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The impact of US export controls on firms' export behavior in a third country: Evidence from Japanese customs data*

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Abstract

This study examines how US export controls targeting Chinese firms affect the export behavior of Japanese firms using Japan Customs data. Focusing on the impact of the US Bureau of Industry and Security's Entity List (EL), we identify exports from Japanese firms to Chinese firm added to the EL by the end of 2022. We find that inclusion of Chinese firms in the EL led to a significant reduction in Japanese firms' exports to those firms. In response, the affected Japanese firms increased their exports to non-targeted Chinese firms and firms in countries aligned with the United States.

Keywords: export controls; Entity List; Japan Customs data.
JEL classification: F13; F14; F51.

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1 Introduction

In addition to traditional trade policy measures such as import tariffs, many countries, including the United States, now employ export control regulations as an important policy tool for shaping national trade policy. In the 1990s, the United States tried to limit exports to parties involved in producing weapons of mass destruction (WMDs). Over time, the scope of US export controls expanded to include any activities deemed contrary to national security or foreign policy interests. In particular, the United States has strengthened its export controls targeting Chinese firms since the first Trump Administration initiated the so-called US-China trade war. The subsequent Biden Administration continued this approach, maintaining the tightened export controls against China.

The US Export Administration Regulations (EAR), administered by the US Bureau of Industry and Security (BIS) within the Department of Commerce, are designed to regulate the export, re-export, and in-country transfer of "purely civilian items, items with both civil and military, terrorism or potential WMD-related applications, and items that are exclusively used for military applications" (Part 730 of Title 15 of the Code of Federal Regulations).[1] Importantly, the EAR applies not only to exports originating in the United States but also to exports from third countries, potentially impacting the export behavior of firms in third countries — an issue of great interest to both academic scholars and policymakers. However, while previous research has provided micro-level evidence on the impact of these controls on directly affected firms — i.e., American and Chinese firms (e.g., Crosignani et al., 2024) — there is limited micro-level evidence regarding the impact on firms in third countries.[2]

Against this backdrop, the main purpose of this study is to explore how the US export controls affect exports from firms in a third country, Japan, to targeted firms, using Japan Customs export declaration data. In particular, the study focuses on how the addition of Chinese firms to the EL affects Japanese firms' export behavior. The EL is a list of parties of concern.[3] When exporting or transferring certain items to specific foreign nationals, entities, or governments (collectively referred to as "entities") in the EL, a license application must be submitted to the US government. First published in 1997 to identify entities involved in the proliferation of WMDs, the EL has since expanded to include entities engaged in activities contrary to US national security or foreign policy interests. Given that China is a major export destination for Japanese firms, US export controls targeting China potentially have a substantial impact on Japanese exports. Figure 1 shows China's share of Japanese exports at the Harmonized System (HS) 2-digit product category level. As explained below, chemical products,

[1] In this context, "items" refers to commodities, software, and technology.

[2] As discussed in Section 2, several previous studies have conducted product-level analyses (Ando, Hayakawa and Kimura, 2024a,b; Kim and Cho, 2024; Hayakawa, 2024; Hayakawa et al., 2023).

[3] The BIS maintains several lists, such as the Denied Persons List, Entity List, Unverified List, Military End User List, and Consolidated Screening List, which specify whether an entity is subject to export bans from the United States or an export license is required for exports to such entities.

plastics, machinery, and optical & other instruments are among the major products that Japanese firms export to Chinese firms that were added to the EL. As can be seen in the figure, China accounted for more than 20% of Japan's total exports in these categories throughout the 2014–2022 period.

Against this background the aim of this study is to examine how the strengthened US export controls against Chinese firms have affected the export behavior of Japanese firms that previously exported goods to targeted Chinese firms. More specifically, we address the following two questions: (1) Did such Japanese firms reduce their exports to targeted Chinese firms? (2) And if so, did they subsequently increase exports to non-targeted Chinese firms or firms in other countries?

To answer these questions, we use export declaration data from Japan Customs. The notable advantage of the Japan Customs export declaration data is that they provide information not only on Japanese exporting firms but also on destination firms abroad, making it possible to identify the pairs of firms involved in each export transaction. However, while Japanese firms are recorded with unique IDs, foreign importers are listed only by name and address (including country). We therefore need to match information on foreign importers in the Japan Customs data with information on the listed entities in the EL.

To identify the causal impact of US export controls on Japanese firms' export behavior, we employ a difference-in-differences (DID) approach. More specifically, because of the staggered nature of the implementation of EL designations, we employ the staggered DID estimator developed by Callaway and Sant'Anna (2021). Our analysis consists of two components. First, we examine how the exports to China of Japanese firms that used to export to firms on the EL have changed compared to the exports to China of firms that did not transact with firms on the EL. Second, we examine how the exports of Japanese firms that exported to EL firms to non-EL Chinese firms and to firms in other countries changed compared to firms that did not export to EL firms.

This is the first study to examine the impact of US export controls on the export behavior of individual firms in a third country using customs data. As mentioned, the key advantage of this study is that we identify exports from Japanese firms to specific Chinese EL firms at the customs transaction level. This allows us to conduct precise DID estimations at the exporter-importer pair level to identify the causal effects of US export controls on third-country exports. Another advantage of this study is that our data cover the whole universe of Japanese exports.

The main findings of this study are as follows. First, we find robust evidence that the addition of Chinese firms to the EL significantly reduced Japanese firms' exports to targeted firms, largely through the extensive margin effect. In other words, many Japanese firms appear to have stopped exporting to Chinese partner firms after these were added to the EL. An affected Japanese firm's exports to an EL firm fell by about 79% on average. In the case of one cohort (where a cohort consists of pairs of Japanese exporters and their Chinese partners and is defined by the timing of the Chinese firms' addition to the EL) the reduction was as large as 94%. Second, among affected

Japanese firms, those with only one EL firm as their export partner significantly increased exports to non-targeted firms in China immediately after the export partner was included in the EL treatment but did not significantly change their exports to firms in other destinations. The average increase in affected Japanese firms' exports to non-targeted firms in China was about 145%. By contrast, firms with multiple EL-listed partners significantly increased exports to non-targeted firms in China during the first one and a half years after their partners were included in the EL and then shifted exports to firms in other countries two years later. That is, exports to non-targeted Chinese firms significantly increased during the first one and a half years, but this impact became insignificant after two years. On the other hand, exports to firms in other countries did not change significantly during the first one and a half years but increased significantly two years later. The increase in exports was concentrated in the United States' trusted partner countries, while exports to other destinations did not increase significantly. Therefore, we find no clear evidence that Japanese firms attempted to circumvent US export restrictions by diverting trade through countries other than the United States' trusted partners in response to the tightening of US export controls against China.

This study makes a substantial contribution to the literature by providing micro-level evidence demonstrating that US export controls *do* affect third-country firms' export behavior. Our findings thus provide important insights from both an academic and a policy perspective.

The remainder of the study is organized as follows. Section 2 discusses the background of this study and briefly reviews related previous studies. Section 3 describes the data used in this study and explains how we construct our data set. Section 4 discusses our empirical framework, while Section 5 provides our empirical results. Finally, Section 6 concludes.

2 Background and Related Literature

Since 2018, when the US-China trade war escalated, numerous empirical studies have examined the impact of additional tariffs imposed by both countries on bilateral trade as well as trade with third countries (see, for example, Fajgelbaum and Khandelwal, 2022). In contrast, there have been relatively few empirical analyses of the effects of US export controls. However, amid the growing US-China confrontation, the US government has increasingly integrated economic, science and technology, and national security policies. Reducing dependence on China in supply chains and reshoring production has become a key priority, both to stimulate the domestic economy and to enhance national security.

In August 2018, the United States enacted the Export Control Reform Act (ECRA) and has since strengthened export controls on dual-use goods and emerging and foundational technologies (EFTs) that are "essential to the national security of the United States." In particular, the United States has tightened regulations on transactions with Chinese firms by adding them to the EL.[4]

[4]By contrast, Japan has not introduced any regulations specific to Chinese firms. Although the Ministry of Economy,

Figure 2 shows the number of Chinese entities on the EL from 1997 to 2022. Following the export control measures introduced during the first Trump Administration, the number of listed entities has risen sharply from 2018 onward; in May 2019, Huawei and 68 of its subsidiaries were added to the EL. The Biden Administration further tightened export controls, with the number of entities on the EL peaking in 2020 when Semiconductor Manufacturing International Corporation (SMIC), China's largest semiconductor foundry, was added to the EL.

In response to the rapid increase in Chinese firms being added to the EL in recent years, a growing body of research has analyzed the impact of these restrictions on innovation in affected Chinese firms and on business relationships between US and Chinese firms. The tightening of regulations targeting Chinese firms is driven by concerns that advances in Chinese technological capabilities increasingly threaten US technological dominance. Consequently, there is growing interest in understanding how EL designation affects Chinese firms' investment in research and development (R&D) and patent applications. For example, Anwar et al. (2024) and Hu et al. (2024) find that Chinese firms added to the EL tend to receive more subsidies from the Chinese government and increase their R&D intensity.[5]

However, empirical findings on whether the number of patents — an outcome of R&D investment — has increased as a result are mixed. For example, while Anwar et al. (2024) and Shen et al. (2024) report that Chinese firms added to the EL were more likely to have filed a larger number of patents, studies by Hu et al. (2024) and Cao et al. (2024) indicate that EL designation has had a negative impact on the number of patents filed by these firms. In contrast, Cao et al. (2024) and Han, Jiang and Mei (2024) suggest that firms operating in upstream industries of those added to the EL may experience an increase in patent filings, implying that stricter US export controls could, in some cases, accelerate innovation among Chinese firms.

Meanwhile, Anwar et al. (2024) and Cao et al. (2024) find that EL designation of Chinese firms negatively affects the number of patents filed by US firms that count these Chinese firms as customers, as well as by US firms that had engaged in joint research with Chinese firms prior to their addition to the EL.

As for the impact on US firms' supply chains, Crosignani et al. (2024) find that when Chinese firms were added to the EL, US firms that had Chinese customers were more likely to terminate relationships not only with Chinese customers added to the EL but also with other Chinese customers that were

Trade, and Industry (METI) amended the Export Trade Control Order to tighten its export regulations by increasing the number of semiconductor equipment categories requiring export licenses on July 23, 2023, these new regulations apply to all countries and are not specific to China. Additionally, Japan does not have an equivalent to the US's EL, meaning that there are no export restrictions aimed at specific Chinese firms. That said, in July 2023, Japan added items/technologies such as semiconductor manufacturing equipment to its export control lists, reflecting a broader trend of tightening regulations in recent years on items and technology sectors likely to impact exports to China. For details on the Japanese government's strengthened export control regulations, see Hayakawa et al. (2023).

[5] However, the EL firms covered in studies in this literature are restricted to listed firms.

not added to the EL. The inclusion of Chinese customers in the EL also had negative effects on the revenue, employment, and profitability of the US suppliers. However, there was no clear evidence that US suppliers were increasing transactions with other Asian firms or US firms. Therefore, it could not be concluded that friend-shoring or reshoring was taking place.

These studies examine the impact of the US government's strengthened export controls on firms in both the United States and China. In contrast, the primary focus of this study is their effects on firms in third countries. In this respect, Hayakawa et al. (2023) suggest that the addition of Huawei to the EL resulted in a reduction of approximately 20% in exports of information and communication technology (ICT) equipment from Japan to China. Ando, Hayakawa and Kimura (2024b) also find that after August 2020, when the Foreign Direct Product Rule (FDPR) targeting Huawei was tightened, Japan's exports to China of advanced technology products used in the production of wireless communication equipment significantly decreased.[6]

Similarly, Hayakawa (2024) finds that the tightening of the FDPR in October 2022 significantly decreased exports of memory integrated circuits (ICs) from South Korea to China and exports of integrated circuits manufacturing equipment (IME) from the Netherlands to China. On the other hand, he finds that exports of ICs from Taiwan and IME from Japan to China did not decrease as a result of the tightening of the FDPR, suggesting that the impact of the FDPR is heterogeneous across exporter countries.[7]

Next, focusing on the impact of US export controls on South Korea's exports to China, Kim and Cho (2024) find a significant decline in Korean semiconductor exports to China following the October 2022 imposition of US controls. However, they also find that the impact of US export control measures varies across different product categories.

These previous studies suggest that the tightening of US export controls is likely to have a negative impact on exports from non-US countries to China. However, as Ando, Hayakawa and Kimura (2024a) and Ando, Hayakawa and Kimura (2024b) argue, the impact is heterogeneous across countries and products, and the magnitude of the negative impact is small compared to the size of sectoral or country-level trade. However, the negative trade effect may be significant at the product or individual

[6] The FDPR is a US export control regulation that extends US jurisdiction to certain foreign-made goods that are produced using US technology or software. Not all EL firms are subject to the FDPR. A well-known example that raised concerns about its impact on Japanese firms is the case where the FDPR was strengthened in May 2020 to cover Huawei and its affiliates, which were added to the EL in May 2019. The FDPR was further tightened in August 2020, and since then, prior authorization has been required if "direct products" — products manufactured directly using US-origin technology or software — are used in the production or development of any part, component, or equipment purchased or ordered by Huawei or its affiliates, even if Huawei and its affiliates are not directly involved in the production or development.

[7] Hayakawa (2024) also finds that the tightening of US export regulations significantly decreased US exports of ICs and IME to China. Meanwhile, with regard to the trade effects of export control regulations introduced by Japan on July 23, 2023, see Hayakawa, Kimura and Yamanouchi (2025).

firm level.

In summary, there has been a growing number of studies analyzing the impact of strengthened US export controls on exports from third countries such as Japan and South Korea to China. However, these studies have relied on publicly available trade data, which do not allow for the identification of destination firms. While recent research on innovation by Chinese firms listed on the EL such as the studies mentioned earlier has identified EL firms and conducted analyses using firm-level data, to the best of the authors' knowledge, no studies have specifically identified exporting firms or Chinese importers in the analysis of trade involving EL firms.[8]

Due to these data limitations, the aforementioned studies fail to precisely identify trade transactions affected by US regulatory tightening, making it difficult to accurately estimate the magnitude of the impact of regulations. For example, when a Chinese importer was added to the EL, exporters may have shifted their exports to another Chinese firm, meaning that overall exports of the affected product to China may not have decreased. Alternatively, if exporters were not shipping regulated products to EL firms, the inclusion of a Chinese firm on the EL may not have led to a decline in exports of the product to China.

If importing firms could be identified, it would be possible to rigorously estimate the impact of regulatory tightening and analyze whether, and how, export destination firms changed following the tightening of export controls. Furthermore, if exporting firms could also be identified and their characteristics were taken into account, this would allow for an analysis of firm-level differences in responses to regulatory tightening.

This study seeks to overcome the shortcomings of previous studies by utilizing detailed transaction-level customs data to identify whether Chinese importers were listed on the EL and is the first empirical study to examine how the tightening of US export controls on China has affected the export behavior of firms in a third country, Japan.

3 Data and Preliminary Analysis

3.1 Data Sources

This section describes the data we use in our empirical analysis.

[8] There are a few studies (Kamal and Monarch, 2018; Monarch, 2022; Monarch and Schmidt-Eisenlohr, 2023) that have identified foreign suppliers for US firms using the Manufacturer ID (MID) included in US import data. However, since the information is limited to the import side of the US trade, those studies cannot be extended to analyze the impact of US export controls.

3.1.1 The Japan Customs export declaration data

We primarily use export declaration data collected by Japan Customs spanning from January 1, 2014, to December 31, 2022. The data contain detailed information for each export transaction, including (1) the trade value in FOB price and the corresponding quantity (expressed in numbers and/or weight such as in tons or kilograms), (2) the name, address, telephone number and corporate ID number of the Japanese exporter, (3) the destination country, (4) the trade partners' name and address, (5) product information based on the Harmonized System (HS) 9-digit classification, and (6) the declaration date and other details.[9] For this study, we exclusively use data on transactions exceeding 200,000 yen in value that fall under the "general trade" classification in Japanese trade statistics.

3.1.2 Japanese firm-level data

To capture firm-level characteristics, we use two Japanese firm-level datasets. The first is the Basic Survey of Japanese Business Structure and Activities (BSJBSA), an annual survey conducted by METI. This survey covers all firms with 50 or more employees and paid-in capital of 30 million yen or more in mining, manufacturing, wholesale, retail, and some service sectors. The BSJBSA includes data on sales, employment, and other firm-level characteristics.

The second dataset is the Basic Survey on Overseas Business Activities (BSOBA), also conducted annually by METI. The BSOBA covers foreign affiliates of Japanese firms based on the following criteria: (a) foreign affiliates in which a Japanese corporation holds at least 10% of the capital; (b) foreign affiliates in which a subsidiary, defined as a firm more than 50% owned by a Japanese corporation, holds more than 50% of the capital; and (c) foreign affiliates in which a Japanese corporation and a subsidiary that is more than 50% owned by a Japanese corporation collectively hold more than 50% of the capital. The BSOBA covers all sectors except for finance, insurance, and real estate. Further, the BSOBA contains information on the location of foreign affiliates and other affiliate-level characteristics, such as sales, procurement, and employment.

3.1.3 The Entity List of the United States

Information regarding the addition and removal of Chinese firms from the Entity List (EL) published by the Bureau of Industry and Security was collected from the website of the Code of Federal Regulations in the United States.[10] We compiled this information for the period until December 31, 2022.

[9] For details on the Japan Customs data, see Ito et al. (2025).
[10] https://www.ecfr.gov

3.2 Identification of Chinese Firms on the EL in the Japan Customs Data

We identified Chinese EL firms in the Japan Customs export declaration data by matching the names and addresses of Chinese firms on the EL and those of destination firms in the Japan Customs export declaration data. Specifically, we matched the words in the firm names in these two datasets and checked the correctness of the matching by checking their addresses.[11] We refer to Chinese destination firms that we identified as firms on the EL as "EL firms."

While we identify individual EL firms included in the Japan Customs export declaration data, we do not identify other destination firms. Thus, exports to destination firms other than EL firms are aggregated as "exports to non-EL firms" and only distinguished by their destination country/region.[12]

3.3 Data Construction

Our analysis focuses on the period from January 1, 2017, to December 31, 2022. In the United States, the first Trump Administration started in January 2017. The first addition of Chinese firms to the EL after the start of the first Trump Administration occurred in August 2018, coinciding with the onset of the US-China trade war. To capture the impact of intensified US export controls targeting Chinese firms on third-country exports, we focus on Japanese exports from January 2017 to December 2022. To avoid biases arising from including Chinese firms that were added to the EL before 2017, we excluded exports to these firms from our analysis.[13]

To clearly capture how exports from Japanese firms to EL firms in our sample are affected by US export controls, we restrict our analysis to HS 9-digit level products exported by Japanese firms to Chinese EL firms in the period 2015–2017, i.e., before they were added to the EL.[14] Specifically, the product categories we focus on are chemical products (HS28, 29, 34, 37, 38), plastics (HS39), machinery (HS84, 85), and optical & other instruments (HS90).[15] In total, we include 417 products at the HS 9-digit level, of which 51 products are chemicals, 35 are plastics, 239 are machinery, and 92 are optical & other instruments.[16] We do not take into account whether exports of individual

[11] In the process of checking, we utilized the results of matching between destination firms in the Japan Customs export declaration data and Japanese firms' foreign affiliates included in the BSOBA and the Overseas Japanese Companies Data collected by Toyo Keizai Inc. and made sure that Japanese firms' foreign affiliates were not mistakenly classified as EL firms.

[12] Hong Kong is considered a separate region and is distinguished from mainland China in our analysis.

[13] We refer to these firms as the "always-treated" group in the DID analysis.

[14] As a robustness check, we repeated the analysis using products exported in the 2017–2022 and 2014–2022 periods and found no major changes in the results. The detailed results are provided in Appendix C.

[15] In Japan, a 9-digit product code is used, which combines the internationally standardized 6-digit HS code with a 3-digit national subdivision code. During our observation period, the HS code was substantially revised twice, on January 1, 2017, and on January 1, 2022. In addition, part of the 3-digit national subdivision code is revised almost every year. To accommodate these changes, we created a harmonized product code at the 9-digit level for our observation period.

[16] These 417 products represent major export items for Japanese firms. Calculating their average share of Japan's

products are regulated by the EAR. We then aggregate the exports of these products from individual Japanese firms for each exporter-importer pair.

Moreover, we aggregate observations biannually, so that our observation period consists of twelve half-year periods from the first half of 2017 to the second half of 2022.

3.4 Preliminary analysis

Before conducting the DID analysis, we look at the trends in Japanese exports of the 417 products included in the analyses presented in Sections 4 and 5. Figure 3 shows the percentage change in exports of these products grouped at the HS 2-digit level from Japan to the world (dotted lines), China (dashed lines), and EL firms in China (solid lines). The percentage changes are calculated as the export value in each year relative to the average for 2015–2017.

The figure shows that exports of chemicals and plastics to the world grew steadily during this period. Moreover, exports of chemicals to China grew at a considerably faster pace. However, exports to EL firms fell precipitously in 2021 to less than 50% of the 2015–2017 average and remained at that level in 2022. Turning to machinery and optical & other instruments, the changes in exports to the world and to China are relatively small. By contrast, exports to the EL firms jumped in 2020 but then fell back substantially — to around the 2015-2017 level in the case of machinery and well below that in the case of optical & other instruments.

This preliminary analysis suggests that the US export controls targeting Chinese firms appear to have had a substantial impact of Japanese firms' exports to those firms.

4 Empirical Framework

In this section, we outline our empirical framework. We conduct two sets of analyses. In the first set, we estimate the impact of US export controls on exports from Japanese firms to the EL firms in our sample. In the second set, we estimate the impact on exports from the Japanese firms that had exported to EL firms to non-EL Chinese firms and to firms in other countries. In both sets of analyses, we conduct DID estimations.

4.1 The Impact on Exports to EL Firms

To examine the impact of US export controls on exports from Japanese firms to EL firms, we concentrate on exports to mainland China, excluding Hong Kong. US export controls potentially affect third-country firms' export behavior through three channels. First, if third-country firms re-export

total exports in each category over the 2014–2022 period reveals that these products accounted for 37.8% of exports in chemicals, 45.8% in plastics, 57.6% in machinery, and 85.2% in optical & other instruments.

US-origin items or export items produced outside of the United States that contain more than the *de minimis* amount of controlled US-origin content as specified in Part 734.4 of the EAR or that fall under the FDPR, their transactions are subject to EAR regulations. In such cases, even non-US firms must obtain export permission from the US government if they export products manufactured outside the US but using US-origin technology or software subject to US regulations to firms covered by the FDPR, such as Huawei. Thus, the FDPR is expected to directly reduce exports from non-US firms to Chinese firms subject to the FDPR. Moreover, for non-US firms, gathering information on US regulations and navigating the procedures to obtain export licenses from the US government can be highly costly. To avoid these expenses, they may choose to reduce or stop exports to EL firms, particularly those targeted by the FDPR.

Second, because of the US export controls, the demand for goods produced by the targeted firms may change. In this case, firms that supply intermediate goods or other products to the targeted firms are indirectly affected through demand linkages. Third, firms in third countries, particularly those in nations allied with the United States, may preemptively reduce exports to the targeted firms in anticipation that the United States could pressure allied governments to strengthen regulations in line with its own, or that allied governments might independently choose to tighten restrictions in the future.

Thus, the tightening of the US export controls is likely to negatively affect exports from non-US firms to EL firms through both direct and indirect effects. Among these three channels, only the first one is the direct and legally binding impact of US export regulations on firms' export behavior in third countries. The ban of certain exports under the FDPR is expected to directly reduce exports. However, in terms of the economic impact, the other two channels also matter. In our analysis, the impact through the first channel may be limited because during the observation period of this study only Japanese exports to Huawei and its affiliates fell under the FDPR.

Our analytical framework is as follows. The treatment group consists of Japanese exporter-Chinese EL firm pairs. As discussed below, the treatment may affect the exporting behavior of Japanese firms in the treated group toward non-EL firms. We therefore exclude exports from Japanese firms in the treated group to non-EL firms from the sample. The control group comprises firm pairs consisting of a Japanese firm that never exported to an EL firm during the observation period and their non-EL Chinese partner. Figure 4 presents a simplified illustration of the treatment and control groups. In this example, Japanese exporter J_1 exports goods to firms X, Y, and O, where firms X and Y are EL firms, while O represents an aggregate of non-EL firms in China. Similarly, Japanese exporter J_2 exports to firm Y, J_3 exports to Z and O, and J_4 exports only to O. Since firms X, Y, and Z are EL firms, transactions from J_1 to X and Y, from J_2 to Y, and from J_3 to Z are in the treatment group. Since firms X, Y, and Z were added to the EL at t_1, t_2, and t_3, respectively, the treatment timing of the J_1-X pair is at t_1, whereas the J_1-Y pair and J_2-Y pair are treated at t_2, and the J_3-Z pair is treated at t_3. On the other hand, since O firms are not on the EL, the pair J_4-O falls into the control group. In our analysis, we exclude transactions between J_1 and O and J_3 and O.

Whereas the Japanese firms in the treated group tend to be relatively large, those in the control group include small firms. To make the Japanese firms in both groups more comparable in terms of firm size, we use the list of firms included in the BSJBSA, which are relatively large. Using the Corporate Number — a common firm identifier — in the Japan Customs data and the BSJBSA, we match firms in the two datasets.

Table 1 shows the results of the matching. In total, our sample consists of 25,506 Japanese exporters, of which 502 (2%) are in the treated group and 25,004 (98%) are in the control group. Among the 502 firms in the treated group, 333 (66.3%) are included in the BSJBSA dataset, whereas only 6,876 out of 25,004 firms (27.5%) in the control group are included in the BSJBSA data. Based on these matching results, we exclude firms that are not in the BSJBSA (i.e., 18,128 firms) from the control group while keeping non-BSJBSA firms in the treated group. To check the robustness of our results, we compare the results both when all firms are included in our sample and when non-BSJBSA firms are excluded not only from the control group but also from the treated group. The results presented in Appendix D generally confirm that our results are robust.

Next, the maximum number of Chinese firms added to the EL between 2018 and 2022 and included in our sample after this procedure is 383.[17]

Another issue we need to address in our analysis is the fact that Chinese entities were added sequentially at different times to the EL during the observation period. Against this background, the simplest way to estimate the causal effect of the inclusion of firms on the EL on Japanese exports is to employ a staggered two-way fixed effect (TWFE) DID model. Specifically, we use the following model:

$$y_{ijt} = \beta \left(Treat_{ij} \times Post_{ijt} \right) + \alpha_{ij} + \gamma_t + \varepsilon_{ijt}, \tag{1}$$

where y_{ijt} is the logarithm of the value of exports from Japanese exporter i to Chinese partner j in half-year period t, $Treat_{ij}$ is an indicator variable that equals one if Japanese exporter i's Chinese partner j is one of the EL firms in the sample, and $Post_{ijt}$ is an indicator variable that equals one if half-year period t is after the ij pair is treated. The terms α_{ij} and γ_t respectively represent exporter-partner pair fixed effects and half-year period fixed effects, while ε_{ijt} is the error term. In the remainder of this study, we simplify the notation by denoting $D_{ijt} = Treat_{ij} \times Post_{ijt}$. That is, D_{ijt} is an indicator variable equal to one if the ij pair receives treatment in period t. We also denote $E_{ij} = \min\{t | D_{ijt} = 1\}$. In other words, E_{ij} indicates the earliest period at which the ij pair received treatment. If the ij pair is never treated during our observation period, then $E_{ij} = \infty$. Treatment is

[17] Since the export declaration data exhibit variations in both firm names and addresses, some of the firms that we identified as different firms may in fact be the same entity.

an absorbing state because once Chinese entity j is listed on the EL, it remains listed until the end of the observation period, so that $D_{ijt} = 1$ for all $t \geq E_{ij}$.

To accommodate zero export values, we use the inverse hyperbolic sine transformation (Burbidge, Magee and Robb, 1988):

$$y_{ijt} = \ln\left(Y_{ijt} + \left(Y_{ijt}^2 + 1\right)^{1/2}\right), \tag{2}$$

where Y_{ijt} is the value of exports from i to j. As shown by Bellemare and Wichman (2020), under this transformation, a percentage change in Y_{ijt} due to a discrete change in $Treat_{ij} \times Post_{ijt}$ from zero to one in equation (1) is approximately equal to $(\exp(\hat{\beta}) - 1) \times 100$.[18]

Note that partner j is an individual firm if this partner is an EL firm, while it is the aggregate of all other firms if it is a non-EL firm.

To examine possible differences in pre-treatment trends and in post-treatment effect dynamics between treated and control groups, we implement the standard dynamic TWFE DID specification, or "event study" specification, which in our case is given by

$$y_{ijt} = \sum_{r=-4, r\neq -1}^{4} \beta_r \mathbb{1}\left(R_{ijt} = r\right) + \alpha_{ij} + \gamma_t + \varepsilon_{ijt}, \tag{3}$$

where $R_{ijt} = t - E_{ij}$ indicates the time relative to treatment and $\mathbb{1}\left(R_{ijt} = r\right)$ is an indicator variable equal to one if the calendar period t is the rth period from E_{ij}. Note that $r = -1$ is excluded because we take $r = -1$ as the reference period.

As discussed by Baker, Larcker and Wang (2022), if the treatment effect is homogeneous across treatment groups and across time, then the dynamic TWFE DID estimator is consistent for the average treatment effect on the treated (ATT). However, when the treatment effect varies across groups and time periods, the dynamic TWFE DID estimates are biased. To address this potential bias, we employ the staggered DID estimator developed by Callaway and Sant'Anna (2021).[19] We define the treatment cohort by the value of E_{ij}. For example, all ij pairs for which $E_{ij} = c$ are in cohort c and those for which $E_{ij} = c'$ are in cohort c'. Then, to address the issue that the ATT may vary over time and over treatment cohorts, the estimator developed by Callaway and Sant'Anna (2021) estimates the ATT for treatment cohort $E_{ij} = c$ at relative time $R_{ijt} = r$ as the cohort-time ATT (CATT):

$$CATT(c, r) \equiv \mathbb{E}\left(y_{ij,c+r}(1) - y_{ij,c+r}(\infty) \mid E_{ij} = c\right), \tag{4}$$

which compares the potential outcome of treatment pair ij in cohort $E_{ij} = c$ at relative time $c + r$ if it received treatment in half-year period c, $y_{ij,c+r}(1)$, and the counterfactual outcome if it never

[18] Bellemare and Wichman (2020) also show that an approximation using the small-sample bias correction is equal to $(\exp(\hat{\beta} - 0.5\hat{\text{Var}}(\hat{\beta})) - 1) \times 100$, where $\text{Var}(\hat{\beta})$ is an estimate of the variance of $\hat{\beta}$.

[19] As a robustness check, we also employ an alternative estimator, the stacked event study estimator discussed in Baker, Larcker and Wang (2022) and implemented by Cengiz et al. (2019). The results are reported in Appendix B. We obtain similar results from the stacked regressions.

received treatment, $y_{ij,c+r}(\infty)$. The estimation equation is given by

$$y_{ijt} = \sum_{c \notin \mathcal{C}} \sum_{r=-4}^{4} \mu_{c,r} \left\{ \mathbb{1}\left(E_{ij} = c\right) \cdot \mathbb{1}\left(R_{ijt} = r\right) \right\} + \alpha_{ij} + \gamma_t + \varepsilon_{ijt}, \tag{5}$$

where $\mathbb{1}\left(E_{ij} = c\right)$ is an indicator variable that equals one if the ij pair is in cohort $E_{ij} = c$ and $\mathcal{C}$ is a set of firms within the control group. Among the three estimators proposed by Callaway and Sant'Anna (2021), we use the augmented inverse-probability weighting (AIPW) estimator.

Our hypothesis is that the addition of the EL firms in our sample to the EL significantly reduced Japanese firms' export to these firms. Thus, the expected sign of $\mu_{c,r}$ is negative when $r \geq 0$.

One of the key issues in this kind of analysis is *attrition* (Hausman and Wise, 1979). If Japanese firms stop exporting to Chinese firms, their transactions with Chinese firms will necessarily be missing from the customs data. Thus, ignoring the extensive margin and estimating the model using unbalanced panel data may underestimate the impact of US export controls. However, given that our data are government administrative records, we can treat missing observations in our data as indicating that there were "really no exports."[20] We therefore construct a balanced panel and include the extensive margin by replacing all missing observations with zero export values. To check the robustness of our approach and highlight the role of the extensive margin, in Section 5.2 we estimate the model using unbalanced panel data without filling in missing observations.

4.2 The Impact on Exports to Non-EL Firms

We next examine the export behavior of Japanese firms whose exports to EL firms were curtailed as a result of US export controls, focusing in particular on their exports to non-EL firms. If their exports to EL firms fell as a result of controls, they may have increased their exports to other firms. "Other firms'' may be non-EL firms in mainland China, or they may be firms in other countries. We consider both possibilities and investigate which switching actually occurred. For firms that have exported to China, switching to a new Chinese firm is likely to be less costly than switching to a firm in a different country. However, if a Japanese exporter switches to another Chinese firm, there is a risk that the new Chinese partner could later be added to the EL, forcing the exporter to find a new partner again. Thus, exporters who could more easily find partners in other countries may have increased their exports to those countries. Larger multinational firms that have networks in many countries are likely to be such exporters.

[20] Our data includes transactions over 200,000 yen (roughly 1,300 USD). This means that there may be attrition bias when a counterpart is added to the EL and the value of exports to that counterpart falls below this threshold. While several recent studies have proposed methodologies to address attrition bias (e.g., Bellégo, Benatia and Dortet-Bernadet, 2024; Ghanem et al., 2024), none of them fits our case. Moreover, Japanese firms trading with EL firms are relatively large and their transactions with EL firms are probably also substantial, so that it is unlikely that the value of their transactions with EL firms fell below 200,000 yen.

To test these hypotheses, we adopt the following analytical framework. The analysis is conducted at the Japanese exporter-destination country level, while treatment assignment occurs at the firm level. Depending on the case, the destination country may be mainland China, all countries other than mainland China, or both. The treated group consists of Japanese firms that used to export at least one of the restricted HS 9-digit products outlined in Section 3.3 to at least one of the EL firms in the sample in the period 2017–2022.[21] In this setting, a Japanese firm receives treatment when one of its Chinese partners is added to the EL. If multiple Chinese partners were added to the EL in the same half-year period, the treatment is counted as a single instance. On the other hand, if, for example, two Chinese partners were added to the EL at different times, the Japanese exporter is regarded as receiving treatment twice. Counting the number of treatments in this manner, firms experienced treatment up to five times, with 80.4% (397 of 494 firms) treated once and 19.6% (97 firms) treated multiple times. We therefore partitioned the treated group into one consisting of firms treated only once, and another consisting of firms treated multiple times. However, even in the latter case, we conduct the analysis focusing on the impact of the first treatment only.

The control group comprises Japanese firms that exported at least one of the restricted HS 9-digit products as outlined in Section 3.3 exclusively to non-EL firms during 2017–2022. As before, we exclude small firms from the control group by omitting firms not included in the BSJBSA. Figure 5 presents a simplified illustration of the treatment and control groups for the analysis on the impact on exports to non-EL firms. In this example, Japanese exporter J_1 exports goods to firms X, Y and P, where firms X and Y are EL firms in the sample, while P represents an aggregate of non-EL firms in country p. Note that country p may be either China or another country. Similarly, Japanese exporter J_2 exports to firms Y and P, while J_3 exports to P only. In this analysis, Japanese exporters' treatment status is assigned depending on whether they transacted with an EL firm. Moreover, when a Japanese exporter transacted with more than one EL firm in the sample, the time of the treatment is determined by the earliest period that a partner was added to the EL. Following this rule, J_1 is treated at t_1 and J_2 is treated at t_2, where J_1 falls into Treated Group 2 (firms with multiple treatments) and J_2 falls into Treated Group 1 (firms with a single treatment). Since J_3 exports only to P, it falls into the control group. Further, we aggregate export values to non-EL firms at the Japanese exporter-destination country level. Thus, exports from J_1 to P, J_2 to P, and J_3 to P are included in the sample, whereas exports from J_1 to X and Y and J_2 to Y are excluded from the sample.

We aggregate each Japanese firm's exports to non-EL firms at the destination country level for each half-year period from the first half of 2017 to the second half of 2022. As explained below, we analyze three cases separately, depending on the destination countries included: (i) all countries; (ii) mainland China only; and (iii) all countries other than mainland China.

[21] Note that the HS 9-digit products included in our analysis are not necessarily regulated by the EAR, because we do not take product-level regulations into account.

As the timing of the first treatment varies across Japanese firms, we employ the staggered DID estimator developed by Callaway and Sant'Anna (2021). The estimation equation is:

$$x_{idt} = \sum_{c \notin \mathcal{C}} \sum_{r=-4}^{4} \mu_{c,r} \left\{ \mathbb{1}\left(E_i = c\right) \cdot \mathbb{1}\left(R_{it} = r\right) \right\} + \alpha_{id} + \gamma_t + \varepsilon_{idt}, \tag{6}$$

where x_{idt} is the inverse hyperbolic sine transformation of the total export value from Japanese exporter i to non-EL firms in destination country d in half-year period t, $\mathbb{1}(E_i = c)$ is an indicator variable equal to one if exporter i belongs to cohort $E_i = c$, which means firm i's first treatment was in half-year period c,[22] $\mathcal{C}$ is the set of firms within the control group, and $\mathbb{1}(R_{it} = r)$ is an indicator variable equal to one if the calendar period t is the rth period from E_i. Finally, α_{id} and γ_t are respectively exporter-destination pair fixed effects and half-year period fixed effects, while ε_{idt} is the error term.

We examine three cases: first, we include all destination countries; second, we include mainland China only as the destination country; and third, we include all destination countries other than mainland China. That is, in the second case, d in equation (6) includes mainland China only, whereas in the third case, d in equation (6) excludes mainland China. By analyzing these three cases, we can determine whether the addition of Chinese entities to the EL affects exports from Japanese firms to Chinese non-EL firms, to firms in other countries, or both.

The descriptive statistics of the outcome variables used in the analyses in Sections 4.1 and 4.2 are reported in Table A.1 in Appendix A.

5 Empirical Results

5.1 The Impact on Exports to EL Firms

We start by reporting the results of the static staggered TWFE DID model (equation (1)) in column (1) of Table 2. The estimated coefficient on $Treated_{ij} \times Post_{ijt}$ is negative and highly significant, indicating that Japanese firms' exports to the Chinese firms that were added to the EL fell after the treatment. The coefficient suggests that exports of certain products from an affected Japanese firm to China fell by about 78% on average after a partner Chinese firm was added to the EL.[23] Next, column (2) reports the overall ATT and aggregated ATT for each cohort (i.e., the weighted average of $CATT(c, r)$ for c) obtained by estimating the dynamic DID specification allowing for potential heterogeneous treatment effects across cohorts (equation (5)) using the estimator developed by Callaway and Sant'Anna (2021). The overall ATT in column (2) is quite similar to the ATT

[22] Similar to the notation in the previous subsection, D_{it} is an indicator variable that is equal to one if firm i receives treatment in period t and $E_i = \min\{t | D_{it} = 1\}$.

[23] The approximate magnitude is calculated as $(\exp(-1.503) - 1) \times 100$.

obtained from the static TWFE estimation in column (1). The addition of a Chinese firm to the EL decreased an affected Japanese firm's exports by about 79% on average. However, treatment effects exhibit substantial heterogeneity across cohorts: while the ATT is negative and significant at the 1% level for cohorts 4 and 5, it is positive and statistically significant at the 1% level for cohort 3 and insignificant for other cohorts. The coefficient estimates suggest that while the addition of Chinese firms to the EL may have caused Japanese firms' exports in cohorts 4 and 5 to decrease by about 92% and 94%, respectively, it may have increased exports from firms included in cohort 3 by about 384%.

Figures 6 and 7 show event study estimates based on estimating equations (3) and (5), respectively. In Figure 6, the blue bars indicate 95% confidence intervals around the estimated dynamic coefficients, which are located in the middle of the bars and linked by green lines. Robust standard errors are used to construct the 95% confidence intervals. In Figure 7, on the other hand, the blue bars indicate 95% simultaneous confidence intervals around the observed ATTs in the relative periods from the treatment indicated by green dots. The simultaneous confidence intervals are computed using the multiplier bootstrap algorithm described in Callaway and Sant'Anna (2021). The estimated standard errors from the bootstrapped samples are used for their construction. Both figures show negative and significant post-treatment effects. Figure 7 indicates that affected Japanese firms' exports to China fell by about 89% in the first period after the treatment and continued to remain about 90–92% below the reference level (i.e., the level at the period immediately before treatment) until four periods after the treatment. Although in Figure 6 the coefficient is positive and significant in the third period prior to the treatment, the parallel trend assumption holds in Figure 7. Moreover, both figures show a positive and significant impact at the time of the treatment (i.e., $R_{ijt} = 0$). This possibly reflects a temporary surge in exports to EL firms immediately after they were added to the EL.

5.2 The Impact on Exports to EL Firms: Intensive Margin Only

The analysis in the previous subsection used a balanced panel constructed by imputing all missing observations. To examine the extent to which the extensive margin contributes to the overall impact on exports from Japanese firms to the EL firms in the sample, we re-estimate the model using the original unbalanced panel before the missing observations are imputed. The results are reported in Table 3 and Figures 8 and 9. As shown in Table 3, the ATT is negative and significant in the unbalanced panel as well, although the pattern of the cohort-specific ATT differs slightly from that in Table 2. In Table 3 the ATT is negative and significant for cohorts 1, 3, 5, and 8. In terms of the magnitude of the impact, the absolute value of the overall ATT is much smaller in Table 3 than in Table 2. According to column (2) in Table 3, the overall ATT indicates a decrease in exports of approximately 48%, 30 percentage points smaller than in Table 2. This result suggests that the extensive margin effect substantially contributed to the negative impact of US export controls on Japanese exports to targeted Chinese firms. That is, many Japanese exporters ceased exporting to targeted Chinese firms following their addition to the EL.

5.3 The Impact on Exports to Non-EL Firms: Single-Treatment Firms

We next report the results on the impact on exports from Japanese firms to firms not added to the EL, focusing on single-treatment firms.[24] The results of the staggered DID model (6) using the estimator developed by Callaway and Sant'Anna (2021) and calculating the overall ATT and aggregated ATTs for cohorts are reported in Table 4. For comparison, the table also reports the corresponding estimation results based on the static TWFE DID estimator. Columns (1) and (2) present the results when all destination countries are included, columns (3) and (4) restrict the destination to mainland China only, and columns (5) and (6) show the results for all destinations excluding mainland China.

The ATT is positive and weakly significant at the 10% level in the estimations in columns (1) and (2) for all destinations. It is positive and significant for China (columns (3) and (4)) but insignificant for other destinations (columns (5) and (6)). According to column (4), the overall ATT was an increase in exports to China of about 145%.

The event study plots in Figures 10–12 based on equation (6) using the Callaway and Sant'Anna (2021) estimator confirm the results in Table 4. That is, the post-treatment effect is positive and significant in all post-treatment periods for China (Figure 11) but not significant at the 5% level in all periods in the estimations for all destinations (Figure 10) and all destinations excluding China (Figure 12).

5.4 The Impact on Exports to Non-EL Firms: Multiple-Treatment Firms

Next, we report the results on the impact on exports from Japanese firms to non-EL firms, focusing on multiple-treatment firms. The results of the static TWFE DID model and the staggered DID model (6) using the estimator developed by Callaway and Sant'Anna (2021) and calculating the overall ATT and aggregated ATTs for cohorts are reported in Table 5. Columns (1) and (2) present the results when all destination countries are included, while those in columns (3) and (4) are for exports to China only, and those in columns (5) and (6) for all destinations excluding China.

Contrasting with the single-treatment results, the ATT is positive and highly significant in the static TWFE DID estimations shown in columns (1), (3), and (5). However, the overall ATT obtained using the Callaway and Sant'Anna (2021) estimator is significant only in column (4). The magnitude of the impact is also much smaller than that for single-treatment firms. Column (4) suggests that exports to China increased by only about 78%. Aggregated ATT estimates for cohorts are obtained

[24] Appendix E reports the results of estimations including both single- and multiple-treatment firms.

only for cohorts 1–5 and are positive and significant for cohort 2 in all columns (i.e., (2), (4), and (6)) and for cohorts 1 and 3 in column (4).

The event study plots obtained by estimating equation (6) using the Callaway and Sant'Anna (2021) estimator are shown in Figures 13–15. Interestingly, in Figure 13 the post-treatment effect becomes positive and significant in the fourth period after the treatment. The same pattern is observed in Figure 15. By contrast, when China is the destination country (i.e., Figure 14), the impact of the treatment is positive and significant until the third period after the treatment but becomes insignificant in the fourth period. Our results therefore suggest that Japanese exporters with multiple treatments first switched their exports from EL firms to other firms in China, but from the fourth period onward they stopped increasing their exports to non-EL firms in China and instead increased exports to firms in other countries.

The findings thus indicate that the impact of US export controls targeting Chinese firms on Japanese firms' export behavior differs between single- and multiple-treatment firms. To understand why the impact on the two groups differs, we compare the characteristics of these two groups using the statistics presented in Table 6. This table shows the number of export destinations, the value of total exports calculated by the inverse hyperbolic sine transformation, the export share of countries other than China, EL firms' share in exports, and the number of foreign countries in which single- and multiple-treatment firms have affiliates. Each statistic is calculated as the average for each group using data for 2015–2017.[25] The table shows that in part (a) multiple-treatment firms have a larger number of export destinations (in terms of the mean, median, and minimum) than single-treatment firms. The same pattern is observed for the number of countries in which firms have affiliates (in part (e)), for total exports (in part (b)), and for the share of exports to countries other than China (in part (c)). Moreover, in part (e), a much larger share of multiple-treatment firms are multinational enterprises with investments in at least one country abroad (63.9% versus 42.1% for single-treatment firms), and they tend to have invested in a larger number of countries abroad (in terms of both the mean and the median). Note that some of the firms in the group of single-treatment firms are highly dependent on transactions with EL firms because, in part (d), the maximum value of the export share of EL firms in exports to China is 0.965. Thus, the firms in the two groups differ considerably in their characteristics, which may explain the different responses to US export controls targeting Chinese firms.

[25] In Table 6, parts (a)–(d) use Japan Customs data only, while part (e) uses Japan Customs data and data from the BSOBA and includes firms that can be matched between these two data. Due to the data protections from the MOF, we cannot report the exact minimum, median, and maximum values. These statistics are calculated as the average of the minimum, median, and maximum values across 10 observations with different exporter IDs. For reference, more statistics are provided in Table F.1 in Appendix F.

5.5 The Impact on Exports to Non-EL Firms: Exports to Tier 1 countries and other destinations

Our analysis in the previous two subsections revealed that Japanese exporters with multiple Chinese EL firms as their export partners responded to the tightening of US export controls by increasing exports to firms in other countries four periods after the treatment, while they increased exports to non-EL firms in China in the first three periods after the treatment. By contrast, Japanese exporters that exported to only one Chinese EL firm increased their exports to non-EL firms in China and saw no significant change in their exports to firms in other countries in the four periods after the treatment.

One concern regarding this result is that the redirection of exports to other countries may be aimed at circumventing export controls by using other firms as intermediaries. To investigate this possibility, we examine the destinations to which Japanese firms redirected their exports using the US export controls' country designations. Many countries, including the United States, typically apply distinct review procedures and criteria for export license applications based on whether the destination is an ally or trusted partner. Review procedures for exports to such countries that participate in international export control regimes and enforce strict regulations on the export of weapons and sensitive technologies tend to be less stringent than other countries. The United States categorizes countries based on various criteria, and these classifications are periodically updated in response to changes in international relations and technological developments. For the analysis here, we use the list of "Tier 1'' countries to identify destinations considered as allies or trusted partners subject to relatively relaxed export controls.[26] If exports to destinations other than Tier 1 countries increased after a Chinese partner was added to the EL, this may indicate possible circumvention of export controls.

We use this country categorization to divide Japanese firms' exports into those to Tier 1 countries

[26] An interim final rule titled "Framework for Artificial Intelligence Diffusion," issued by the BIS on January 15, 2025, established a three-tiered licensing framework for transactions involving advanced computing ICs and related items. This framework allows for the export, reexport, or transfer (in-country) of advanced ICs to a select group of US allies and partners, designated as "Tier 1'' countries in the new Supplement No. 5 to EAR Part 740. The Tier 1 group comprises the United States and other 18 low-risk destinations, including Australia, Belgium, Canada, Denmark, Finland, France, Germany, Ireland, Italy, Japan, the Netherlands, New Zealand, Norway, the Republic of Korea, Spain, Sweden, Taiwan, and the United Kingdom. By contrast, Tier 3 countries are Macau and US arms-embargoed destinations such as China, Russia, and North Korea. Tier 2 countries are all other countries not identified in Tier 1 or Tier 3. See the Framework for Artificial Intelligence Diffusion for further details at https://www.federalregister.gov/documents/2025/01/15/2025-00636/framework-for-artificial-intelligence-diffusion. Thus, Tier 1 countries can generally access advanced AI technology of the United States without restrictions. Although the second Trump Administration stopped using this country categorization in May 2025, it is valid for our analysis because we focus on the period of the first Trump Administration and the Biden Administration.

and those to other countries.[27]

As in the previous two subsections, we conduct separate estimations for single- and multiple-treatment firms. The results are reported in Table 7 and Figures 16–19. Table 7 shows that — for both single- and multiple-treatment firms — the overall ATT is positive and significant for exports to Tier 1 countries but insignificant for exports to other destinations. The results suggest that affected Japanese firms' exports to one of the Tier 1 countries on average increased by about 21% during the post-treatment periods in case of single-treatment firms and by about 47% in the case of multiple-treatment firms.[28] However, the event study plots shown in Figures 16–19 indicate that the impact is positive and significant only for the fourth period after the treatment in the case of exports from multiple-treatment firms to Tier 1 countries and that there are no other significant impacts. The results therefore suggest that there is no clear indication of export control circumvention by Japanese firms in response to US export controls targeting China.[29] Our results also imply that Japanese firms have a tendency to shift their exports to less risky destination countries with some time lag.

6 Conclusions

Export control regulations imposed by one country can potentially affect the exporting behavior of firms in third countries, especially when implemented by a major economy such as the United States. Motivated by this consideration, this study investigated the impact of US export controls targeting Chinese firms on Japanese firms' exporting behavior using Japan Customs data. Focusing on the impact of the EL issued by the BIS of the United States, we found that the addition of Chinese firms to the EL in the 2018–2022 period decreased Japanese firms' exports to the targeted entities. Furthermore, our analysis revealed that Japanese exporters affected by the addition of their Chinese partner firms to the EL increased their exports to other firms in China. It also showed that some relatively large Japanese firms with multiple targeted Chinese partners initially increased exports to non-EL firms in China but later increased their exports to firms in countries that are US allies or

[27] In our analysis, we exclude Japan from Tier 1 countries and include the United States in Tier 1 countries.

[28] The percentage changes are calculated as $(\exp(0.191) - 1) \times 100 = 21.05$ and $(\exp(0.385) - 1) \times 100 = 46.96$, respectively.

[29] We conduct two additional analyses. First, similar to the US tiered framework, Japan's Export Trade Control Order — in Annex Table 3 — identifies countries that participate in international conventions and the four international regimes on export controls and strictly enforce their own export controls. We utilize this categorization of countries and conduct similar estimations. Second, to investigate whether exports to non-EL firms in China are actually exports to Japanese firms' affiliates in China, we divide Japanese exporters into those with foreign affiliates in China and those without, and conduct similar estimations. The results of these additional analyses are reported in Appendices G and H. Appendix G shows that the results are quite similar even when we change the way of countries are categorized. On the other hand, the results in Appendix H suggest that not only Japanese firms with affiliates in China but also those without affiliates in China increased their exports to China after the treatment. Thus, Chinese partners to which exports increased are not limited to Japanese affiliates.

trusted partner countries. We found no evidence of export control circumvention by Japanese firms through third countries in response to US export controls targeting China. The finding that US export controls significantly reduced Japanese firms' exports to targeted Chinese firms is highly relevant from both an academic and a policymaking perspective.

Several policy implications can be drawn from the findings of this study. First, firms in third countries *do* react to export control regulations imposed by a major economy such as the United States. Third-country governments therefore need to take such effects into account when formulating policy related to national economic security. Second, our findings suggest that firms may change their exporting behavior more than required by policy. Therefore, calculations of the costs and benefits of export controls should reflect such responses by firms. Third, export controls affect not only exports to targeted firms but also exports to other firms. Given the current complexity of international supply chains, the impact of export controls needs to be carefully examined. Finally, in terms of the magnitude of the impact on Japanese exports overall, the impact — at least up to the end of 2022 — appears to have been relatively small.[30] This is because exports to the targeted firms accounted for a relatively small share of Japan's total exports, even when total exports are measured in terms of exports to China alone (less than 6% of total annual exports at the HS 2-digit level). However, although the macro-level impact may be relatively small, our results suggest that US export controls have statistically significant effects on third-countries' exports at the firm level.

We should note some limitations of this study. First, we only identified Chinese firms that were added to the EL among the many export partners of Japanese firms. Therefore, firms in the control group are aggregated at the destination country level. Such simplification may affect our results. Second, we did not account for potential heterogeneity in the impact across types of exported goods — such as differences between final and intermediate goods or sectoral variations — which could yield differential effects. Third, our analysis focused exclusively on the impact of the EL. However, as mentioned in Section 2, the BIS has issued various lists other than the EL, including the Denied Persons List and Unverified List. Not controlling for these other lists may affect our estimations.

Finally, we would like to highlight several potential extensions of the analysis. First, as mentioned, we only identified Chinese firms that were added to the EL. A useful extension therefore would be to extend the coverage of firms that we identify. One possible direction would be to match foreign affiliates of Japanese multinationals in China with the destination firms included in the Japan Customs export transaction data. Doing so would allow us to examine whether the increased exports from Japanese firms to non-EL firms in China after the treatment may have gone to foreign affiliates. Second, we could use the Japan Customs import transaction data to extract information on the import behavior of Japanese firms that were affected by US export control regulations. Based on information on whether

[30] This finding is consistent with the results of previous studies (Ando, Hayakawa and Kimura, 2024a,b; Hayakawa et al., 2023).

such firms import goods from the United States, we may possibly be able to separate the direct and the indirect effects of US export controls on the exporting behavior of these firms. Third, due to data availability, the observation period of this study ends at the end of 2022. However, the Biden Administration continued to tighten export controls against China and added more Chinese firms to the EL in 2023 and 2024. Therefore, it is important to extend the observation period beyond 2023 and examine whether there are any changes in the impact of US export controls on Japanese firms' exporting behavior. Fourth, while this study showed that Japanese firms responded to the tightening of US export controls by reducing exports to targeted Chinese firms and increasing exports to other firms, we did not analyze the impact on prices, total sales, and other performance indicators of the affected Japanese exporters. Examining these aspects is also important. Fifth, this study primarily focused on the impact on firms' export behavior. However, US export controls may also affect other aspects of firm behavior in third countries. For example, changes in export patterns could affect firms' procurement of inputs and intermediate goods, and in the longer term could have an impact on their R&D activities. Further research on these aspects of firm behavior would be valuable. Finally, while this study focuses on the impact of US export controls on Japanese firms' export behavior, similar research should be conducted for other countries to examine how firms in other countries are affected by US export controls.

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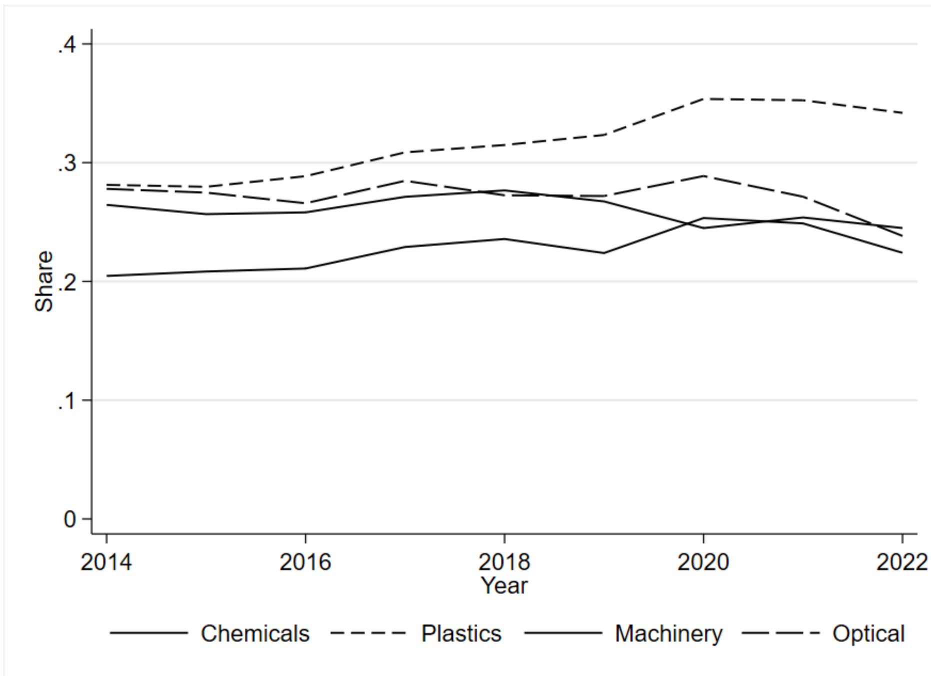

Figure 1: China's share in Japan's total exports in selected HS 2-digit product categories

Note: This figure shows China's share in Japan's total exports across selected HS 2-digit product categories. The category labeled "Chemicals" includes products classified under HS chapters 28, 29, 34, 37, and 38 categories. "Plastics" refers to products in HS chapter 39, while "Machinery" includes products in HS chapters 84 and 85. The "Optical" category consists of optical and other instruments in HS chapter 90.

Source: Authors' calculations based on Japan Customs data.

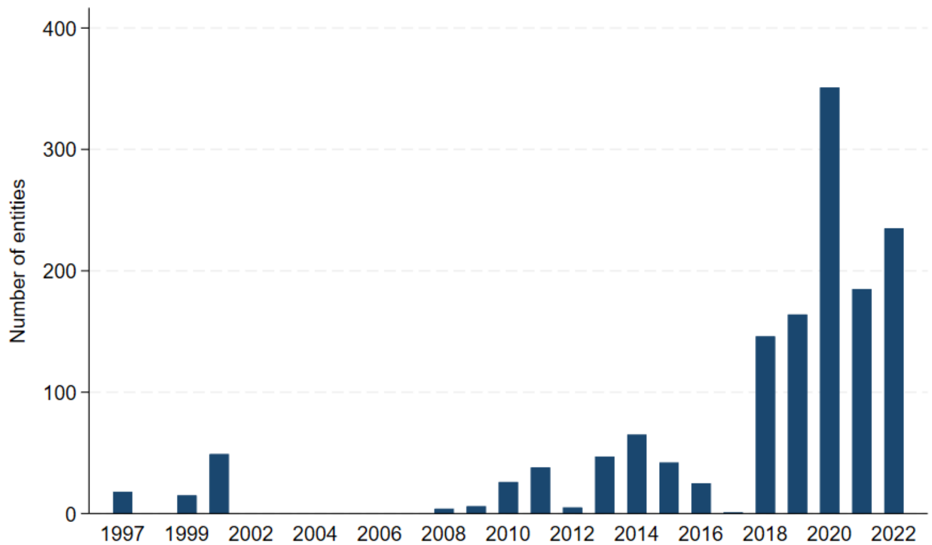

Figure 2: Number of Chinese entities on the EL from 1997 to 2022

Source: Compiled by authors based on information from the EL.

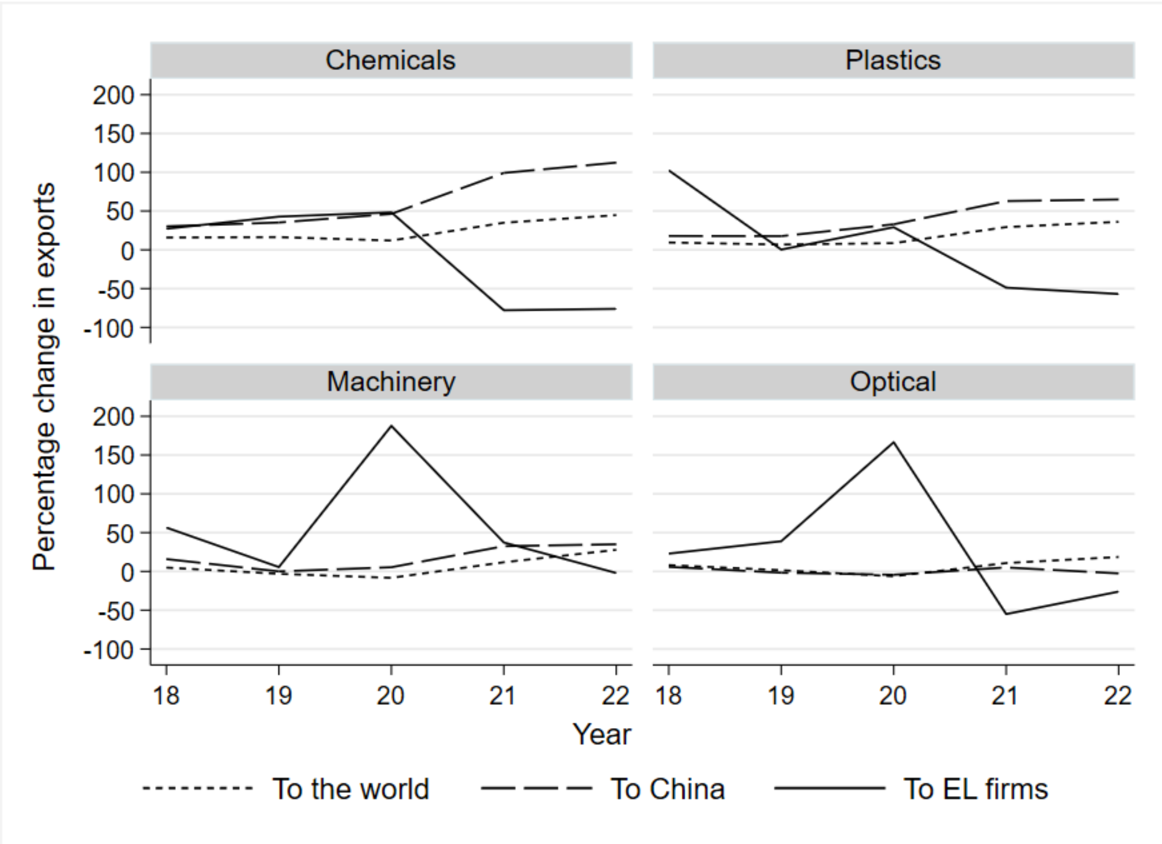

Figure 3: Percentage changes in Japan's exports to the world, China, and EL firms for HS 2-digit product categories compared to 2015–2017 average

Note: This figure presents the change in exports of 417 HS 9-digit level products included in the analysis from Japan to the world, China, and EL firms in China. The change is calculated as the percentage change in export value relative to the average for the 2015–2017 period. The upper left panel for "Chemicals" is for products from HS chapters 28, 29, 34, 37, and 38; the upper right panel, "Plastics," for products from HS chapter 39; the lower left panel, "Machinery," for products from HS chapters 84 and 85; and the lower right panel, "Optical," for optical & other instruments in HS chapter 90.

Source: Authors' calculations based on Japan Customs data.

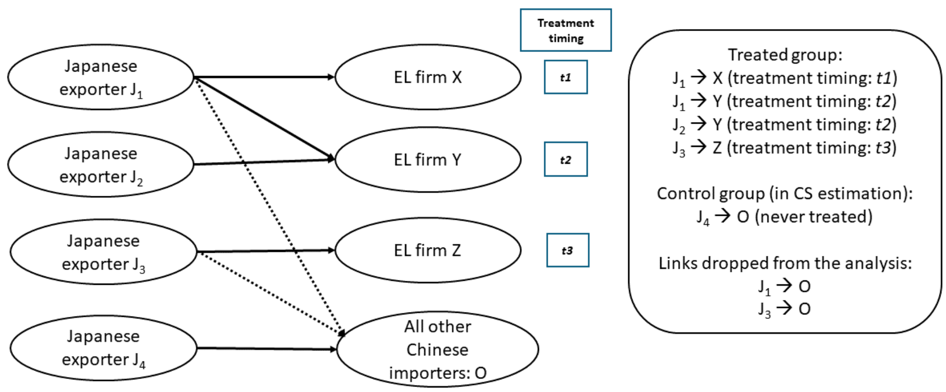

Figure 4: Treated and control groups for Analysis III.A

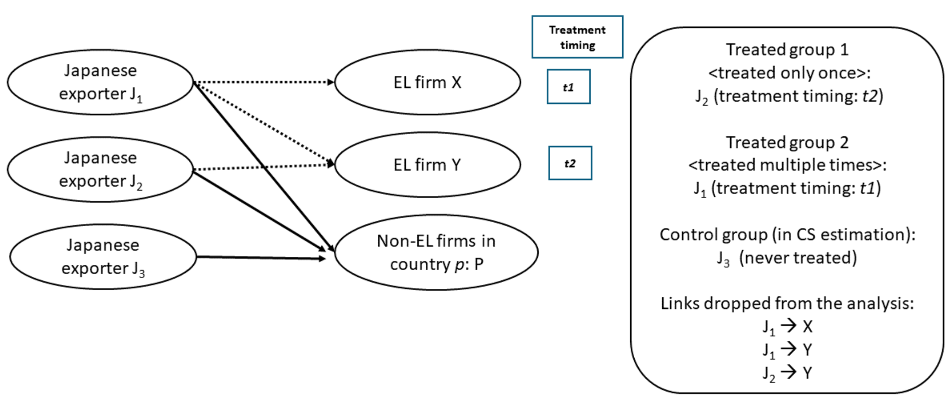

Figure 5: Treated and control groups for Analysis III.B

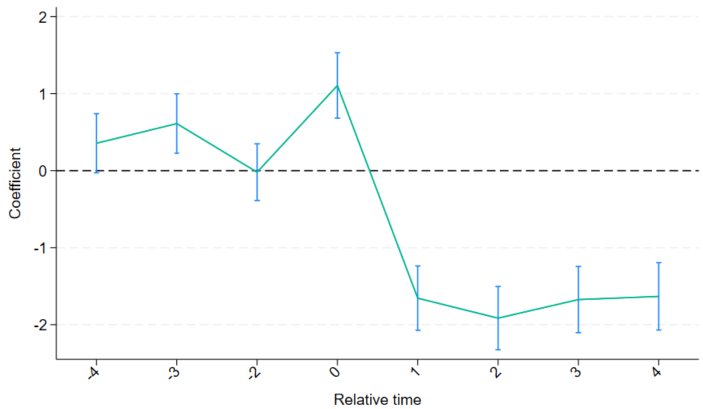

Figure 6: Impact on exports to EL firms: Dynamic TWFE DID

Note: This figure shows the event study plots obtained by estimating the dynamic TWFE DID model. The blue bars indicate 95% confidence intervals around the estimated dynamic coefficients, which are located in the middle of the bars and linked by green lines. Robust standard errors are used to construct the 95% confidence intervals.

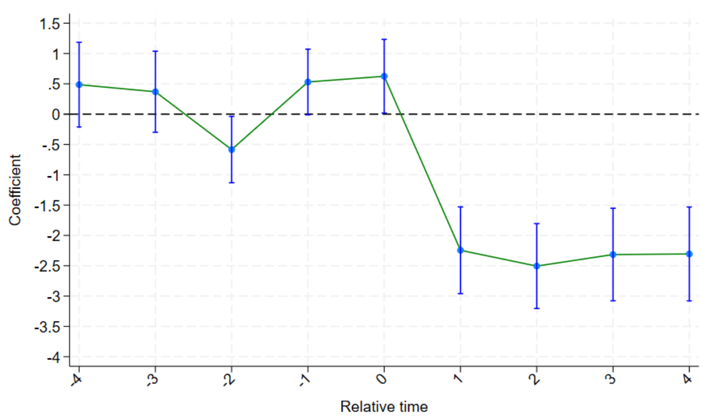

Figure 7: Impact on exports to EL firms: Callaway and Sant'Anna (2021) estimator

Note: This figure shows the event study plots obtained by estimating the dynamic staggered DID model using the estimator developed by Callaway and Sant'Anna (2021). The blue bars indicate 95% simultaneous confidence intervals around the observed ATTs in the relative periods from the treatment indicated by green dots. The simultaneous confidence intervals are computed using the multiplier bootstrap algorithm described in Callaway and Sant'Anna (2021). The estimated standard errors from the bootstrapped samples are used for their construction.

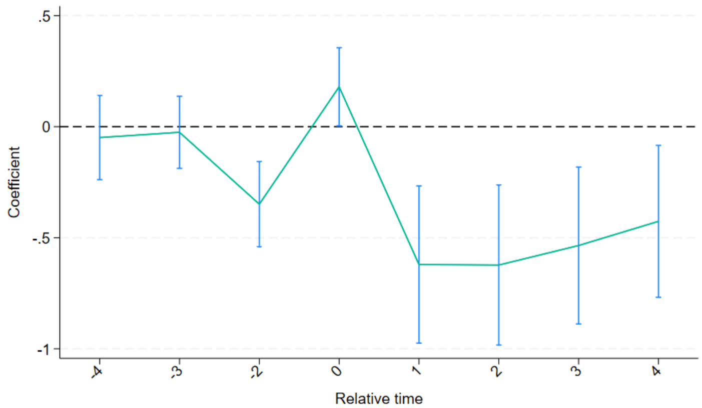

Figure 8: Impact on exports to EL firms: Dynamic TWFE DID, intensive margin only

Note: This figure shows the event study plots obtained by estimating the dynamic TWFE DID model. An unbalanced panel is used for the estimation. Details of the figure construction are provided in the note to Figure 6.

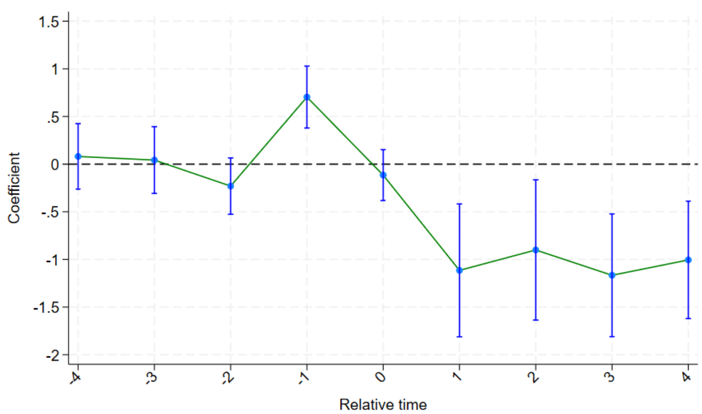

Figure 9: Impact on exports to EL firms: Callaway and Sant'Anna (2021) estimator, intensive margin only

Note: This figure shows the event study plots obtained by estimating the dynamic staggered DID model using the estimator developed by Callaway and Sant'Anna (2021). An unbalanced panel is used for the estimation. Details of the figure construction are provided in the note to Figure 7.

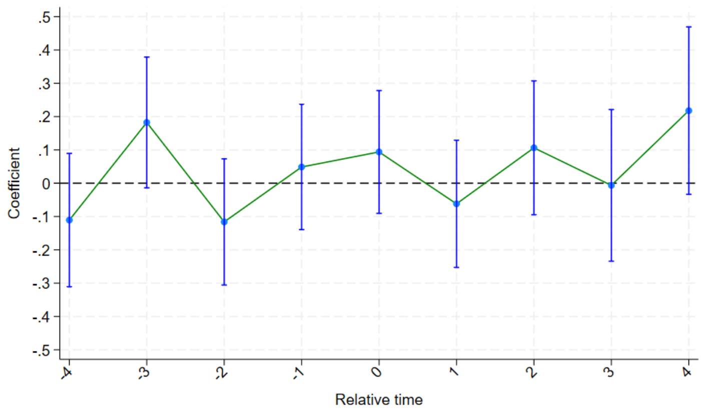

Figure 10: Impact on exports to non-EL firms in all destinations: Callaway and Sant'Anna (2021) estimator, firms with single treatment

Note: This figure shows the event study plots obtained by estimating the dynamic staggered DID model using the estimator developed by Callaway and Sant'Anna (2021). Exports to all destination countries are included. Details of the figure construction are provided in the note to Figure 7.

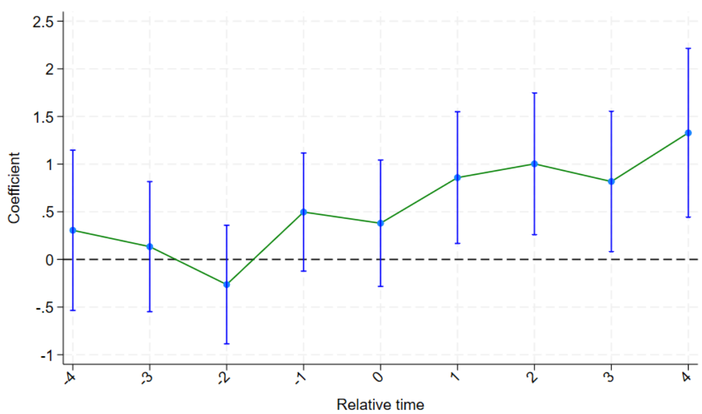

Figure 11: Impact on exports to non-EL firms in China: Callaway and Sant'Anna (2021) estimator, firms with single treatment

Note: This figure shows the event study plots obtained by estimating the dynamic staggered DID model using the estimator developed by Callaway and Sant'Anna (2021). The analysis is restricted to exports to China. Details of the figure construction are provided in the note to Figure 7.

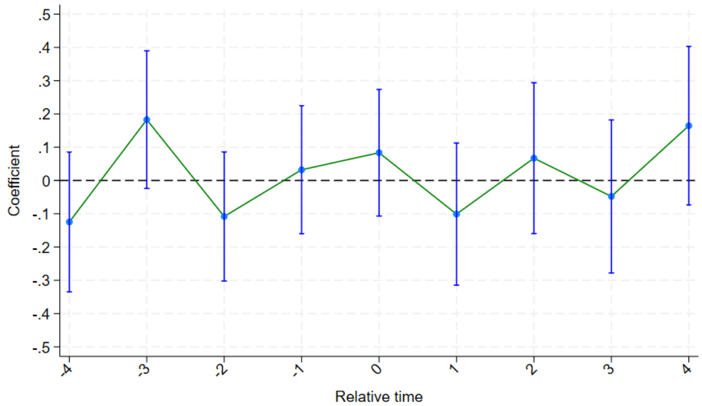

Figure 12: Impact on exports to non-EL firms in all destinations except China: Callaway and Sant'Anna (2021) estimator, firms with single treatment

Note: This figure shows the event study plots obtained by estimating the dynamic staggered DID model using the estimator developed by Callaway and Sant'Anna (2021). Exports to all destination countries except China are included. Details of the figure construction are provided in the note to Figure 7.

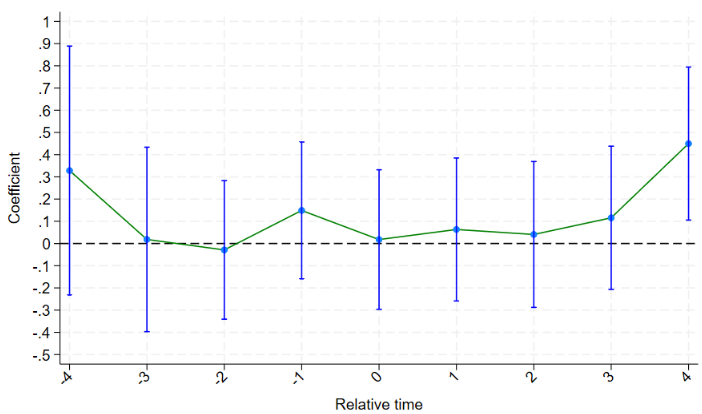

Figure 13: Impact on exports to non-EL firms in all destinations: Callaway and Sant'Anna (2021) estimator, firms with multiple treatments

Note: This figure shows the event study plots obtained by estimating the dynamic staggered DID model using the estimator developed by Callaway and Sant'Anna (2021). Exports to all destination countries are included. Details of the figure construction are provided in the note to Figure 7.

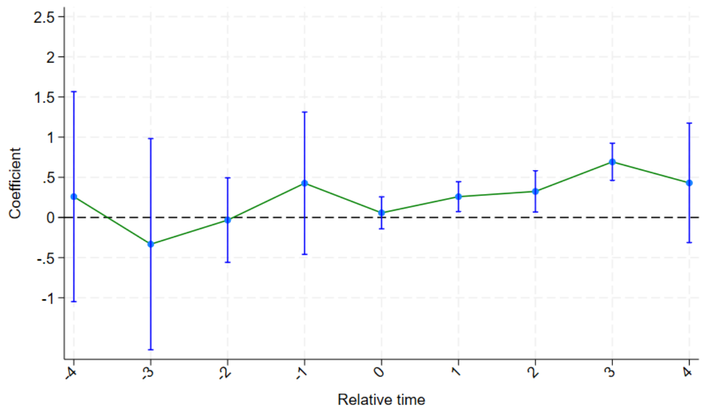

Figure 14: Impact on exports to non-EL firms in China: Callaway and Sant'Anna (2021) estimator, firms with multiple treatments

Note: The figure shows the event study plots obtained by estimating the dynamic staggered DID model using the estimator developed by Callaway and Sant'Anna (2021). The analysis is restricted to exports to China. Details of the figure construction are provided in the note to Figure 7.

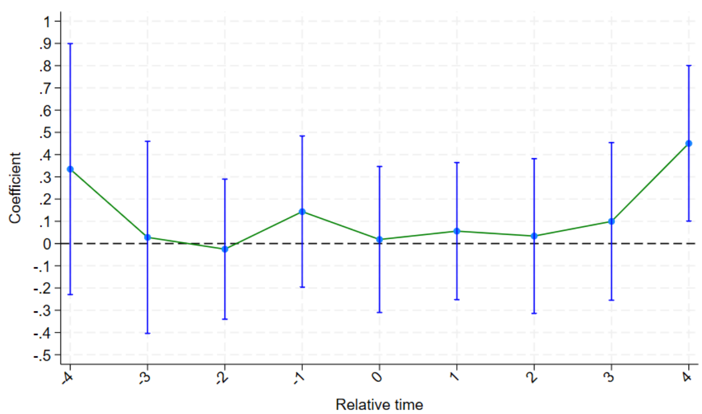

Figure 15: Impact on exports to non-EL firms in all destinations except China: Callaway and Sant'Anna (2021) estimator, firms with multiple treatments

Note: This figure shows the event study plots obtained by estimating the dynamic staggered DID model using the estimator developed by Callaway and Sant'Anna (2021). Exports to all destination countries except China are included. Details of the figure construction are provided in the note to Figure 7.

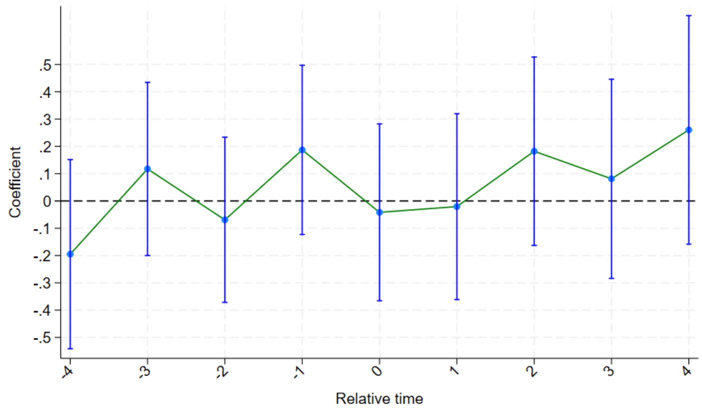

Figure 16: Impact on exports to non-EL firms in Tier 1 destinations by Japanese firms with single treatment: Callaway and Sant'Anna (2021) estimator

Note: This figure shows the event study plots obtained by estimating the dynamic staggered DID model using the estimator developed by Callaway and Sant'Anna (2021). The analysis is restricted to exports to Tier 1 countries. The treated group is restricted to single-treatment Japanese firms. Details of the figure construction are provided in the note to Figure 7.

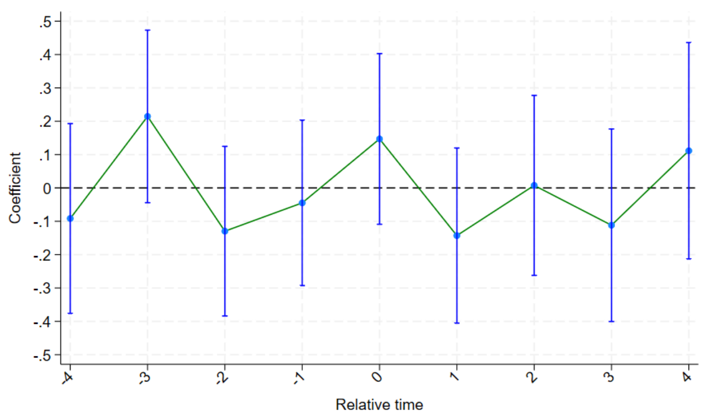

Figure 17: Impact on exports to non-EL firms in other destinations by single-treatment Japanese firms: Callaway and Sant'Anna (2021) estimator

Note: This figure shows the event study plots obtained by estimating the dynamic staggered DID model using the estimator developed by Callaway and Sant'Anna (2021). The analysis is restricted to exports to non-Tier 1 countries. The treated group is restricted to single-treatment Japanese firms. Details of the figure construction are provided in the note to Figure 7.

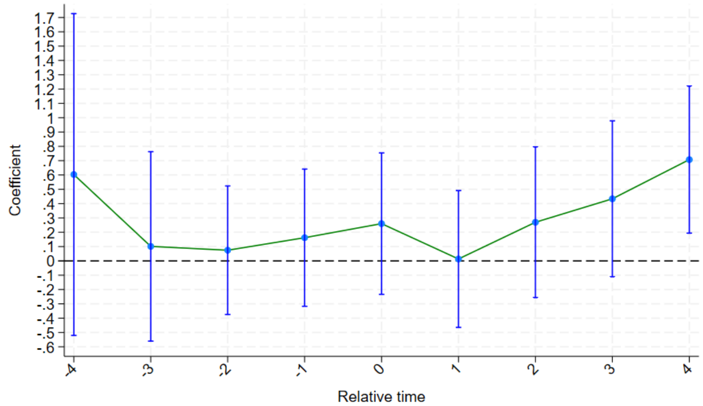

Figure 18: Impact on exports to non-EL firms in Tier 1 destinations by multiple-treatment Japanese firms: Callaway and Sant'Anna (2021) estimator

Note: This figure shows the event study plots obtained by estimating the dynamic staggered DID model using the estimator developed by Callaway and Sant'Anna (2021). The analysis is restricted to exports to Tier 1 countries. The treated group is restricted to multiple-treatment Japanese firms. Details of the figure construction are provided in the note to Figure 7.

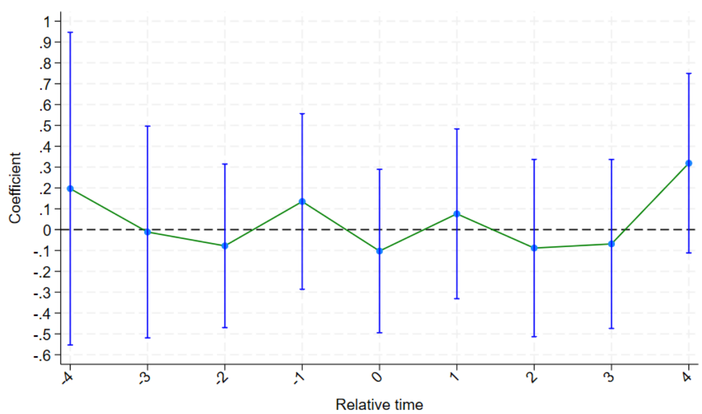

Figure 19: Impact on exports to non-EL firms in other destinations by multiple-treatment Japanese firms: Callaway and Sant'Anna (2021) estimator

Note: This figure shows the event study plots obtained by estimating the dynamic staggered DID model using the estimator developed by Callaway and Sant'Anna (2021). The analysis is restricted to exports to non-Tier 1 countries. The treated group is restricted to multiple-treatment Japanese firms. Details of the figure construction are provided in the note to Figure 7.

Table 1: Matching of the sample with the BSJBSA

Japanese exporters	Matching with BSJBSA			
in the sample	In BSJBSA	Not in BSJBSA	Total	
Treated group	333	169	502	(2%)
Control group	6,876	18,128	25,004	(98%)
Total	7,209 (28.3%)	18,297 (71.7%)	25,506	(100%)

Note: The firm IDs of Japanese exporting firms in the sample are matched with those in the BSJBSA.

Table 2: Impact on exports to EL firms

	(1) TWFE	(2) CS
$Treated_{ij} \times Post_{ijt}$	-1.503^{***}	
	(0.150)	
Overall ATT		-1.555^{***}
		(0.212)
Aggregated ATTs for cohorts		
Cohort 1		1.291^{*}
		(0.781)
Cohort 2		0.270
		(0.578)
Cohort 3		1.577^{***}
		(0.478)
Cohort 4		-2.576^{**}
		(1.067)
Cohort 5		-2.794^{***}
		(0.251)
Cohort 6		−0.733
		(0.832)
Cohort 7		0.170
		(0.708)
Cohort 8		0.118
		(0.239)
Cohort 9		0.310
		(0.872)
Fixed effects:		
Exporter × Partner	Yes	Yes
Half-year period	Yes	Yes
No. of obs.	97,188	97,188
Adjusted R^2	0.641	

Note: The dependent variable is y_{ijt}. Column (1) reports the results from the static staggered TWFE DID model, while column (2) reports the results from the dynamic staggered DID model using the Callaway and Sant'Anna (2021) estimator. The results in column (2) include the overall ATT and aggregated ATT for each cohort, which is the weighted average of the estimated cohort-time ATTs. Standard errors clustered at the exporter-partner level are in parentheses.

Table 3: Impact on exports to EL firms: Intensive margin only

	(1) TWFE	(2) CS
$Treated_{ij} \times Post_{ijt}$	-0.219^{**}	
	(0.090)	
Overall ATT		-0.659^{***}
		(0.109)
Aggregated ATTs for cohorts		
Cohort 1		-1.327^{***}
		(0.295)
Cohort 2		0.188
		(0.282)
Cohort 3		-2.125^{***}
		(0.017)
Cohort 4		-1.381
		(0.839)
Cohort 5		-0.747^{***}
		(0.119)
Cohort 6		-0.599
		(1.005)
Cohort 7		0.340
		(0.575)
Cohort 8		-0.771^{***}
		(0.017)
Cohort 9		0.609
		(0.576)
Fixed effects:		
Exporter × Partner	Yes	Yes
Half-year period	Yes	Yes
No. of obs.	52,416	54,194
Adjusted R^2	0.825	

Note: The dependent variable is y_{ijt}. Estimations are conducted using an unbalanced panel. Column (1) reports the results from the static staggered TWFE DID model, while column (2) reports the results from the dynamic staggered DID model using the Callaway and Sant'Anna (2021) estimator. Column (2) reports the overall ATT and aggregated ATT for each cohort, which is the weighted average of the estimated cohort-time ATTs. Standard errors clustered at the exporter-partner level are in parentheses.

Table 4: Impact on exports to non-EL firms: Single-treatment Japanese firms

	All destinations		To China only		All destinations except China	
	(1) TWFE	(2) CS	(3) TWFE	(4) CS	(5) TWFE	(6) CS
$Treated_i \times Post_{it}$	0.082*		1.110***		0.040	
	(0.047)		(0.200)		(0.049)	
Overall ATT		0.113*		0.897***		0.076
		(0.063)		(0.218)		(0.065)
Aggregated ATTs for cohorts						
Cohort 1		0.371		−0.154		0.405
		(0.306)		(0.708)		(0.323)
Cohort 2		0.496***		1.339***		0.457***
		(0.167)		(0.479)		(0.172)
Cohort 3		−0.428		1.808		−0.528
		(0.413)		(1.563)		(0.424)
Cohort 4		−0.308		−0.461		−0.307
		(0.193)		(0.807)		(0.197)
Cohort 5		0.094		1.420***		0.038
		(0.081)		(0.290)		(0.083)
Cohort 6		−0.503**		−1.247		−0.495
		(0.209)		(1.018)		(0.213)
Cohort 7		0.688***		−0.00005		0.724***
		(0.262)		(0.641)		(0.275)
Cohort 8		−10.979***		−10.762***		
		(0.020)		(0.065)		
Cohort 9		0.451		−1.342		0.567
		(0.329)		(0.939)		(0.344)
Fixed effects:						
Exporter × Destination	Yes	Yes	Yes	Yes	Yes	Yes
Half-year period	Yes	Yes	Yes	Yes	Yes	Yes
No. of obs.	1,151,928	1,151,928	85,548	85,548	1,066,380	1,066,380
Adjusted R^2	0.590		0.668		0.578	

Note: The dependent variable is x_{idt}. The estimations in columns (1) and (2) include all destination countries. The estimations in columns (3) and (4) include China only as the destination country, while the estimations in columns (5) and (6) exclude China from the destination countries. Columns (1), (3), and (5) report the results from the static staggered TWFE DID model, while columns (2), (4), and (6) report the results from the dynamic staggered DID model using the Callaway and Sant'Anna (2021) estimator. Columns (2), (4), and (6) report the overall ATT and aggregated ATT for each cohort, which is the weighted average of the estimated cohort-time ATTs. Standard errors clustered at the exporter-destination level are in parentheses.

Table 5: Impact on exports to non-EL firms: Multiple-treatment Japanese firms

	All destinations		To China only		All destinations except China	
	(1) TWFE	(2) CS	(3) TWFE	(4) CS	(5) TWFE	(6) CS
$Treated_i \times Post_{it}$	0.326***		0.881***		0.311***	
	(0.073)		(0.210)		(0.075)	
Overall ATT		0.121		0.578***		0.106
		(0.098)		(0.121)		(0.101)
Aggregated ATTs for cohorts						
Cohort 1		−0.059		0.528***		−0.077
		(0.140)		(0.175)		(0.144)
Cohort 2		0.525***		0.907***		0.512***
		(0.189)		(0.124)		(0.193)
Cohort 3		−0.451		0.682**		−0.485
		(0.567)		(0.310)		(0.585)
Cohort 4		−0.289		−0.354		−0.290
		(0.543)		(0.551)		(0.561)
Cohort 5		0.262		0.404		0.251
		(0.192)		(0.285)		(0.198)
Fixed effects:						
Exporter × Destination	Yes	Yes	Yes	Yes	Yes	Yes
Half-year period	Yes	Yes	Yes	Yes	Yes	Yes
No. of obs.	1,075,548	1,075,548	82,092	82,092	993,456	993,456
Adjusted R^2	0.590		0.665		0.579	

Note: The dependent variable is x_{idt}. The estimations in columns (1) and (2) include all destination countries. The estimations in columns (3) and (4) include China only as the destination country, while the estimations in columns (5) and (6) exclude China from the destination countries. Columns (1), (3), and (5) report the results from the static staggered TWFE DID model, while columns (2), (4), and (6) report the results from the dynamic staggered DID model using the Callaway and Sant'Anna (2021) estimator. Columns (2), (4), and (6) report the overall ATT and aggregated ATT for each cohort, which is the weighted average of the estimated cohort-time ATTs. Standard errors clustered at the exporter-destination level are in parentheses.

Table 6: Comparison between single- and multiple-treatment Japanese firms

Variable	No. of firms	Mean	Std. dev.	Min	Median	Max
(a) No. of export destinations						
Single-treatment firms	383	16.7	17.1	1.0	11.2	80.1
Multiple-treatment firms	96	25.1	18.3	5.6	18.2	64.1
(b) Log total exports						
Single-treatment firms	383	21.0	2.8	14.2	21.4	26.6
Multiple-treatment firms	96	23.5	2.3	19.0	23.6	27.0
(c) Export share of other countries						
Single-treatment firms	383	0.69	0.29	0.00	0.78	1.00
Multiple-treatment firms	96	0.76	0.17	0.39	0.81	0.96
(d) EL firms' share in exports to China						
Single-treatment firms	362	0.084	0.203	0.00	0.00043	0.965
Multiple-treatment firms	95	0.070	0.133	0.00	0.017	0.373
(e) No. of foreign countries in which a firm has invested						
Single-treatment firms	167 (42.1%)	7.0	8.4	1.0	4.0	32.6
Multiple-treatment firms	62 (63.9%)	8.7	7.3	1.4	7.1	22.0

Note: The original numbers of single- and multiple-treatment firms are 397 and 97, respectively. Statistics in parts (a)–(d) are calculated for the 417 HS 9-digit level products included in the analysis, with each value representing the group average in 2015–2017. Since firms that did not export those products in 2015–2017 are excluded from the calculation, the number of firms for each group is different from the original number. Moreover, the number of firms in each group in part (d) differs from that in (a)–(d) because firms that did not export those products to China in 2015–2017 are excluded. In (b), the calculation is performed using the inverse hyperbolic sine transformation. The minimum, median, and maximum are calculated as average values of these statistics using 10 observations with different exporter IDs. Part (e) uses data from the BSOBA and includes firms that can be matched between the Japan Customs data and the BSOBA. In (e), the number in parentheses indicates the share of multinational enterprises in each group, where multinational enterprises are defined as firms with foreign affiliates in at least one foreign country and the shares are calculated as 167/397 and 62/97, where the denominator is the original number of firms in each group.

Table 7: Impact on exports to non-EL firms: Exports to Tier 1 countries and other destinations

	Firms with single treatment		Firms with multiple treatments	
	(1)	(2)	(3)	(4)
	Tier 1 countries	Other destinations	Tier 1 countries	Other destinations
Overall ATT	0.191*	0.016	0.385**	−0.037
	(0.106)	(0.083)	(0.161)	(0.128)
Aggregated ATTs for cohorts				
Cohort 1	1.200***	−0.190	0.370	−0.325*
	(0.419)	(0.466)	(0.299)	(0.184)
Cohort 2	0.582**	0.386	0.707**	0.427*
	(0.267)	(0.224)	(0.299)	(0.244)
Cohort 3	−1.246*	−0.118	−0.572	−0.458
	(0.669)	(0.543)	(0.996)	(0.719)
Cohort 4	−0.143	−0.374	−1.618	0.268
	(0.296)	(0.251)	(1.444)	(0.495)
Cohort 5	0.105	0.0015	0.289	0.230
	(0.137)	(0.105)	(0.283)	(0.262)
Cohort 6	−0.769*	−0.423		
	(0.137)	(0.243)		
Cohort 7	0.358	0.970***		
	(0.411)	(0.366)		
Cohort 9	0.164	0.841		
	(0.466)	(0.482)		
Fixed effects:				
Exporter × Destination	Yes	Yes	Yes	Yes
Half-year period	Yes	Yes	Yes	Yes
No. of obs.	410,148	656,232	385,920	607,536

Note: The dependent variable is x_{idt}. In the estimations in columns (1) and (2), the treated group is restricted to Japanese exporters with a single EL partner. In the estimations in columns (3) and (4), the treated group is restricted to Japanese exporters with multiple EL partners. The results in all columns are based on the dynamic staggered DID model using the Callaway and Sant'Anna (2021) estimator. The overall ATT and aggregated ATT for each cohort, which is the weighted average of the estimated cohort-time ATTs, are reported. Standard errors clustered at the exporter-destination level are in parentheses.

Appendix

A Descriptive Statistics

Descriptive statistics of the outcome variables used in the analysis in the main text are reported in Table A.1.

Table A.1: Descriptive statistics

Variable	No. of obs.	Mean	Std. dev.	Min	Max
A. Section 5.1					
y_{ijt}	97,644	9.644	8.814	0	25.656
B. Section 5.2					
y_{ijt}	54,261	17.355	2.443	12.857	25.656
C. Section 5.3					
x_{idt} (all destinations)	1,151,928	8.103	8.447	0	25.973
x_{idt} (China)	85,548	11.137	8.687	0	25.852
x_{idt} (all destinations except China)	1,066,380	7.859	8.380	0	25.742
D. Section 5.4					
x_{idt} (all destinations)	1,075,548	8.073	8.442	0	26.145
x_{idt} (China)	82,092	10.984	8.682	0	25.907
x_{idt} (all destinations) except China)	993,456	7.833	8.378	0	25.966
E. Appendix C					
y_{ijt} (2017–2022)	99,120	9.736	8.852	0	25.804
y_{ijt} (2014–2022)	100,524	9.807	8.867	0	25.796
F. Appendix D					
y_{ijt} (all firms)	304,752	6.879	8.313	0	25.656
y_{ijt} (BSJBSA firms only)	94,392	9.875	8.796	0	25.656

Note: The dependent variable y_{ijt} is the inverse hyperbolic sine transformation of export values from Japanese exporter i to Chinese partner j in half-year period t. Similarly, x_{idt} is the inverse hyperbolic sine transformation of total exports from Japanese exporter i to non-EL firms in destination country d in half-year period t. Due to the data protections from the MOF, we cannot report the exact minimum, median, and maximum values. These statistics are calculated as the average of the minimum, median, and maximum values across 10 observations with different exporter IDs.

B Robustness checks: Analysis Based on the Stacked Event Study Estimator

In this appendix, we present the results from the stacked event study estimations.

The stacked event study approach involves constructing "stacks," each of which contains all observations from a cohort that received treatment in the same half-year period and all exporter-partner pairs that never received treatment. Effects are identified within each stack by comparing an individual cohort of treated pairs to never-treated pairs.

The estimation equations for analyzing the impact on exports to EL firms are given by

$$y_{ijct} = \beta \left(Treat_{ijc} \times Post_{ct} \right) + \alpha_{ijc} + \gamma_{ct} + \varepsilon_{ijct}, \tag{B1}$$

$$y_{ijct} = \sum_{r=-4}^{4} \beta_r \mathbb{1} \left(R_{ijct} = r \right) + \alpha_{ijc} + \gamma_{ct} + \varepsilon_{ijct}, \tag{B2}$$

where y_{ijct} is the inverse hyperbolic sine transformation of the export value from Japanese exporter i to Chinese partner j in cohort c in half-year period t, $Treat_{ijc}$ is equal to one if Japanese exporter i's Chinese partner j is one of the EL firms in the sample that is included in the treated group of cohort c, $Post_{ct}$ is equal to one if half-year period t is after cohort c of the treated group is treated, $R_{ijct} = t - E_{ij}$ indicates the time relative to treatment for cohort $E_{ij} = c$, $\mathbb{1} \left(R_{ijct} = r \right)$ is an indicator variable equal to one if calendar period t is the rth period from $E_{ij} = c$, α_{ijc} and γ_{ct} are respectively exporter-partner-pair-by-stack fixed effects and half-year-period-by-stack fixed effects, and ε_{ijct} is an error term.

On the other hand, the stacked event study regression equations for analyzing the impact on exports to non-EL firms are given by

$$x_{idct} = \beta \left(Treat_{ic} \times Post_{ct} \right) + \alpha_{idc} + \gamma_{ct} + \varepsilon_{idct}, \tag{B3}$$

$$x_{idct} = \sum_{r=-4}^{4} \beta_r \mathbb{1} \left(R_{ict} = r \right) + \alpha_{idc} + \gamma_{ct} + \varepsilon_{idct}, \tag{B4}$$

where x_{idct} is the inverse hyperbolic sine transformation of the total export value from Japanese exporter i in cohort c to non-EL firms in destination country d in half-year period t, $Treat_{ic}$ is equal to one if Japanese exporter i is included in the treated group of cohort c, which means firm i received the first treatment in half-year period c, $Post_{ct}$ is equal to one if half-year period t is after cohort c of the treated group is treated, $R_{ict} = t - E_i$ indicates the time relative to treatment for cohort $E_i = c$, $\mathbb{1} \left(R_{ict} = r \right)$ is an indicator variable equal to one if calendar period t is the rth period from $E_i = c$, α_{idc} and γ_{ct} are respectively exporter-destination-pair-by-stack fixed effects and half-year-period-by-stack fixed effects, and ε_{idct} is an error term. As in Section 4.2, we analyze three cases: exports to (i) all destinations; (ii) China only; and (iii) all destinations except China.

The results of the stacked regressions are reported in Table B.1 and Figures B.1–B.4. Column (1) in Table B.1 reports the coefficient on $Treated_{ijc} \times Post_{ct}$ estimated using equation (B1). Consistent with the results in Section 5.1, the estimated coefficient is negative and significant. The event study plot based on equation (B2) is shown in Figure B.1. The result is quite similar to that obtained using the dynamic TWFE DID estimation (Figure 6).

Table B.1: Stacked regression results

		Exports to non-EL firms		
		All destinations	To China only	All destinations except China
	(1)	(2)	(3)	(4)
$Treated_{ijc} \times Post_{ct}$	-1.491^{***}			
	(0.147)			
$Treated_{ic} \times Post_{ct}$		0.084^{*}	1.117^{***}	0.042
		(0.046)	(0.197)	(0.048)
Fixed effects:				
Exporter-Partner × Stack	Yes	No	No	No
Exporter-Destination × Stack	No	Yes	Yes	Yes
Half-year period × Stack	Yes	Yes	Yes	Yes
No. of obs.	825,540	8,383,656	652,044	7,731,612
Adjusted R^2	0.656	0.584	0.659	0.572

Note: The dependent variable is y_{ijt} in column (1) and x_{idt} in columns (2)–(4). All regressions are conducted using the stacked regression estimator. In column (1), the figure in parentheses shows the standard error clustered at the exporter-partner-pair-by-stack level, while in columns (2)–(4) figures in parentheses show standard errors clustered at the exporter-destination-pair-by-stack level.

On the other hand, columns (2)–(4) in Table B.1 report the estimated coefficients on $Treated_{ic} \times Post_{ct}$ based on equation (B3). The coefficient is positive in all estimations but significant only in column (3) and, albeit weakly, in column (2). The event study plots based on equation (B4) are shown in Figure B.2–B.4. The impact is positive and significant after the treatment if the destination is restricted to China (Figure B.3) but insignificant for all other cases.

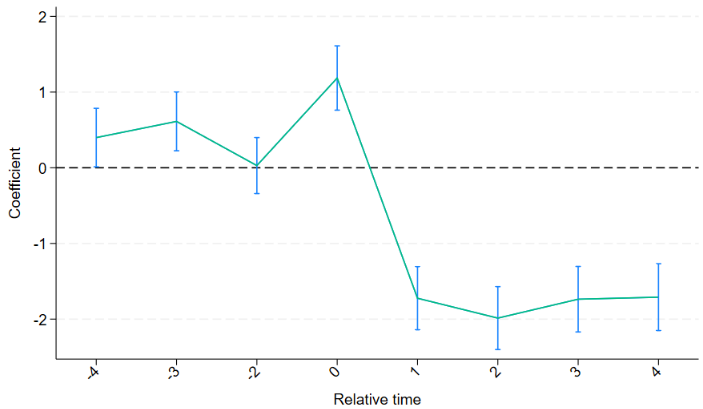

Figure B.1: Impact on exports to EL firms: Stacked event study estimator

Note: This figure shows the event study plots based on the stacked event study estimator. The blue bars indicate 95% confidence intervals around the estimated coefficients, which are located in the middle of the bars and linked by green lines. Robust standard errors are used to construct the 95% confidence intervals.

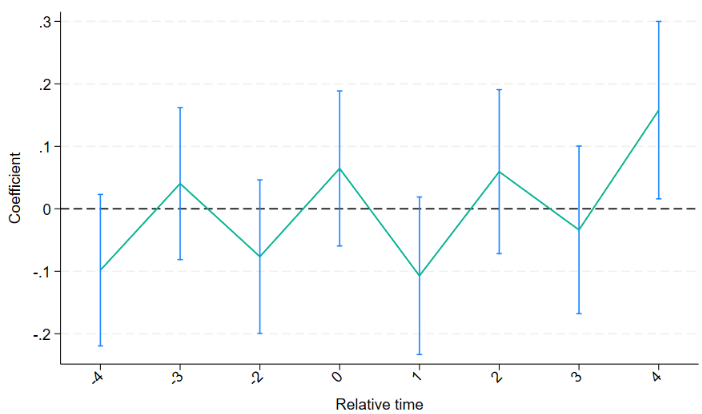

Figure B.2: Impact on exports to non-EL firms in all destinations: Stacked event study estimator

Note: Details of the figure construction are provided in the note to Figure B.1.

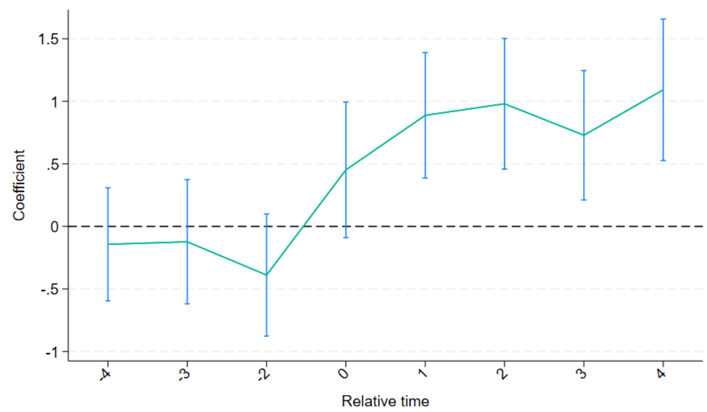

Figure B.3: Impact on exports to non-EL firms in China: Stacked event study estimator

Note: Details of the figure construction are provided in the note to Figure B.1.

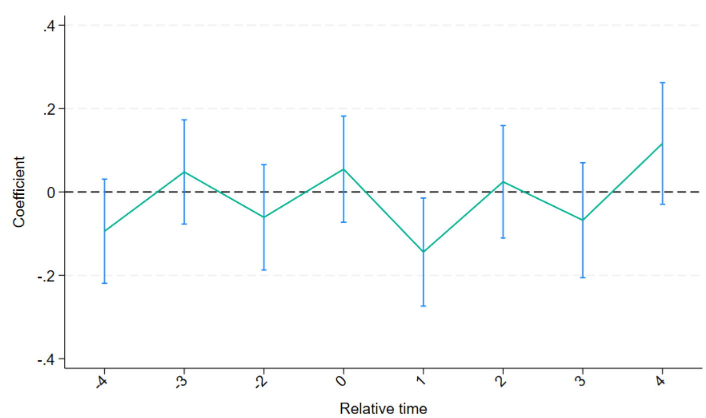

Figure B.4: Impact on exports to non-EL firms in all destinations except China: Stacked event study estimator

Note: Details of the figure construction are provided in the note to Figure B.1.

C Robustness checks: Analysis of the Impact on Exports to EL Firms When the Coverage of Products Is Changed

As explained in Section 3.3, in the analysis in the main text, we restrict HS 9-digit level products included in the analysis to those Japanese firms exported to Chinese EL firms in the period 2015–2017, before the firms were added to the EL. Specifically, we focused on 417 HS 9-digit level products falling under chemicals (HS28, 29, 34, 37, 38), plastics (HS39), machinery (HS84, 85), and optical and other instruments (HS90). To check the robustness of the results, we re-estimate the models changing the set of products included in the analysis. Specifically, we change the products included in the analysis to those Japanese firms exported to Chinese EL firms in the period 2017–2022 or 2014–2022. The reason for choosing these alternative periods is that 2017–2022 is the observation period of our analysis, while 2014–2022 represents the full span for which data are available to us. When we restrict products to those exported in the 2017–2022 period, the number of products included in the analysis rises to 480 at the HS 9-digit level, with 275 of these falling under HS84 and 85. When we instead use the 2014–2022 period, the number of products rises to 554, with 319 falling under HS84 and 85.

The results are reported in Table C.1 and Figures C.1 and C.2. Both when the choice of products is based on export records for 2017–2022 and for 2014–2022, the findings remain essentially unchanged from the results in Section 5.1.

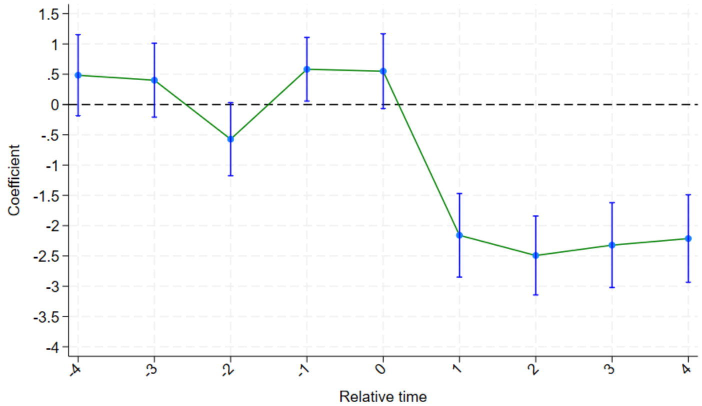

Figure C.1: Impact on exports to EL firms when products are restricted based on the export record in the 2017–2022 period

Note: This figure shows the event study plots based on the dynamic staggered DID model using the estimator developed by Callaway and Sant'Anna (2021) when products are restricted at the HS 9-digit level to those exported by Japanese firms to Chinese EL firms in the period 2017–2022. The blue bars indicate 95% simultaneous confidence intervals around the observed ATTs in the relative periods from the treatment indicated by green dots. The simultaneous confidence intervals are computed using the multiplier bootstrap algorithm described in Callaway and Sant'Anna (2021). The estimated standard errors from the bootstrapped samples are used for their construction.

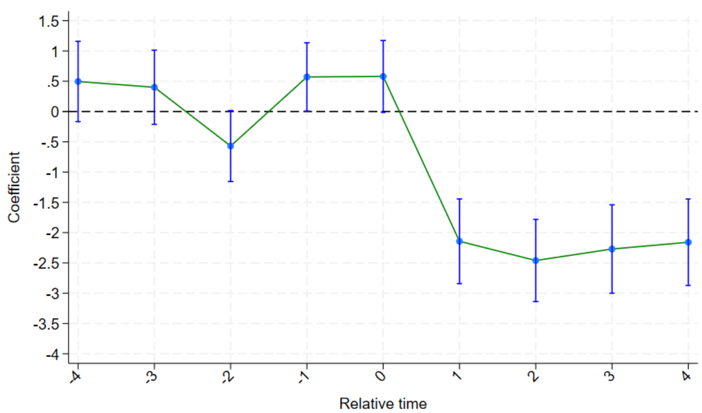

Figure C.2: Impact on exports to EL firms when products are restricted based on the export record in the 2014–2022 period

Note: This figure shows the event study plots based on the dynamic staggered DID model using the estimator developed by Callaway and Sant'Anna (2021) when products are restricted to those exported by Japanese firms to Chinese EL firms in the period 2014–2022. Details of the figure construction are provided in the note to Figure C.1.

Table C.1: Impact on exports to EL firms changing the products covered

	Choosing products based on export records for 2017–2022		Choosing products based on export records for 2014–2022	
	(1)	(2)	(3)	(4)
	TWFE	CS	TWFE	CS
$Treated_{ij} \times Post_{ijt}$	-1.424^{***}		-1.396^{***}	
	(0.145)		(0.145)	
Overall ATT		-1.538^{***}		-1.501^{***}
		(0.206)		(0.206)
Aggregated ATTs for cohorts				
Cohort 1		1.422^{*}		1.448^{*}
		(0.769)		(0.769)
Cohort 2		0.381		0.397
		(0.547)		(0.547)
Cohort 3		1.639^{***}		1.658^{***}
		(0.496)		(0.496)
Cohort 4		-2.497^{***}		-2.478^{***}
		(0.967)		(0.967)
Cohort 5		-2.797^{***}		-2.747^{***}
		(0.246)		(0.246)
Cohort 6		−0.778		−0.776
		(0.795)		(0.795)
Cohort 7		0.013		0.052
		(0.680)		(0.680)
Cohort 8		0.068		0.089
		(0.239)		(0.239)
Cohort 9		−0.261		−0.261
		(0.872)		(0.872)
Fixed effects:				
Exporter × Partner	Yes	Yes	Yes	Yes
Half-year period	Yes	Yes	Yes	Yes
No. of obs.	98,652	98,652	100,044	100,044
Adjusted R^2	0.648		0.651	

Note: The dependent variable is y_{ijt}. For the estimations reported in columns (1) and (2) and those reported in columns (3) and (4), y_{ijt} is the inverse hyperbolic since transformation of the total export value from i to j at t of the products at the HS 9-digit level, where the products included are restricted to those exported by Japanese firms to Chinese EL firms in the period 2017–2022 and in the period 2014–2022, respectively. Columns (1) and (2) report the results from the static staggered TWFE DID model, while columns (2) and (4) report the results from the dynamic staggered DID model using the Callaway and Sant'Anna (2021) estimator. Columns (2) and (4) report the overall ATT and aggregated ATT for each cohort, which is the weighted average of the estimated cohort-time ATTs. Standard errors clustered at the exporter-partner level are in parentheses.

D Robustness checks: Using all firms, and excluding non-BSJBSA firms from the treated group

As explained in Section 4.1, we exclude small firms from the control group in the analysis in the main text. That is, we exclude firms not included in the BSJBSA from the control group. To check the robustness of our baseline results, we re-estimate the models using two alternative samples. In the first, we include all firms, regardless of whether they are included in the BSJBSA. In the second, we exclude non-BSJBSA firms not only from the control group but also from the treated group. The results are reported in Table D.1 and Figures D.1 and D.2. Comparing the results with those in Table 2, we find that although the sign of the aggregated ATTs for cohorts changes for some cohorts, there is no change in the significance of the estimated coefficients. Compared with the event study results reported in Figure 7, the only qualitative difference is that the impact at $r = 0$ becomes insignificant in Figure D.2 when the sample is restricted to BSJBSA firms only.

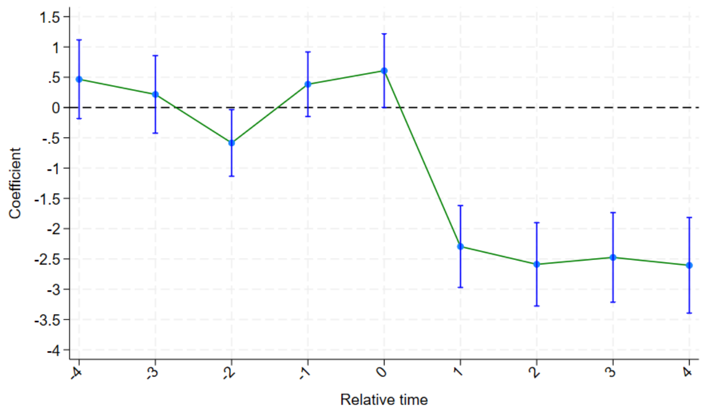

Figure D.1: Impact on exports to EL firms when all types of Japanese firms are included

Note: This figure shows the event study plots based on the dynamic staggered DID model using the estimator developed by Callaway and Sant'Anna (2021) when small firms that are not covered by the BSJBSA are included. Details of the figure construction are provided in the note to Figure C.1.

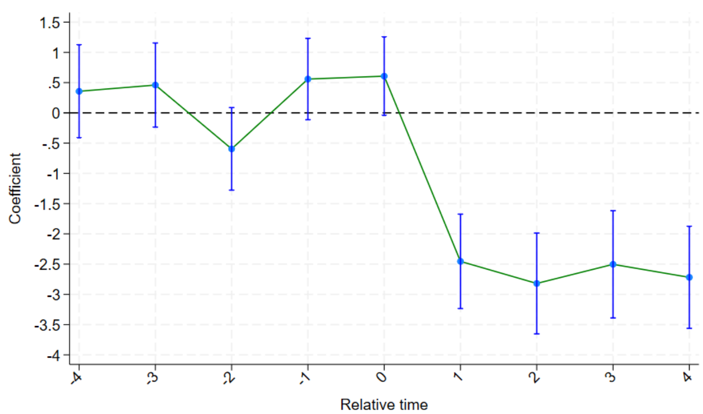

Figure D.2: Impact on exports to EL firms when small firms are excluded

Note: This figure shows the event study plots based on the dynamic staggered DID model using the estimator developed by Callaway and Sant'Anna (2021) when small firms that are not covered by the BSJBSA are excluded from the sample. Details of the figure construction are provided in the note to Figure C.1.

Table D.1: Impact on exports to EL firms when non-BSJBSA firms are included or excluded

	Including all firms		Excluding non-BSJBSA firms	
	(1)	(2)	(3)	(4)
	TWFE	CS	TWFE	CS
$Treated_{ij} \times Post_{ijt}$	-1.874^{***}		-1.749^{***}	
	(0.145)		(0.170)	
Overall ATT		-1.723^{***}		-1.812^{***}
		(0.208)		(0.241)
Aggregated ATTs for cohorts				
Cohort 1		0.908		1.550^{***}
		(0.779)		(0.912)
Cohort 2		−0.133		−0.281
		(0.575)		(0.677)
Cohort 3		1.340^{***}		1.417^{**}
		(0.475)		(0.648)
Cohort 4		-2.854^{***}		-2.996^{***}
		(1.065)		(1.118)
Cohort 5		-2.852^{***}		-3.022^{***}
		(0.246)		(0.279)
Cohort 6		−0.860		0.639
		(0.830)		(0.562)
Cohort 7		0.052		0.233
		(0.706)		(0.771)
Cohort 8		−0.067		
		(0.233)		
Cohort 9		0.119		0.368
		(0.870)		(1.019)
Fixed effects:				
Exporter × Partner	Yes	Yes	Yes	Yes
Half-year period	Yes	Yes	Yes	Yes
No. of obs.	304,200	304,200	93,984	93,984
Adjusted R^2	0.551		0.643	

Note: The dependent variable is y_{ijt}. In the estimations reported in columns (1) and (2), all firms are included in the sample, whereas in those reported in columns (3)and (4), Japanese firms that are not included in the BSJBSA are completely excluded from the sample. Columns (1) and (2) report the results from the static staggered TWFE DID model, while columns (2) and (4) report the results from the dynamic staggered DID model using the Callaway and Sant'Anna (2021) estimator. Columns (2) and (4) report the overall ATT and aggregated ATT for each cohort, which is the weighted average of the estimated cohort-time ATTs. Standard errors clustered at the exporter-partner level are in parentheses.

E Analysis of the Impact on Exports to Non-EL Firms: Single- and Multiple-Treatment Firms

In Sections 5.3 and 5.4 we discussed the impact of US export controls distinguishing between Japanese firms with one EL partner only (single-treatment firms) and with multiple EL partners (multiple-treatment firms). This appendix provides results from estimations when both types of firms are included. These results are shown in Table E.1 and Figures E.1–E.3.

In Table E.1, the point estimate of the coefficient on $Treated_i \times Post_{it}$ based on the TWFE is significant at the 1% level in the estimations for all destinations and China and at the 5% level for all destinations except China, while the overall ATT based on the Callaway and Sant'Anna (2021) estimator is significant at the 5% for all destinations and for China but insignificant for all destinations except China. Meanwhile, in the event study plots, the impact is positive and significant in all post-treatment periods for exports to non-EL firms in China (Figure E.2) but only in the fourth period after the treatment for exports to non-EL firms in all destinations (Figure E.1) and all destinations except China (Figure E.3)

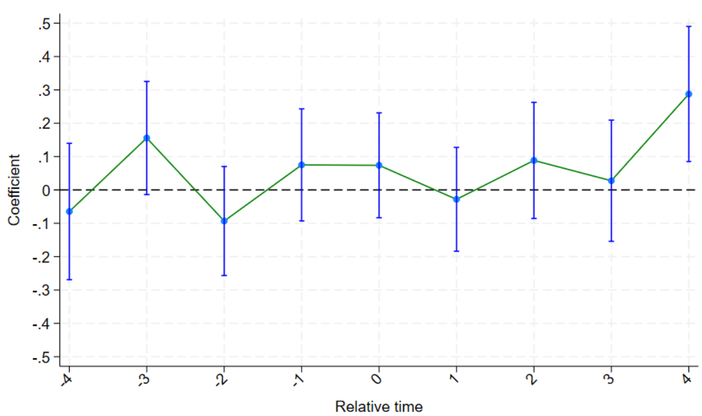

Figure E.1: Impact on exports to non-EL firms in all destinations: Callaway and Sant'Anna (2021) estimator

Note: This figure shows the event study plots based on the dynamic staggered DID model using the estimator developed by Callaway and Sant'Anna (2021). Exports to all destination countries are included. Details of the figure construction are provided in the note to Figure C.1.

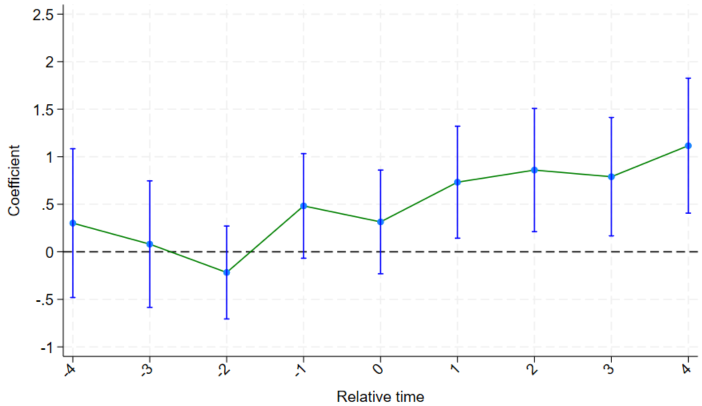

Figure E.2: Impact on exports to non-EL firms in China: Callaway and Sant'Anna (2021) estimator

Note: This figure shows the event study plots based on the dynamic staggered DID model using the estimator developed by Callaway and Sant'Anna (2021). The analysis is restricted to exports to China. Details of the figure construction are provided in the note to Figure C.1.

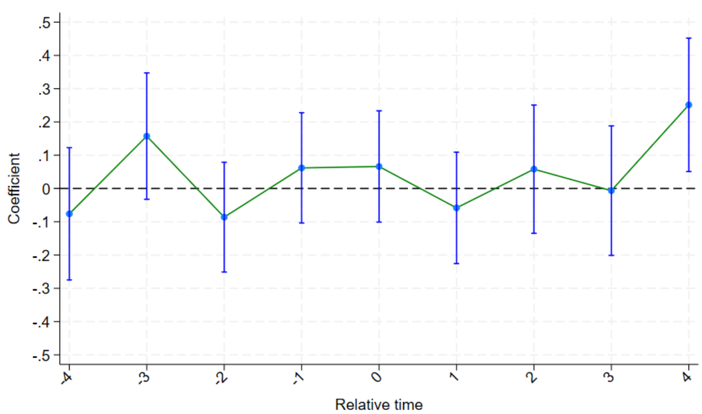

Figure E.3: Impact on exports to non-EL firms in all destinations except China: Callaway and Sant'Anna (2021) estimator

Note: This figure shows the event study plots based on the dynamic staggered DID model using the estimator developed by Callaway and Sant'Anna (2021). Exports to all destination countries except China are included. Details of the figure construction are provided in the note to Figure C.1.

Table E.1: Impact on exports to non-EL firms: All firms

	All destinations		To China only		All destinations except China	
	(1)	(2)	(3)	(4)	(5)	(6)
	TWFE	CS	TWFE	CS	TWFE	CS
$Treated_i \times Post_{it}$	0.140***		1.061***		0.105**	
	(0.041)		(0.168)		(0.042)	
Overall ATT		0.116**		0.812***		0.086
		(0.054)		(0.165)		(0.056)
Aggregated ATTs for cohorts						
Cohort 1		0.014		0.326		0.003
		(0.128)		(0.250)		(0.132)
Cohort 2		0.508***		1.230***		0.479***
		(0.126)		(0.362)		(0.130)
Cohort 3		−0.436		1.486		−0.512
		(0.334)		(1.129)		(0.344)
Cohort 4		−0.307*		−0.454		−0.306
		(0.184)		(0.755)		(0.188)
Cohort 5		0.115		1.319***		0.064
		(0.075)		(0.265)		(0.078)
Cohort 6		−0.503**		−1.247		−0.495**
		(0.209)		(1.018)		(0.213)
Cohort 7		0.688***		−0.00005		0.724***
		(0.262)		(0.641)		(0.275)
Cohort 8		−10.979***		−10.762***		
		(0.020)		(0.065)		
Cohort 9		0.451		−1.342		0.567
		(0.329)		(0.939)		(0.344)
Fixed effects:						
Exporter × Destination	Yes	Yes	Yes	Yes	Yes	Yes
Half-year period	Yes	Yes	Yes	Yes	Yes	Yes
No. of obs.	1,194,372	1,194,372	86,712	86,712	1,107,660	1,107,660
Adjusted R^2	0.595		0.674		0.584	

Note: The dependent variable is x_{idt}. The estimations in columns (1) and (2) include all destination countries. The estimations in columns (3) and (4) include China only as the destination country, while the estimations in columns (5) and (6) exclude China from the destination countries. Columns (1), (3), and (5) report the results from the static staggered TWFE DID model, while columns (2), (4), and (6) report the results from the dynamic staggered DID model using the Callaway and Sant'Anna (2021) estimator. Columns (2), (4), and (6) report the overall ATT and aggregated ATT for each cohort, which is the weighted average of the estimated cohort-time ATTs. Standard errors clustered at the exporter-destination level are in parentheses.

F Comparison between single- and multiple-treatment Japanese firms: Additional statistics

In this appendix, we supplement Table 6 in the main text by providing additional statistics to compare the characteristics of single- and multiple-treatment Japanese firms in the analysis of the impact on Japanese exports to non-EL firms. The additional statistics are provided in Table F.1. All statistics are averages for the 2015–2017 period.

Part (a) of the table shows the share of exports to EL firms in total exports to all countries for the 417 HS 9-digit level products included in the analysis in the main text and calculated using firm-level Japan Customs data. For parts (b)–(d), we matched the single- and multiple-treatment firms in the Japan Customs data with the BSJBSA data, which we used to extract data on the total number of employees, the number of regular employees, and sales. Finally, for part (e), we matched the single- and multiple-treatment firms in the Japan Customs data with the BSOBA data, which we used to extract the countries in which Japanese firms had foreign affiliates and the number of affiliates in China.

Table F.1: Comparison between single- and multiple-treatment Japanese firms based on additional statistics

Variable	No. of Firms	Mean	Std. Dev.	Min	Median	Max
(a) Export share of EL firms in total exports						
Single-treatment firms	383	0.024	0.083	0.00	0.000030	0.45
Multiple-treatment firms	96	0.018	0.059	0.00	0.0040	0.12
(b) No. of total employees						
Single-treatment firms	238	1,761.4	4,322.9	59.1	446.9	17,167.8
Multiple-treatment firms	78	3,326.1	8,680.0	121.2	993.6	17,945.4
(c) No. of total regular employees						
Single-treatment firms	238	1,650.4	4,199.3	51.7	440.5	16,525.9
Multiple-treatment firms	78	3,065.5	7,984.0	106.8	907.5	16,334.0
(d) Total sales (billion yen)						
Single-treatment firms	238	212.5	716.3	1.3	28.0	3,032.2
Multiple-treatment firms	78	242.1	576.2	3.7	49.7	1,325.4
(e) Firms that have affiliates in China: No. of affiliates in China						
Single-treatment firms	125	4.1	7.7	0.9	2	23.7
Multiple-treatment firms	54	4.2	8.6	1	2	14.2

Note: Each statistic is calculated as the average for each group for 2015–2017. The original numbers of single- and multiple-treatment firms are 397 and 97, respectively. Due to the data protections from the MOF, we cannot report the exact minimum, median, and maximum values. These statistics are calculated as the average of minimum, median, and maximum values across 10 observations with different exporter IDs. (a) is calculated for the 417 HS 9-digit level products included in the analysis in the main text. (b)–(d) use data from the BSJBSA and include firms that can be matched between the Japan Customs data and the BSJBSA. (e) uses data from the BSOBA and includes firms that can be matched between the Japan Customs data and the BSOBA.

G Impact on Exports to Non-EL Firms: Exports to Annex Table 3 Countries and Other Destinations

We supplement the analysis in Section 5.5 by dividing export destinations into two groups based on the classification of countries under Japan's Export Trade Control Order. Annex Table 3 of this order designates 27 countries that participate in international conventions and the four major international export control regimes, and that strictly enforce their own export controls, as Preferred Trade Partner List countries (also referred to as "Annex Table 3 countries").[31]

We then re-estimated the model, dividing destinations into two groups: Annex Table 3 countries and all other countries. The results are reported in Table G.1 and Figures G.1–G.4. Table G.1 indicates that the results are quite similar to those presented in Table 7. That is, with regard to the overall ATT, the impact is positive and significant only for exports to preferred countries by multiple-treatment firms, as shown in column (3). The magnitude of the increase in exports to preferred countries (of about 56%) is slightly larger than that in exports to Tier 1 countries in Table 7 (where it is about 47%).[32] Moreover, the event study results shown in Figures G.1–G.4 are quite similar to those shown in Figures 16–19. That is, we observe a significantly positive impact only for the fourth period after the treatment in the case of exports from multiple-treatment firms to Annex Table 3 countries. The impacts are insignificant in all other cases and periods.

[31] In our analysis, we exclude South Korea from the group of Preferred Trade Partner List countries because Japan removed South Korea from Annex Table 3 in August 2019 and did not reinstate it until July 2023. The other 26 countries are Argentina, Australia, Austria, Belgium, Bulgaria, Canada, Czech Republic, Denmark, Finland, France, Greece, Germany, Hungary, Ireland, Italy, Luxembourg, Netherlands, New Zealand, Norway, Poland, Portugal, Spain, Sweden, Switzerland, the United Kingdom, and the United States. For further details, see Japan's Export Trade Control Order at https://www.japaneselawtranslation.go.jp/en/laws/view/2150/en.

[32] The percentage changes are calculated as $(\exp(0.447) - 1) \times 100 = 56.36$ and $(\exp(0.385) - 1) \times 100 = 46.96$, respectively.

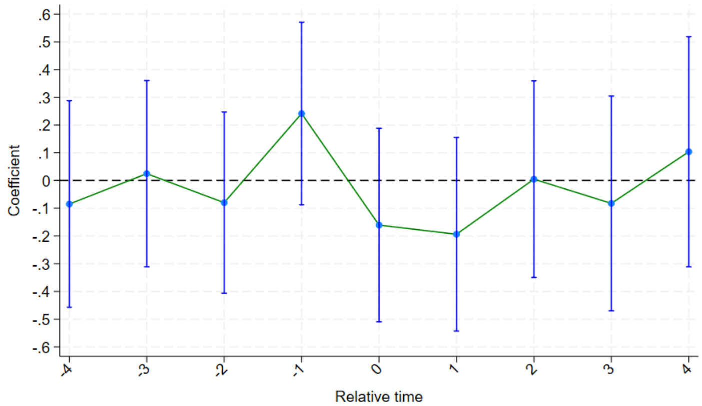

Figure G.1: Impact on exports to non-EL firms in Annex Table 3 countries by single-treatment Japanese firms: Callaway and Sant'Anna (2021) estimator

Note: This figure shows the event study plots based on the dynamic staggered DID model using the estimator developed by Callaway and Sant'Anna (2021). The analysis is restricted to exports to Annex Table 3 countries. The treated group is restricted to single-treatment Japanese firms. Details of the figure construction are provided in the note to Figure C.1.

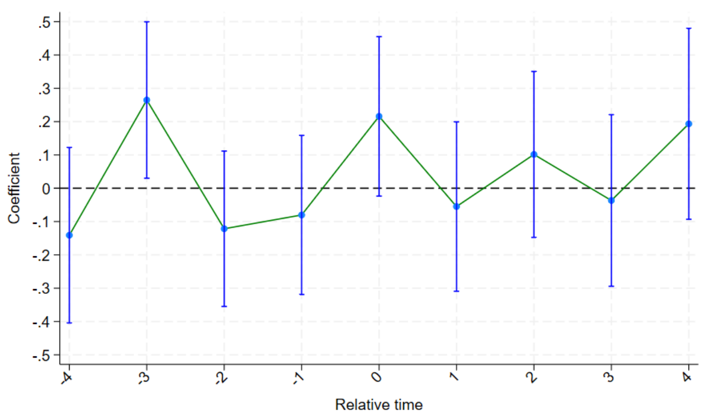

Figure G.2: Impact on exports to non-EL firms in countries not in Annex Table 3 by single-treatment Japanese firms: Callaway and Sant'Anna (2021) estimator

Note: This figure shows the event study plots based on the dynamic staggered DID model using the estimator developed by Callaway and Sant'Anna (2021). Exports to all destination countries not in Annex Table 3 are included. The treated group is restricted to single-treatment Japanese firms. Details of the figure construction are provided in the note to Figure C.1.

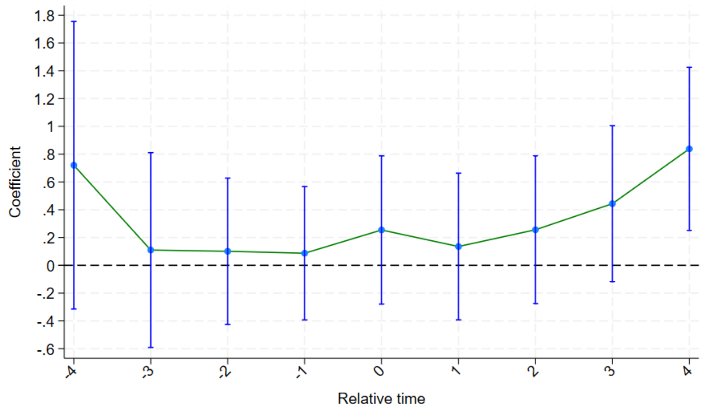

Figure G.3: Impact on exports to non-EL firms in Annex Table 3 countries by multiple-treatment Japanese firms: Callaway and Sant'Anna (2021) estimator

Note: This figure shows the event study plots based on the dynamic staggered DID model using the estimator developed by Callaway and Sant'Anna (2021). The analysis is restricted to exports to Annex Table 3 countries. The treated group is restricted to multiple-treatment Japanese firms. Details of the figure construction are provided in the note to Figure C.1.

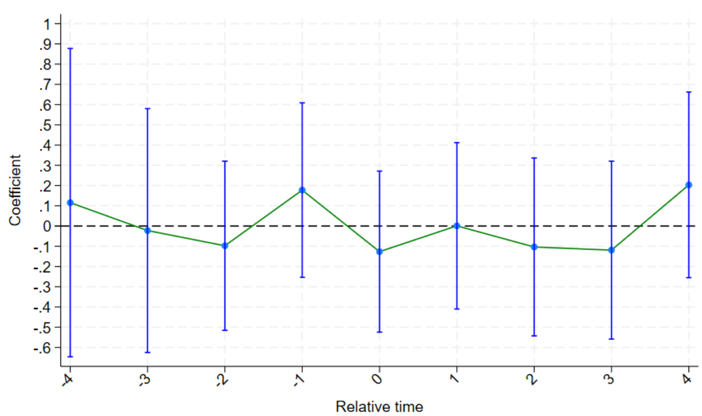

Figure G.4: Impact on exports to non-EL firms in countries not in Annex Table 3 by multiple-treatment Japanese firms: Callaway and Sant'Anna (2021) estimator

Note: This figure shows the event study plots based on the dynamic staggered DID model using the estimator developed by Callaway and Sant'Anna (2021). Exports to all destination countries not in Annex Table 3 are included. The treated group is restricted to multiple-treatment Japanese firms. Details of the figure construction are provided in the note to Figure C.1.

Table G.1: Impact on exports to non-EL firms: Exports to Annex Table 3 countries and all other countries

	Single-treatment firms		Multiple-treatment firms	
	(1)	(2)	(3)	(4)
	Preferred countries	Other destinations	Preferred countries	Other destinations
Overall ATT	0.034	0.095	0.447***	−0.115
	(0.113)	(0.080)	(0.161)	(0.127)
Aggregated ATTs for cohorts				
Cohort 1	0.706	0.192	0.296	−0.328*
	(0.497)	(0.423)	(0.239)	(0.179)
Cohort 2	0.591**	0.357	0.917***	0.261
	(0.280)	(0.219)	(0.293)	(0.253)
Cohort 3	−1.398**	0.033	−0.282	−0.610
	(0.701)	(0.526)	(0.964)	(0.735)
Cohort 4	−0.413	−0.254	−1.134	0.070
	(0.325)	(0.247)	(1.380)	(0.541)
Cohort 5	−0.020	0.064	0.509	0.085
	(0.146)	(0.101)	(0.315)	(0.254)
Cohort 6	−1.288***	−0.216		
	(0.447)	(0.241)		
Cohort 7	0.388	0.928***		
	(0.470)	(0.336)		
Cohort 9	0.300	0.785*		
	(0.515)	(0.460)		
Fixed effects:				
Exporter × Destination	Yes	Yes	Yes	Yes
Half-year period	Yes	Yes	Yes	Yes
No. of obs.	353,916	712,464	329,724	663,732

Note: The dependent variable is x_{idt}. The estimations in columns (1) and (2) restrict the treated group to Japanese exporters with a single EL partner. The estimations in columns (3) and (4) restrict the treated group to Japanese exporters with multiple EL partners. All columns are based on the dynamic staggered DID model using the Callaway and Sant'Anna (2021) estimator. The overall ATT and aggregated ATT for each cohort, which is the weighted average of the estimated cohort-time ATTs, are reported. Standard errors clustered at the exporter-destination level are in parentheses.

H Impact on Exports to Non-EL Firms in China: Japanese exporters with and without affiliates in China

This appendix supplements the analysis in Sections 5.3 and 5.4 by examining whether exports to non-EL firms in China are actually exports to Japanese firms' affiliates in China. To examine this issue, we match single- and multiple-treatment firms in the Japan Customs data with the BSOBA data, which we use to extract information on whether each Japanese firm in the treatment group had affiliates in China. We then divide the treatment group into two subgroups: firms with affiliates in China and those without. We estimate the impact on exports to non-EL firms in China. The results are reported in Table H.1 and Figures H.1 and H.2.

As shown in Table H.1, the overall ATT is positive and significant, regardless of whether Japanese firms have affiliates in China or not. Moreover, Figure H.1 shows that the impact is positive and significant from the second period after the treatment for firms with affiliates in China, whereas Figure H.2 indicates that the post-treatment impact is significantly positive in all periods for firms without affiliates in China. These results suggest that the increased exports from Japanese firms to non-EL firms in China due to the addition of Chinese firms to the EL do not necessarily reflect greater shipments to Japanese affiliates located in China. Some Japanese firms also increased exports to Chinese non-EL firms other than their affiliates.

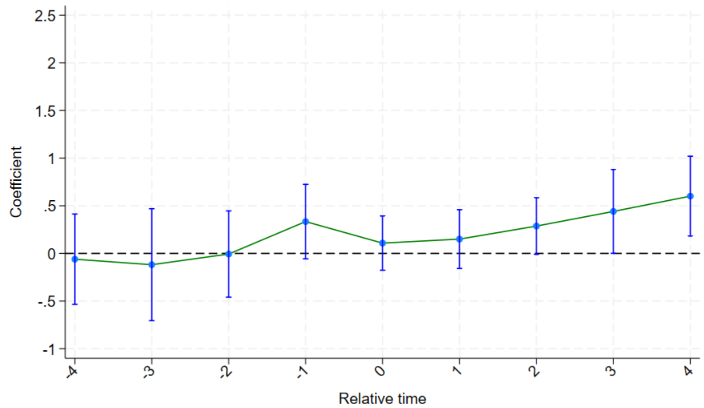

Figure H.1: Impact on exports from Japanese firms with affiliates in China to non-EL firms in China: Callaway and Sant'Anna (2021) estimator

Note: This figure shows the event study plots based on the dynamic staggered DID model using the estimator developed by Callaway and Sant'Anna (2021). The analysis is restricted to exports to China. The treated group is restricted to Japanese firms with affiliates in China. Details of the figure construction are provided in the note to Figure C.1.

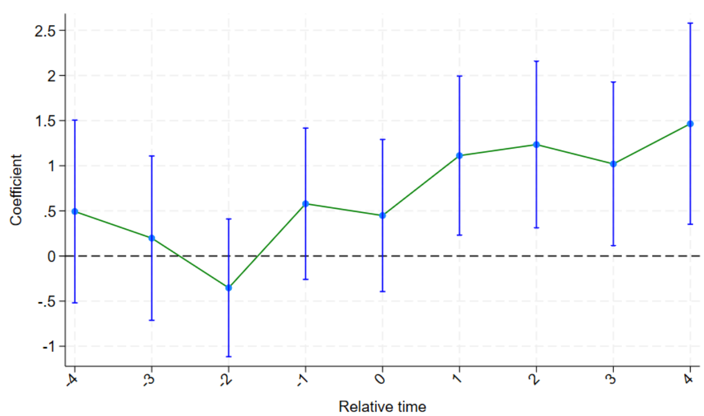

Figure H.2: Impact on exports from Japanese firms without affiliates in China to non-EL firms China: Callaway and Sant'Anna (2021) estimator

Note: This figure shows the event study plots based on the dynamic staggered DID model using the estimator developed by Callaway and Sant'Anna (2021). The analysis is restricted to exports to China. The treated group is restricted to Japanese firms without affiliates in China. Details of the figure construction are provided in the note to Figure C.1.

Table H.1: Impact on exports to non-EL firms in China: Japanese firms with and without affiliates in China

	(1) Exporters with affiliates in China	(2) Exporters without affiliates in China
Overall ATT	0.455***	1.066***
	(0.087)	(0.270)
Aggregated ATTs for cohorts		
Cohort 1	0.610***	0.018
	(0.126)	(0.488)
Cohort 2	0.605***	1.806***
	(0.155)	(0.661)
Cohort 3	0.506*	1.878
	(0.284)	(1.558)
Cohort 4	0.630***	−1.402
	(0.126)	(1.365)
Cohort 5	0.355***	1.814***
	(0.125)	(0.384)
Cohort 6	−1.652	−1.067
	(1.587)	(1.287)
Cohort 7	0.350	−0.187
	(0.216)	(0.971)
Cohort 8		−10.762***
		(0.065)
Cohort 9	−0.0023	−2.011
	(0.099)	(1.372)
Fixed effects:		
Exporter × Destination	Yes	Yes
Half-year period	Yes	Yes
No. of obs.	83,196	84,444

Note: The dependent variable is x_{idt}. The estimation in column (1) restricts the treated group to Japanese exporters with affiliates in China. The estimation in column (2) restricts the treated group to Japanese exporters without affiliates in China. All columns report the results from the dynamic staggered DID model using the Callaway and Sant'Anna (2021) estimator. The overall ATT and aggregated ATT for each cohort, which is the weighted average of the estimated cohort-time ATTs, are reported. Standard errors clustered at the exporter-destination level are in parentheses.