Securing Technological Leadership? The Cost of Export Controls on Firms*

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Abstract

To safeguard its technological leadership, the U.S. has restricted domestic suppliers from exporting specific cutting-edge technologies to selected Chinese firms. As intended, these targeted export controls lead to an immediate decoupling between domestic suppliers and Chinese customers. However, domestic suppliers cannot find alternative customers either domestically or in other regions. Due to these disruptions, domestic suppliers experience a $130 billion decline in market capitalization, along with reductions in profitability, employment, and bank lending. We also show how Chinese firms strategically respond to export controls. Overall, export controls impose significant costs on the very domestic firms they are designed to protect.

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1 Introduction

After decades of continuous globalization, the landscape is now shifting towards fragmentation and decoupling, particularly between the U.S. and China. Afraid that China could catch up and even overcome the U.S. in advanced technologies, the U.S. is attempting to safeguard its competitive edge by imposing export controls on China. These measures restrict domestic firms from selling advanced technology to selected Chinese firms, thus forcing a technological decoupling. The potential benefits of export controls depend on their ability to restrict the transfer of domestic technologies to China and thus hinder their innovation. Yet, the successes of Huawei and DeepSeek despite U.S. export controls cast doubt on the ability of these policies to achieve their stated goal (Tedford, 2023; Yang, 2025). On the other hand, the costs of export controls to domestic firms depend on how quickly they can find alternative customers outside China. Similar trade-offs are highlighted in the recent theoretical literature on the use of economic coercion and export controls (Clayton et al., 2023b; Liu et al., 2024). Despite the widespread bi-partisan adoption of export controls as the primary tool to safeguard U.S. technological leadership, there is little research on their impact and costs to domestic firms.[1]

In this paper, we document the consequences of export controls on firms. As intended, export controls prompt domestic firms to stop selling products to Chinese customers and lead to a decoupling between domestic and Chinese supply chains. However, they also impose considerable collateral damage on the same U.S. firms that these policies aim to protect. We also show how Chinese firms strategically respond to U.S. export controls. We start

[1] See Heifetz (2024) for an op-ed discussing the surprising lack of a comprehensive cost-benefit analysis.

by analyzing the reconfiguration of domestic supply chains due to export controls. The Bureau of Industry and Security (BIS) under the U.S. Department of Commerce restricts U.S. companies from exporting certain goods and services to a list of Chinese firms (referred to as Chinese "targets") deemed a risk to U.S. national security and foreign policy interests. We hand-collect the identities of these firms and observe their evolving supply chain relations using supplier-to-customer linkage data from FactSet Revere. Our data allow us to identify the domestic suppliers that export to the targeted Chinese firms over time. This unique setting helps us identify the causal effect of export controls by comparing the behavior of affected and unaffected suppliers within the same industry, size bucket, and time period.

We find that export controls prompt an immediate, broad-based decoupling of affected U.S. suppliers from their Chinese customers. After the inclusion of Chinese targets in BIS export control lists, affected suppliers are more likely to terminate relationships with both targeted *and non-targeted* Chinese customers. Additionally, affected U.S. suppliers are less likely to establish new relationships with other Chinese customers. While the immediate decoupling from the Chinese firms directly targeted by export controls is the intended outcome of such policies, our findings of a broader decoupling are less intuitive. In particular, this broader decoupling likely reflects concerns among affected U.S. suppliers that non-targeted Chinese firms could re-export sensitive technology to the restricted entities, potentially resulting in export control violations.[2]

Despite export controls achieving their primary purpose of reducing transfers of U.S.

[2]A U.S. exporter may be liable for the re-exports by its customer to a firm targeted by export controls.

strategic technology to Chinese targets, a key question arises whether such restrictions also trigger reshoring or friendshoring of supply chains. Reshoring and friendshoring commonly refer to the formation of new relations with alternative customers domestically or in politically aligned countries, respectively. In the three years following the imposition of export controls, U.S. firms do not form new supply chain relationships with alternative customers either domestically or in more politically aligned regions. In sum, we do not find any evidence of reshoring or friendshoring in the medium term on the U.S. side, suggesting that export controls might impose significant collateral damage on domestic firms.

We next document such collateral damage on domestic firms. Using equity prices, we find that affected U.S. suppliers experience negative cumulative abnormal returns (CAR) following the addition of their Chinese customers to the BIS export control lists. The stock market reaction occurs immediately after the export control announcement and is economically significant, representing a 2.5% abnormal decline in stock prices. Our estimates suggest that export controls cost the average affected U.S. supplier $857 million in market capitalization, with total losses for all affected suppliers totaling $130 billion.

Using balance sheet data, we also find that affected suppliers experience adverse real outcomes following the imposition of export controls. Relative to similar firms, affected suppliers display a decline in revenues, profitability, and employment, while capital expenditures do not exhibit a significant reduction. This result is consistent with export controls not considerably changing the long-term investment opportunities of firms but instead requiring some firms to make short-term adjustments, such as cutting segments of their labor force. Using confidential loan-level data, we also find that affected U.S. suppliers face tighter bank lending conditions.

Lastly, we analyze how targeted Chinese firms strategically respond to U.S. export controls. On the extensive margin, Chinese targets offset the reduction in relationships with U.S. suppliers by forming new connections with alternative Chinese suppliers—an indication of reshoring on the Chinese side. This immediate Chinese reshoring is in contrast with the lack of reshoring on the U.S. side, potentially indicating a more coordinated effort by the Chinese government. On the intensive margin, non-U.S. firms (unaffected by U.S. export controls) that supply goods to targeted Chinese firms experience increased revenues following the imposition of U.S. export controls. We interpret these results as evidence that Chinese firms actively try to offset U.S. export controls by forming a new network of alternative suppliers and increasing purchases from their existing global suppliers unaffected by U.S. export control restrictions. The case of the Dutch lithography company ASML is an example of such a strategic Chinese response. While U.S. export controls restricted the flow of U.S.-made microchip technology to China, targeted Chinese firms managed to increase the purchase of ASML lithographic machinery producing cutting-edge microchips. Only several years later, after significant pressure from the U.S., did the Dutch government restrict ASML's ability to export its machinery to China (Kharpal, 2024).

Of note, export controls are a strategic toll used for a different purpose than tariffs or sanctions. Unlike tariffs, which target imports of consumer goods, and sanctions, which are used to penalize military aggression, export controls are designed to ensure "continued U.S. strategic technology leadership."[3] If export controls are to remain the primary tool for safeguarding the competitive edge of the U.S. in advanced technologies, our findings

[3]For a description of the goals of export control policy, see https://www.trade.gov/us-export-controls.

suggest that they may need to be complemented with policies that stimulate domestic demand for the very same products under export control restrictions. The CHIPS Act of 2022 is consistent with this goal, authorizing $280 billion in funding to boost domestic research and manufacturing of semiconductors, even though such investments typically take years to generate productive capacity (VerWey, 2021).

Our results are unlikely to be driven by the 2018–2019 trade war between the U.S. and China, which saw a few waves of U.S. tariffs on Chinese imports followed by Chinese retaliatory tariffs on U.S. exports. While those tariffs were broad-based and did not target specific companies (Fajgelbaum et al., 2020; Amiti et al., 2019), our estimates rely on the identification of U.S. companies that are not allowed to export to *specific* Chinese entities. Granular fixed effects allow us to exploit variation within industry and size quartiles among firms that export to China and are thus unlikely to be affected by broad-based tariffs. Similarly, our results are unlikely to be driven by the August 2022 CHIPS Act, which provided subsidies to chip makers with operations in the U.S., and the August 2023 executive order, which limited U.S. investments to China in some sensitive sectors. Indeed, these policies apply to a broad set of firms (not just our set of affected suppliers) and are enacted at the end of our sample period.

Contribution to the literature. First, our empirical results inform the nascent theoretical literature in geoeconomics (Clayton et al., 2023a,b; Liu et al., 2024; Broner et al., 2024). On the topic of export controls, Clayton et al. (2023b) argues that these restrictions may be optimal for the hegemonic country even if they destroy some value for its domestic firms, while Liu et al. (2024) employs a calibrated model with technology transfers to show that comprehensive restrictions on semiconductors could raise domestic welfare. Our paper provides

a well-identified analysis of how global supply chains and the broader productive sector adjust to export controls, highlighting a set of facts and trade-offs associated with these policies. Aimed at safeguarding domestic technological leadership, export controls end up imposing significant collateral damage on the domestic firms producing the very same technologies that these policies attempt to protect.

Second, our analysis of export controls complements the literature on sanctions (e.g., Efing et al., 2023; Ahn and Ludema, 2020; Felbermayr et al., 2020; Crozet et al., 2021; Besedeš et al., 2021). Sanctions typically involve a combination of travel bans, asset freezes, restrictions on capital flows, and trade restrictions. Importantly, they are often applied to small countries or a selected group of entities with a small global footprint and thus tend to have limited effects on domestic firms. Due to the relatively small global footprint of countries or entities being sanctioned, Besedeš et al. (2021) finds little evidence of collateral damage to domestic German firms. In contrast, export controls aim to protect domestic technological leadership by selectively decoupling critical supply chains from China—an economically significant trade partner of U.S. firms. Overall, sanctions and export controls are used for different strategic goals and, as we show, produce different outcomes.

Finally, by focusing on the geopolitical confrontation between the U.S. and China, our analysis is related to the literature on the labor and trade costs of U.S.-China trade wars (e.g., Benguria and Saffie, 2023, 2020; Flaaen et al., 2020; Fajgelbaum et al., 2020).[4] Broadly related to the policy-induced reconfiguration of supply chains documented in this paper,

[4]See Caldara and Iacoviello (2022) for a measure of adverse geopolitical events and associated risks.

Alfaro and Chor (2023) documents how the COVID-19 pandemic and geopolitical tensions induced a shift in U.S. imports away from China and towards alternative locations, such as Vietnam and Mexico. More closely related to our analysis, Han et al. (2024) develops measures of technology dependence between the U.S. and China, documenting the effect of Chinese industrial policy and U.S. export controls on Chinese firms' innovation quality and productivity. We complement these findings by analyzing the effect of U.S. export controls on U.S. firms and global supply chains.[5]

2 Background

In this section, we provide some background on the regulations and policies surrounding export controls and then present a few case studies of export controls.

The use of economic linkages and strategic dependencies as a weapon has many historical precedents, including Britain and France imposing blockades on Germany during World War I and Germany retaliating by endangering transatlantic commerce with the use of U-boats (Mulder, 2022). At the beginning of World War II, U.S. President Franklin Roosevelt passed the Export Control Act of 1940, limiting the shipment of critical military supplies to Japan to curtail the Axis powers' bellicose potential. After the war, the Export Control Act was expanded to prevent the export of sensitive technologies to the Soviet Union. The Export

[5]This paper is also related to the supply chain literature by documenting how firm-to-firm linkages respond to a policy aiming to induce a selective decoupling of critical supply chains. The empirical literature has so far mainly focused (i) on how shocks propagate through the existing configuration of supply chains (Hertzel et al., 2008; Barrot and Sauvagnat, 2016; Cortes et al., 2019; Costello, 2020; Boehm et al., 2019; Carvalho et al., 2021; Bonadio et al., 2021; Alfaro et al., 2021; Crosignani et al., 2023; Franzoni et al., 2024) and (ii) on how supply chains adapt to shocks (Elliott et al., 2022; Pankratz and Schiller, 2024; Ersahin et al., 2024).

Administration Act of 1979 formally authorizes the U.S. President to control exports of U.S. goods and technology to all foreign destinations for national security and foreign policy purposes. The 1979 Act is implemented via the Export Administration Regulations.

2.1 Export Administration Regulations

Title 15 of the United States Code contains regulations related to trade and commerce. In particular, Chapter VII introduces Export Administration Regulations (EAR). These are issued by the Bureau of Industry and Security, BIS, of the Department of Commerce to control certain export activities. Part 774, Supplement No. 4, also known as the "Entity List", contains names of foreign persons, including businesses, institutes, and universities, subject to license requirements for the export, re-export, and in-country transfer of certain items. In other words, U.S. firms that intend to export, re-export, and transfer goods and services to foreign firms included in the Entity List must first obtain a license from the Commerce Department. These export controls apply to U.S. firms and foreign firms that use U.S.-origin components, manufacturing equipment, technology, and software.[6] The BIS license review policy indicates that, for the most part, there is a presumption of license denial.

An item requires an export license from the Department of Commerce if it belongs to the Commerce Control List (CCL), which includes nuclear material, toxins, electronics, computers, telecommunications, information security, navigation, sensors, lasers, and aerospace and propulsion systems. Items not listed on the CCL fall under EAR99, including low-tech

[6] See Part 734.9 Foreign-Direct Product Rules for more details.

consumer goods, and require a license only if exported to embargoed countries or end-users of concern. The latter consists of persons, institutes, universities, and corporations in the Entity List or similar lists described below. A license can thus be required for CCL items and EAR99 items destined to Entity List parties.[7]

The first Entity List was published in 1997 and was meant to limit exports to entities involved in producing weapons of mass destruction (WMDs). Since then, reasons for inclusion in the Entity List have expanded to include engagement in "activities contrary to the national security or foreign policy interests of the United States." In particular, items subject to EAR export controls include purely civilian items, items with both civil and military use (dual-use), terrorism or potential WMD-related applications, and items exclusively used for military applications.[8]

On December 23, 2022, the BIS introduced an additional list, the Military End User (MEU) list, published in Part 774, Supplement No. 7. Entities are added to this list if they pose an "unacceptable risk of use in or diversion to a 'military end use' or 'military end user' in China, Russia, or Venezuela." This includes firms producing or mediating military technologies for these countries. Exporters of military items (listed in Part 744, Supplement No. 2) to entities included in the MEU list must receive a prior license.[9]

[7]The specific license requirement details are provided in Part 744, Supplement No. 4, for each company included in the Entity List.

[8]Other offices in the State and Treasury Departments have jurisdiction over EAR export controls, including the Department of Treasury's Office of Foreign Assets Control (OFAC) and the Department of State's International Traffic in Arms Regulations (ITAR). Decisions regarding the Entity List are made by the End-User Review Committee, composed of representatives of the Departments of Commerce, State, Defense, Energy, and, where appropriate, the Treasury. An entry to the Entity List requires a majority vote, while unanimity is required for removal or modification.

[9]In addition to export controls, the U.S. government deploys other tools toward selected Chinese companies. Chief among them is the Treasury Department's OFAC, which forbids U.S. persons from trading securities

Finally, the BIS also publishes the Unverified List (UVL) in Part 774, Supplement No. 6. Inclusion in the UVL generally occurs if the BIS cannot verify the legitimacy of the end-use and end-user of items subject to export controls. Removal from the UVL occurs when the BIS completes a pre-license check or post-shipment verification to confirm the end-user's legitimacy. A license is required to export items in the CCL to entities in the UVL. On the other hand, to export EAR99 items, the end-user must provide a statement with an agreement to comply with EAR and a declaration about the end-use for the item.[10]

From the point of view of a U.S. firm trying to export goods and services to foreign companies, including such foreign companies in either the Entity List or the MEU list is more restrictive than including them in the Unverified List.

2.2 Entity List Case Studies

We now provide examples of Chinese firms included in the Entity List to highlight the different motivations for export controls.

Huawei is a Chinese company that specializes in telecommunications equipment and consumer electronics. It became the largest telecommunications equipment manufacturer in 2012 and the largest smartphone manufacturer in 2020. Regarding the development of

issued by certain Chinese companies in the Chinese military-industrial complex. The list appears in Executive Orders 13959 (November 12, 2020) and 14032 (June 3, 2021), intended to deny Chinese companies that "enable the development and modernization of its military, [...] which continues to allow the [People's Republic of China] to directly threaten the United States homeland" access to U.S. capital markets.

[10] In October 2022, the BIS announced a new two-step policy to address foreign government interference with end-use checks. If end-use checks are not completed within 60 days, the BIS will initiate the regulatory process to add the foreign party to the UVL. If the addition to the UVL is due to the foreign government's interference, a second 60-day clock starts after the listing. If the BIS cannot complete an end-use check within the second 60-day clock, it will start a process to move the foreign party from the UVL to the Entity List.

5G networks, some countries voiced concerns that Huawei's equipment could be used as a backdoor for espionage by the Chinese military and intelligence services, citing the 2014 Counter-Espionage Law and the 2017 National Intelligence Law of the People's Republic of China that require Chinese companies to cooperate on intelligence gathering. Indeed, Western intelligence agencies have alleged that Huawei's equipment was used to hack into several telecommunication companies in the U.S., Canada, and Australia, such as Nortel, Cysco, and Optus.

Moreover, in January 2019, the U.S. Department of Justice (DOJ) unsealed an indictment alleging that Huawei circumvented U.S. sanctions on Iran and stole trade secrets from worldwide telecommunications companies, including T-Mobile. Shortly after, in May 2019, the BIS added Huawei and its subsidiaries to the Entity List because it violated U.S. sanctions on Iran by causing the export of goods, technology, and services from the U.S. to Iran without obtaining a license from OFAC. Several additions of Huawei's affiliates to the Entity List occurred until April 2022.

Semiconductor Manufacturing International Corporation Incorporated (SMIC) is the largest semiconductor manufacturer in China. SMIC was added to the Entity List due to its activities with the Chinese military-industrial complex. "The Entity List designation limits SMIC's ability to acquire certain U.S. technology by requiring exporters, reexporters, and in-country transferors of such technology to apply for a license to sell to the company. Items uniquely required to produce semiconductors at advanced technology nodes of 10 nanometers or below will be subject to a presumption of denial to prevent such key enabling technology from supporting China's military modernization efforts."

Another motivation for including Chinese companies in the Entity List is intellectual property (IP) theft. A clear case of IP theft-driven inclusion involves Fujian Jinhua Integrated Circuit Company (Jinhua). On October 30, 2018, Jinhua was included in the Entity List for being "involved in activities that could hurt the national security interests of the United States." On November 1, 2018, the Department of Justice issued an indictment charging Jinhua with economic espionage and theft of intellectual property from Micron, a semiconductor company specializing in memory storage devices, including dynamic random-access memory.

3 Data

We now describe our data sources and present some summary statistics.

Data sources. We use several data sources to examine the financial and real effects of export controls. First, information on export controls comes from the Bureau of Industry and Security, part of the U.S. Department of Commerce. It can be obtained online via the Federal Register (federalregister.gov) and the Code of Federal Regulations (ecfr.gov). We hand-collect additions and removals of Chinese companies from the Entity List (Part 774, Supplement No. 4), the Military End Use List (Part 774, Supplement No. 7), and the Unverified List (Part 774, Supplement No. 6). For each entity, we collect the many aliases often provided, the dates when the notices of addition and removal are announced, the dates they become effective (usually five calendar days after the announcement), and the physical addresses of the entities and their aliases. For consistency, we focus only on Chinese entities, as they are the vast majority of the targets of export controls that can be matched with our supply chain data.

Excluding aliases from the 1,120 total Chinese entries, we have 732 unique Chinese entities. Of them, 497 are corporations, and 235 are universities and institutions. Moreover, 425 are from the Entity List, 58 from the MEU list, and 253 from the UVL. The total across lists is greater than the number of Chinese entities since some are listed in multiple lists at different times. For instance, some are listed in Entity and MEU lists, while others first included in the UVL end up permanently in the Entity List. The Entity List started in 1997, and most Chinese entities were added after 2014. The MEU list currently contains Chinese companies added on December 23, 2020, and January 14, 2021. The Unverified List started in 2002, with most Chinese entities included after 2019.

Second, information on supply chain relationships comes from FactSet Revere, which is arguably the most comprehensive source of supply chain data available.[11] Each supply chain relationship includes the names and identifiers of the customer and the supplier, as well as the start and end dates of the relation. The information is collected via public filings, investor presentations, websites, corporate actions, press releases, and news reports. We follow Gofman et al. (2020) and Crosignani et al. (2023) and drop relations with start and end dates within a longer relationship between the same two entities and combine multiple relations with time gaps shorter than six months into a continuous relationship. Using International Securities Identification Numbers (ISINs) and name matching, we identify 92 Chinese entities subject to export controls (target firms) with supply chain relations with 358 affected suppliers. Of

[11] For instance, Bloomberg and Capital IQ do not report the start and end dates of a supply chain relationship at sufficiently high frequency, while the Compustat Segments data report only the largest customers of a given supplier on an annual basis.

these, 176 have supply chain relations overlapping with the export control event dates.[12] Our sample for the supply chain reconfiguration analysis covers data up to 2023:Q3.

Third, we obtain daily stock price data from the Center for Research in Security Prices (CRSP daily stock file) and firm-level balance sheet data from Compustat (North America, fundamentals annual). We use the firm's CUSIP to match firm identifiers among CRSP, Compustat, and Factset data. The final daily stock price sample has 250 events involving 156 affected suppliers from 2010 to 2022. The number of events is higher than that of affected suppliers because some Chinese target firms are included in BIS lists multiple times, often because some previously neglected subsidiaries are added later on.[13] On the other hand, the firm-level balance sheet annual panel runs from 2007 to 2022 and has a total of 655 firms, of which 126 are affected suppliers. We focus on firms that export to China and remove firms with less than $5 million in total assets.

To assess whether Chinese firms manage to circumvent U.S. export controls by purchasing similar goods from unaffected firms outside of the U.S., we also obtain balance sheet data on an international sample of firms from Capital IQ. Specifically, we obtain EBIT (universal net earnings before interest and taxes) and revenues (universal revenue attributable to the ongoing operations) for 6,372 suppliers of Chinese firms, 600 of which are connected to firms targeted by export controls.

Finally, we obtain loan-level information on bank credit to U.S. firms from the corporate

[12]We allow one year buffer between the event date and supply chain relationship end year.

[13]For each affected supplier, we consider events that happen at least six months apart when estimating the pre-treated betas and cumulative abnormal returns.

loan schedule (H.1) of the Federal Reserve's Y-14Q data. These data have been collected since 2012 to support the Dodd-Frank Act's stress tests and assess bank capital adequacy for large U.S. banks. The credit register provides confidential information at a quarterly frequency on credit exposures exceeding $1 million for banks with more than $50 billion in assets. These loans account for around 75 percent of all commercial and industrial lending volume during our sample period. In addition to the committed credit for each bank-firm pair, the data set also contains information on the committed and drawn amounts on credit lines, the credit amount past due, and other loan characteristics, such as the interest rate spread, maturity, and collateral. We use the firms' CUSIPs to identify firms affected by export controls in the loan-level data and, as before, focus on firms that export to China, resulting in a sample of 331 firms—71 of which are subject to export controls—borrowing from 38 banks from 2012:Q3 to 2023:Q3.

Summary Statistics. Panel A of Figure 1 shows the number of affected U.S. suppliers over time as the BIS includes Chinese customers on the Entity List. Most targeted Chinese firms belong to the telecommunication, transportation, and electronic equipment sectors, while most affected suppliers are in the electronics and industrial machinery equipment sectors (Figure 1, Panel B). Summary statistics on supply chain and balance sheet variables are presented in Tables 1 and 2, respectively. In the supply chain analysis, treated firms (affected suppliers) export to Chinese entities in the BIS lists, and control firms are firms that export to Chinese firms that are not included in the BIS lists. Affected suppliers tend to have more total customers than control firms and thus also terminate and form more customer relations than control firms. However, treated and control firms have a similar geographical distribution

of their customer base. The average share of Chinese customers is 9.4% for treated and 5.8% for control firms, the European share is 13.6% for treated and 12.9% for control firms, and finally, the domestic share is 40.5% for treated and 51.3% for control firms.

Affected suppliers, being exporters to Chinese conglomerates, tend to be larger than unaffected firms. They also tend to be more profitable (greater cash flow and return on assets) due to higher operating income and lower interest payments over total assets. Once we split the sample by industry-specific size quartiles and focus on the sample of exporters to China, treated and control firms are more comparable, other than for the bottom size quartile (Table 3). Across all size quartiles, capital expenditure, interest expenses, and the number of employees are similar between treated and control firms. Since size quartiles are computed within each industry (2-digit SIC code), treated firms are still possibly larger than control ones within each size quartile if treated firms are concentrated in industries with larger firms on average. However, this is not a concern in our empirical analysis since we compare each treated firm to control firms within the same industry and industry-specific size quartile.

4 Decoupling and Supply Chain Dynamics

We now present evidence of the domestic supply chain reconfiguration after the imposition of export controls. Section 4.1 discusses our empirical strategy, Section 4.2 presents evidence of export controls inducing an immediate, broad-based decoupling, and Section 4.3 focuses on the domestic supply chain reconfiguration, indicating a lack of reshoring or friend-shoring.

4.1 Empirical Strategy

The BIS has been including Chinese entities in the various export control lists since the early 2000s in a staggered fashion. Due to the staggered nature of the shock (i.e., a Chinese customer is included in a BIS list), a standard differences-in-differences model may produce biased estimates of the treatment effects.[14] Hence, we employ the stacked regression estimator methodology developed by Gormley and Matsa (2011) and described in Baker et al. (2022). Specifically, we stack observations from multiple cohorts, where a cohort includes treated and control firms in a $[-3, 3]$ year window centered around an event. We restrict the control group to firms that have either never been treated or are not yet treated. An event is the first time a Chinese firm is included in a BIS export control list, while treatment refers to the first time a firm's customer is included in the BIS lists.

We then estimate the following stacked regression specification:

$$y_{ict} = \sum_{j=-3}^{j=3} \beta_j \mathbb{1}(J_{ict} = j) + \mu_{ic} + \mu_{ckt} + \varepsilon_{ict} \tag{1}$$

where c indicates a specific cohort (i.e., a round of export controls), i a firm, and t a year. y_{ict} is the outcome variable for firm i in cohort c and year t, including cash flow, EBIT, CapEx, revenue, and employees. When we analyze supply chain relation data and use count or count-like outcome variables, such as the number of terminated relations, we follow Cohn et al. (2022) and estimate Poisson regressions using the maximum likelihood approach of

[14] See Roth et al. (2023), for instance, for a detailed review of the recent literature on staggered differences-in-differences designs.

Correia et al. (2020). $\mathbb{1}(J_{ict} = j)$ is an indicator variable equal to one if an export control c on a Chinese customer of firm i occurred j years apart from the event year. Each cohort includes observations from 3 years before to 3 years after the event. The interaction term for the year prior to treatment is excluded and thus constitutes the omitted group. Each cohort c includes treated, never treated, and not yet treated units. To ensure that each treated unit is compared to units within the same cohort that are similar in industry and size, we include cohort-industry-size quartile-year fixed effects, μ_{ckt}. As customary in stacked regressions, we include firm-cohort fixed effects, μ_{ic}. Standard errors are double-clustered at the firm and year levels.

Sometimes, subsidiaries of the same Chinese parent company are added sequentially to the BIS lists. This happens because the Department of Commerce later discovers that additional subsidiaries may acquire controlled technology for the same target parent company. Often, further subsidiaries are included just a few months later. We include events at least six months apart for a specific U.S. firm to avoid contamination of the CAR estimates. While each of these additions is treated as a separate event in the CAR study, multiple treatments are more cumbersome in a panel setting with yearly data. To only capture the specific Chinese entity with which U.S. firms conduct a meaningful amount of business, in our main yearly panel regressions (Eq. 1), we define the treatment as the first time that a parent company of a Chinese customer enters the BIS lists, conditional on the U.S. supplier having a sizable CAR response to such event.[15] To select the more stringent among all export controls, we restrict

[15]Specifically, if a Chinese customer of U.S. firm i is added multiple times under different aliases or subsidiary names to the BIS lists, we require that the first one of such events is also the one with the most negative CAR response for firm i. This requirement excludes 17 out of the 156 treatments. These are instances in

the sample to Chinese firms belonging to the Entity List and the MEU list ("Restrictive Sample") in some specifications, thus excluding the less restrictive and often temporary inclusions in the Unverified List.

In robustness tests, we also estimate the more standard (albeit potentially biased) two-way fixed effects (TWFE) model as follows:

$$y_{it} = \sum_{j=-3}^{j=3} \beta_j \mathbb{1}(J_{it} = j) + \mu_i + \mu_{kt} + \varepsilon_{it}, \tag{2}$$

where y_{it} and is an outcome of firm i in year t and $\mathbb{1}(J_{it} = j)$ is an indicator variable equal to one if an export control on a Chinese customer of firm i occurred j years from the event year. We consider a window of 3 years around the incident date ($-3 \leq j \leq 3$). The interaction term for the year prior to treatment is excluded and is thus part of the omitted group. We include firm and industry-size quartile-year fixed effects, namely μ_i and μ_{kt}, respectively. The latter fixed effects are included to ensure that the control group consists of firms in the same industry and of comparable size to the treated firms. Since treated firms are, by definition, exporting to China, we also require control firms to export to China (but not to the BIS-targeted entities) and belong to the same industry as the treated firms. Standard errors are double-clustered at the firm and year levels.

As shown later in the paper, our main results using the stacked regression approach of Eq.

which the first inclusion in the BIS list covers a limited number of goods or only includes a specific subsidiary with marginal importance to the U.S. firm. Using the entire sample that includes the first time the parent company enters a BIS list (without CAR response restrictions), results are qualitatively unchanged, albeit more noisy due to the inclusion of firms that are only marginally affected.

(1) are qualitatively similar to those employing the TWFE model of Eq. (2), consistent with the fact that the TWFE bias is less likely to be a problem when the number of ever-treated units is small relative to the entire sample (Baker et al., 2022), as it is the case in our setting.

4.2 Decoupling

We now document how supply chain relations respond to export controls. By definition, affected suppliers must stop exporting critical goods to the Chinese customers included in the BIS export control lists. To ensure that control firms are comparable to the treated ones, we require control firms in each cohort to export to China in the pre-treatment period.

We explore various ways export controls may lead to a U.S.-China decoupling. Specifically, we study the effect of export controls on both termination and creation of relations with Chinese customers. Since the affected suppliers must terminate relations only with the Chinese firms targeted by export controls, we explore whether affected suppliers selectively terminate relations only with the targeted Chinese customers or, more broadly, with any of their Chinese customers. Terminating relations with Chinese customers not directly targeted by export controls could indicate concerns that these other Chinese firms (i) may end up being targeted by export controls shortly or (ii) may re-export the technology to the directly targeted firms, potentially violating BIS rules.

Notice that we cannot directly estimate whether affected suppliers are more likely to terminate relations with Chinese targets because control firms, by definition, do not have relations with those firms. As a result, we estimate the effect of export controls on the number of terminated relations with any Chinese customer and compare it to the effect on terminated

relations excluding the Chinese targets. If affected suppliers terminate relations only with the directly targeted firms, we should estimate a significant effect on total terminations but not on terminations excluding Chinese targets. If, on the other hand, affected suppliers terminate relations with both groups, we should estimate significant effects on terminations with any Chinese customer and terminations excluding Chinese targets, albeit with the latter effect being smaller in magnitude.

Finally, we study whether affected suppliers are less likely to form new relations with other Chinese customers following export controls. Indeed, concerns about re-export may make affected U.S. suppliers reluctant to sell critical technology to new Chinese customers. The supply chain variables, summarized in Table 1, are the total number of terminated or new relations. We use Poisson regressions on these count variables, as suggested by Cohn et al. (2022).

Table 4 presents the regression results using the preferred stacked regression approach of Eq. (1) and displays the main coefficient of interest, Affected $\times$ Post. The dependent variables are the number of terminated relations with Chinese customers in columns (1) to (3), with Chinese customers excluding the targeted ones in columns (4) to (6), and the number of new relations with Chinese customers in columns (7) to (9). In columns (3), (6), and (9), we also interact our fixed effects with the quartile of the lagged number of total customers to control for differences in the richness of supply chain relations between treated and control firms. As a result, we compare firms with a similar number of customers one year prior.

The positive and significant coefficients of interest (Affected $\times$ Post) in columns (1) to (3) indicate that export controls lead to more relations with Chinese customers being

terminated. Once we exclude the Chinese customers directly targeted by export controls, the coefficients in columns (4) to (6) show that affected suppliers are more likely to terminate relations even with Chinese firms not directly targeted by export controls. The coefficients in columns (3) and (6) indicate that affected suppliers are more likely to terminate relations with Chinese customers targeted by export controls *and* other Chinese customers that are not directly targeted. Finally, columns (7) to (9) explore the formation of new relations with Chinese customers. After one of their customers is targeted by export controls, affected suppliers form fewer relations with new Chinese customers.

While the decoupling from the targeted Chinese firms constitutes the intended effect of export controls, the additional broad-based decoupling from other Chinese customers is not an obvious result ex-ante. This broad-based decoupling is consistent with a "wake-up call" whereby affected suppliers become more aware of geopolitical risk and the possibility of future controls. It is also consistent with fear that intermediate Chinese firms may purchase sensitive goods and sell them back to the targeted firms, violating export control laws. The decoupling effects are not only statistically but also economically significant. Export controls lead to an increase in terminations with Chinese customers by 50%-75% (columns (5) to (6)) and a decline in the establishment of new Chinese customer relations by 60%-68% (columns (8) to (9)).[16]

Our results are not driven by pre-trends. Figure 2 displays the coefficient plots for total terminations, terminations excluding targeted Chinese firms, and new relations with Chinese

[16]The interpretation of coefficients in a Poisson regression is equivalent to that of a linear regression where the outcome variable is in logs. Thus, we obtain these economic magnitudes by taking the exponential of the estimated coefficients and then subtracting one.

firms using the preferred stacked regression approach of Eq. (1) (Panels A, C, and E) and the TWFE model of Eq. (2) (Panels B, D, and F). The dynamic plots show no pre-trends, indicating that our results are not due to pre-existing supply chain dynamics unrelated to export controls. Consistent with our previous static results, the coefficient plots show that following export controls, there is a significant increase in the total number of terminations with Chinese customers, whether or not we include the targeted Chinese firms. At the same time, there is a significant decrease in the number of new relations formed with Chinese customers. The results are qualitatively similar between the stacked regression approach and the TWFE method.

4.3 Domestic Supply Chain Reconfiguration

Next, we explore whether affected suppliers reconfigure their supply chains and form new relations away from China to offset the drop in Chinese customers following export controls. The results are displayed in Table 5. The dependent variables are the total number of customers in columns (1) and (2) and the total number of domestic (U.S.) customers in columns (3) and (4). The negative and significant coefficients of Affected $\times$ Post in columns (1) and (2) indicate that affected suppliers experience a reduction in the overall number of customers. Therefore, they cannot significantly offset the reduction in Chinese customers due to the imposition of export controls by finding alternative ones in the following 3 years. We also find no evidence of reshoring. Indeed, the insignificant coefficients in columns (3) and (4) suggest that affected suppliers do not significantly change the number of domestic customers following export controls.

We further examine the effect of export controls on the customer shares of U.S. suppliers by region. The results are displayed in Table 6. In Panel A, the dependent variables are the share of customers from the U.S. and China, respectively. The positive and significant coefficient of Affected × Post in columns (1) to (2) shows that affected suppliers are more reliant on domestic customers as they reduce the reliance on Chinese customers (columns (3) to (4)). As previously discussed, the greater reliance on domestic customers is simply because the number of total customers declines while that of domestic customers is unchanged. In Panel B, we examine customer shares of U.S. suppliers from other regions in Asia and Europe. The dependent variables are the share of customers from Asia (excluding China), Asia allies (South Korea, Japan, Taiwan, and Australia), and the European Union in columns (1) to (6). If U.S. suppliers reroute their customer base to politically friendly regions, we would expect an increase in customer shares from those regions. The negative and insignificant coefficients of Affected × Post in columns (1) to (6) suggest that firms are not friend-shoring and, in general, are not substituting the drop in Chinese customers with other international customers in the 3 years following export controls. The lack of meaningful short-run adjustments in supply chains is consistent with the findings in Boehm et al. (2019) that the short-run elasticity of substitution between different inputs is near zero.

Overall, the supply chain results of Tables 4, 5, and 6 suggest that affected suppliers cannot easily find new customers to make up for the decline in Chinese customers following the imposition of export controls. These supply chain rigidities suggest that export controls may impose significant collateral damage on the domestic firms producing the very same technologies that these policies aim to safeguard.

5 Collateral Damage

We now present evidence of the collateral damage of export controls on domestic firms. Section 5.1 documents that domestic firms experience negative abnormal stock returns following the announcement of export controls on their customers. Section 5.2 shows consistent evidence using balance sheet characteristics—namely, reductions in cash flows, revenue, profitability, and employment. Section 5.3 shows that affected domestic suppliers experience tighter lending conditions after the imposition of export controls.

5.1 Evidence from the Stock Market

To study the stock market reaction to export controls, we estimate abnormal stock returns of affected suppliers around the announcement dates of their Chinese customers being added to the relevant BIS lists: Entity List, UVL, and MEU list. Affected suppliers are the U.S. firms that export to the Chinese entities included in the BIS lists. The same affected supplier can participate in multiple events if it exports to more than one target company or if the same target company enters the BIS lists more than once. The latter can happen when different subsidiaries of the same company are added at different times. For those reasons, we have 250 events and 156 unique affected suppliers. The main specifications estimate cumulative abnormal returns in a $[-10, 20]$ day window around the event date, using either the Fama-French 3-factor model (Fama and French, 1993) or the Fama-French 5-factor model

(Fama and French, 2015).[17]

Panels A and B of Figure 3 display the cumulative abnormal returns relative to the Fama-French 3-factor and 5-factor models, respectively. Upon announcement that Chinese entities are added to the BIS lists (the event), the U.S. suppliers of these targeted entities experience negative abnormal returns. While there is no evidence of abnormal returns in the 10 days preceding the event, the market seems to quickly incorporate the negative news for the affected suppliers once the inclusion of the targeted entities in the BIS lists is announced.[18] Most of the decline in CAR following the event is concentrated within the first few days and persists for at least the next 20 days.

The stock market reaction indicates that export controls may create some collateral damage. By restricting the ability of domestic firms to export products to selected Chinese firms, export controls impose immediate valuation losses on the affected U.S. suppliers. On average, U.S. suppliers experience a negative 2.5% cumulative abnormal return in the 20 days following the export control. This estimate implies that the average U.S. firm affected by export controls loses $857 million in market capitalization. Across all the firms in our sample, this translates to a decrease in market capitalization of $130 billion, which is economically significant.[19] The CAR results are quantitatively unchanged if we focus on the more restrictive

[17]We follow standard event study methods and use a $[-150, -50]$ day window to estimate betas and then estimate the out-of-sample abnormal returns during the event window $[-10, 20]$.

[18]The significant negative CAR happens in the post-announcement period. Five-factor CAR$[-10, -1]$ is -0.6% with 95% confidence interval being $[-0.015, 0.003]$. The five-factor CAR$[-10, 2]$ is -2.7% with the confidence interval being $[-0.038, -0.015]$. In the 3-factor model, day -1 is the first day with significantly negative CAR. In the 5-factor model, day 0 is the first day with significantly negative CAR.

[19]The aggregate loss is estimated by multiplying the loss for the average affected supplier by the number of affected suppliers, 156.

export control events, namely those in the Entity and Military End Use lists (hence excluding events from the Unverified List), as shown in Online Appendix Figure B.1.

5.2 Evidence from Profitability, Employment, and Investment

We now document the real effects of export controls on affected suppliers. Consistent with our findings on the supply chain reconfiguration, export controls may lead to an economic loss for U.S. firms that export goods and services to the Chinese firms included in the BIS lists.

Our analysis is again based on the stacked regression Eq. (1). Table 7 displays the real effect of export controls on affected suppliers. The dependent variables are cash flow in column (1), revenues in column (2), EBIT in column (3), CapEx in columns (4), and the number of employees in column (5). Panel A uses the main sample, while Panel B uses only the more restrictive export controls.

The collateral damage of export controls on U.S. suppliers is statistically and economically significant. The coefficient of column (1) in Panel A suggests that export controls lead to a decline in cash flow that is equal to 20% of its average value for treated firms. Revenues for treated firms decline by 8.6% after the imposition of export controls, as shown in column (2). The coefficient of column (3) in Panel A suggests that export controls lead to a decline in EBIT that is equal to 25% of its average value for treated firms. Affected suppliers seem to adjust to the negative consequences of export controls by reducing employment but not investment, as shown in columns (4) and (5). The effect on employment is statistically and economically significant, representing a 6.6% decline in the total number of employees. The asymmetric effect on investment and employment is consistent with export controls not

significantly changing the long-term investment opportunities of affected firms while requiring short-term adjustments to the labor force.

5.3 Evidence from Bank Lending Conditions

Finally, we study whether affected U.S. suppliers face tighter lending conditions from U.S. banks following the imposition of export controls. To do so, we employ confidential loan-level data from the corporate loan schedule of the Federal Reserve's Y-14Q collection. As before, we focus on firms that export to China, resulting in a sample of 331 firms—71 of which are affected by export controls—borrowing from 38 banks from 2012:Q3 to 2023:Q3.

Table 8 presents the Poisson Pseudo Maximum Likelihood (PPML, columns (1) to (4)) and OLS (columns (5) to (6)) regression results when considering the effects on total credit commitments, the amounts of committed term loans and credit lines, the share of the credit line that is utilized, the interest rate spread, and the maturity of total commitment, respectively. We observe a reduction in banks' credit exposure to affected suppliers, driven by a reduction in the quantity of term loans but no change in credit line commitments and utilization. Banks also charge higher interest rate spreads and shorten the maturity of their credit exposures to affected suppliers following the imposition of export controls.

6 Foreign Supply Chain Reconfiguration

Finally, we examine how Chinese firms respond to U.S. export controls designed to deny them access to U.S. cutting-edge technologies. We use again the stacked regression approach of

Eq. (1). In line with our previous results, we document a decoupling from U.S. suppliers and, in addition, find that Chinese targets find alternative domestic suppliers. Online Appendix Table B.1 reports the summary statistics for Chinese supply chain variables.

We first examine whether Chinese firms directly targeted by U.S. export controls decouple from the U.S. and whether they reshore by finding alternative suppliers domestically. Table 9 shows the results. The dependent variables are the total terminations with U.S. suppliers in columns (1) to (2), new relations formed with Chinese suppliers in columns (3) to (4), and new relations formed with U.S. suppliers in columns (5) to (6). The positive and significant coefficients of Affected $\times$ Post in columns (1) and (2) indicate that relations between targeted Chinese firms and their U.S. suppliers are more likely to be terminated after the export controls relative to unaffected Chinese firms. This decoupling between targeted Chinese firms and their U.S. suppliers is indeed the intended effect of U.S. export controls. What is unknown is how Chinese supply chains react to export controls. To this regard, we find that affected Chinese firms increase new relationships with domestic Chinese suppliers in columns (3) to (4). We also find in columns (5) to (6) that targeted Chinese firms reduce the number of new relationships with U.S. suppliers following export controls, even though the effect is not statistically significant.

We examine the total number of suppliers and the change in supplier shares in Table 10. The dependent variables are the total number of suppliers in columns (1) to (2), the share of Chinese suppliers in columns (3) to (4), and the share of U.S. suppliers in columns (5) to (6). The total number of suppliers of the affected Chinese firms does not change significantly after the export controls, indicating a substitution of new Chinese suppliers for the terminated U.S.

suppliers. Indeed, the share of Chinese suppliers increases significantly in columns (3) to (4), while the share of U.S. suppliers decreases significantly in columns (5) to (6). These results indicate that Chinese firms directly targeted by U.S. export controls can quickly adjust their supply chain by forming new relationships with domestic Chinese suppliers. In other words, decoupling is accompanied by reshoring for the Chinese firms targeted by U.S. export controls. It is possible that Chinese firms reshore faster and more effectively than U.S. firms hit by export controls because large state-owned Chinese firms enjoy a more substantial degree of economic coordination. Figure 4 shows that these results are not driven by pre-trends.

In addition to forming new relations with alternative suppliers, targeted Chinese firms can also try to buy more goods similar to those denied to them by U.S. export controls from non-U.S. firms with whom they have a pre-existing relation. Notice that non-U.S. firms are exempt from U.S. export controls unless they have significant operations in the United States. We classify non-U.S. firms as exempt, which, if any, would bias our estimates toward finding a decline in revenues by non-U.S. firms that sell to Chinese targets. Table 11 displays the results. Non-U.S. firms that supply goods to Chinese targets experience higher revenues and profitability (measured by EBIT) following the inclusion of the Chinese targets in the U.S. export control lists, even though the effect is statistically significant only for revenues.[20] The results are stronger when we focus on non-U.S. firms headquartered in U.S.-allied countries, likely because these firms produce high-tech products more comparable with those produced by U.S. firms. Anecdotal evidence indeed suggests that China is engaging in such strategic

[20]The sample of international firms used in Table 11 relies on data from CapitalIQ. The Cash Flow measure of Table 7 is not available in CapitalIQ and thus not used in Table 11.

behavior. For example, faced with controls on semiconductor technology from U.S. firms, some large Chinese firms bought similar technology from ASML in the Netherlands for years before the Dutch government also restricted those exports to China (Kharpal, 2024).

In summary, we find evidence that Chinese firms respond to being subject to U.S. export controls along both extensive and intensive margins. They form new relations with alternative Chinese suppliers and increase their purchases from non-U.S. firms with which they had pre-existing relations. Relatedly, Han et al. (2024) also finds evidence that U.S. export controls have the unintended consequence of boosting domestic Chinese innovation to be less reliant on U.S. technologies.

7 Conclusion

Forbidding U.S. firms from exporting cutting-edge products to a targeted list of Chinese firms, export controls aim to safeguard U.S. technological leadership. As intended, export controls prompt domestic suppliers to decouple from the targeted Chinese firms. Less obvious is the fact that domestic suppliers are also more likely to decouple from other Chinese firms not targeted by export controls. This broad-based decoupling is consistent with fear of future controls or concerns with re-export to the targeted firms, also a violation of export controls. On the U.S. side, this broad-based decoupling of U.S. firms from China is not offset by creating new supply chain relations domestically or in other countries. These supply chain rigidities may be detrimental to domestic firms. We indeed find that export controls impose significant collateral damage on the affected U.S. firms. Following the introduction of Chinese customers

in the export control lists, we estimate a negative cumulative abnormal return of 2.5% and a sizable decline in revenues and profitability for affected suppliers. These costs should be weighed against the expected benefits of such measures.

Lastly, we also document some strategic responses by Chinese firms to U.S. export controls. We find evidence that targeted Chinese firms offset the decline in U.S. suppliers with an increase in domestic suppliers. This is in contrast woth the lack of reshoring on the U.S. side. We also find suggestive evidence that targeted Chinese firms increase purchases from non-U.S. firms that produce similar technologies to the U.S.-made ones subject to export controls.

If national security is a public good, are export controls a viable policy to make firms internalize their negative externalities? If so, what are the costs for the domestic firms exporting targeted cutting-edge technologies? Should export controls be accompanied by policies to boost domestic demand for the restricted goods in a de facto industrial plan to reshore or friendshore high-tech supply chains? More research along the lines of Clayton et al. (2023b) is needed to understand the costs and benefits of using economic leverage as a coercive tool in a polarized world. Many questions still need to be answered. Among the tools at our disposal, such as trade agreements, reshoring subsidies, and export controls, we need to understand their relative costs and benefits—and whether they should be used in a particular order.

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Figure 1: Number of Affected U.S. Suppliers. Figure 1 Panel A displays the number of affected U.S. suppliers over time as the BIS includes Chinese customers on the Entity List. The histogram shows the number of affected U.S. suppliers in a specific year. The blue line represents the cumulative number of affected U.S. suppliers over time. Symbolic Chinese firms that are included in the Entity List are highlighted with orange text. Panel B displays the top 10 most affected industries based on the total number of affected U.S. suppliers in each industry. The industry classification is based on the 2-digit SIC code.

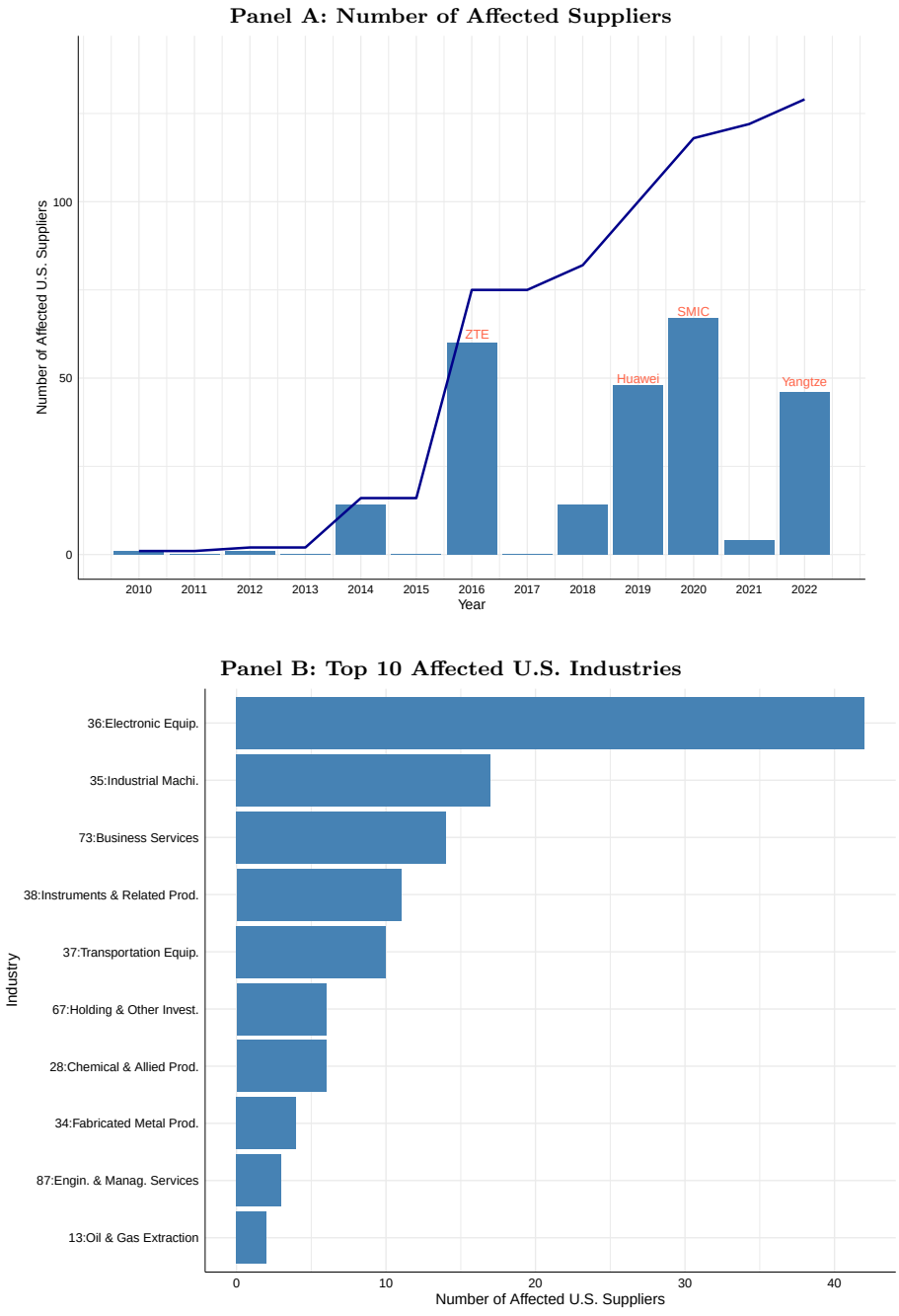
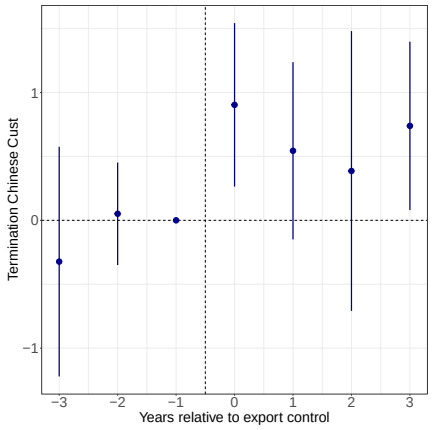
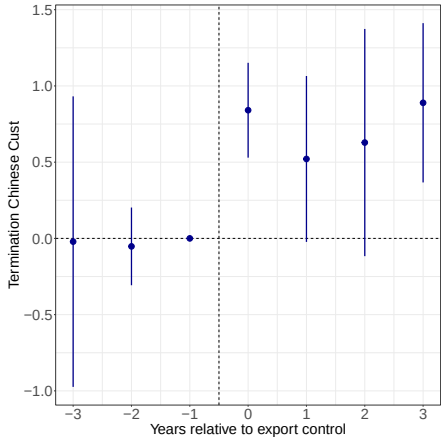


Figure 2: Decoupling from Chinese Customers. Figure 2 displays the dynamic effects of export controls on the number of terminated Chinese customers in affected suppliers. Panels A, C and E show the coefficient plots for the number of terminated Chinese customers using the Poisson Maximum likelihood regression (PPML) on the stacked regression of Eq. (1) while Panels B, D and F employ the TWFE model of Eq. (2). Panels A and B display the results on the total terminations with Chinese customers. Panels C and D show terminations with Chinese customers, excluding the targeted ones. Panels E and F display the results on the new relationship with Chinese customers. Regressions include firm and industry-size quartile-lagged customer number quartile-year fixed effects. In the stacked regressions, the fixed effects are further interacted with the cohort indicator variable. The blue bars indicate 95% confidence intervals around the estimated dynamic coefficient (blue dot).

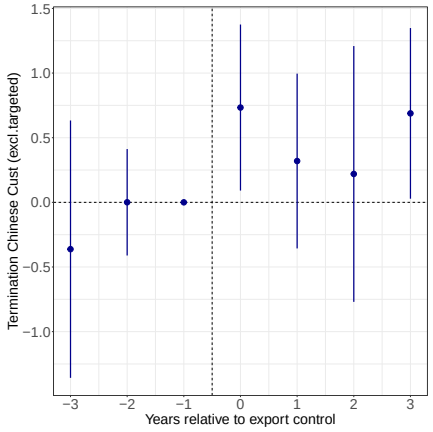
Panel A: Terminations (total), Stacked



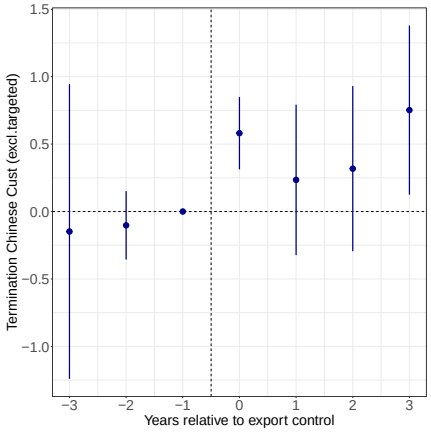
Panel B: Terminations (total), TWFE



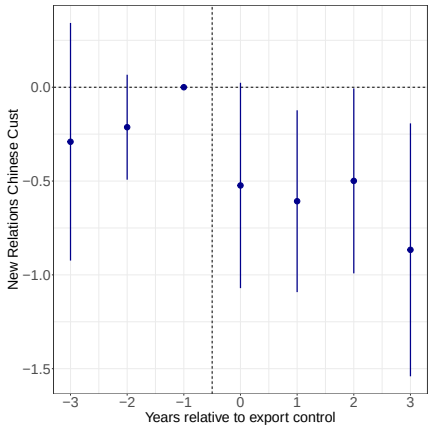
Panel C: Terminations (excl. targeted), Stacked



Panel D: Terminations (excl. targeted), TWFE



Panel E: New relationship, Stacked



Panel F: New relationship, TWFE

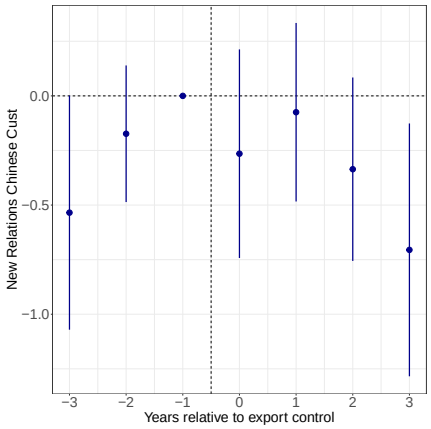


Figure 3: Cumulative Abnormal Returns around Announcement Dates. Figure 3 displays the cumulative abnormal returns (CAR) of affected suppliers in a $[-10, 20]$ day window around the announcement date of the inclusion of a target entity in the BIS lists. Panel A shows CARs using the Fama-French 3-factor model (Fama and French, 1993) while Panel B uses the Fama-French 5-factor model (Fama and French, 2015). On the vertical axis are the cumulative abnormal returns in percentages and on the horizontal axis the days relative to the announcement dates. The dashed vertical line represents the day before announcement date. The solid red line represents the average CARs and the dot-dash blue lines represent the 95% confidence intervals.

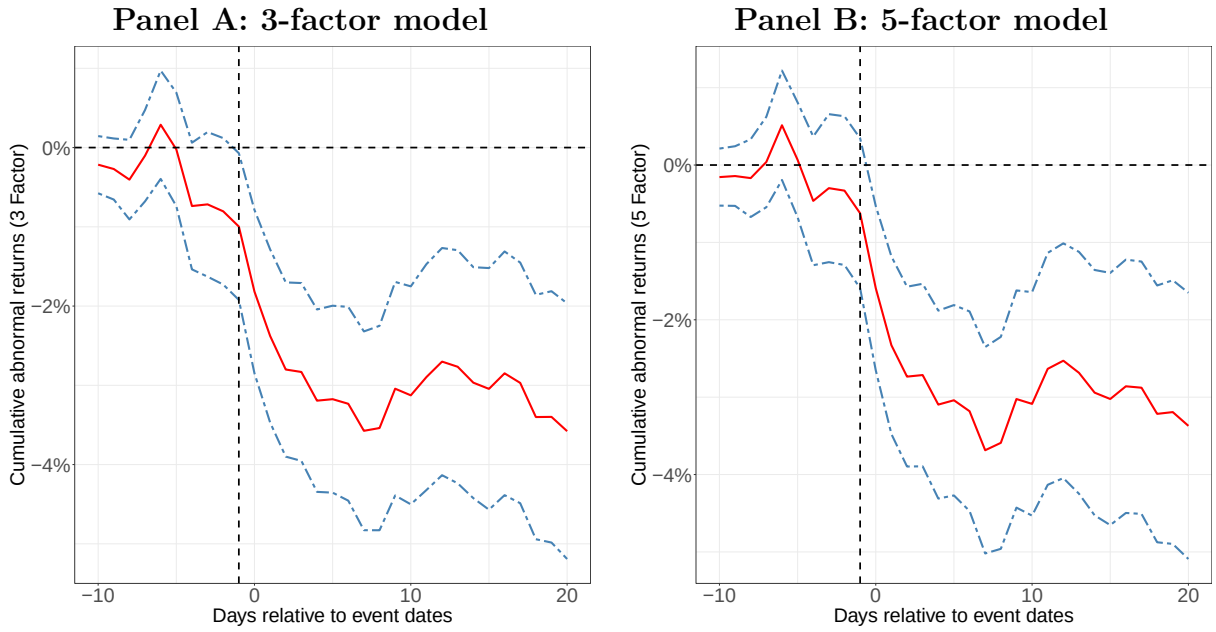


Figure 4: Chinese Firms' Supply Chain Reconfiguration. Figure 4 displays the dynamic effects of export controls on the supply chains of Chinese firms targeted by U.S. export controls. Panel A shows the coefficient plot for the terminations with U.S. suppliers using the Poisson Maximum likelihood regression (PPML) on the stacked regression of Eq. (1). Panel B displays the dynamic effect on new relationships with Chinese suppliers using the Poisson Maximum likelihood regression (PPML) on the stacked regression of Eq. (1). Regressions include cohort-firm and cohort-lagged customer number quartile-year fixed effects. The blue bars indicate 95% confidence intervals around the estimated dynamic coefficient (blue dot).

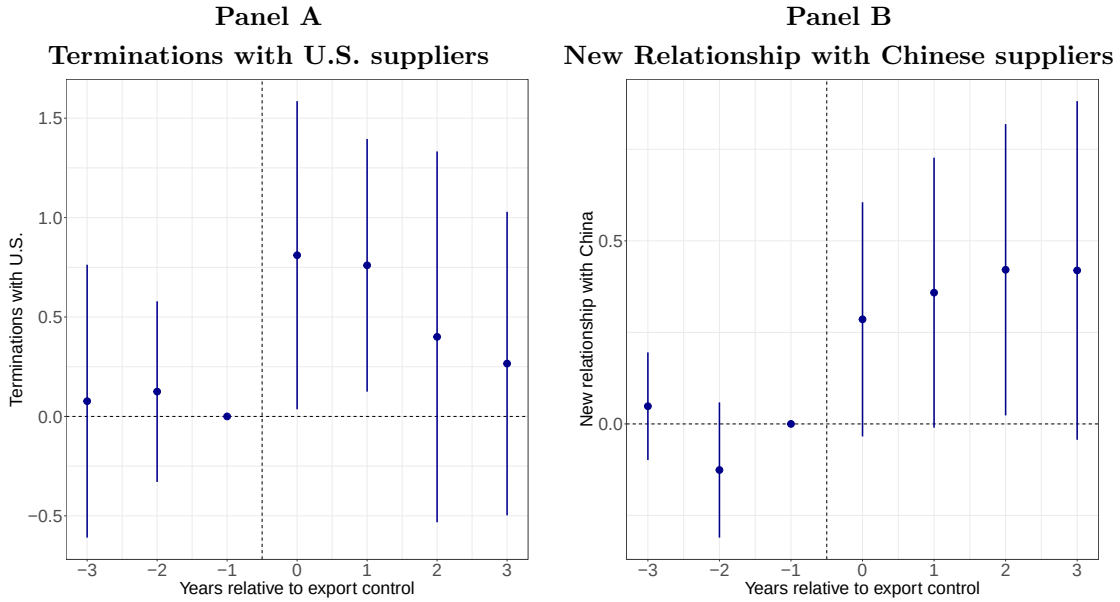


Table 1: Summary Statistics—Supply Chain Reconfigurations. Table 1 presents summary statistics for firms' supply chain relationships based on their treatment status (treated if they supply to Chinese entities in the BIS lists; control if they exported to Chinese entities not in the BIS lists). Termination Chinese Cust is the total number of terminated relations with Chinese customers. Termination Chinese Cust (excl. targeted) is the total number of terminated relations with Chinese customers, excluding those targeted by the BIS lists. New Relations Chinese Cust is the number of new Chinese customers. Total Cust is the total number of customers. Domestic Cust is the number of domestic (U.S.) customers. Domestic Share is the ratio of the total number of domestic U.S. customers to the contemporaneous number of total customers. China share is the ratio of the total number of Chinese customers to the contemporaneous number of total customers. Asia share is the ratio of the total number of customers from Asian countries other than China to the contemporaneous number of total customers. Asia Friend Share is the ratio of the total number of customers from South Korea, Japan, Australia, and Taiwan to the contemporaneous number of total customers. EU share is the ratio of the total number of customers from European Union countries to the contemporaneous number of total customers. SD refers to standard deviation, Obs to the number of observations, and p(25), p(50), and p(75) to the 25^{th}, 50^{th}, and 75^{th} percentiles, respectively.

	Mean	SD	Obs	p(25)	p(50)	p(75)
Termination Chinese Cust	0.212	0.741	5,246	0	0	0
Treated	0.597	1.42	737	0	0	1
Control	0.149	0.531	4,509	0	0	0
Termination Chinese Cust (excl. targeted)	0.199	0.703	5,246	0	0	0
Treated	0.502	1.301	737	0	0	0
Control	0.149	0.531	4,509	0	0	0
New Relations Chinese Cust	0.447	1.308	5,246	0	0	0
Treated	1.221	2.476	737	0	0	2
Control	0.321	0.937	4,509	0	0	0
Total Cust	33.165	61.384	5,246	8	19	39
Treated	62.248	120.915	737	17	34	60
Control	28.411	42.849	4,509	7	17	36
Domestic Cust	15.417	24.89	5,246	3	9	18
Treated	24.654	44.382	737	6	14	23
Control	13.907	19.569	4,509	3	8	18
Domestic Share	0.498	0.246	5,139	0.333	0.5	0.667
Treated	0.405	0.174	733	0.3	0.395	0.5
Control	0.513	0.252	4,406	0.333	0.5	0.68
China Share	0.063	0.133	5,139	0	0.012	0.071
Treated	0.094	0.111	733	0.027	0.065	0.122
Control	0.058	0.136	4,406	0	0	0.059
Asia Share	0.182	0.187	5,139	0.025	0.143	0.269
Treated	0.234	0.169	733	0.115	0.222	0.323
Control	0.174	0.189	4,406	0	0.125	0.25
Asia Friend Share	0.152	0.178	5,139	0	0.1	0.222
Treated	0.203	0.167	733	0.078	0.167	0.294
Control	0.143	0.178	4,406	0	0.088	0.2
EU Share	0.13	0.127	5,139	0	0.111	0.19
Treated	0.136	0.099	733	0.062	0.13	0.199
Control	0.129	0.131	4,406	0	0.106	0.19

Table 2: Summary Statistics—Financial and Real Collateral Damage. Table 2 presents summary statistics for firms' balance sheet characteristics based on their treatment status (treated if they supply to Chinese entities in the BIS lists; control otherwise) and for the cumulative abnormal returns of Treated suppliers before and after the announcement of export controls. SD refers to standard deviation, Obs to the number of observations, and p(25), p(50), and p(75) to the 25^{th}, 50^{th}, and 75^{th} percentiles, respectively. Cash Flow equals operating income before depreciation minus interest and taxes, divided by lagged assets, Revenues is the logarithm of the total revenues (in millions), Sale is the logarithm of the total sales (in millions), ROA is return on assets, CapEx is capital expenditures divided by lagged assets, Income equals operating income before depreciation divided by lagged assets, EBIT is earnings before interest and taxes divided by lagged assets, Interest is interest expenses divided by lagged assets, and Employees is the logarithm of the total number of employees.

	Mean	SD	Obs	p(25)	p(50)	p(75)
Balance Sheet Characteristics						
Assets, $m	11,741	47,886	5,220	216	1,010	4,498
Treated	15,027	41,501	734	437	1,916	7,810
Control	11,203	48,835	4,486	195	887	4,066
Cash Flow	0.012	0.264	5,193	−0.008	0.075	0.123
Treated	0.084	0.128	731	0.052	0.098	0.135
Control	−0.0002	0.278	4,462	−0.025	0.069	0.119
Revenues	6.52	2.215	5,183	5.1	6.688	8.094
Treated	7.125	2.028	733	5.822	7.234	8.596
Control	6.42	2.229	4,450	4.969	6.608	8.023
Sales	6.51	2.211	5,160	5.089	6.68	8.085
Treated	7.122	2.028	731	5.822	7.183	8.601
Control	6.409	2.224	4,429	4.956	6.596	8.009
ROA	−0.04	0.272	5,219	−0.075	0.027	0.08
Treated	0.032	0.142	734	0.002	0.048	0.092
Control	−0.050	0.286	4,485	−0.096	0.023	0.077
CapEx	0.034	0.04	5,190	0.012	0.023	0.042
Treated	0.037	0.044	731	0.013	0.024	0.041
Control	0.034	0.039	4,459	0.012	0.023	0.042
Income	0.037	0.261	5,193	0.007	0.098	0.154
Treated	0.107	0.132	731	0.073	0.122	0.165
Control	0.026	0.275	4,462	−0.013	0.093	0.151
EBIT	-0.003	0.259	5,196	−0.038	0.058	0.114
Treated	0.064	0.136	732	0.032	0.081	0.124
Control	−0.014	0.272	4,464	−0.056	0.052	0.111
Interest	0.014	0.027	4,687	0.002	0.008	0.017
Treated	0.01	0.01	672	0.003	0.008	0.013
Control	0.015	0.029	4,015	0.001	0.008	0.018
Employees	7.716	2.048	5,169	6.28	7.857	9.159
Treated	8.283	2.05	730	6.928	8.521	9.861
Control	7.623	2.033	4,439	6.207	7.716	9.06
Cumulative Abnormal Returns						
3-factor CAR						
[−10, −1]	−0.011	0.082	250	−0.053	−0.009	0.024
[0, 20]	−0.025	0.103	250	−0.081	−0.029	0.024
5-factor CAR						
[−10, −1]	−0.007	0.085	250	−0.047	−0.007	0.027
[0, 20]	−0.027	0.11	250	−0.086	−0.025	0.023

Table 3: Summary Statistics for China Exporters by Size Quartiles. Table 3 presents summary statistics for balance sheet characteristics of firms that export to China, broken down by size quartiles and treatment status (whether or not they were ever treated, namely suppliers of Chinese entities included in the BIS lists). SD refers to the standard deviation. Cash Flow equals operating income before depreciation minus interest and taxes, divided by lagged assets, Revenues is the logarithm of the total revenues (in millions), Sale is the logarithm of the total sales (in millions), ROA equals earnings before extraordinary items divided by lagged assets, CapEx is capital expenditures divided by lagged assets, Income equals operating income before depreciation divided by lagged assets, EBIT is earnings before interest and taxes divided by lagged assets, Interest equals interest expense divided by lagged assets, and Employees equals the logarithm of the total number of employees.

		Full	Size Q1		Size Q2		Size Q3		Size Q4	
	Stat.	Sample	Treated	Control	Treated	Control	Treated	Control	Treated	Control
No. Obs.	Tot.	5,220	31	247	134	862	196	1,440	373	1,937
Assets, $m	Mean	11,741	1,057	141	2,690	698	1,404	1,187	27,778	24,735
	Median	1,010	119	21	166	108	767	496	6,665	4,269
	SD	47,886	1,750	455	10,027	3,437	1,670	1,799	54,993	72,073
Cash Flow	Mean	0.012	−0.015	−0.286	−0.01	−0.072	0.086	−0.001	0.125	0.07
	Median	0.075	0.07	−0.083	0.028	0.018	0.088	0.066	0.115	0.088
	SD	0.264	0.294	0.645	0.183	0.332	0.074	0.225	0.069	0.148
Revenues	Mean	6.52	5.474	3.151	4.928	4.71	6.42	5.982	8.417	7.893
	Median	6.688	4.8	2.88	4.926	4.653	6.375	6.02	8.26	7.979
	SD	2.215	1.714	1.729	2.092	1.712	1.178	1.647	1.298	1.699
Sale	Mean	6.51	5.474	3.151	4.927	4.71	6.42	5.984	8.418	7.877
	Median	6.68	4.8	2.88	4.926	4.653	6.375	6.022	8.27	7.967
	SD	2.211	1.714	1.729	2.089	1.712	1.178	1.649	1.298	1.695
ROA	Mean	−0.04	−0.085	−0.319	−0.048	−0.131	0.024	−0.058	0.074	0.022
	Median	0.027	0.011	−0.125	−0.003	−0.034	0.036	0.011	0.069	0.045
	SD	0.272	0.373	0.608	0.195	0.364	0.087	0.237	0.074	0.156
CapEx	Mean	0.034	0.063	0.031	0.035	0.037	0.037	0.038	0.035	0.03
	Median	0.023	0.026	0.018	0.024	0.024	0.026	0.027	0.023	0.021
	SD	0.04	0.107	0.049	0.04	0.046	0.044	0.041	0.035	0.031
Income	Mean	0.037	0.005	−0.262	0.004	−0.052	0.106	0.025	0.154	0.098
	Median	0.098	0.073	−0.070	0.037	0.035	0.108	0.089	0.145	0.117
	SD	0.261	0.285	0.604	0.183	0.326	0.079	0.226	0.074	0.156
EBIT	Mean	−0.003	−0.057	−0.299	−0.031	−0.094	0.06	−0.018	0.111	0.061
	Median	0.058	0.02	−0.117	0.006	−0.01	0.065	0.044	0.102	0.079
	SD	0.259	0.322	0.601	0.191	0.324	0.081	0.224	0.069	0.151
Interest	Mean	0.014	0.012	0.023	0.009	0.016	0.009	0.014	0.01	0.013
	Median	0.008	0.009	0.004	0.003	0.004	0.008	0.007	0.01	0.009
	SD	0.027	0.017	0.072	0.017	0.035	0.009	0.027	0.007	0.016
Employees	Mean	7.716	6.778	4.564	6.157	6.077	7.656	7.232	9.502	8.948
	Median	7.857	6.057	4.376	6.077	5.951	7.647	7.128	9.582	8.949
	SD	2.048	1.702	1.628	2.103	1.659	1.373	1.445	1.398	1.551

Table 4: Decoupling from China. This table presents the Poisson Pseudo Maximum Likelihood (PPML) regression results of the effect of export controls on supply chain configurations. Termination Chinese Cust is the total number of terminated relations with Chinese customers. Termination Chinese Cust (excl. targeted) is the total number of terminated relations with Chinese customers, excluding those targeted by the BIS lists. New Relations Chinese Cust is the number of new Chinese customers. Affected equals one for firms that within the previous year had a customer included in the BIS lists (Entity List, UVL, and MEU list) and Post equals one after the inclusion of such customer in the BIS lists. For each cohort, the control group includes never treated and not yet treated firms. SIC refers to the 2-digit standard industrial classification (SIC) code. Size refers to the industry-specific size quartile of each firm. Custom refers to the lagged total number of customers quartile of each firm in the treatment group. We require all firms to be exporting to China in the pre-treatment period. We double cluster the standard errors at the firm and year level. *** p<0.01, ** p<0.05, * p<0.1.

Dependent variables:	Termination Chinese Cust			Termination Chinese Cust (excl.targeted)			New Relations Chinese Cust		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Affected × Post	0.571***	0.587**	0.697***	0.371*	0.408*	0.557**	−0.479***	−0.523***	−0.472**
	(0.21)	(0.234)	(0.266)	(0.224)	(0.242)	(0.267)	(0.139)	(0.153)	(0.193)
Fixed Effects:									
Cohort-Firm	✓	✓	✓	✓	✓	✓	✓	✓	✓
Cohort-SIC-Year	✓			✓			✓		
Cohort-SIC-Size-Year		✓			✓			✓	
Cohort-SIC-Size-Custom-Year			✓			✓			✓
Observations	18,375	16,034	11,337	18,266	15,960	11,267	25,294	23,221	19,000

Table 5: Supply Chain Reconfiguration—Number of customers. This table presents the Poisson Pseudo Maximum Likelihood (PPML) regression results of the effect of export controls on supply chain configurations. Total Cust is the total number of customers. Domestic Cust is the number of domestic customers. Affected equals one for firms that within the previous year had a customer included in the BIS lists (Entity List, UVL, and MEU list) and Post equals one after the inclusion of such customer in the BIS lists. For each cohort, the control group includes never treated and not yet treated firms. SIC refers to the 2-digit standard industrial classification (SIC) code, and Size to the industry-specific size quartile of each firm. We require all firms to be exporting to China in the pre-treatment period. We double cluster the standard errors at the firm and year level. *** p<0.01, ** p<0.05, * p<0.1.

Dependent variables:	Total Cust		Domestic Cust	
	(1)	(2)	(3)	(4)
Affected × Post	−0.144**	−0.138**	−0.117	−0.098
	(0.064)	(0.07)	(0.076)	(0.084)
Fixed Effects:				
Cohort-Firm	✓	✓	✓	✓
Cohort-SIC-Year	✓		✓	
Cohort-SIC-Size-Year		✓		✓
Observations	32,294	32,159	31,803	31,639

Table 6: Supply Chain Reconfigurations—Customer Share. This table presents the Poisson Pseudo Maximum Likelihood (PPML) regression results of the effect of export controls on supply chain reconfigurations. Domestic Share is the ratio of the total number of domestic U.S. customers to the contemporaneous number of total customers. China Share is the ratio of the total number of Chinese customers to the contemporaneous number of total customers. Asia Share is the ratio of the total number of customers from Asia, excluding China, to the contemporaneous number of total customers. Asia Friend Share is the ratio of the total number of customers from South Korea, Japan, Taiwan, and Australia to the contemporaneous number of total customers. EU Share is the ratio of the total number of customers from European Union countries to the contemporaneous number of total customers. Affected equals one for firms that within the previous year had a customer included in the BIS lists (Entity List, UVL, and MEU list), and Post equals one after the inclusion of such customer in the BIS lists. For each cohort, the control group includes never treated and not yet treated firms. SIC refers to the 2-digit standard industrial classification (SIC) code. Size refers to the industry-specific size quartile of each firm. Custom refers to the lagged number of customers in each region quartile of each firm in the treatment group. We require firms to export to China in the pre-treatment period. We double-cluster the standard errors at the firm and year level. *** p<0.01, ** p<0.05, * p<0.1.

Panel A: Domestic Share and China Share

	Domestic Share		China Share	
	(1)	(2)	(3)	(4)
Affected × Post	0.081***	0.100**	−0.332***	−0.406***
	(0.029)	(0.033)	(0.075)	(0.122)
Fixed Effects:				
Cohort-Firm	✓	✓	✓	✓
Cohort-SIC-Size-Year	✓		✓	
Cohort-SIC-Size-Custom-Year		✓		✓
Observations	31,443	31,337	27,897	27,270

Panel B: Other Customer Share

	Asia Share		Asia Friend Share		EU Share	
	(1)	(2)	(3)	(4)	(5)	(6)
Affected × Post	−0.028	−0.014	−0.043	0.003	−0.081	−0.029
	(0.044)	(0.038)	(0.049)	(0.047)	(0.06)	(0.039)
Fixed Effects:						
Cohort-Firm	✓	✓	✓	✓	✓	✓
Cohort-SIC-Size-Year	✓		✓		✓	
Cohort-SIC-Size-Custom-Year		✓		✓		✓
Observations	29,029	28,720	29,209	27,857	27,744	27,091

Table 7: Real Effects of Export Controls. This table presents the stacked regression results of the effect of export controls on cash flow, revenue, EBIT, capital expenditure and employment. Cash Flow equals operating income before depreciation minus interest and taxes, divided by lagged total assets. Revenues is the logarithm of the total revenues (in millions), EBIT is earnings before interest and taxes divided by lagged assets, CapEx is capital expenditures divided by lagged assets, Employees is the logarithm of the number of employees, and Affected equals one for firms that within the previous year had a customer included in the BIS lists (Entity List, UVL, and MEU list). Post equals one after the inclusion of such customer in the BIS lists. For each cohort, the control group includes never treated and not yet treated firms. SIC refers to the 2-digit standard industrial classification (SIC) code, Size to the industry-specific size quartile of each firm, and China equals one if a firm exports to China. We require all firms to be exporting to China in the pre-treatment period. We double cluster the standard errors at the firm and year level. *** p<0.01, ** p<0.05, * p<0.1.

Panel A: Full Sample

Dependent variables:	Cash Flow	Revenues	EBIT	CapEx	Employees
	(1)	(2)	(3)	(4)	(5)
Affected × Post	−0.017**	−0.087**	−0.016*	0.005	−0.069**
	(0.007)	(0.031)	(0.008)	(0.003)	(0.031)
Fixed Effects:					
Cohort-Firm	✓	✓	✓	✓	✓
Cohort-SIC-Size-Year	✓	✓	✓	✓	✓
Observations	32,108	32,079	32,110	32,065	31,899

Panel B: Restrictive Sample

Dependent variables:	Cash Flow	Revenues	EBIT	CapEx	Employees
	(1)	(2)	(3)	(4)	(5)
Affected × Post	−0.017**	−0.093**	−0.016*	0.004	−0.072**
	(0.007)	(0.031)	(0.008)	(0.003)	(0.031)
Fixed Effects:					
Cohort-Firm	✓	✓	✓	✓	✓
Cohort-SIC-Size-Year	✓	✓	✓	✓	✓
Observations	26,771	26,777	26,773	26,737	26,601

Table 8: Bank Lending to Affected U.S. Suppliers. This table presents the Poisson Pseudo Maximum Likelihood (PPML, columns 1–4) and OLS (columns 5–6) regression results of the effect of export controls on bank lending. Affected equals one for firms that within the previous year had a customer included in the BIS lists (Entity List, UVL, and MEU list) and Post equals one after the inclusion of such customer in the BIS lists. For each cohort, the control group includes never treated and not yet treated firms. SIC refers to the 2-digit standard industrial classification (SIC) code. Size refers to the industry-specific size quartile of each firm. We require all firms to be exporting to China in the pre-treatment period. We double cluster the standard errors at the firm and quarter level. *** p<0.01, ** p<0.05, * p<0.1.

Dependent variables:	Committed Total Credit	Committed Term Loans	Committed Credit Lines	Utilized Credit Lines	Spread	Maturity
	(1)	(2)	(3)	(4)	(5)	(6)
Affected × Post	−0.136*	−0.630**	−0.081	−0.197	0.179**	−4.874***
	(0.073)	(0.251)	(0.068)	(0.171)	(0.088)	(1.538)
Fixed Effects:						
Cohort-Firm	✓	✓	✓	✓	✓	✓
Cohort-SIC-Size-Quarter	✓	✓	✓	✓	✓	✓
Cohort-Bank-Quarter	✓	✓	✓	✓	✓	✓
Observations	356,012	356,012	356,012	356,012	174,368	202,016

Table 9: Decoupling from the U.S.—The Chinese Perspective. This table presents the Poisson Pseudo Maximum Likelihood (PPML) regression results of the effect of export controls on Chinese firms' supply chain reconfigurations. Termination U.S. Supp is the total number of terminated relations with the U.S. suppliers. New Relations Chinese Supp is the number of new Chinese suppliers. New Relations U.S. Supp is the number of new U.S. suppliers. Affected equals one for Chinese firms that within the previous year are included in the BIS lists (Entity List, UVL, and MEU list) and Post equals one after the inclusion of such firms in the BIS lists. For each cohort, the control group includes never treated and not yet treated firms. Custom refers to the lagged total number of customers quartile of each firm of the targeted Chinese firm group. We require all firms to be importing from U.S. suppliers in the pre-treatment period. We double cluster the standard errors at the firm and year level. *** p<0.01, ** p<0.05, * p<0.1.

Dependent variables:	Terminations U.S. Supp		New Relations Chinese Supp		New Relations U.S. Supp	
	(1)	(2)	(3)	(4)	(5)	(6)
Affected × Post	0.567**	0.533*	0.470***	0.399**	−0.206	−0.255
	(0.288)	(0.298)	(0.180)	(0.189)	(0.174)	(0.187)
Fixed Effects:						
Cohort-Firm	✓	✓	✓	✓	✓	✓
Cohort-Year	✓		✓		✓	
Cohort-Custom-Year		✓		✓		✓
Observations	164,404	163,292	191,616	190,181	181,496	180,782

Table 10: Decoupling from the U.S.—Customer Shares. This table presents the Poisson Pseudo Maximum Likelihood (PPML) regression results of the effect of export controls on Chinese firms' supply chain configurations. Total Suppliers is the total number of suppliers. China Supplier Share is the ratio of the total number of Chinese suppliers to the contemporaneous number of total suppliers. U.S. Supplier Share is the ratio of the total number of U.S. suppliers to the contemporaneous number of total suppliers. Affected equals one for Chinese firms that within the previous year are included in the BIS lists (Entity List, UVL, and MEU list) and Post equals one after the inclusion of such Chinese firms in the BIS lists. For each cohort, the control group includes never treated and not yet treated firms. Custom refers to the lagged total number of customers quartile of each firm in the treatment group. We require all control firms to be importing from U.S. in the pre-treatment period. We double cluster the standard errors at the firm and year level. *** p<0.01, ** p<0.05, * p<0.1.

Dependent Variables:	Total Suppliers		China Supplier Share		U.S. Supplier Share	
	(1)	(2)	(3)	(4)	(5)	(6)
Affected × Post	0.064	0.002	0.302***	0.295***	−0.327**	−0.282**
	(0.122)	(0.107)	(0.114)	(0.108)	(0.135)	(0.125)
Fixed Effects:						
Cohort-Firm	✓	✓	✓	✓	✓	✓
Cohort-Year	✓		✓		✓	
Cohort-Custom-Year		✓		✓		✓
Observations	250,368	250,368	180,707	180,647	191,090	191,090

Table 11: Supply Chain Circumvention. This table presents the regression results of the effect of export controls on the revenues and EBIT of suppliers from all regions (excluding the U.S.) and suppliers in allied regions (European Union, South Korea, Japan, Taiwan, Australia, and Canada). Revenues and EBIT are as defined in Table 7. Affect equals one for firms that within the previous year had a customer included in the BIS lists (Entity List, UVL, and MEU list) and Post equals one after the inclusion of such customer in the BIS lists. For each cohort, the control group includes never treated and not yet treated firms. SIC refers to the 2-digit standard industrial classification (SIC) code, and Size to the industry-specific size quartile of each firm in each region (Europe, Asia, etc). We require all firms to be exporting to China in the pre-treatment period. We double-cluster the standard errors at the firm and year level. *** p<0.01, ** p<0.05, * p<0.1.

Panel A: Treated firms in allied regions

Dependent variables:	Revenues		EBIT	
	(1)	(2)	(3)	(4)
Affected × Post	0.159***	0.131**	0.006	0.004
	(0.048)	(0.050)	(0.007)	(0.008)
Fixed Effects:				
Cohort-Firm	✓	✓	✓	✓
Cohort-SIC-Year	✓		✓	
Cohort-SIC-Size-Year		✓		✓
Observations	97,697	97,697	98,192	98,192

Panel B: Treated firms in all regions

Dependent variables:	Revenues		EBIT	
	(1)	(2)	(3)	(4)
Affected × Post	0.045*	0.034	0.001	0.002
	(0.025)	(0.023)	(0.003)	(0.003)
Fixed Effects:				
Cohort-Firm	✓	✓	✓	✓
Cohort-SIC-Year	✓		✓	
Cohort-SIC-Size-Year		✓		✓
Observations	359,052	359,052	360,701	360,701

Online Appendix: Not For Publication

This appendix includes several sections of supplemental information. Appendix A contains definitions for the variables used in the paper and Appendix B includes additional results.

A Variable Definitions

Variable Name	Description
Terminations Chinese Cust	Total number of terminated relations with Chinese customers *Source:* Factset Revere.
Terminations Chinese Cust (excl.targeted)	Total number of terminated relations with Chinese customers, excluding those targeted by the BIS lists. *Source:* Factset Revere.
New Relations Chinese Cust	The number of new Chinese customers *Source:* Factset Revere.
Total Cust	Total number of customers. *Source:* Factset Revere.
Domestic Cust	Total number of domestic customers. *Source:* Factset Revere.
Domestic Share	Ratio of the total number of domestic U.S. customers to the contemporaneous number of total customers. *Source:* Factset Revere.
China Share	Ratio of the total number of Chinese customers to the contemporaneous number of total customers. *Source:* Factset Revere.
Asia Share	Ratio of the total number of customers from Asia, excluding China, to the contemporaneous number of total customers. *Source:* Factset Revere.
Asia Friend Share	Ratio of the total number of customers from South Korea, Japan, Taiwan, and Australia to the contemporaneous number of total customers. *Source:* Factset Revere.
EU Share	Ratio of the total number of customers from the Europe Union to the contemporaneous number of total customers. *Source:* Factset Revere.
Termination U.S. Supp	Total Number of terminated relations with the U.S. suppliers. *Source:* Factset Revere.
New Relations Chinese Supp	Number of new Chinese suppliers. *Source:* Factset Revere.
New Relations U.S. Supp	Number of new U.S. suppliers. *Source:* Factset Revere.
Total Suppliers	Total number of suppliers. *Source:* Factset Revere.
China Supplier Share	Ratio of the total number of Chinese suppliers to the contemporaneous number of total suppliers. *Source:* Factset Revere.

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Table A.1 – *Continued from previous page*

Variable	**Description**
U.S. Supplier Share	Ratio of the total number of U.S. suppliers to the contemporaneous number of total suppliers. *Source:* Factset Revere.
Assets	Total assets in $ million (at). *Source:* Compustat.
Cash Flow	Operating income before depreciation (oibd) minus interest (xint) and taxes (txt), divided by lagged assets. *Source:* Compustat.
ROA	Earnings before extraordinary items (ib) divided by lagged assets. *Source:* Compustat.
CapEx	Capital expenditures (capx) divided by lagged assets. *Source:* Compustat.
Income	Operating Income before depreciation (oibdp) divided by lagged assets. *Source:* Compustat.
Interest	Interest expense (xint) divided by lagged assets. *Source:* Compustat.
Employees	Logarithm of the number of employees in thousands (emp). *Source:* Compustat.
Revenues	Logarithm of the Revenues in $ million (revt). *Source:* Compustat and Capital IQ
Sale	Logarithm of the Sale in $ million (sale) *Source:* Compustat
EBIT	Earnings before Interest and Taxes (ebit) divided by lagged assets. *Source:* Compustat and Capital IQ
Affected	Firm that supplied goods and services to a Chinese entity within one year of its inclusion in a BIS export control list. *Source:* FactSet Revere.

B Additional Results

Table B.1: Summary Statistics of Chinese firms' Supply Chain Reconfigurations. This table presents summary statistics for Chinese firms' supply chain relationships based on their treatment status (treated if they are included the BIS lists; control if they are not in the BIS lists). Termination U.S. Supp is the total number of terminated relations with U.S. suppliers. New Relations Chinese Supp is the number of new Chinese suppliers. New Relations U.S. Supp is the number of new U.S. suppliers. Total Suppliers is the total number of suppliers. China share is the ratio of the total number of Chinese suppliers to the contemporaneous number of total suppliers. U.S. share is the ratio of the total number of U.S. suppliers to the contemporaneous number of total suppliers. SD refers to standard deviation, Obs to the number of observations and p(25), p(50), and p(75) to the 25^{th}, 50^{th}, and 75^{th} percentiles, respectively.

	Mean	SD	Obs	p(25)	p(50)	p(75)
Termination U.S. Supp.	0.202	0.498	271,345	0	0	0
Treated	0.507	0.765	211	0	0	1
Control	0.201	0.498	271,134	0	0	0
New Relations Chinese Supp.	1.253	2.576	271,345	0	0	1
Treated	2.839	3.951	211	0	1	4
Control	1.252	2.574	271,134	0	0	1
New Relations U.S. Supp.	0.303	0.686	271,345	0	0	0
Treated	0.668	1.03	211	0	0	1
Control	0.303	0.686	271,134	0	0	0
Total Suppliers	6.824	11.265	271,345	1	2	7
Treated	14.739	16.411	211	2	7	21.5
Control	6.818	11.258	271,134	1	2	7
China Share	0.476	0.369	214,378	0	0.5	0.8
Treated	0.433	0.305	198	0.167	0.5	0.647
Control	0.476	0.369	214,180	0	0.5	0.8
U.S. Share	0.295	0.351	214,378	0	0.157	0.5
Treated	0.352	0.305	198	0.113	0.25	0.5
Control	0.295	0.351	214,180	0	0.157	0.5

Figure B.1: Cumulative Abnormal Returns and Tighter Export Controls. This figure displays the cumulative abnormal returns (CAR) of affected suppliers in a $[-10, 20]$ day window around the announcement date of the inclusion of a target entity in the most stringent BIS lists, the Entity and MEU lists. Panel A shows CARs using the Fama-French 3-factor model (Fama and French, 1993) while Panel B uses the Fama-French 5-factor model (Fama and French, 2015). On the vertical axis are the cumulative abnormal returns in percentages and on the horizontal axis the days relative to the announcement dates. The dashed vertical line represents the day before the announcement date. The solid red line represents the average CARs and the dot-dash blue line the 95% confidence intervals.

