Spillover effects of subsidies on downstream trade

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Working paper for GSIPE
Preliminary draft: PLEASE DO NOT CITE

Abstract

Corporate subsidies are at the center of the political, economic, and trade policy debate as a major source of controversy in the world trading system. Subsidization of industrial activities is often considered to distort the allocation of scarce resources and generate friction in international trade. Much attention has been devoted to direct subsidies, but there is scarce evidence on the indirect effect of government support on downstream trade. In the present study, I use detailed information on US subsidies to examine the effect of government support on the export performance of the recipient industries and industries that use subsidized goods and services as inputs of production. I address endogeneity concerns by re-adapting a shift-share instrument developed by Bown *et al.* (2021). The instrument leverages on the exogenous variation in the political importance of US battleground states across electoral terms and the importance of industries within states. I estimate that corporate subsidies boost the export performance of the targeted industries and increase exports of indirectly exposed (downstream) industries.

Keywords: Industrial subsidies, Export, Trade, Supply Chains, Input-Output Linkages.

JEL Codes: D57, F13, H25.

[1]I am grateful to seminar participants at ECARES - Universite libre de Bruxelles and Université catholique de Louvain for their helpful comments and suggestions. I wish to thank Paola Conconi and Mathieu Parenti, my supervisors, for precious academic advice and council. Funding from the FNRS is gratefully acknowledged. Mail: elisa.navarra@ulb.be. Personal website: sites.google.com/view/elisanavarra

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1 Introduction

Corporate subsidies are at the center of the political, economic, and trade policy debate as a major source of controversy in the world trading system.[2] Subsidization of industrial activities is often considered to distort the allocation of scarce resources and generate friction in international trade. In the present study, I use detailed information on US corporate subsidies to examine the effect of US government support on the export performance of the recipient industries, and industries that use subsidized goods and services as inputs of production.

There is an increasing concern, both at the national and supranational level, about the distorting effect of foreign subsidies on trade and local markets.[3] As a matter of fact, "the number of subsidy-related trade disputes have increased sharply since 2010, as have investigations launched into subsidized imports" (Evenett and Fritz, 2021). As far as market access impairment is concerned, state support undermines the level playing field in the international market if it enables unprofitable companies to crowd out others that are better performing. On the one hand, if government support is granted to exporting firms, subsidized firms would be favored when competing in foreign markets. On the other hand, if subsidies are awarded to firms in import-competing industries, firms exporting to the subsidizing country would face unfair local competition. Corporate subsidies distort the market by creating an uneven playing field for competition as long as they provide competitive advantages on the basis of the support received. Yet, industrial subsidies might still be among governments' preferred tools to tackle national and global challenges, to address externalities, or to attain industrial policy objectives, for example. However, as no comparable worldwide regime is in place for the support granted by national governments to their firms, the discrepancy in local subsidies schemes creates an uneven playing field at the international level.

As of today, subsidies are regulated at the multilateral level by the World Trade Organization's Agreement on Subsidies and Countervailing Measures (i.e., "SCM Agreement").[4] Howver,

[2] A punctual definition of corporate subsidies is provided later on in this section.

[3] Foreign subsidies are defined as "any financial contribution by a foreign government that confers a benefit" (The World Trade Organization's Agreement on Subsidies and Countervailing Measures, WTO (2006)).

[4] The Agreement applies to measures that can be classified as "specific subsidy" within the meaning of the Agreement, namely any financial contributions by a government or any public body within the territory of a World Trade Organization (WTO) Member which confers a benefit and, most importantly, that meet certain criteria. Within this scope, the SCM Agreement defines two basic categories of subsidies: prohibited subsidies, namely export subsidies and local content subsidies, and actionable subsidies, which are subjected to challenge in the WTO or to countervailing measures, if they cause adverse effects to the interests of another Member. For a more extensive description of the SCM Agreement coverage and measures consult the Agreement on Subsidies

not only the scope of the current system is limited (for example, it does not apply to services or investment flows),[5] but its mechanisms and notification system have been highly contested and argued to be incomplete and weak (Cosbey and Mavroidis, 2014). On this view, the need for further international trade cooperation - including the elaboration of new trade rules that discipline trading partners' subsidies - has been invoked by multiple WTO members. The European Union, most notably, has recently proposed a new instrument to address the potential distortive effects of foreign subsidies in the European Single Market, which would allow the European Commission (EC) to investigate concentrations involving a financial contribution by foreign governments. The proposal builds upon the adoption by the EC of the White Paper in June 2020, which aimed to extend the definition of foreign subsidy to any selective financial contribution originating directly or indirectly from the government of a non-EU country. The largest concerns of the EC are about China's State capacity with respect to subsidies and are shared by many other countries, including Japan, and the United States (US). However, China is arguably alone in sustaining its industries. The Global Trade Alert's monitoring of subsidies[6] has revealed that along with China the US, Germany, the United Kingdom, India, France, Italy, Japan, the Republic of Korea, and Thailand frequently award subsidies (see Figure 1). Since 2008 (earlier observation), each of these countries has made more than 1,700 policy interventions that have been judged as harmful to trade.

In the current paper, I focus on corporate subsidies granted by the US to domestic industries. I examine the direct and indirect effects of corporate subsidies on the export activity at the industry level, taking a value chain approach. Building on the WTO's definition of subsidies, I consider a corporate subsidy to be "any actual or potential financial contribution by a public body under stated circumstances that confers an advantage to the recipient firm." The first element of this definition implicates that the deployment of public resources does not have to take a specific form for being designated as a subsidy. Therefore, not only direct grants, but also tax breaks, loan financing, cost reimbursement, and low-cost financing, among others, fall within the scope of an inventory of subsidies. While the form of the subsidy does not matter, a necessary condition is that it involves transfers of public resources.[7] The second element regards

and Countervailing Measures, available at: $https://www.wto.org/english/docs_e/legal_e/24-scm.pdf$.

[5] More specifically, the SCM Agreement does not apply to foreign subsidies related to trade in services, foreign subsidies related to establishment and operation of undertakings abroad which do not entail any trade in goods, foreign subsidies facilitating the acquisition of local undertakings, and foreign subsidies for which no causal link can be proved between the injury to a domestic industry and the foreign subsidy.

[6] https://www.globaltradealert.org/.

[7] Accordingly, currency devaluations and depreciations fall outside the scope of an inventory of subsidies.

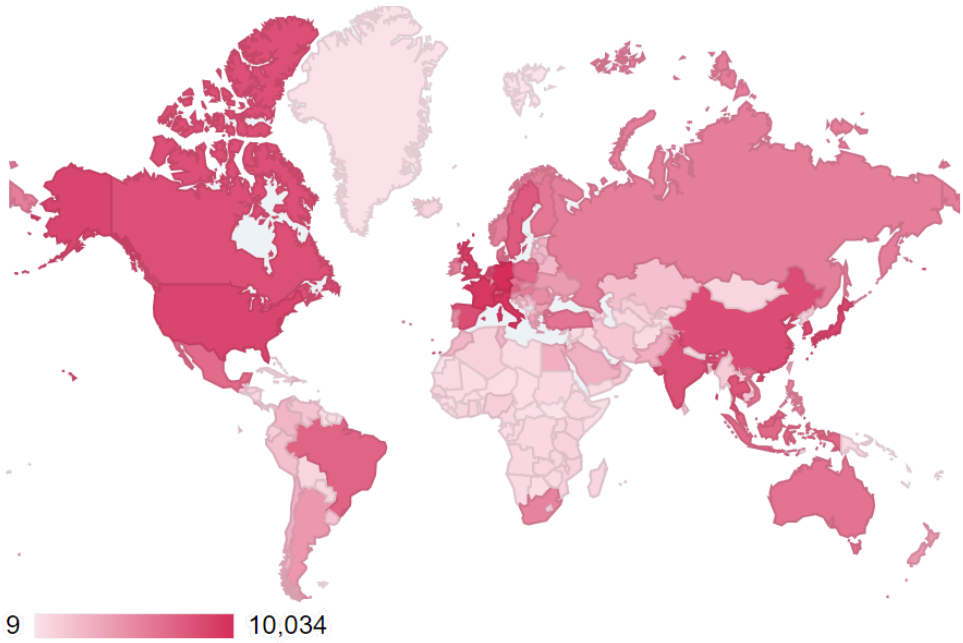


Figure 1: Total government interventions harmful to trade by awarding state in 2009-2019
Source: Global Trade Alert.

the agency granting the subsidy. This might be either the US federal government or a US state, a local government or an agency. Moreover, the subsidy must confer an economic or commercial advantage to the recipient firm.[8] Differently from the subsidy definition advanced by the EC in the White Paper, the proposed definition does not require subsidies to be selective "a priori." In the setting of the current paper, that would in fact imply excluding transfers of state resources that treat every actual US beneficiary firm identically. However, while being undiscriminating within the US, those subsidies could still confer an advantage to US firms "vis-à-vis" foreign firms in the international market. Finally, the focus of the current paper is on US corporate subsidies, namely subsidies awarded to firms engaged in economic activities. Subsidies given to individuals, as well as welfare state payments, development aid, and subsidies across different levels of governments, are not considered in the analysis. The proposed definition is conventional in the subsidy literature, and it is in line with what is observed in the data used for this analysis, which are sourced from Subsidy Tracker.

The focus on the US is motivated by multiple facts. After China, the US is the country that has been awarding the largest number of subsidies in the last decade. Total subsidies granted in

[8]This latter requirement excludes, for instance, public procurement contracts.

the US from 2000 to 2019 from the federal government and local and state agencies respectively accounted for 112.8 and 55.5 billion USD.[9] In addition to accounting for a large share of the world's trade, the US is also the country that is most frequently accused of breaking WTO subsidy rules (see Figure 3). The 17-year-old WTO Boeing case is only one example of a huge subsidy dispute that costed the airline company a fine of 244 million USD and resulted in a trade war between the US and the EU.[10] The repeated criticism by US policymakers of foreign (in particular, Chinese) subsidies and their strong subsidization in return, makes the US an interesting case also from a political point of view. Lastly, the availability of detailed subsidy data for the US allows overcoming the limits related to the scarcity of available resources for documenting subsidies, although this comes at the cost of restricting the attention to a single (but relevant) country.[11]

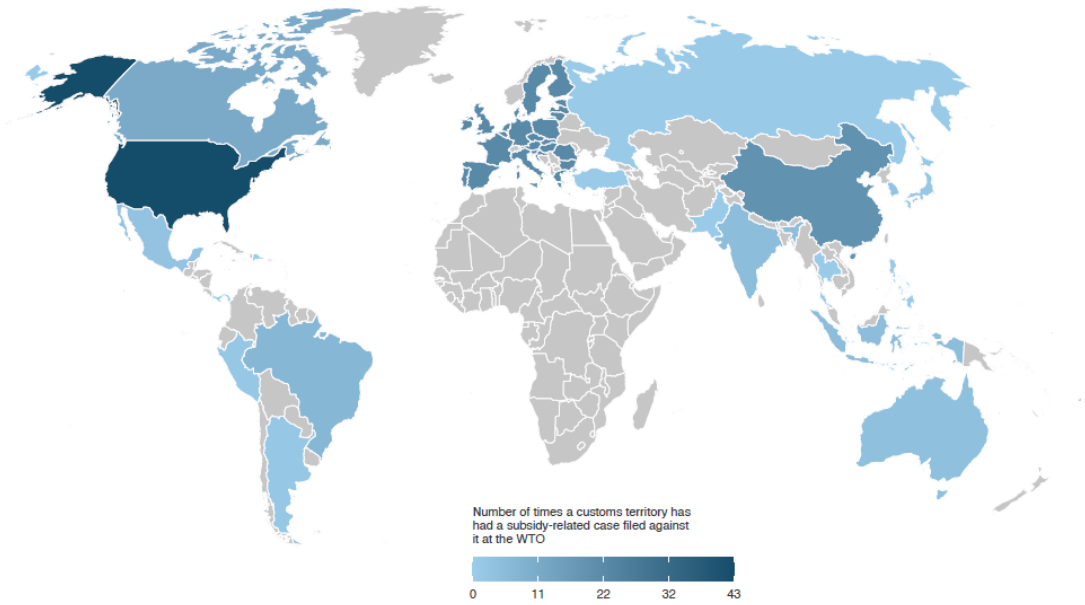


Figure 3: Number of times a country has had a subsidy-related case filed against it at the WTO
Source: Evenett and Fritz (2021).

A very salient concern in policy debates is the trade distortion arising from subsidies granted to import-competing, which might conceal protectionism intents. However, trade distortions might also arise from the support of exporting firms. When looking at the pattern of subsidies

[9] *Source:* Subsidy Tracker.

[10] *Source:* The Economist: https://www.economist.com/business/2021/01/27/can-boeing-fly-without-government-help.

[11] Among the other big players and candidates for the analysis there would be China and the European Union. However, data on Chinese subsidies, by contrast, would be hard to collect without significant measurement error, as there is no centralized inventory of corporate subsidy information and sub-national governments do not publish inventories either. The European Union, instead, has a very peculiar setting, because of the EU State Aid Register.

and exports in the US (Figure 4), it emerges that the two have followed similar trends over the years. Several studies have highlighted the positive effect of government support in boosting the export performance of the targeted industries (Holger, Henry, and Strobl, 2008; Girma, Görg, and Stepanok, 2020). More specifically, much attention has been devoted to the effectiveness of export subsidies in promoting trade (Bernard and Jensen, 2004; Broocks and Van Biesebroeck, 2017; Munch and Schaur, 2018). Yet, the effect of corporate subsidies may propagate along the value chain. Financial support that is granted upstream in the value chain might eventually indirectly affect the export activity of downstream industries that use the subsidized goods and services as input of production (i.e., in other words, those that source locally). This might occur, for example, if the cost advantages derived from the subsidy are passed through via a price reduction. Subsidies may harm competitors and benefit downstream buyers even if they do not affect pricing directly (Møllgaard, 2005). For instance, if the subsidy eases the access to capital and boosts investments of the recipient firms, downstream industries might benefit from their suppliers' investments thanks to the use of novel or higher-quality inputs. For example, they would indirectly benefit from the subsidy through productivity gains. Higher-quality inputs could eventually translate into higher-quality output and provide a comparative advantage to downstream firms in the export market (quantity pass-through). Similarly, subsidies aimed at promoting research and development might indirectly benefit downstream firms.

Taking a value chain approach is crucial when investigating the effect of subsidization policies on any measure of economic performance, including export activity. Limiting the attention to direct grants when analyzing the effect of subsidies on exports would lead to inaccurate conclusions that could be possibly biased downward, if the exporting firms are not directly supported by the government but many of their inputs are.[12] The relevance of taking a value-chain approach has been also stressed by the OECD, in its longstanding work measuring government support in agriculture, fossil fuels, and fisheries to estimate support and related market distortions in the aluminum value chain (OECD Trade Policy Papers, 2019). In particular, the OECD estimated total government support to the aluminum value chain of 20-70 billion USD in 2013-2017.

[12]The complementary research question on whether downstream governmental support favors upstream export activity is not taken into consideration in the current paper. The main effect of downstream subsidies on upstream industry performance is thought to be on domestic sales or aggregate productivity, through the increase in local demand, rather than on the export activity.

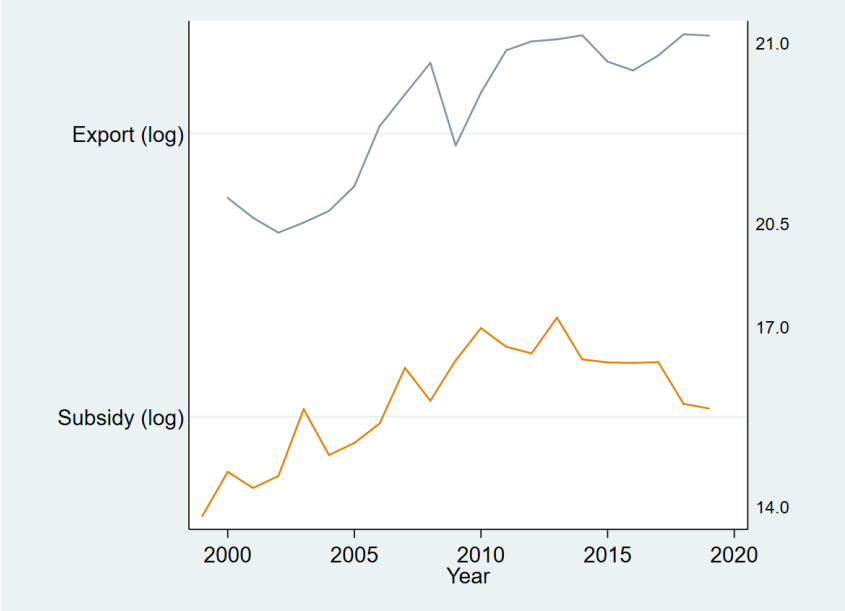


Figure 4: Average subsidies and exports over 2000-2019

Notes: Self-computation based on data from WITS and Subsidy Tracker. The figure depicts the trend (in logs) respectively of industry-level subsidies and export activity for tradable sectors only (yearly averages).

Notwithstanding the importance of taking a value chain approach, there are relatively few works that consider the transmission of subsidies policies to downstream industries that focus on trade (Blonigen, 2016; Moerenhout, 2020). Moreover, being the empirical evaluation of industrial policies notoriously challenging, relatively few studies can provide causal evidence about the impact of subsidies. In the current paper, I aim to fill the existing gap in the literature by providing causal evidence on the effect of subsidies on (downstream) export activity. In particular, I use detailed information on US (state and federal) subsidies and on the linkages between industries to examine the effect of US government support on the export performance of the subsidized industries and the industries that use the subsidized goods and services as inputs of production.

Being the data on US subsidies collected at the firm-level, the analysis would be ideally conducted at the firm-level. However, aggregating the unit of analysis to very granular 6-digits NAICS industries allows addressing several threats arising from the firm-level analysis without losing much variation. First, it allows overcoming endogeneity concerns arising from individual lobbying by firms for subsidies. It is well-documented in the literature that firms that are politically connected through lobbying are more likely to benefit from government expenditure (Faccio, 2006; Ji and Zhang, 2019; Aobdia, Koester, and Petacchi, 2021). Similarly, the fast-growing literature on lobbying in trade highlights that lobbying also affects the structure of

trade (Gawande, Krishna, and Robbins, 2004; Stoyanov, 2009; Blanga Gubbay, Conconi, and Parenti, 2020) and can be associated with higher firms' performance (Goldman, Rocholl, and So, 2009; Faccio and Parsley, 2009; Cooper, Gulen, and Ovtchinnikov, 2010). Any firm-level analysis on subsidies and trade, therefore, would have to deal with endogeneity concerns linked to lobbying. Second, I can fit an instrumental variable approach that lingers on a political source of exogenous variation between industries and states in the US, namely swing industries.[13] The instrument, originally developed by Bown et al. (2021), is re-adapted to the setting of the current paper. It is a shift-share instrument that leverages the exogenous variation in the political importance of US battleground states across electoral terms, and the importance of industries within states. The instrumental variable approach allows addressing potential endogeneity concerns triggering the relationship between corporate subsidies and exports at the industry level. Most notably, reverse-causality and self-selection issues might arise from the fact that industrial interventions are often driven by unobservable forces, such as state capacity, the scope of market imperfections, and welfare objectives. For example, it might be in the government's interest to sustain declining industry or, by contract, to boost the performance of strategic industries that are already performing well in the international market.

I estimate that corporate subsidies not only boost the export performance of the targeted industries but also increase the exports of downstream industries indirectly exposed to them. The elasticity of exports to corporate subsidies is about 22% when subsidies are directly granted to exporting industries, and 26% when subsidies are awarded to their supplying industries. When tackling endogeneity through an instrumental variable approach, I find a very similar effect in terms of direction and size, that is significant at the 99% confidence level. In particular, a one-percentage change in the level of subsidies increases the export performance of the recipient industry by 0.55%. Moreover, a one-percentage change in the level of subsidies given to all the suppliers of an industry boosts the export performance of that industry by 0.25%.

These results demonstrate that government support affects export performance both directly and indirectly through subsidized inputs. The result is relevant from both an academic and policy perspective and it contributes to the current debate on leveling the playing field for foreign subsidies. In fact, the analysis suggests that if policymakers worry about the distorting effects of subsidies on trade (in particular, on exports), they should also care about the indirect exposure

[13] A formal definition of swing states and swing industries is provided in Section 6.

to subsidies through heavily subsidized inputs. In this view, achieving a leveling playing field across jurisdictions in terms of competition policy might be preferred to imposing anti-subsidy tariffs.

The rest of the paper is structured as follows. In Section 2, I briefly review the related literature. Section 3 provides information on the institutional procedures for the granting of US subsidies from either the federal government or state and local agencies. Section 4 describes the data and variables used in the empirical analysis in Section 5. In Section 6, I tackle endogeneity concerns by employing an instrumental variable approach. Results from the Two-Stage Least Squares (2SLS) regression are illustrated and discussed in Section 7. Section 8 concludes by discussing the implications of the analysis for the ongoing debates about the leveling playing field in the multilateral trading system.

2 Related Literature

The literature on subsidies and, more generally, on industrial policy, is vast. Both early and recent empirical works on subsidies have investigated the effect of government support along several macro and micro-economic dimensions, including aggregate growth (Pack, 2000; Becker, Egger, and Ehrlich, 2010), employment (Bernini and Pellegrini, 2011; Slattery and Zidar, 2020), total factor productivity (Aghion et al., 2015; Giorcelli, 2019), and trade (Bernard and Jensen, 2004; Holger, Henry, and Strobl, 2008). Being industrial policy complex and multidimensional, deployed across different economies, the evidence is often mixed. Different programs might have different objectives. For example, some policies might be aimed at promoting strategic industries while others might be intended to rescue declining industries. Therefore, it would not be surprising to find positive correlations between interventions and policy development in the former case, and negative correlations in the latter one (Beason and Weinstein, 1996; Lee, 1996), which would be entirely driven by self-selection. In the interest of concision, I refer to the recent study by Lane (2020) for an extended review of the literature on subsidies and industrial policy and focus here on the literature that specifically relates to subsidies and export performance.

Much attention has been devoted in the literature to export subsidies, namely subsidies aimed at facilitating the export performance of the recipient firms. With regards to their effect on exports, the evidence is mixed. Munch and Schaur (2018), for example, document positive effects of the Danish export promotion policy across several firm performance measures. Broocks and

Van Biesebroeck (2017) have comparable results for a Flemish export-promotion program. In evaluating the effectiveness of China's tax rebate on textile exports, Bao et al. (2017) find that the policy boosted the growth of textile exports to the USA. By contrast, Bernard and Jensen (2004) find no significant effect of state export promotion expenditures on the probability of exporting. A complementary line of the literature, instead, explores the effect of local subsidies on the beneficiaries' export performance (Moerenhout, 2020; Girma, Görg, and Stepanok, 2020; Holger, Henry, and Strobl, 2008). For example, Holger, Henry, and Strobl (2008) highlight that, for grants large enough, local government support can successfully encourage already internationalized firms to export more. Despite this very large literature, relatively few of these studies provide causal evidence on the effects of state support on trade. Those that do, leverage aspects of quasi-natural experiments, such as external changes in policies or the eligibility criteria, to utilize exogenous variation in a specific industrial policy. For example, Criscuolo et al. (2019) utilize exogenous variation on who becomes eligible or ineligible to receive industrial incentives under the place-based Regional Selective Assistance program, in the United Kingdom. While being able to document the causal impact of subsidies, these studies have nonetheless relatively limited external validity, as they focus on specific policy interventions.

A smaller set of studies examines the effects of government support on downstream sectors. These works relate to the growing literature on firms' networks and intra-industry linkages (Barrot and Sauvagnat, 2016; Erbahar and Zi, 2017; Carvalho et al., 2020). Liu (2019) and Rotemberg (2019), for instance, model the transmission of policy through linkages. The study by Blonigen (2016) is the closest to mine. By focusing on industrial policies targeting the steel sector (including production subsidies, export subsidies, as well as import protection), the paper documents that a one-standard-deviation increase in IP presence is associated with a 3.6% decline in export competitiveness for downstream manufacturing sectors. Differently from Blonigen (2016), I only examine corporate subsidies but I exploit cross-industry variation, in addition to time variation. Similar to this latter line of the literature on government support and value chain spillovers, I consider the transmission of subsidies policies to downstream industries, but I focus on the effect of subsidies on downstream export performance. Moreover, by employing an instrumental variable approach, I can address common endogeneity concerns in industrial policy and provide causal evidence on the direct and indirect impact of subsidies on export.

3 Subsidies in the United States

In this section, I give a brief overview of the composition of corporate subsidies and the process of bidding for firms in the United States, as well as an overview of the subsidy awards over the past 20 years. Subsidies in the United States can be granted by either the Federal Government and federal agencies (i.e., Federal subsidies) or State and local governments (i.e., State subsidies). By looking at the trend of federal and state subsidies over time (Figure 6), a closely comparable trend emerges.[14] Given the similar pattern, in the rest of the analysis I jointly combine federal, state, and local subsidies.

Figure 6: Total subsidies by granting agency over 2000-2019

Notes: Self-computation based on data from Subsidy Tracker. The figure depicts the trend (in logs) of industry-level subsidies awarded respectively by federal and state-level granting agencies (annual sum).

The (broad) definition of corporate subsidies provided in Section 1, namely "any actual or potential financial contribution by a public body under stated circumstances that confers an advantage to the recipient firm," is already suggesting that subsidies may differ along several dimensions. One way to distinguish subsidies is from the viewpoint of the recipient company, namely whether the company competes for the subsidy (i.e., discretionary subsidies) or whether it gets the subsidy automatically (i.e., entitlement subsidies). Discretionary subsidies are those for which

[14] One possible explanation for the very similar pattern of federal and state subsidies is that federal awards also contribute to state and local governments' financial resources.

companies compete and the granting authority is in charge of the award. Officials have a lot of discretion on whether a company gets a subsidy and on the size of the subsidy since the criteria that a company must meet are very broad (or even null). For this reason, discretionary subsidies might be very political. Within this group fall property tax abatement, tax increment financing projects, infrastructure, and training grants. On the other hand, entitlement subsidies are automatically available to any company that meets the program's criteria. This is the case, for example, of tax breaks.

Another way of categorizing subsidies is by distinguishing how governments' spending occurs, namely through tax spending (also called "off-budget" spending) or direct spending (also called "on-budget" spending). A tax expenditure is tax revenue that the government does not collect as a result of a tax break in the name of economic development. A direct expenditure, instead, is money that the government allocates in its budget, and then has to be authorized each year.

Type	**Description**
Federal grant	Federal award of a specific amount of money.
Federal allocated tax credit	Tax credit allocated to specific companies.
Federal loan or loan guarantee	Programs that provide a company with financing that needs to be repaid.
Federal insurance	E.g. political risk insurance.
Federal tax-exempt bonds	E.g. Gulf Opportunity Zone bonds. Corporation.

Table 1: Federal subsidies type

Source: Subsidy Tracker.

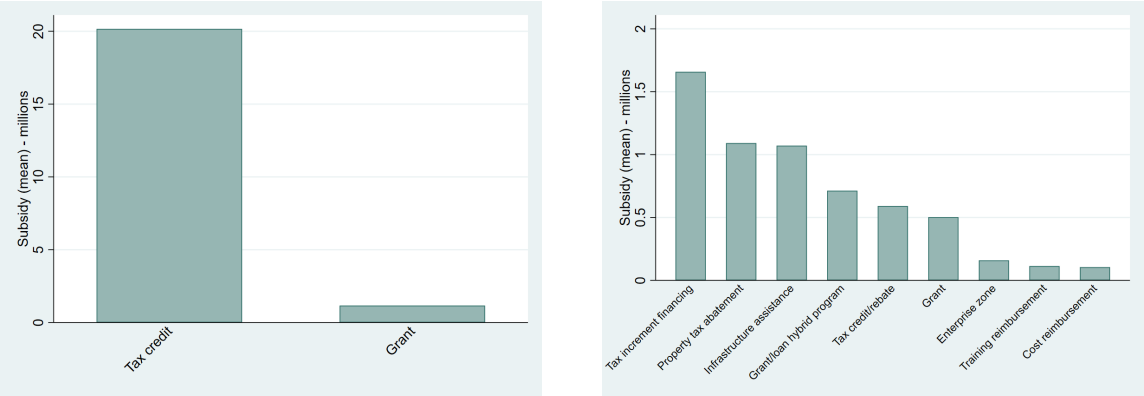
Type	**Description**
Cost reimbursement	Programs reimbursing companies for specific expenditures in the state.
Enterprise zone	Programs tied to investment in specific areas bundling various local tax breaks.
Grant	Awards in connection with meeting job performance or other goals.
Grant/loan hybrid programs	Hybrid loans such as forgivable loans.
Industrial revenue bond	Low-cost financing.
Infrastructure assistance	Programs covering costs like installation of utilities or private roads building.
Loan or bond financing	Programs that provide a company with financing that needs to be repaid.
Megadeals	Entries on subsidy packages worth 75 mln USD or more each.
Property tax abatement	Reductions on real and business property.
Tax credit/rebate and grant	Programs that combine tax credits/rebates with grants.
Tax increment financing	Diversion of property taxes to increase assessed value for redevelopment.
Tax rebate	Corporate income tax credits and sales tax exemptions.
Training reimbursement	Reimbursement of workers' training costs.
Venture capital	State governments' investments in a company, loans, and bond financing.

Table 2: State subsidies type

Source: Subsidy Tracker.

Finally, subsidies might be broken down by type, namely by the form that they take. Tables 1 and 2 lists the most common types of subsidy along with a short description, as observed in the data. In particular, subsidies granted by the federal government and federal agencies

might take the form of either federal grants, federal allocated tax credit, federal loans, federal insurances, and federal tax-exempt bonds. In the period 2000 to 2019, federal support mainly occurred in the form of a tax credit, as depicted in Figure 9. Subsidies granted by state and local governments and agencies, instead, include many different forms, such as cost reimbursement programs, grants, and tax rebates. Figure 9 summarizes the average financial contribution by subsidy type for the main categories over the period from 2000 to 2019.



(a) Federal subsidies: 2000-2019 **(b)** State/local subsidies: 2000-2019

Figure 9: Average industry subsidies in 2000-19 by type and granting agency.

Notes: Self-computation based on data from Subsidy Tracker. Industry-level subsidies are averaged by type and granting agency over the period 2000-2019.

Finally, in Figure 11, I plot total subsidies by broad industry classification, as defined by the Subsidy Tracker classification, and averaged over the period 2000-2019. In the period of analysis, the largest amount of state and federal support was directed to the aerospace and military industry, which received nearly 1,11 billion USD on average over the period considered, followed by utilities, and oil and gas. However, in the empirical analysis of this paper, I use a more granular industry classification, namely 6-digits NAICS code. Table 3 gives some insights on the granularity of the industry data, by listing the top 15 6-digits industries with the highest average value of subsidies over the period from 2000 to 2019. Graph 13, instead, plots the top 15 6-digits industries with the highest average value of subsidies, normalized by output, over the period from 2013 to 2019.[15]

[15]Data on industry output are sourced from the Annual Survey of Manufactures, US Census, which provides information on "Sales and total value of shipments and receipts".

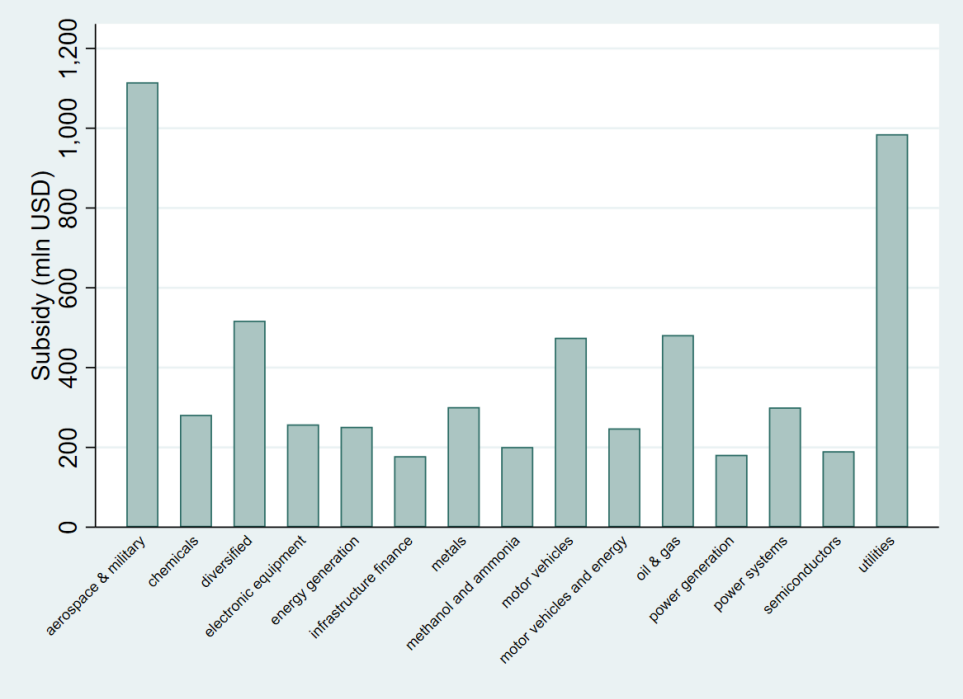


Figure 11: Top 15 Subsidy Tracker industries with the highest average value of subsidies in the period 2000-2019 (mln USD).

Notes: Self-computation based on data from Subsidy Tracker. Industry-level subsidies are averaged by industry (as reported by Subsidy Tracker) over the period 2000-2019.

Industry	**Description**	**Avg. Subsidy**	**Total Subsidy**
541710	R&D in the Physical, Eng., and Life Sciences	628.90	12578.11
325120	Industrial Gas Manufacturing	434.26	8685.14
334511	Aeronautical and Nautical Systems, Instrument Manufacturing	395.51	7910.20
336111	Automobile Manufacturing	319.87	6397.31
221112	Fossil Fuel Electric Power Generation	300.88	6017.68
221111	Hydroelectric Power Generation	239.70	4794.05
221113	Nuclear Electric Power Generation	234.80	4696.09
221119	Other Electric Power Generation	225.33	4506.53
221122	Electric Power Distribution	220.06	4401.17
221121	Electric Bulk Power Transmission and Control	219.34	4386.74
334290	Other Communications Equipment Manufacturing	217.60	1958.41
423130	Tire and Tube Merchant Wholesalers	205.45	205.45
333912	Air and Gas Compressor Manufacturing	169.28	1862.11
334413	Semiconductor and Related Device Manufacturing	157.15	3143.02
334220	Radio/TV Broadcast and Wireless Comm. Eq. Manuf.	147.03	2940.61

Table 3: Top 15 6-digits NAICS industries with the highest average value of subsidies in the period 2000-2019 (mln USD).

Notes: Self-computation based on data from Subsidy Tracker. Avg. Subsidy is industry-level subsidies averaged by industry (6-digits NAICS) over the period 2000-2019. Total Subsidy is industry-level subsidies aggregated by industry (6-digits NAICS) over the period 2000-2019.

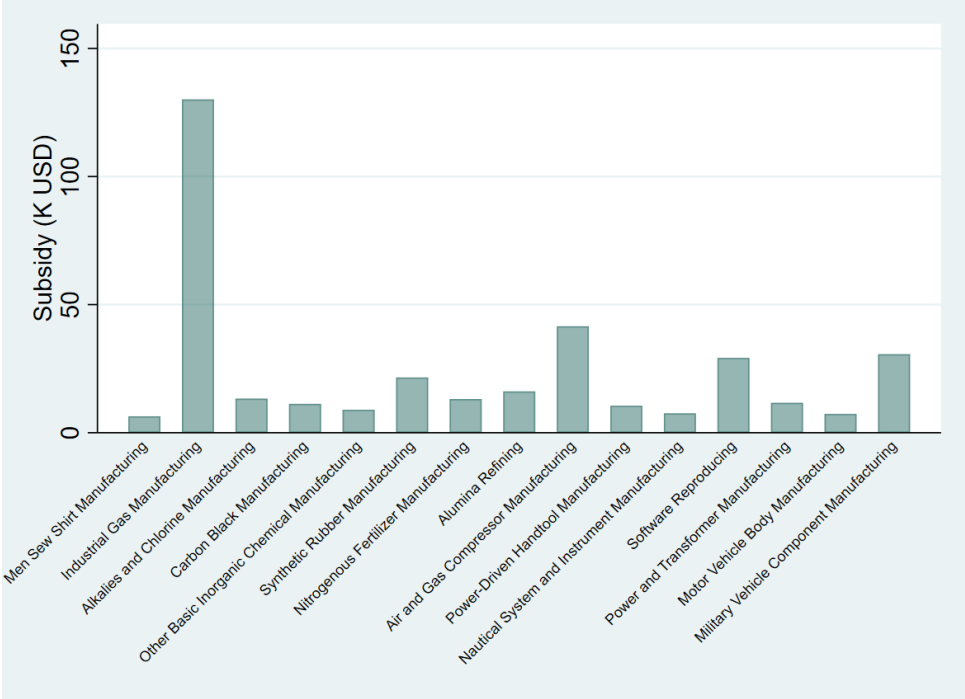


Figure 13: Top 15 Subsidy Tracker industries with the highest average (normalized) value of subsidies in the period 2013-2019 (K USD).
Notes: Self-computation based on data from Subsidy Tracker. Industry-level subsidies are normalized by total industry sales, as reported by the Annual Survey of Manufactures from US Census. Discounted subsidies are averaged by industry (as reported by Subsidy Tracker) over the period 2013-2019.

4 Data and Variables

In this section, I provide some information on the data and variables used in the empirical analysis. I combine two types of data: detailed information on US Corporate Subsidies data, which allows measuring variation in government support across industries and over time, US Input-Output (I-O) tables, which allow identifying supply chain linkages, and export data.

4.1 Data on subsidies

Data on corporate subsidies are sourced from Subsidy Tracker.[16] The database has been used in the literature by other recent studies, including Slattery and Zidar (2020) and Slattery (2020).[17] The database provides information on subsidies by recipient firms from more than 1,000 state, local, and federal economic programs. For each subsidy (or portion of a multi-year subsidy), the data-set provides information on the recipient company (i.e. company name, headquar-

[16] https://www.goodjobsfirst.org/subsidy-tracker
[17] An alternative database for US state subsidy programs, at the firm-level, is that of the Global Trade Alert. However, the latter dataset begins in 2008.

ters location, NAICS code, Subsidy Tracker own industry classification), the value and type of the subsidy, the year of award and the level of government (i.e. state, local, or federal) of the awarding agency. Data are compiled by Good Jobs First (GJF), a national policy resource center promoting corporate and government accountability in economic development The data on subsidies are drawn from government disclosures via reports and websites, direct data requests to government agencies through the Freedom of Information Act (1967) requests, government and corporate press releases, newspaper articles, and reports on specific projects by academics, government agencies, and non-profit organizations. I aggregate firm-level subsidies to the industry-year level, by summing the value of subsidies across the recipient companies.[18] I use the information on the 6-digits NAICS code that is provided in the original data-set. When not available, I manually match the company's name to Compustat to retrieve details about the NAICS code and I double-check the match with the broader industry classification provided by Subsidy Tracker.[19] I assume that NAICS codes in my data refer to the year of award of the subsidy, as the NAICS codes are reported by state and local governments. I thus harmonize NAICS codes over time to the NAICS 2002 nomenclature, which is at the beginning of my sample. To this end, I use the concordance tables provided by the United Nations Statistics Division, following the procedure of Autor, Dorn, and Hanson (2013).

I define $Subsidy_{j,t-1}$ as the total state and federal US subsidies granted in year $t-1$, aggregated to the NAICS-6 industry j. The variable is lagged by one year with respect to the outcome variable, namely $Export_{j,t}$, to avoid reverse causality.

4.2 Export data

Data on exports are sourced from the United Nations (UN) Comtrade database, as available on the World Integrated Trade Solution (WITS). I harmonize export data, originally expressed in the 4-digit SIC classification, to the 6-digit NAICS classification, using the Census conversion tables and weights (SIC87 to NAICS 2002).[20] I define $Export_{j,t}$ as the total exports in year t of industry j. The variable is defined for only tradable industries, according to the cluster

[18] After aggregating the data, I fill missing subsidy data with zeros, assuming that not-reported subsidies to an industry j correspond to no subsidy granted to that industry j.

[19] For the manual match, I relied on the official website of the US Department of Labor: https://www.osha.gov/data/sic-searchhttps://www.osha.gov/data/sic-search. Missing industries or industries that were not possible to match manually according to the former website (e.g., "diversified," "consumer products," and "seasonal products") were dropped from the sample.

[20] I fill missing subsidies data in a given industry j with zeros, assuming that not-reported exports correspond to no export activity of the corresponding industry.

classification developed by Delgado and Mills (2020).

4.3 Data on Input-Output linkages

Data on supply linkages are from the US Input-Output tables of the US Bureau of Economic Analysis (BEA). BEA Input-Output tables have been widely used in the literature, due to their high level of disaggregation (Acemoglu, Johnson, and Mitton, 2009; Alfaro et al., 2015). I employ the 2002 Use of Commodities by Industries After Redefinition (Producers' Prices) tables, taking the year at the beginning of the sample. I use BEA's concordance guide to convert 6-digit BEA industry codes into 6-digit NAICS codes (NAICS 2002) to be able to combine Input-Output tables with industry-level data.[21] Input-Output tables are taken at the beginning of the sample to guarantee exogeneity. I identify upstream linkages for 1,145 industries, including both manufacturing and non-manufacturing, 802 of which are tradable. For every pair of industries, (i, j), the Input-Output accounts provide the dollar value of i required to produce a dollar's worth of j.[22] I denote with $w_{i,j}$ the direct requirement coefficient for the industry pair (i, j), i.e. the dollar value of i used as an input in the production of one dollar of j. I use cost shares that incorporate higher-order I-O linkages to take a full value chain approach.[23] This measure considers not only direct suppliers but also higher-order suppliers. Moreover, I exclude the diagonal of the Input-Output matrix, namely suppliers that are in the same 6-digit NAICS industry j as the buyer. In this way, I clean the indirect supply chain effect from the direct effect.[24] Combining Input-Output coefficients with subsidy data, I can define the following variable for upstream subsidization:

$$Upstream\ subsidy_{j,t-1} = \sum_i^N w_{i,j} * Subsidy_{i,t-1},$$

where $w_{i,j}$ is the cost share of input i in the production of j.

The variable captures total subsidies granted in year $t-1$ to industries i that are vertically related to industry j. The variable is lagged by one year with respect to the outcome variable, namely $Export_{j,t}$, to partially avoid reverse causality.

[21] When the match is not one to one, I define weights to split each entry equally across the multiple matches.

[22] I define cost shares for both tradable and non-tradable industries.

[23] Note that, as the cost shares are not state-specific, this implies assuming that suppliers are not necessarily located in the same state as the buyer. However, this assumption is standard in the literature that uses I-O linkages.

[24] In some untabulated robustness checks I exclude suppliers that are in the same 4-digit industry, to address the concern that some subsidy programs might be correlated within broader industrial categories. Results do not significantly change.

4.4 Other Data

In my empirical analysis, I make use of several other data-sets. First, I use the US Census County Business Patterns (CBP) to define employment shares when constructing the instrument in Section 6. The instrument, namely $Swing\ industry_{j,T}$, exploits the interaction of data on employment shares and swing-state politics. To capture heterogeneity in the relative importance of industries within states, I use state-level employment shares taken at the beginning of the sample, which are sourced from the US Census County Business Patterns. More specifically, I define the variable $Employment_{j,t}$, which measures total employment in industry j in year t. Second, to construct the swing state variable, instead, I use data vote shares of Democratic and Republican candidates during presidential elections. Data on presidential election results come from Dave Leip's Atlas of U.S. Presidential Elections.[25] Finally, I use data on cluster mapping from Delgado and Mills (2020) to identify tradable and non-tradable industries in my data.

Tables 5 and 6 provide some descriptive statistics for the variables defined above.

Variables	**Obs.**	**Mean**	**Std. Dev.**	**Min**	**Max**
$\text{Exports}_{j,t}$	28,980	692	3,170	0	122,000
$\text{Subsidy}_{j,t-1}$	28,980	5.80	82.40	0	8,990
$\text{Upstream subsidy}_{j,t-1}$	28,980	4.08	21.30	0	2,360
$\text{Log exports}_{j,t}$	9,974	20.00	1.91	7.95	25.53
$\text{Log subsidy}_{j,t-1}$	11,785	12.93	2.75	2.23	22.92
$\text{Log upstream subsidy}_{j,t-1}$	22,754	13.57	2.39	1.19	21.58

Table 5: Descriptive statistics

Notes: Unit of observation is 6-digits NAICS code. Time period is 2000-2019. All sectors (tradable and non-tradable). Unit of measure (for variables expressed in levels): mln USD.

		Tradable	*Non-tradable*
Export	Mean	1,250	-
		(4,170)	
	Obs.	16,060	11,760
Subsidy	Mean	9.00	2.01
		(0.10)	(0.02)
	Obs.	16,060	11,760

Table 6: Descriptive statistics for tradable and non-tradable sectors

Notes: Non-tradable sectors are defined following Delgado and Mills (2020), for industries with 0 exports in all the years. Unit of measure: mln USD.

[25] https://uselectionatlas.org/RESULTS/index.html

5 Benchmark results

5.1 Direct subsidies

In this section, I estimate basic OLS regressions, with and without fixed effects, to test the correlation between corporate subsidies and the export activity of the subsidized industries. In particular, I estimate the following equation at the 6-digits NAICS-year level:

$$Log\ export_{j,t} = \alpha + \beta\ Log\ subsidy_{j,t-1} + \delta_j + \delta_t + \epsilon_{j,t} \tag{1}$$

Where the variables featured in Equation 1 have been defined in Section 4. The variable $Log\ subsidy_{j,t-1}$ is lagged by one year with respect to $Log\ export_{j,t}$ to avoid reverse causality.

Table 7 summarizes the regression results. Columns (1) and (2) fit an OLS model, respectively without and with year and industry-fixed effects to absorb time and industry trends. Columns (3) and (4) fit a Poisson pseudo maximum likelihood (PPML) model, respectively without and with year and industry-fixed effects. Column (4) reports the coefficients from estimating a PPML model with multi-way fixed effects for year and NAICS-4 industry.[26] By absorbing high-dimensional fixed effects groups, the estimator controls for time and industry trends but reduces the number of observations. The regression is run in logs in the OLS specification, and in levels in the Poisson specification. Note that the number of observations in Columns (1) and (2) is smaller than in Columns (3) and (4) due to the log specification of the OLS model which requires strictly positive values. All the specifications are tested on the sample of tradable 6-digits NAICS industries j_s, between 2000 and 2019. In the Appendix, Table 16, I run the same specification on the separate samples of federal and state-level subsidies.

I find that subsidization is associated with larger exports of subsidized industries, with the elasticity of exports to corporate subsidies being 21.8%. The coefficient remains positive and significant across the various specifications.

5.2 Upstream subsidies

I then turn to upstream subsidies, namely subsidies that are conferred to the industries supplying industry j. Similarly to Equation 1, I estimate the relationship between $Log\ export_{j,t}$ and

[26] As the PPML model is very demanding, I include NAICS-4 rather than NAICS-6 fixed effects.

	Log export$_{j,t}$		**Export**$_{j,t}$	
	(1)	(2)	(3)	(4)
Log subsidy$_{j,t-1}$	0.218***	0.007***		
	(0.01)	(0.00)		
Subsidy$_{j,t-1}$			3.83e-10***	1.15e-10
			(0.00)	(0.00)
NAICS FE	NO	YES	NO	YES
Year FE	NO	YES	NO	YES
Model	OLS	OLS	PPML	PPML
S.e.	Robust	NAICS-6	Robust	NAICS-6
Obs.	4,588	4,588	16,060	11,140
No. of NAICS-6	459	459	802	802
R^2	0.11	0.00	0.95	0.55

Table 7: Correlation between subsidies and export activity of the subsidized industries
Notes: Columns (1) and (2) report OLS estimates, while Columns (3) and (4) report PPML coefficients. Column (4) reports the coefficients from estimating a PPML with multi-way fixed effects for year and NAICS-4 industry. Accordingly, in Columns (1) and (2), variables are in logs. In Columns (4) and (5), variables are in levels. The analysis is run on tradable 6-digits NAICS industries only, as export activity is null for non-tradable industries. For comparability, I remove non-tradable sectors in Columns (3) and (4). Period of analysis: 2000-2019. NAICS FE: respectively 6 and 4-digits. R^2 in the model with fixed effects is R^2 within. *** p<0.01, ** p<0.05, * p<0.1.

corporate subsidies, but here I examine government support that is given to the industries supplying industry j, namely *Log upstream subsidy*$_{j,t-1}$. The *Log upstream subsidy*$_{j,t-1}$ variable is lagged by one year to avoid reverse causality. I estimate the following equation:

$$Log\ export_{j,t} = \alpha + \beta\ Log\ upstream\ subsidy_{j,t-1} + \gamma\ Log\ subsidy_{j,t-1} + \delta_j + \delta_t + \epsilon_{j,t} \quad (2)$$

Where the variables featured in Equation 2 have been defined in Section 4. Most importantly, the variable *Log upstream subsidy*$_{j,t-1}$ represents the weighted average of subsidies granted to all the industries, tradable and non-tradable, supplying industry j. The variable is constructed using I-O tables. In the baseline specification, I use I-O weights that incorporate higher-order linkages and exclude the diagonal of the I-O matrix. The variable *Log upstream subsidy*$_{j,t-1}$ is lagged by one year with respect to *Log export*$_{j,t}$ to avoid reverse causality.

Table 8 summarizes the regression results. Columns (1) and (2) estimate Equation 2 with an OLS model, respectively without and with year and industry-fixed effects, which absorb time and industry trends. In Columns (3) and (4), I control for corporate subsidies that are directly awarded to the exporting industries, namely *Log subsidy*$_{j,t-1}$, respectively without and with year and industry-fixed effects. Columns (5) to (8) estimate Equation 2 with a PPML model. Column (6) and Column (8) report the coefficients from estimating a PPML with multi-way fixed

effects for year and NAICS-4 industry.[27] By absorbing high-dimensional fixed effects groups, the estimator controls for time and industry trends but reduces the number of observations. The regressions are run in logs in the OLS specifications (Columns (1) to (4)), and in levels in the Poisson specifications (Columns (5) to (8)). Note that the number of observations in Columns (1) to (4) is smaller than in Columns (5) to (8), due to the log specification of the OLS model which cancels out the zeros. All the specifications are tested on the sample of tradable 6-digits NAICS industries js, between 2000 and 2019.

Regression results indicate that subsidization is associated with larger exports of industries that use the subsidized goods and services as inputs of production (i.e., downstream industries). In particular, I estimate an elasticity of exports to corporate subsidies of 26% when subsidies are awarded to upstream industries. The coefficient remains positive and significant across the various specifications.

[27] As the PPML model is very demanding, I include NAICS-4 rather than NAICS-6 fixed effects for the industry groups.

	Log export$_{j,t}$				**Export**$_{j,t}$			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Log upstream subsidy$_{j,t-1}$	0.261***	0.157***	0.146***	0.126***				
	(0.01)	(0.01)	(0.01)	(0.01)				
Log subsidy$_{j,t-1}$			0.192***	-0.001				
			(0.01)	(0.00)				
Upstream subsidy$_{j,t-1}$					2.04e-09***	7.70e-10*	2.04e-09***	8.01e-10*
					(0.00)	(0.00)	(0.00)	(0.00)
Subsidy$_{j,t-1}$							3.73e-10***	1.30e-10
							(0.00)	(0.00)
NAICS FE	NO	YES	NO	YES	NO	YES	NO	YES
Year FE	NO	YES	NO	YES	NO	YES	NO	YES
Model	OLS	OLS	OLS	OLS	PPML	PPML	PPML	PPML
S.e.	Robust	NAICS-6	Robust	NAICS-6	Robust	NAICS-6	Robust	NAICS-6
Obs.	9,854	9,854	4,547	4,547	17,220	11,360	17,220	11,360
No. of NAICS-6	495	495	455	455	1,448	1,448	1,448	1,448
R^2	0.09	0.14	0.13	0.11	0.02	0.55	0.02	0.55

Table 8: Correlation between upstream subsidies and export

Notes: Columns (1) to (4) report OLS estimates, while Columns (5) and (8) report PPML coefficients. In Columns (6) and Columns (8), I run a PPML model absorbing 2 HDFE groups for year and NAICS-4 industry, which reduces the number of observations. Accordingly, in Columns (1) to (4), variables are in logs. In Columns (5) to (8), variables are in levels. *Log upstream subsidy*$_{j,t1}$ incorporates higher-order I-O linkages and excludes the diagonal of the I-O matrix. The analysis is run on tradable 6-digits NAICS industries only, as export activity is null for non-tradable. However, the *Log upstream subsidy*$_{j,t1}$ variable incorporates subsidies given to non-tradable sectors, too. For comparability, I remove non-tradable sectors in Columns (5) to (8). Period of analysis: 2000-2019. R^2 in models with FE is R^2 within. NAICS FE: respectively 6 and 4-digits. *** p<0.01, ** p<0.05, * p<0.1.

In Table 9, I show that these results are robust to several alternative specifications and robustness checks. In Columns (1) and (2), I respectively estimate Equation 1 and 2 by running a regression in log (term) differences. To define term differences, I split the sample in five terms (each term lasting 4 years), which also corresponds to the US electoral terms. Estimating the regression in changes, as captured by the log differences, rather than in levels, allows absorbing persistent industry trends which are not captured by the industry-fixed effects. In Columns (3) and (4), I include the diagonal of the I-O matrix when constructing the upstream subsidy variable, which was excluded from the main specification. In Column (4), I include NAICS-6 and year-fixed effects. Including the diagonal of the I-O matrix equals to say that I also account for the suppliers that are in the same industry j of the buyer. The drawback of this approach is that I cannot distinguish between $Log\ upstream\ subsidy_{j,t-1}$ and $Log\ subsidy_{j,t-1}$, since the latter would be part of the former. Clearly, the coefficient of $Logupstream\ subsidy_{j,t-1}$ is larger than in the baseline specification, as upstream subsidies now incorporate direct subsidies. However, no upward bias is observed when adding industry and year-fixed effects. Finally, in Columns (5) and (6), I exclude Megadeals, which are the largest economic development subsidy packages ever awarded by state and local governments in the US. This robustness check addresses the concern that very large subsidy awards, with a total state and local cost of 75 million USD or more each, could entirely drive the results. However, by comparing the coefficients in Columns (5) and (6) with the baseline specification, this does not seem to be the case.

	Log export$_{j,t}$					
	Reg in Diff		*I-O Diagonal*		*No Megadeals*	
	(1)	(2)	(3)	(4)	(5)	(6)
Log subsidy$_{j,t-1}$	0.012*				0.008***	
	(0.01)				(0.02)	
Log upstream subsidy$_{j,t-1}$		0.051***	0.310***	0.125***		0.161***
		(0.01)	(0.01)	(0.00)		(0.01)
NAICS FE	YES	YES	NO	YES	YES	YES
Year FE	YES	YES	NO	YES	YES	YES
Model	OLS	OLS	OLS	OLS	OLS	OLS
S.e.	NAICS-6	NAICS-6	Robust	NAICS-6	NAICS-6	NAICS-6
Obs.	846	2,460	9,854	9,854	4,588	9,854
No. of NAICS-6	309	495	-	495	459	495
R^2	0.01	0.03	0.14	0.12	0.002	0.15

Table 9: Baseline correlations: Robustness checks

Notes: Columns (1) and (2) estimate Equations 1 and 2 in differences, to absorb industry-specific trends. To define differences, I split the sample in five equal terms, each term lasting four years. Columns (3) and (4), include the I-O diagonal when defining *Log upstream subsidy*$_{j,t1}$. Columns (5) and (6) exclude Megadeals (i.e., very large state subsides). The variable *Log upstream subsidy*$_{j,t1}$ incorporates higher-order I-O linkages and excludes the diagonal of the I-O matrix (except for Columns (3) and (4)). The analysis is run on tradable industries js, as export activity is null for non-tradable industries. However, the *Log upstream subsidy*$_{j,t1}$ variable incorporates subsidies given to non-tradable sectors, too. Results are robust to not-including time and industry-fixed effects. R^2 is R^2 within. Period of analysis: 2000-2019. NAICS FE: 6-digits. *** p<0.01, ** p<0.05, * p<0.1.

6 Endogeneity concerns and identification strategy

6.1 Endogeneity concerns

"Empirical evaluation of industrial policy is notoriously challenging. Not only is randomization unlikely, by construction industrial policies are meant to promote special industries, products, and places. These endogenous interventions seem awkward in the world of randomized policy evaluations." (Lane, 2020).

The challenges highlighted by Lane (2020) with regards to industrial policy are also a source of concern when studying corporate subsidies. State policy interventions are often driven by unobservable forces, such as state capacity, the scope of market imperfections, and welfare objectives, which might give rise to endogeneity concerns when looking at policies' outcomes. For example, it might be in the government's interest to sustain declining industries or, by contrast, to boost the performance of industries that are strategic and already perform well.

In either case, the correlation between subsidies and any measure of the industry performance, including export activity, would be biased by reverse causality. The sources of endogeneity are especially worrying when investigating the (direct) impact of government support on the export performance of the targeted industries. By contrast, the concerns are less severe when looking at the (indirect) impact of subsidies on downstream export activity. Still, it could be thought that it is in the government's interest to sustain some of its industries by subsidizing its inputs. In that case, endogeneity concerns would still apply.

In both the subsidy and industrial policy literature, relatively few studies can address endogeneity in a precise and clear way. Those that do, focus on specific policy interventions and leverage aspects of quasi-natural experiments, such as external changes in policies or in the eligibility criteria. Common identifying strategies include differences-in-differences approaches that exploit changes in specific policies (Pack, 2000; Bao et al., 2017; Criscuolo et al., 2019; Rotemberg, 2019), regression discontinuity designs (Becker, Egger, and Ehrlich, 2010), large panel fixed-effects (Blonigen, 2016), and high data-demanding firm-level propensity scores matching (Bernini and Pellegrini, 2011; Munch and Schaur, 2018; Girma, Görg, and Stepanok, 2020). Moreover, a few studies instrument public support through either the government's budget availability (Wolff and Reinthaler, 2008; Aguiar and Gagnepain, 2017), or assignment rules linked to specific policy interventions (Einiö, 2014). Yet, by focusing on specific settings, these studies have limited external validity.

6.2 A shift-share instrument based on swing politics

To deal with endogeneity concerns, I take an instrumental variable (IV) approach. I use the shift-share instrument developed by Bown et al. (2021). The instrument relies on an industry's importance in political "battleground" or "swing" states in the US, namely in states where the two major political parties have similar levels of support among voters and that have an important influence on the result of the US presidential elections. The logic of the identification strategy is that variation in public policies should depend on the politicians' incentives to favor key industries in swing states. I re-adapt Bown et al. (2021)'s instrument, which was developed for anti-dumping policy, to my setting to instrument corporate subsidies and upstream corporate subsidies.

The instrument exploits random variation in the political importance of industries driven by

swing-state politics in the US. It is a shift-shares instrument in the sense that it exploits exogenous variation arising from the impact of a set of shocks ("shifters"), on units that are differently exposed to them ("shares"). On the one hand, the shocks are driven by changes in the identity of swing states across electoral terms (each term lasts 4 years). On the other hand, exposure to shocks varies across industries, depending on the industry's relative importance across states (as captured by initial employment shares). The underlining assumption guaranteeing exogeneity is that the swing states' identity is not determined by corporate subsidies.

6.2.1 Swing states

In US presidential elections, voters choose their state's representatives in the Electoral College, who then vote for the president. In this two-step procedure, candidates can count some states as "safe." The most important states, instead, are "swing" states, namely states in which no single candidate or party has overwhelming support, and "in which a few thousand or even a few hundred votes can shift the entire pot of electors from one candidate to the other" (Bown et al., 2021). It would therefore be in the interest of politicians to favor "swing" states with public policies, as also documented by the literature (Conconi et al., 2017; Fajgelbaum et al., 2020). To define swing states, in the empirical analysis I rely on the information on the difference in vote shares of Democratic and Republican candidates in the previous presidential election.[28] In line with Bown et al. (2021) and with the rest of the literature, I define a dummy variable, $Swing\ State_{s,T}$, which classifies a state s to be "swing" during a presidential term T if the difference in the vote shares of the two main candidates in the previous presidential election was less than 5%. Figure 15 indicates in blue the states classified as "swing" during the last five presidential terms, based on the previous presidential elections. Five electoral terms are considered during the period from 2000 to 2019 (I exclude 2020 because of state interventions and economic disruptions related to COVID-19). In some robustness checks, I exclude the Trump's presidency (i.e., 2017-2019). The identification strategy thus relies on changes in the identity of swing states across terms. For example, the dummy variable $Swing\ State_{s,T}$ changed four times for Missouri during my sample period (in 2000, 2004, 2008, 2012).

[28] Data on presidential election results come from Dave Leip's Atlas of U.S. Presidential Elections: https://uselectionatlas.org/RESULTS/index.html.

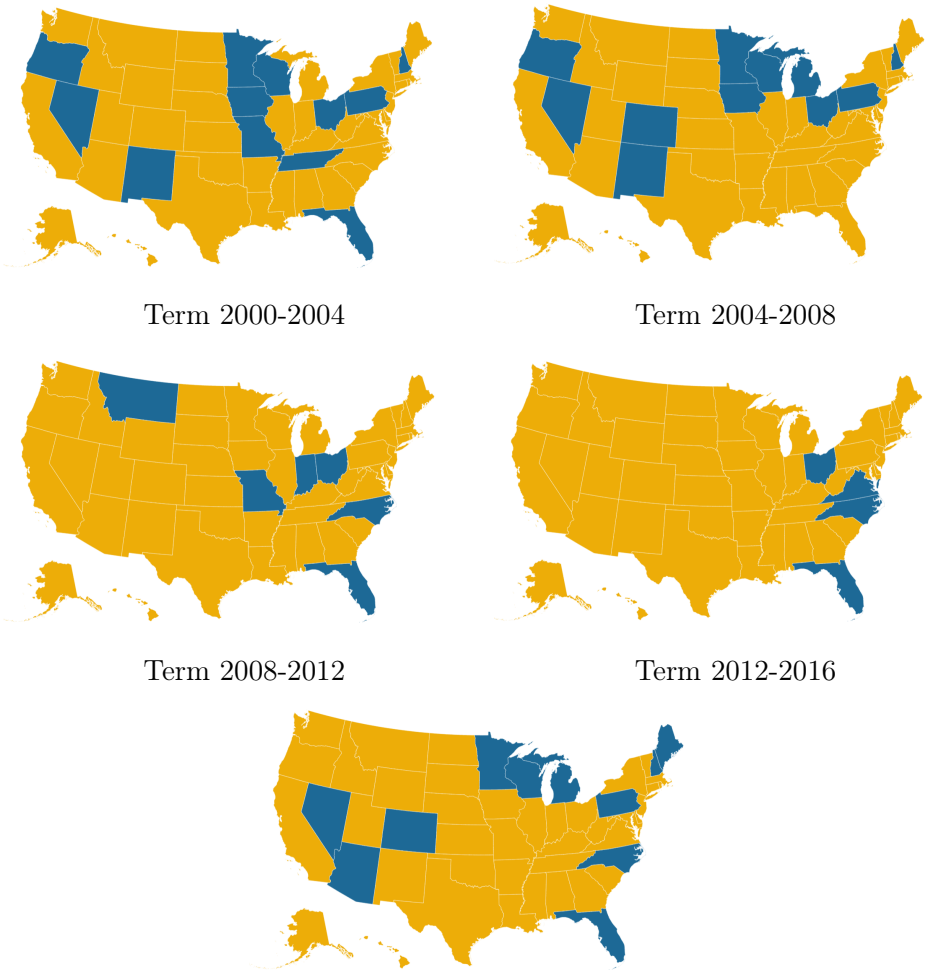


Figure 15: Swing states during the last eight presidential terms

Notes: The maps indicate in blue the states classified as "swing" during the last five presidential terms, namely the states with less than 5% difference in the vote shares of Democratic and Republican candidates in the previous presidential election.

6.2.2 Industries' political importance

The logic behind the identification strategy is that the assignment of corporate subsidies is skewed in favor of industries that are important in "swing" states. To capture heterogeneity in the geographical distribution of industries, I use state-level employment shares, from CBP. I use data from 2000, which is at the beginning of the sample, to dismiss the concern that the shares might be affected by government support policies. Accordingly, I define $L_{s,j}^{2000}$ as the initial state-level employment shares capturing differences in the industries' importance across states.

I thus define the instrument for corporate subsidies granted to industry j in a term T[29] as follows:

$$IV_{j,T} = Swing\ Industry_{j,T} = \frac{\sum_s L_{s,j}^{2000} * Swing\ State_{s,T}}{\sum_s \sum_j L_{s,j}^{2000} * Swing\ State_{s,T}} \tag{3}$$

The instrument, $Log\ Swing\ industry_{j,T}$, is defined as the ratio of the total number of workers employed in industry j in states that are classified as swing during electoral term T, over total employment in swing states. The instrument captures the importance of an industry j in states classified as swing during a presidential term T. It exploits changes in the importance of states across electoral terms driven by swing-state politics ($Swing\ State_{s,T}$) and differences in the importance of industries across states, driven by initial employment shares ($L_{s,j}^{2000}$).

Similarly, I construct the instrument for upstream corporate subsidies, which is defined by the variable $Log\ Upstream\ Swing\ Industries_{j,T}$. The instrument is the weighted average of the respective instruments of subsidies granted to industries that are upstream to industry j, with weights the cost shares $w_{i,j}$.

$$Upstream\ IV_{j,T} = Upstream\ Swing\ Industries_{j,T} = \sum_{i}^{N} w_{i,j} * Swing\ Industry_{i,T} \tag{4}$$

6.3 IV assumptions

In this section, I briefly discuss the assumptions of the instrumental variable approach, namely exogeneity, exclusion and relevance of the instruments.

[29] Being the instrument defined at the electoral term level, I average subsidies and exports over each term T.

6.3.1 Exogeneity and Exclusion

First, the instrument has to be exogenous, namely it should be uncorrelated with any of the omitted variables. More formally,

$$Export_{j,T} = \alpha + \beta\ Subsidy_{j,T}\delta_j + \delta_T + \epsilon_{j,T} \tag{5}$$

$$Cov(Swing\ Industries_{j,T}, Subsidy_{j,T}) = 0 \tag{6}$$

The same assumption should hold for upstream subsidies, too.

In this setting, the exogeneity assumption requires that the (political) shocks are exogenous, namely that subsidy exposure does not affect the identity of swing states. The second component of the instrument, namely labor shares, is exogenous to subsidies as I use data from 2000.

Second, the exclusion restriction should be satisfied. It requires that the instrument is uncorrelated with other determinants of the dependent variable, namely exports. In other words, $Log\ Swing\ industry_{j,T}$ is required to have no partial effect on the outcome, namely exports, after the endogenous variable and omitted variables have been controlled for. More formally:

$$Cov(Swing\ Industries_{j,T}, \epsilon_{j,T}) = 0 \tag{7}$$

The exclusion restriction might be threatened if the IV picked up the effects of state-level policies other than corporate subsidies. For example, $Log\ Swing\ Industries_{j,T}$ might be correlated with anti-dumping policy. However, it should be noted that anti-dumping is a federal policy, while the instrument exploits exogenous variation at the state level. Moreover, Bown et al. (2021) show that the correlation between $Log\ Swing\ Industries_{j,T}$ and anti-dumping policies is only significant when controlling for past anti-dumping experience.

6.3.2 Relevance

In this section, I show that the IV strategy allows predicting corporate subsidies and upstream corporate subsidies, namely that it is relevant. Since the instrument for (upstream) corporate subsidies is defined at the presidential term level, I consider four-year terms as the time dimension of the panel. Accordingly, I take the average value of each variable over the term T.

First, I check the validity of the instrument defined in Equation 3 by estimating the following regression:

$$Log\ subsidy_{j,T} = \alpha + \beta\ Log\ Swing\ industry_{j,T} + \delta_j + \delta_T + \epsilon_{j,T} \tag{8}$$

Where direct subsidies are measured by $Log\ subsidy_{j,T}$, which is the average over the term T of subsidies granted to industry j. $Log\ Swing\ industry_{j,T}$ is the instrument for subsidies, as defined in Equation 3.

Results from estimating Equation 8 are reported in Table 10. In Columns (1) and (3), I report the coefficients from estimating the correlation between $Log\ subsidy_{j,T}$ and $Log\ Swing\ industry_{j,T}$, respectively on the sample of all industries and tradable industries. The distinction will be relevant when estimating the impact of subsidies on the export activity of the recipient industries, since exports are exclusively defined for tradable industries. OLS results evidence that a 1 unit change in the swingness of industry j is associated with an expected change in the subsidies granted to industry j by 0.23%. In Columns (2) and (4), I add NAICS-4 and term fixed effects. In Columns (5) and (6) I report the coefficients from estimating Equation 8 with a PPML model, respectively on the sample of all industries and of tradable industries only. Columns (7) and (8) add fixed effects to the PPML model of Equation 8. Results are stable across all the specifications. Overall, $Log\ Swing\ industry_{j,T}$ is proved to perform well in predicting corporate subsidies.

	Log subsidy$_{j,T}$				Subsidy$_{j,T}$			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Log swing industry$_{j,T}$	0.23***	0.30***	0.38***	0.36***				
	(0.03)	(0.04)	(0.06)	(0.07)				
Swing industry$_{j,T}$					7.73***	20.50***	484.15***	193.19***
					(0.00)	(0.00)	(131.56)	(50.23)
NAICS FE	NO	NO	YES	YES	NO	NO	YES	YES
Term FE	NO	NO	YES	YES	NO	NO	YES	YES
Model	OLS	OLS	OLS	OLS	PPML	PPML	PPML	PPML
S.e.	Robust	Robust	NAICS-6	NAICS-6	Robust	Robust	NAICS-6	NAICS-6
Sample	All	Tradable	All	Tradable	All	Tradable	All	Tradable
Obs.	3,004	2,143	3,004	2,143	4,915	3,560	4,880	3,520
No. of NAICS-6	839	594	839	594	983	720	983	720
R^2	0.02	0.03	0.39	0.38	0.00	0.00	0.59	0.56

Table 10: Predicting corporate subsidies

Notes: The table reports OLS and PPML coefficients (in Columns 1-2 and 4-6 respectively) from estimating Equation 9. The unit of analysis is industry j, as measured by NAICS-6, in term T, as given by the US presidential election terms. The table shows the results for the sample of all industries (namely, both tradable and non-tradable). NAICS FE: 4-digits. Five terms starting from the presidential term 2000-2004 are taken into consideration (namely, terms corresponding to the period 2001 to 2019). *** p<0.01, ** p<0.05, * p<0.1.

I then test the relevance of the instrument for upstream subsidies. I estimate the following:

$$Log\ upstream\ subsidy_{j,T} = \alpha + \beta\ Log\ Upstream\ swing\ industry_{j,T} + \delta_j + \delta_T + \epsilon_{j,T} \quad (9)$$

Where upstream subsidies are measured by $Log\ upstream\ subsidy_{j,T}$, namely the weighted average of subsidies granted to industry j's suppliers, averaged over the term T. $Log\ Upstream\ swing\ industry_{j,T}$ is the instrument for upstream subsidies, as defined in Equation 4.

Results from estimating Equation 9 are reported in Table 10. Columns (1) and (2) report the results from estimating Equation 9 with OLS, respectively without and with NAICS-4 and term fixed effects. In Columns (3) and (4), estimating the parameters of a Poisson regression model (PPML) for cases in which some of the covariates are endogenous. It is not necessary to distinguish between tradable and non-tradable industries as regards to upstream industries. Downstream industries could indeed still benefit from subsidies granted upstream to non-tradable industries. Nevertheless, the distinction will be necessary as regards to downstream industries, when estimating the effect of subsidies on downstream export activity. Results show that a 1 unit change in the swingness of the industries supplying industry j is associated with an expected change in the subsidies granted industry j's suppliers by 0.95%. The correlation is mechanically amplified with respect to that uncovered in Table 10 because of the supply chain effect. The positive and strongly significant correlations, which are robust across the several specifications, show that the instrument performs well in predicting upstream subsidies.

	Log up. subsidy$_{j,T}$		**Upstream subsidy$_{j,T}$**	
	(1)	(2)	(3)	(4)
Log up. swing industry$_{j,T}$	0.95***	0.89***		
	(0.02)	(0.03)		
Up. swing industry$_{j,T}$			529.62***	643.03**
			(0.00)	(271.90)
NAICS FE	NO	YES	NO	YES
Term FE	NO	YES	NO	YES
Model	OLS	OLS	PPML	PPML
S.e.	Robust	NAICS-6	Robust	NAICS-6
Obs.	5,695	5,695	5,730	4,135
No. of NAICS-6	1,139	1,139	1,146	1,146
R^2	0.37	0.91	0.27	0.86

Table 11: Predicting upstream subsidies

Notes: The table reports OLS and PPML results (respectively in Columns 1 to 4, and 5 to 8) from estimating Equation 9. The unit of analysis is industry j, as measured by NAICS-6, in term T, as given by US presidential election terms. The table shows the results for the sample of all industries and for tradable industries only. Five terms starting from the presidential term 2000-2004 are taken into consideration (namely, terms corresponding to the period 2001 to 2019). *** p<0.01, ** p<0.05, * p<0.1.

7 The effect of subsidies on (downstream) export activity

7.1 2SLS

In this section, I estimate the impact of corporate subsidies on the export activity and downstream export activity. I instrument corporate subsidies with *Log Swing industry*$_{j,T}$, as defined in Equation 3, and upstream corporate subsidies with *Log Swing industry*$_{j,T}$, as defined in Equation 4.

To examine whether subsidies boost the export activity of the recipient industries, I estimate the following equation with a 2SLS model :

$$Log\ export_{j,T} = \alpha + \beta\ Log\ subsidy_{j,T} + \delta_j + \delta_T + \epsilon_{j,T} \tag{10}$$

Log export$_{j,T}$ is the average of exports of industry j over the term T. The variable is defined for tradable industries only. *Log subsidy*$_{j,T}$ is the average of corporate subsidies granted to industry j over the term T, and it is instrumented by *Log Swing industry*$_{j,T}$.

Results from estimating Equation 10 are reported in Table 12. In Columns (1) and (2), I estimate Equation 3 using a 2SLS log-log model. In Columns (3) and (4), I implement a Generalized Method of Moments estimator of Poisson regression that allows for instrumental variables. The

models are estimated on the sample of tradable industries only.[30]

I find that corporate subsidies have a positive and significant effect on the exporting activity of the recipient industry. In particular, a one percentage point increase in the level of subsidies granted to industry j causes a 0.55% increase in exports. Compared to the OLS estimates, the coefficient is about 2.5 times larger, pointing at a downward bias of OLS.[31] The first stage of the 2SLS regression is reported in the top panel of Table 12. The positive and highly significant coefficients confirm the validity of the instrument. The last row of Table 12 reports the Kleibergen-Paap (KP) F-statistics, which is a version of the Cragg-Donald statistic adjusted for clustered robust standard errors. The KP F-statistics is well above the critical value of 16, which allows rejecting the hypothesis that the instrument is weak.

	Log export$_{j,T}$		**Export**$_{j,T}$	
	(1)	(2)	(3)	(4)
		First Stage		
Log swing industry$_{j,T}$	0.48***	0.51***	-	-
	(0.06)	(0.08)		
		Second Stage		
Log subsidy$_{j,T}$	0.55***	0.59***		
	(0.08)	(0.13)		
Subsidy$_{j,T}$			1.10e-09	1.01e-0
			(0.00)	0.00
NAICS FE	NO	YES	NO	YES
Term FE	NO	YES	NO	YES
Model	2SLS	2SLS	PPML	PPML
S.e.	Robust	NAICS-6	Robust	NAICS-6
Obs.	1,308	1,308	3,560	3,560
No. of NAICS-6	368	368	712	712
KP F-statistic	65.54	40.15	-	-

Table 12: 2SLS estimates: direct subsidies

Notes: Columns (1) and (2) estimate Equation 3 using a 2SLS model. Columns (3) and (4) report the coefficients from estimating Equation 11 with a Poisson regression model for cases in which some of the covariates are endogenous, namely subsidies. NAICS FE: 4-digits. Log subsidy$_{j,T}$ is instrumented by Swing industry$_{j,T}$. The unit of analysis is industry j, as measured by 6-digits NAICS-6, in the presidential term T. The sample comprehends tradable industries only. Accordingly, the instrument for subsidies, namely swing industry, is constructed using tradable industries only. Five terms starting from the presidential terms 2000-2004 are taken into consideration (namely, terms corresponding to the period 2001 to 2019 included). Yearly subsidy and exports data are averaged over each term T to define *Log subsidy*$_{j,T}$ and *Log export*$_{j,T}$. *** p<0.01, ** p<0.05, * p<0.1.

[30] In Columns (1) and (2), the model is specified in logarithm scale. Hence, industries with zero export values, including non-tradable industries, are out of the sample. For consistency, when estimating Equation 10 with the Poisson model, I restrict the sample to tradable industries.

[31] It could be, for example, that declining or domestic industries are more heavily subsidized, and this biases the results.

I then estimate the indirect impact of upstream subsidies on the export activity of industries that use the subsidized goods and services as inputs of production. I estimate the following equation:

$$Log\ export_{j,T} = \alpha + \beta\ Log\ upstream\ subsidy_{j,T} + \gamma\ Log\ subsidy_{j,T} + \delta_j + \delta_T + \epsilon_{j,T-1} \quad (11)$$

$Log\ export_{j,T}$ is the average of exports of industry j over the term T. The variable is defined for tradable industries only. $Log\ upstream\ subsidy_{j,T}$ is the average of corporate subsidies granted to industry j over the term T, and it is instrumented by $Log\ upstream\ swing\ industry_{j,T}$, as defined in Equation 4. Both tradable and non-tradable goods and services are taken into consideration when constructing this variable.

Results from estimating Equation 11 are reported in Table 13. In Columns (1) and (2), I estimate Equation 4 using a 2SLS log-log model. Columns (3) and (4) implement a Generalized Method of Moments estimator of Poisson regression that allows for instrumental variables. The models are estimated on the sample of tradable industries.[32] I find that upstream subsidies do influence export activity. In particular, I document that a 1% change in the level of subsidies granted to the suppliers of industry j boosts industry j's exports by 0.25%. The effect is highly comparable to the OLS estimates. The result is especially interesting if considering that it excludes subsidies that are directly granted to industry j. In fact, I exclude the diagonal of the I-O matrix when defining supply linkages and constructing the $Log\ upstream\ subsidy_{j,T}$ variable. The first stage of the 2SLS regression is reported in the top panel of Table 12. The positive and highly significant coefficients confirm the validity of the instrument. The KP F-statistics is very high and well above the threshold value of 16 in all the specifications, indicating that I can reject the hypothesis that the instrument is weak.

In the Appendix, Table 17,I run the same specification on the separate samples of federal and state-level subsidies.

[32]In Columns (1) and (2), the model is specified in logarithm scale. Hence, industries with zero export values are out of the sample. For consistency, When estimating Equation 4 with the Poisson model in Columns (3) and (4), I restrict the sample to tradable industries.

	Log export$_{j,T}$		**Export**$_{j,T}$	
	(1)	(2)	(3)	(4)
			First Stage	
Log up. swing industry$_{j,T}$	1.05***	0.90***		
	(0.03)	(0.04)		
			Second Stage	
Log up. subsidy$_{j,T}$	0.25***	0.17**		
	(0.03)	(0.12)		
Upstream subsidy$_{j,T}$			2.10e-08***	2.92e-09***
			(0.00)	(0.00)
NAICS FE	NO	YES	NO	YES
Term FE	NO	YES	NO	YES
Model	2SLS	2SLS	PPML	PPML
S.e.	Robust	NAICS-6	Robust	NAICS-6
Obs.	2,468	2,468	4,135	4,135
No. of NAICS-6	455	455	826	826
KP F-statistic	1252.07	390.19	-	-

Table 13: 2SLS Estimates: upstream subsidies

Notes: Columns (1) and (2) estimate Equation 11 through a 2SLS model. Columns (3) and (4) test Equation 11 by estimating the parameters of a Poisson regression model for cases in which some of the covariates are endogenous, namely upstream subsidies. *Log upstream subsidy*$_{j,T}$ is instrumented respectively by Upstream *Log Swing industry*$_{j,T}$, as defined in Equation 4. The unit of analysis is industry j (NAICS-6) in term T. *Log upstream subsidy*$_{j,T}$ and *Log export*$_{j,T}$ are averaged over each term T. The sample comprehends tradable downstream industries only. Accordingly, the instrument for subsidies, namely swing industry, is constructed using tradable industries only. However, the instrument for upstream subsidies considers all industries. Five terms starting from the presidential terms 2000-2004 are taken into consideration (namely, terms corresponding to the period 2001 to 2019 included). NAICS FE: 3-digits. *** p<0.01, ** p<0.05, * p<0.1.

In Table 14 and 15, I show that these estimates are robust to alternative specifications.

In Table 14, I exclude the Trump's presidency (namely, years 2017-2019). In fact, during the Trump administration tariffs on hundreds of goods have been introduced that especially targeted sectors concentrated in politically competitive counties (Fajgelbaum et al., 2020). Yet, I find that the estimates remain stable even when excluding the years of the Trump's administration.

In Table 15, Columns (1) and (2), I include the I-O diagonal in the construction of *Log upstream subsidy*$_{j,T}$, which is excluded from the main specification. Accordingly, in this specification *Log upstream subsidy*$_{j,T}$ comprehends both subsidies granted to industry j's suppliers that belong in industries different from j, and subsidies granted to industry j's suppliers that are in the same industry of j. In other words, as the analysis is at the industry level, the effect of direct subsidies and upstream subsidies gets confounded. As expected, the effect of upstream subsidies is larger when consid-

ering also suppliers that operate in the same industry of the exporting industries. In particular, I find that a 1% change in the level of subsidies granted to the suppliers of industry j, including suppliers which are in the same industry as j, boosts industry j's exports by 0.28%.

Finally, In Table 15, Columns (3) to (6), I show that the results are also robust to the exclusion of Megadeals, namely state subsidy packages worth $50 millions or more each.

	Log export$_{j,T}$			
	No Trump's presidency			
	(1)	(2)	(3)	(4)
	First Stage			
Log swing industry$_{j,T}$	0.46***	0.53***	-	-
	(0.06)	(0.08)		
Log up. swing industry$_{j,T}$			1.05***	0.91***
			(0.03)	(0.04)
	Second Stage			
Log subsidy$_{j,T}$	0.56***	0.55***		
	(0.09)	(0.12)		
Log up. subsidy$_{j,T}$			0.24***	0.16**
			(0.03)	(0.07)
NAICS FE	NO	YES	NO	YES
Term FE	NO	YES	NO	YES
Model	2SLS	2SLS	2SLS	2SLS
S.e.	Robust	NAICS-6	Robust	NAICS-6
Obs.	1,032	1,032	1,976	1,976
No of NAICS-6	368	368	455	455
KP F-statistic	53.39	39.63	1,001.49	568.77

Table 14: 2SLS: Robustness checks

Notes: Log subsidy$_{j,T}$ and Log upstream subsidy$_{j,T}$ are instrumented by Swing industry$_{j,T}$ and Log upstream swing industry$_{j,T}$, respectively. The unit of analysis is industry j (NAICS-6) in term T. Variables are averaged over T. In Columns (1) to (4), I run the 2SLS on the sample excluding Trump's presidency (namely, 2017-2019). NAICS FE: 4-digits. *** p<0.01, ** p<0.05, * p<0.1.

	Log export$_{j,T}$					
	I-O Diagonal		**No Megadeals**			
	(1)	(2)	(3)	(4)	(5)	(6)
			First Stage			
Log swing industry$_{j,T}$			0.48***	0.51***	-	-
			(0.06)	(0.08)		
Log up. swing industry$_{j,T}$	0.92***	0.73***			1.05***	0.90***
	(0.04)	(0.06)			(0.03)	(0.05)
			Second Stage			
Log subsidy$_{j,T}$			0.55***	0.59***		
			(0.08)	(0.13)		
Log up. subsidy$_{j,T}$	0.28***	0.21***			0.25***	0.17**
	(0.03)	(0.08)			(0.03)	(0.07)
NAICS FE	NO	YES	NO	YES	NO	YES
Term FE	NO	YES	NO	YES	NO	YES
Model	2SLS	2SLS	2SLS	2SLS	2SLS	2SLS
S.e.	Robust	NAICS-6	Robust	NAICS-6	Robust	NAICS-6
Obs.	2,468	2,468	1,308	1,308	2,468	2,468
No of NAICS-6	825	825	276	276	494	494
KP F-statistic	587.50	144.94	65.54	40.15	1166.79	363.54

Table 15: 2SLS: Robustness checks

Notes: Log subsidy$_{j,T}$ and Log upstream subsidy$_{j,T}$ are instrumented by Swing industry$_{j,T}$ and Log upstream swing industry$_{j,T}$. The unit of analysis is industry j (NAICS-6) in term T. Variables are averaged over T. In Columns (1) and (2), I exclude the I-O diagonal. In Columns (3) to (6), I exclude Megadeals. Five terms starting from the presidential term 2000-2004 are taken into consideration (namely, terms corresponding to the period 2001 to 2019). NAICS FE: 4-digits. *** p<0.01, ** p<0.05, * p<0.1.

8 Conclusion

Distortions to international trade caused by local subsidies are a salient topic in current policy and academic debates. In the present study, I use detailed information on US corporate subsidies to examine the effect of US government support on the export performance of the recipient industries, and of industries that use subsidized goods and services as inputs of production.

The research contributes to the literature by providing novel causal evidence of a positive impact of US corporate subsidies on the export activity of the recipient industries, and the industries that use the subsidized products and services as input of production. In particular, I estimate an elasticity of exports to corporate subsidies of about 22% when subsidies are directly granted to exporting industries, and 26% when subsidies are awarded to upstream industries.

I address concerns about the endogeneity of subsidy programs by instrumenting for corporate subsidies as in Bown et al. (2021). The instrument exploits exogenous variation in the political importance of different industries in swing states. When tackling endogeneity through the instrumental variable approach, I find that the results continue to hold. In particular, a one percentage point increase in corporate subsidies increases the export performance of the recipient industry by 0.55%. Moreover, a one-percentage change in the level of subsidies given to the suppliers of a given industry boosts the export activity of that industry by 0.25%. These results demonstrate that both direct government support and indirect support through subsidized inputs affect export performance.

A possible explanation for the documented positive effect of subsidies on downstream export is that the cost advantages derived from the subsidy are passed through via a price reduction. However, subsidies might indirectly favour downstream users of subsidized inputs even if they do not affect pricing directly (Møllgaard, 2005), but they facilitate investments leading to productivity gains. If subsidies ease access to capital and boost investments of the recipient industries, downstream industries might benefit from their suppliers' investments thanks to the use of novel and higher-quality inputs. Higher-quality inputs could eventually translate into higher-quality outputs and provide a comparative advantage in the export market.

The present paper contributes to the literature by providing novel causal evidence of a positive impact of US corporate subsidies on the export activity of the recipient industries, and the industries that use the subsidized products and services as input of production. Previous

studies focus on single public interventions or subsidy programs to assess the effects of public intervention by exploiting changes in policies or eligibility criteria. By employing a shift-share instrument that is robust across all types of US subsidies, this paper provides causal evidence on the effect of multiple subsidy programs on export activity. From a policy perspective, this research contributes to the ongoing policy debate about the distorting effects of subsidies on trade and the need for leveling the playing field for foreign subsidies. In particular, the findings stress the importance of taking a value chain approach when evaluating the effects of corporate subsidies. Limiting the attention to direct grants when analyzing the effect of subsidies on exports would lead to inaccurate conclusions that could be possibly biased downward if the exporting firms are not directly supported by the government but many of their inputs are. In this view, achieving a leveling playing field across jurisdictions in terms of competition policy might be preferred to imposing anti-subsidy tariffs to address the indirect exposure to subsidies through heavily subsidized inputs.

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Appendix

	Log export$_{j,T}$							
	Federal subsidies				*State subsidies*			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Log subsidy$_{j,T}$	0.28***	0.02**			0.18***	0.01***		
	(0.02)	(0.01)			(0.01)	(0.00)		
Log up. subsidy$_{j,T}$			0.26***	0.15***			0.23***	0.11***
			(0.01)	(0.01)			(0.01)	(0.01)
NAICS FE	NO	YES	NO	YES	NO	YES	NO	YES
Year FE	NO	YES	NO	YES	NO	YES	NO	YES
Model	2SLS	2SLS	2SLS	2SLS	2SLS	2SLS	2SLS	2SLS
S.e.	Robust	NAICS-6	Robust	NAICS-6	Robust	NAICS-6	Robust	NAICS-6
Obs.	1,311	1,311	9,854	9,854	4,328	4,328	9,854	9,854
No of NAICS-6	133	133	495	495	456	456	495	495
R^2	0.13	11.87	0.10	0.10	0.07	0.07	0.07	0.07

Table 16: Correlation between subsidies and export by granting agency

Notes: Columns (1)-(4) and (5)-(8) are estimated respectively on the sample of federal and state level subsidies. The analysis is run on tradable industries js, but *Log upstream subsidy*$_{j,t1}$ includes non-tradable. Fixed effects: NAICS-6 digits. *** p<0.01, ** p<0.05, * p<0.1.

	Log export$_{j,T}$							
	Federal subsidies				**State subsidies**			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
				First Stage				
Log swing industry$_{j,T}$	0.30***	0.28**			0.47***	0.52***	-	-
	(0.07)	(0.12)			(0.06)	(0.07)		
Log up. swing industry$_{j,T}$			1.13***	0.92***			1.04***	0.90***
			(0.03)	(0.05)			(0.03)	(0.04)
				Second Stage				
Log subsidy$_{j,T}$	0.70***	**-0.02**			0.58***	0.60***		
	(0.20)	(0.24)			(0.08)	(0.12)		
Log up. subsidy$_{j,T}$			0.23***	0.17**			0.25***	0.17**
			(0.02)	(0.07)			(0.03)	(0.07)
NAICS FE	NO	YES	NO	YES	NO	YES	NO	YES
Term FE	NO	YES	NO	YES	NO	YES	NO	YES
Model	2SLS	2SLS	2SLS	2SLS	2SLS	2SLS	2SLS	2SLS
S.e.	Robust	NAICS-6	Robust	NAICS-6	Robust	NAICS-6	Robust	NAICS-6
Obs.	372	372	2,468	2,468	1,291	1,291	2,468	2,468
No of NAICS-6	116	116	110	110	366	366	495	495
KP F-statistic	19.81	5.42	1218.42	325.15	64.96	47.52	1220.79	410.97

Table 17: 2SLS Estimates by granting agency

Notes: Log subsidy$_{j,T}$ and Log upstream subsidy$_{j,T}$ are instrumented by Swing industry$_{j,T}$ and Upstream Swing industry$_{j,T}$, respectively, the former being constructed on the sample of tradable industries only. The unit of analysis is industry j (NAICS-6) in term T. Variables are averaged over T. Five terms starting from the presidential term 2000-2004 are taken into consideration (namely, terms corresponding to the period 2001 to 2019). FE: NAICS-4 and NAICS-3. *** p<0.01, ** p<0.05, * p<0.1.