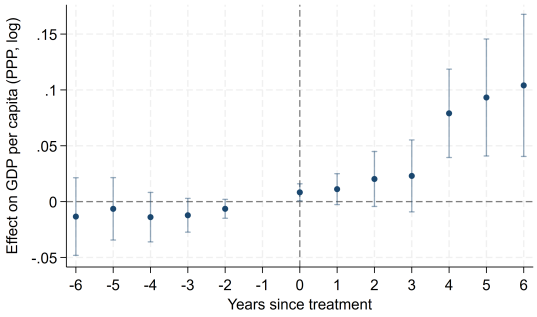

Notes: These figures show the average treatment effect on FDI from the top 10 source countries, using the staggered DID estimation of Sun and Abraham (2021) and assuming that the treatment is given one year before signing an MOU. The reference year where the effect is set to zero is one year before the treatment. Standard errors are clustered at the country-pair level. Each vertical line shows the confidence interval at the 95% level.

Figure A3: Staggered DID effect of the BRI on the attributes of partner countries

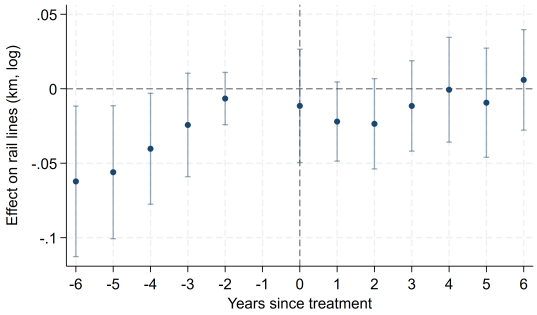
(A) Nominal GDP



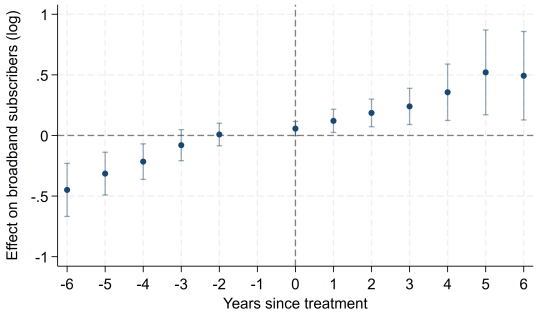

(B) Real GDP per capita (PPP)



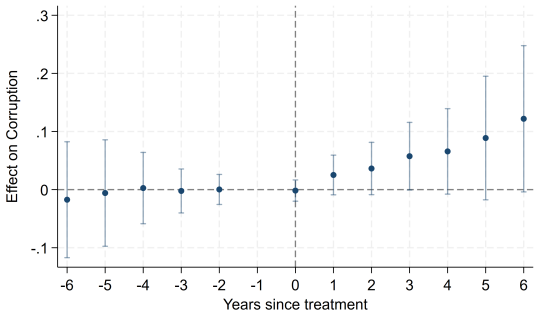

(C) Rail lines



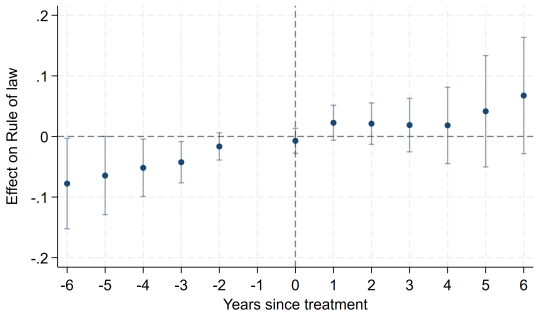

(D) Broadband subscribers




(E) Corruption (inverse)



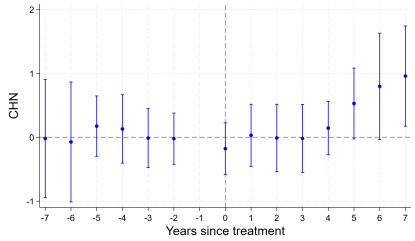

(F) Rule of law



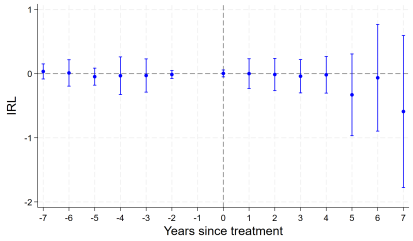

Notes: These figures show the average effect of the BRI on various attributes of partner countries, using the staggered DID estimation of Sun and Abraham (2021) and assuming that the treatment is given one year before signing an MOU for the BRI. The reference year where the effect is set to zero is one year before the treatment. Standard errors are clustered at the country-pair level. Each vertical line shows the confidence interval at the 95% level. In Panels (A)-(D), the outcome variables are in logs. In Panels (E) and (F), the variables are measures of better institutions and are normalized to range from -2.5 to 2.5. All the outcome variables are taken from the World Development Indicators of the World Bank.

Figure A4: Staggered DID effect of the BRI on FDI inflows from the top 10 source countries: Integrating Hong Kong SAR and Macau into China and controlling for GDP of host and source countries and country-pair and year fixed effects

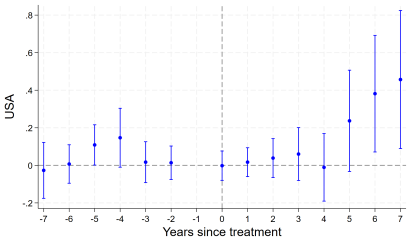
(A) China



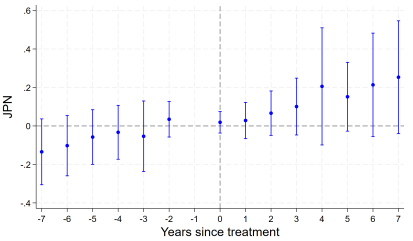

(B) Ireland



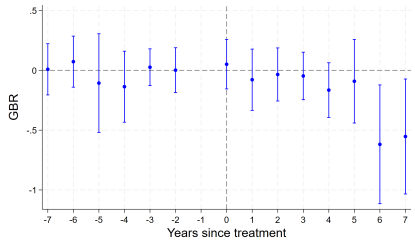

(C) United States



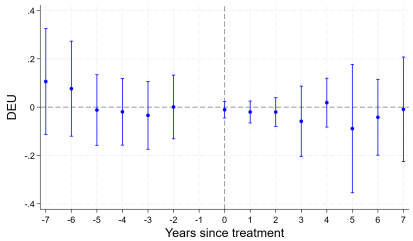

(D) Japan



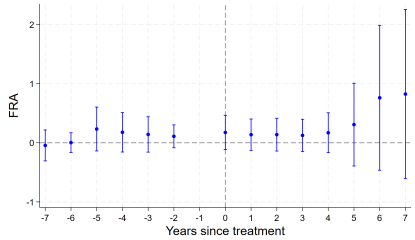

(E) United Kingdom



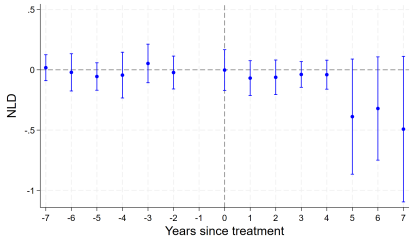

(F) Germany



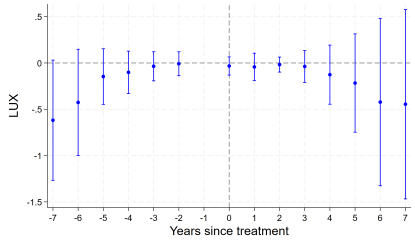

(G) France



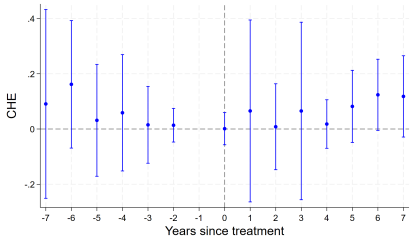

(H) Netherlands




(I) Luxembourg



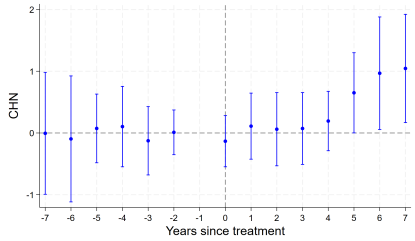

(J) Switzerland



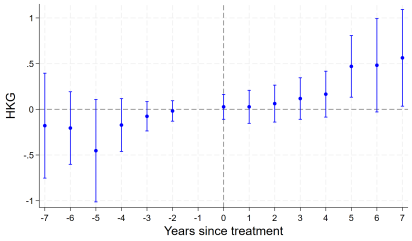

Notes: These figures show the average treatment effect on FDI from the top 10 source countries, using the staggered DID estimation of Sun and Abraham (2021),d using a sample where China and Hong Kong SAR are excluded as host countries, and assuming that the treatment is given one year before signing an MOU. The reference year where the effect is set to zero is one year before the treatment. Standard errors are clustered at the country-pair level. Each vertical line shows the confidence interval at the 95% level.

Figure A5: Staggered DID effect of the BRI on FDI inflows from the top 10 source countries: Excluding country pairs when the host country is China or Hong Kong SAR and controlling for GDP of host and source countries and country-pair and year fixed effects

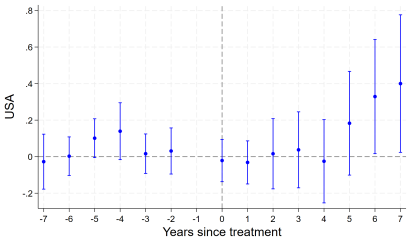
(A) China



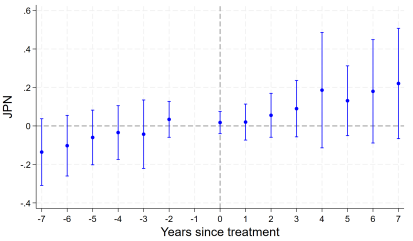

(B) Hong Kong SAR



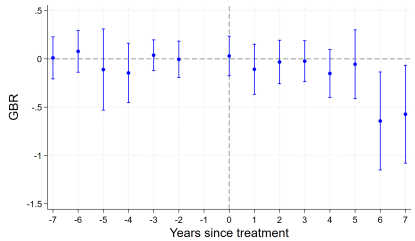

(C) United States



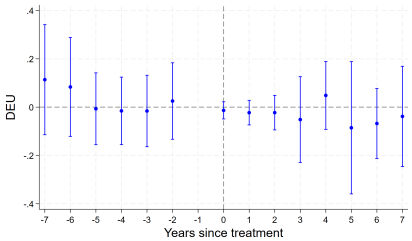

(D) Japan



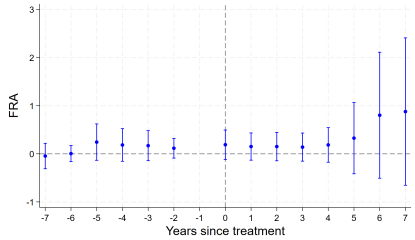

(E) United Kingdom



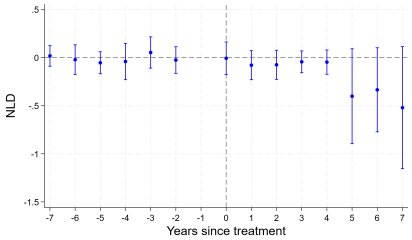

(F) Germany



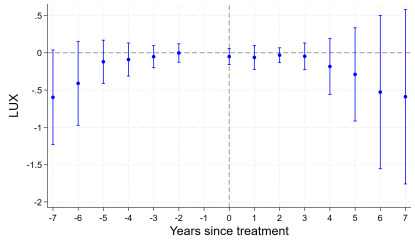

(G) France



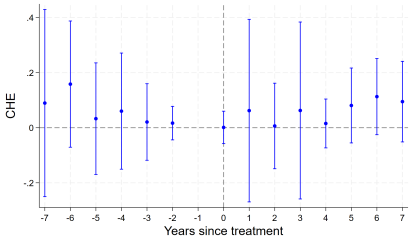

(H) Netherlands




(I) Luxembourg



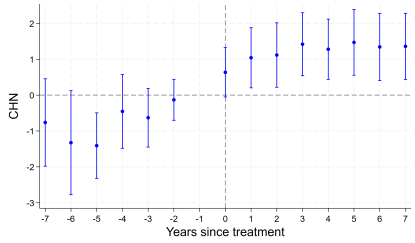

(J) Switzerland



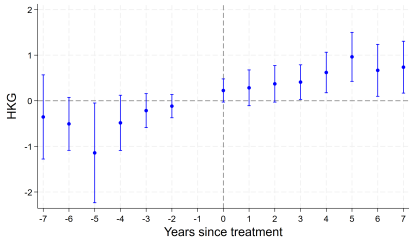

Notes: These figures show the average treatment effect on FDI from the top 10 source countries, using the staggered DID estimation of Sun and Abraham (2021), using a sample where China and Hong Kong SAR are excluded as host countries, and assuming that the treatment is given one year before signing an MOU. The reference year where the effect is set to zero is one year before the treatment. Standard errors are clustered at the country-pair level. Each vertical line shows the confidence interval at the 95% level.

Figure A6: Event-study DID effect of the BRI on FDI inflows from the top 10 source countries: Controlling for GDP of host and source countries and country-pair and year fixed effects

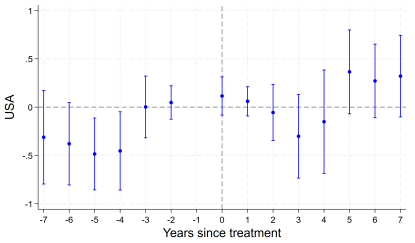
(A) China



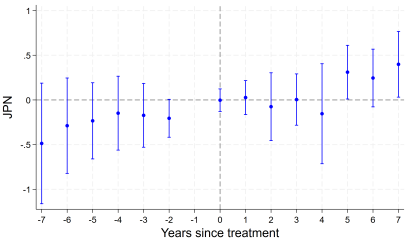

(B) Hong Kong SAR



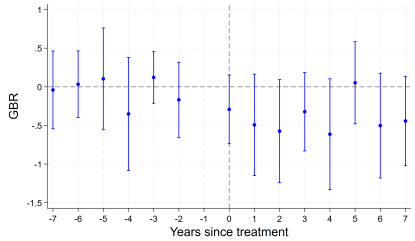

(C) United States



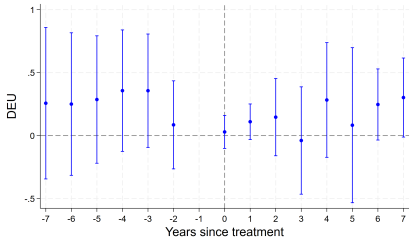

(D) Japan



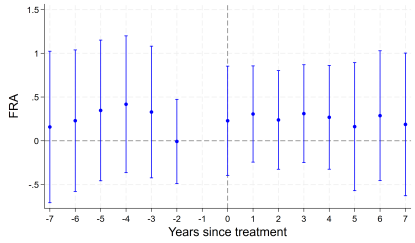

(E) United Kingdom



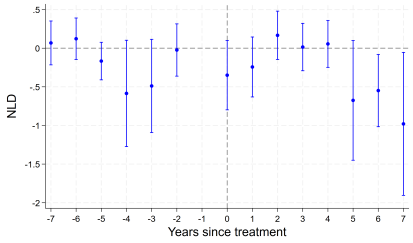

(F) Germany



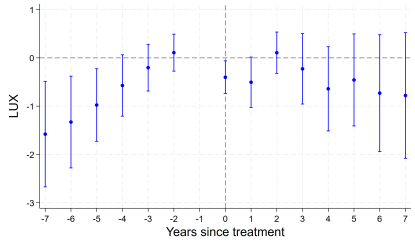

(G) France



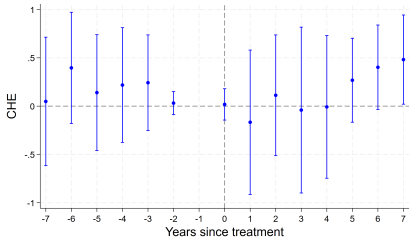

(H) Netherlands




(I) Luxembourg

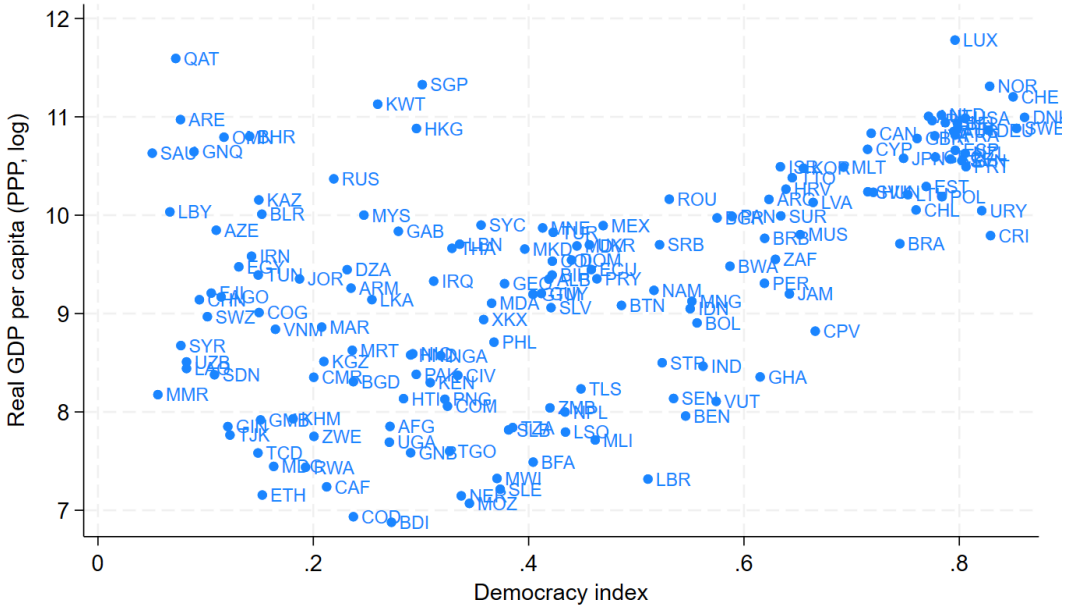



(J) Switzerland




Notes: These figures show the average treatment effect on FDI from the top 10 source countries, using an event-study DID model, rather than the staggered DID model of Sun and Abraham (2021) and assuming that the treatment is given one year before signing an MOU. The reference year where the effect is set to zero is one year before the treatment. Standard errors are clustered at the country-pair level. Each vertical line shows the confidence interval at the 95% level.

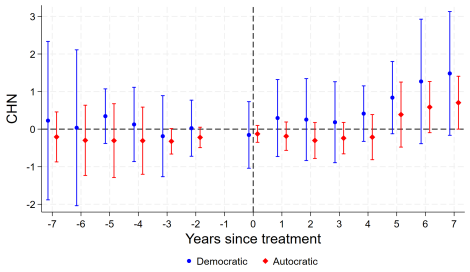
Figure A7: Correlation between real GDP per capita and the democracy level (2009)



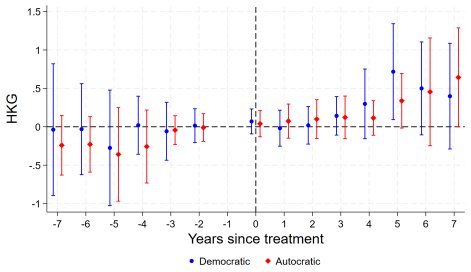

Notes: The democracy index is defined by the average democracy score (0–1) of V-Dem's seven core indices.

Figure A8: Staggered DID effect of the BRI on FDI from selected major source countries to democratic and autocratic countries: Controlling for GDP of source and host countries and country-pair and year fixed effects

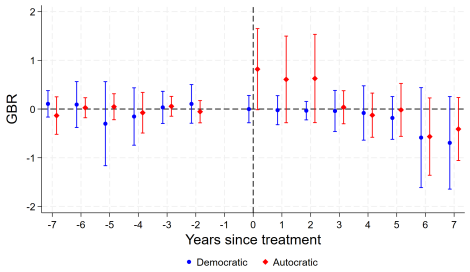
(A) From China



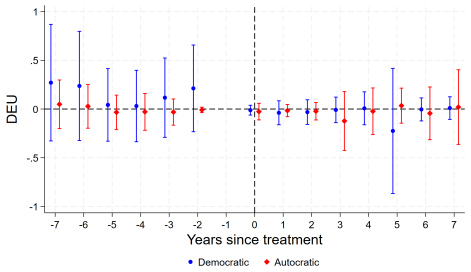

(B) From Hong Kong SAR



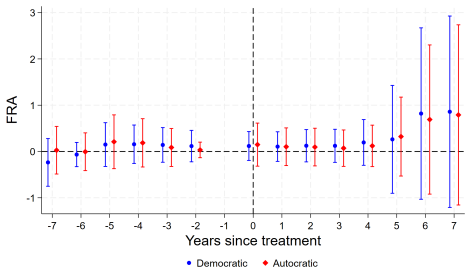

(C) From the UK



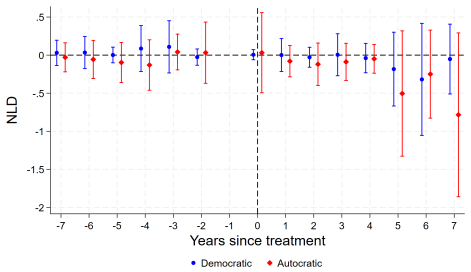

(D) From Germany



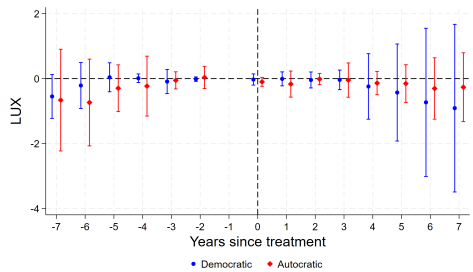

(E) From France



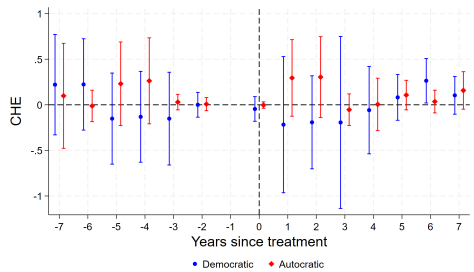

(F) From the Netherlands




(G) From Luxembourg



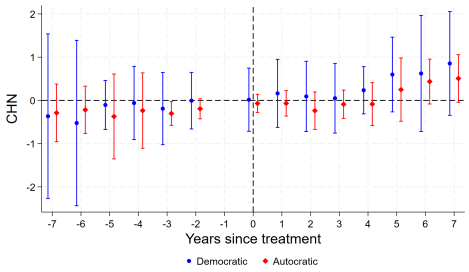

(H) From Switzerland



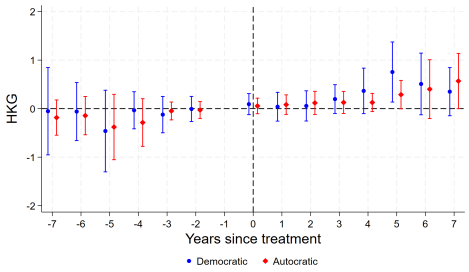

Notes: These figures show the average treatment effect on FDI from the top 10 countries, except for the US and Japan, to democratic (blue lines) and autocratic countries (red), using the staggered DID estimation of Sun and Abraham (2021) and assuming that each treatment is given one year before signing an MOU. The reference year is one year before the treatment. Standard errors are clustered at the country-pair level. Each vertical line shows the confidence interval at the 95% level. Democratic countries are defined by countries with an average democracy score (0–1) of V-Dem of 0.5 or higher in 2009.

Figure A9: Staggered DID effect of the BRI on FDI from selected major source countries to democratic and autocratic countries: Controlling for various attributes of source and host countries and country-pair and year fixed effects

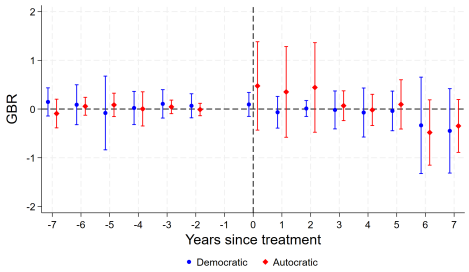
(A) From China



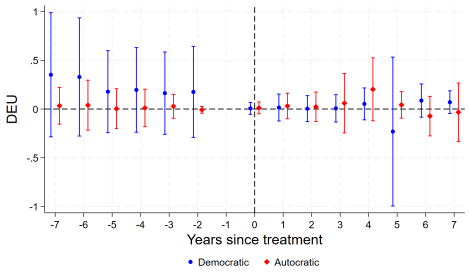

(B) From Hong Kong SAR



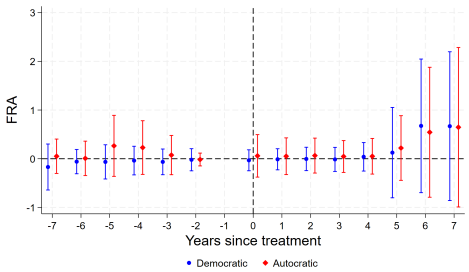

(C) From the UK



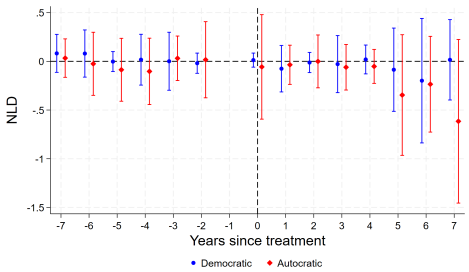

(D) From Germany



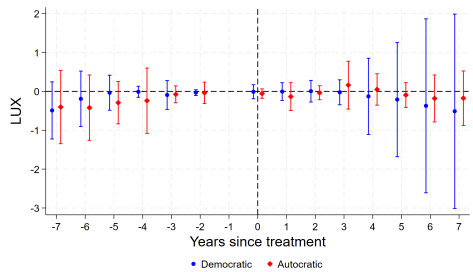

(E) From France



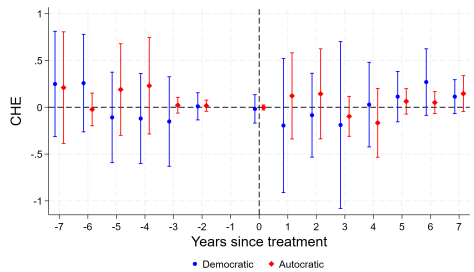

(F) From the Netherlands




(G) From Luxembourg



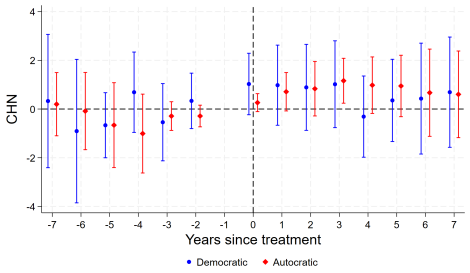

(H) From Switzerland



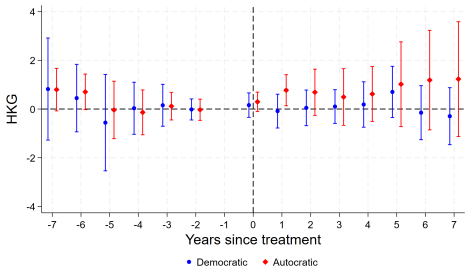

Notes: These figures show the average treatment effect on FDI from the top 10 countries, except for the US and Japan, to democratic (blue lines) and autocratic countries (red), using the staggered DID estimation of Sun and Abraham (2021) and assuming that each treatment is given one year before signing an MOU. The reference year is one year before the treatment. Standard errors are clustered at the country-pair level. Each vertical line shows the confidence interval at the 95% level. Democratic countries are defined by countries with an average democracy score (0–1) of V-Dem of 0.5 or higher in 2009.

Figure A10: Staggered DID effect of the BRI on FDI in democratic and autocratic countries: Controlling for country-pair and country-year fixed effects

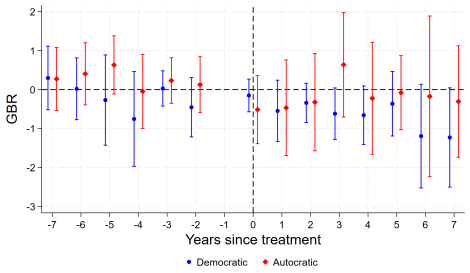
(A) From China



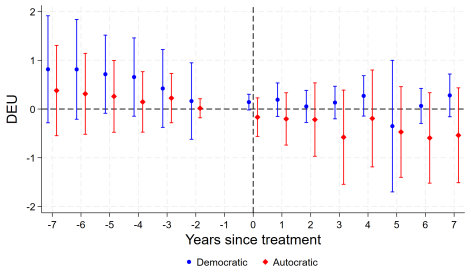

(B) From Hong Kong SAR



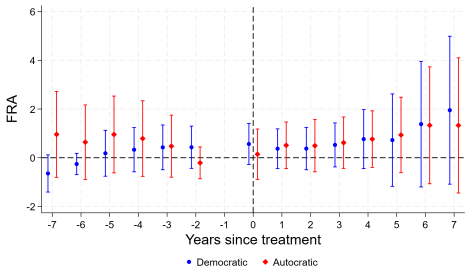

(C) From the UK



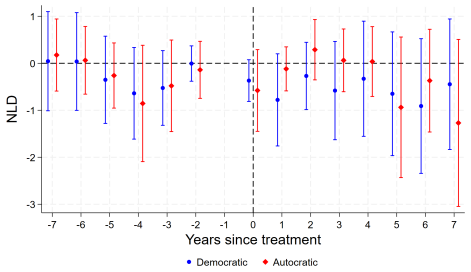

(D) From Germany



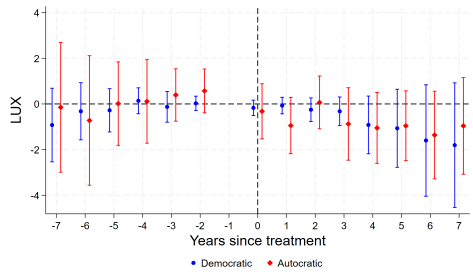

(E) From France



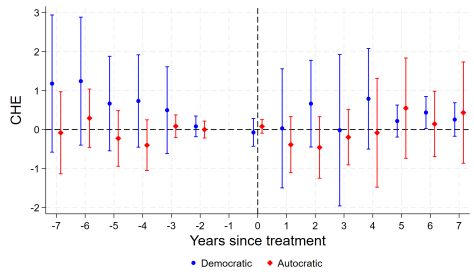

(F) From the Netherlands




(G) From Luxembourg

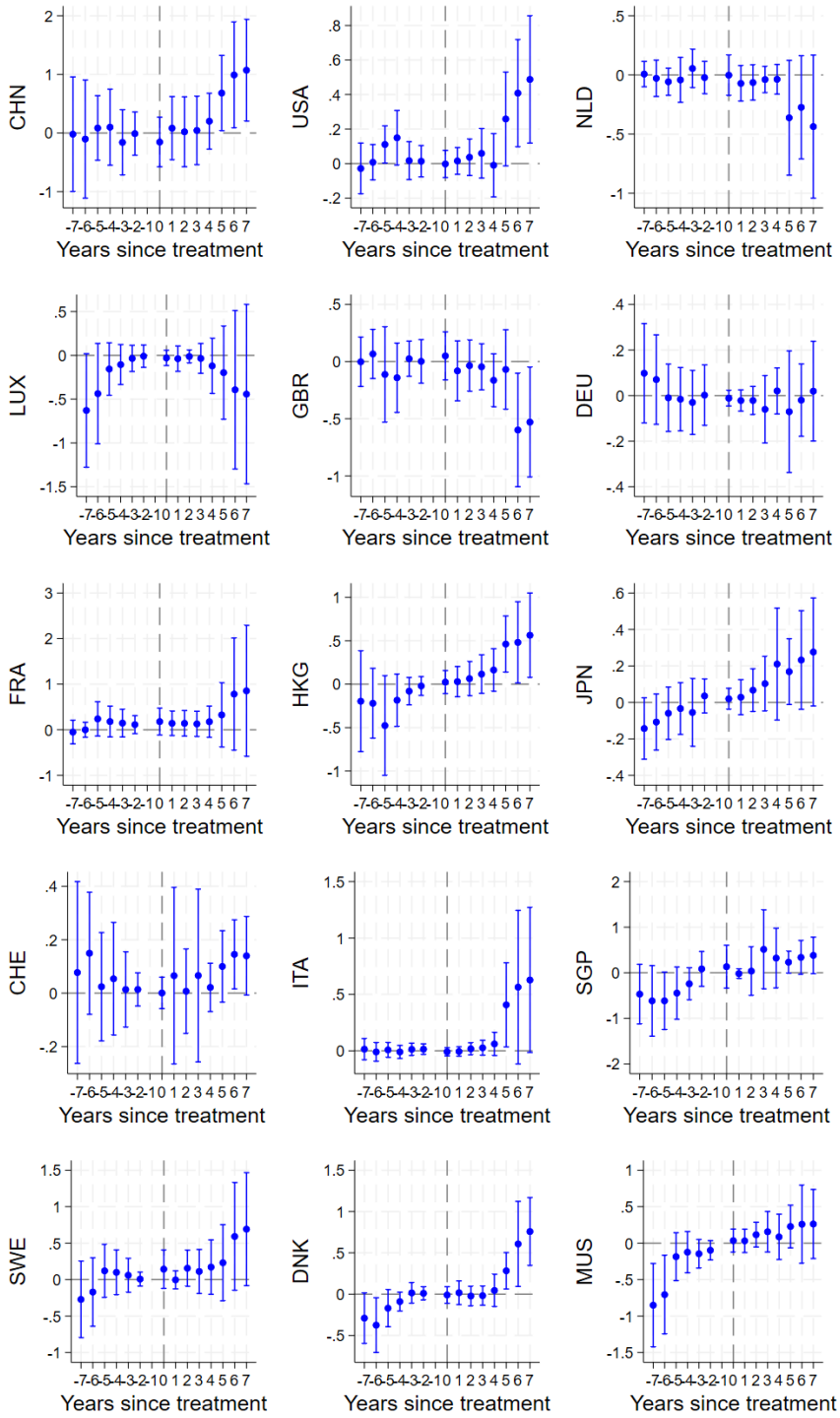



(H) From Switzerland



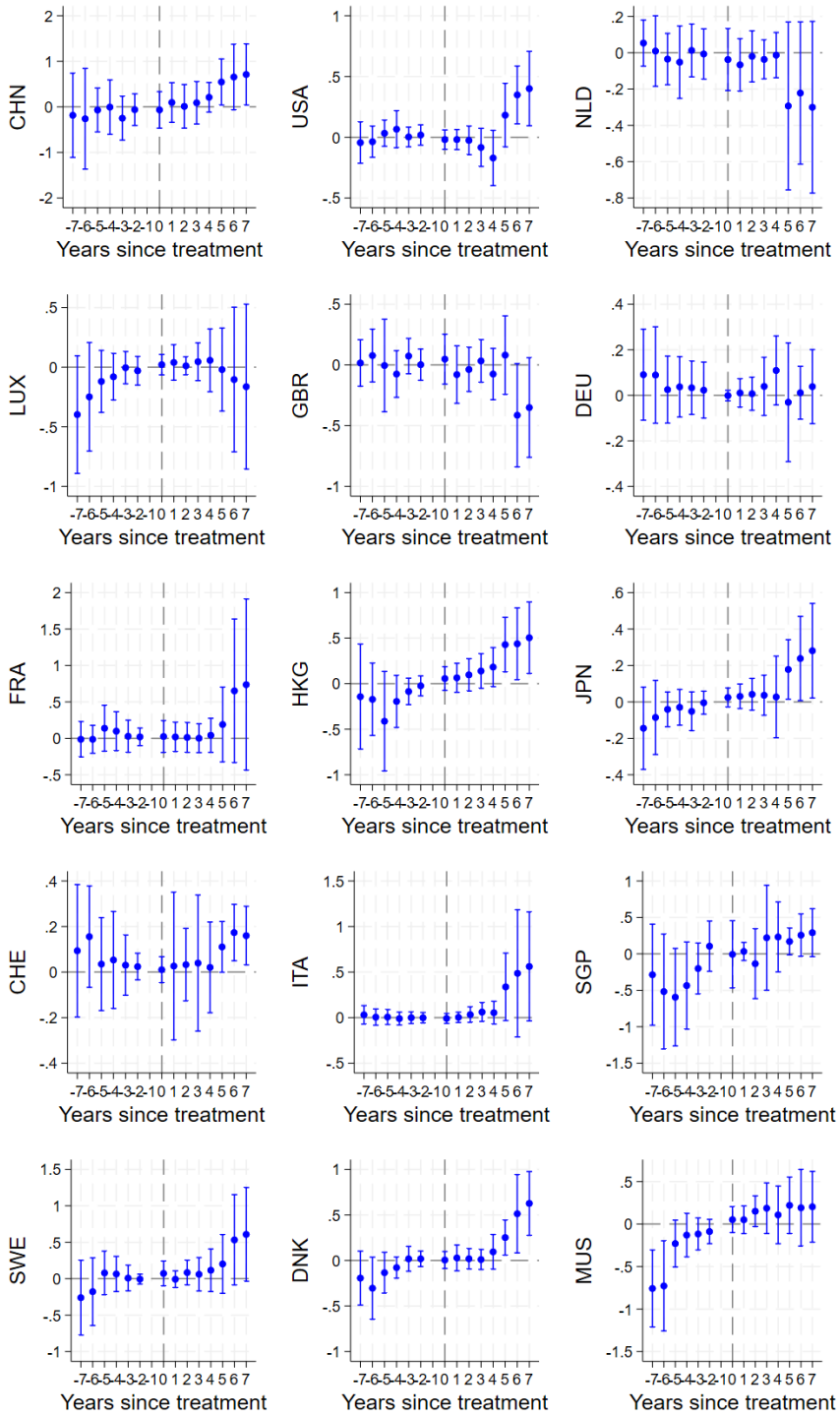

Notes: These figures show the average treatment effect on FDI from the top 10 countries, except for the US and Japan, to democratic (blue lines) and autocratic countries (red), using the staggered DID estimation of Sun and Abraham (2021) and assuming that each treatment is given one year before signing an MOU. The reference year is one year before the treatment. Standard errors are clustered at the country-pair level. Each vertical line shows the confidence interval at the 95% level. Democratic countries are defined by countries with an average democracy score (0–1) of V-Dem of 0.5 or higher in 2009.

Figure A11: Staggered DID effect of the BRI on FDI inflows from the top 10 and 5 major source countries: Controlling for GDP of source and host countries and country-pair and year fixed effects



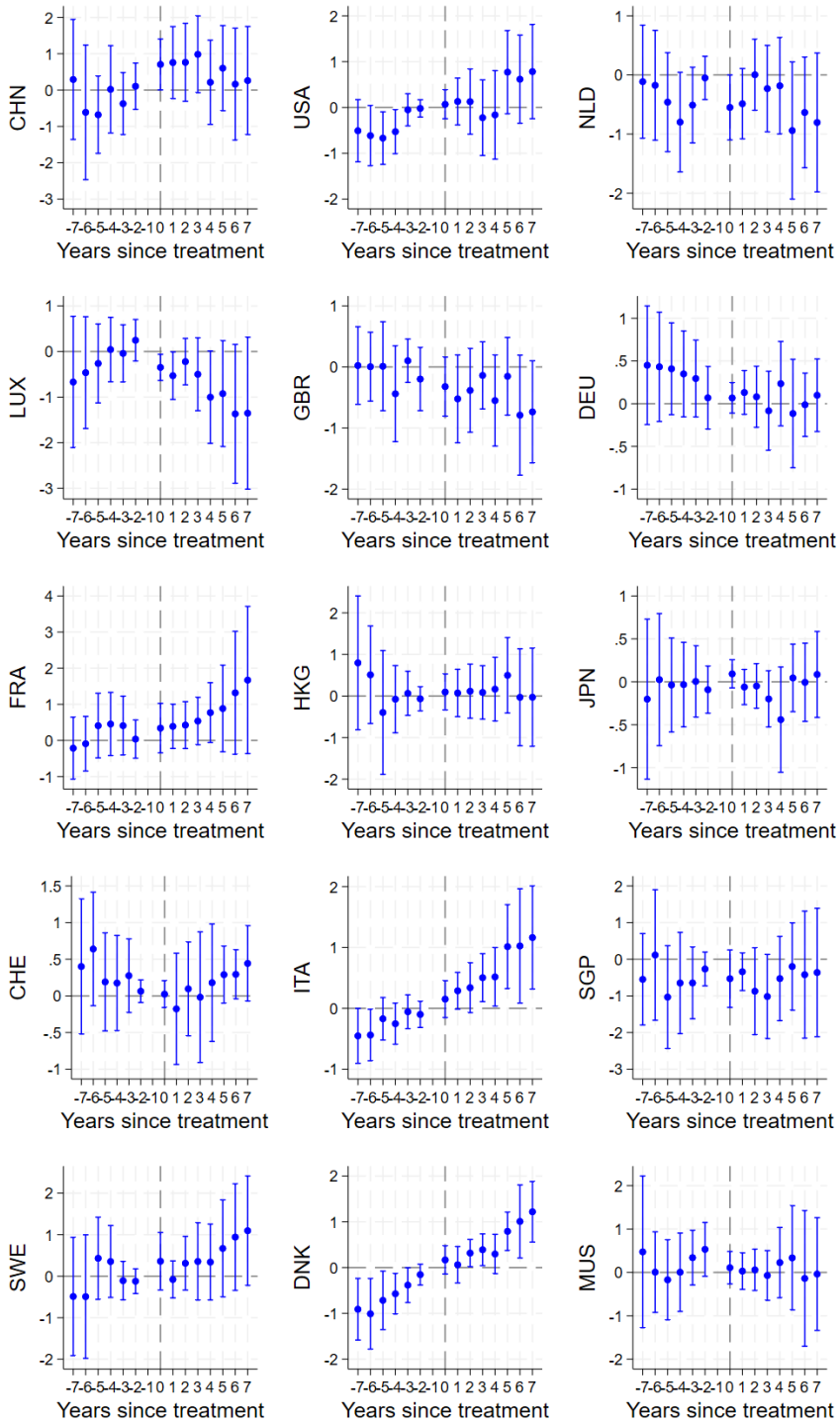

Notes: These figures show the average treatment effect on FDI from 15 major source countries, using the staggered DID estimation of Sun and Abraham (2021) and assuming that the treatment is given one year before a MOU is signed. The reference year is one year before the treatment. Standard errors are clustered at the country-pair level. Each vertical line shows the confidence interval at the 95% level. The country name for each code on the horizontal axis is as follows: China (CHN), the US (USA), the Netherlands (NLD), Luxembourg (LUX), the UK (GBR), Germany (DEU), France (FRA), Hong Kong SAR (HKG), Japan (JPN), Switzerland (CHE), Italy (ITA), Singapore (SGP), Sweden, (SWE), Denmark (DNK), and Mauritius (MUS).

Figure A12: Staggered DID effect of the BRI on FDI inflows from the top 10 and 5 major source countries: Controlling for attributes of source and host countries and country-pair and year fixed effects




Notes: These figures show the average treatment effect on FDI from 15 major source countries, using the staggered DID estimation of Sun and Abraham (2021) and assuming that the treatment is given one year before a MOU is signed. The reference year is one year before the treatment. Standard errors are clustered at the country-pair level. Each vertical line shows the confidence interval at the 95% level. The country name for each code on the horizontal axis is as follows: China (CHN), the US (USA), the Netherlands (NLD), Luxembourg (LUX), the UK (GBR), Germany (DEU), France (FRA), Hong Kong SAR (HKG), Japan (JPN), Switzerland (CHE), Italy (ITA), Singapore (SGP), Sweden, (SWE), Denmark (DNK), and Mauritius (MUS).

Figure A13: Staggered DID effect of the BRI on FDI inflows from the top 10 and 5 major source countries: Controlling for source and host country-year and country-pair fixed effects




Notes: These figures show the average treatment effect on FDI from 15 major source countries, using the staggered DID estimation of Sun and Abraham (2021) and assuming that the treatment is given one year before a MOU is signed. The reference year is one year before the treatment. Standard errors are clustered at the country-pair level. Each vertical line shows the confidence interval at the 95% level. The country name for each code on the horizontal axis is as follows: China (CHN), the US (USA), the Netherlands (NLD), Luxembourg (LUX), the UK (GBR), Germany (DEU), France (FRA), Hong Kong SAR (HKG), Japan (JPN), Switzerland (CHE), Italy (ITA), Singapore (SGP), Sweden, (SWE), Denmark (DNK), and Mauritius (MUS).