The Effects of Corporate Subsidies Along Supply Chains*

Elisa Navarra

Université libre de Bruxelles (ECARES)

Click here for the most recent version

Abstract

The increasing use of corporate subsidies by governments worldwide raises concerns about their trade-distorting effects. In this paper, I study the trade effects of corporate subsidies, both direct (in subsidized industries) and indirect (in industries connected through input-output linkages). To this end, I use a unique dataset on all federal subsidies introduced by the United States since 2000. I document that, against multilateral trading rules, only a fraction of these subsidies are notified to the World Trade Organization. To identify causal effects, I exploit exogenous political shocks driven by changes in the identity swing states across electoral terms. I find that politically motivated subsidies foster exports in industries directly and indirectly exposed to them. Employment also increases. Contrary to the existing jurisprudence, the positive effects along supply chains stem from increased investments rather than price suppression. My analysis contributes to the ongoing debate about reforming multilateral trading rules on subsidies by advocating enhanced transparency and a broader interpretation of pass-through effects.

Keywords: Corporate Subsidies, Exports, Input-Output Linkages.

JEL Codes: D57, F13, H25.

*I am extremely grateful to my supervisors Paola Conconi and Mathieu Parenti for their continuous guidance and support. I am thankful to Andrew Bernard, Meredith Crowley, Aksel Erbahar, Ariell Reshef, and Lorenzo Trimarchi for useful comments and participants at the 2023 CEP-Warwick Junior Trade workshop, the Future of Global Trade Amid Shifting Geopolitics ECB-BoC 2023 Conference, the 2023 Sardinian Empirical Trade Conference, the 2nd NSE PhD and Postdoc Workshop, the 5^{th} EBRD and CEPR Research Symposium on the Geopolitics of Trade, the 2022 Local GTDW Workshop, the 2023 Villars Workshop on International Trade and Multilateralism, the 22^{nd} Annual Conference of the ETSG, the 49^{th} Annual Conference of the EARIE, the 2022 AIB-UNCTAD Annual Conference, the XXIV Encuentro de Economía Aplicada, the 2022 ECORES Summer School, the 26^{th} SMYE, and the 18^{th} Doctorissimes Conference and seminar participants at the Université libre de Bruxelles, Université Catholique de Louvain, the GSIPE Workshop, and the GROW Economic Meetings at the European Commission for their helpful comments and suggestions and David J. Sonnewald for proofreading the article. I am grateful to FREIT for the 2023 Best Graduate Student Paper Prize and AIB-UNCTAD for the 2022 Research on Investment and Development Award finalist nomination. I thank Good Jobs First for permission to access the Subsidy Tracker dataset and for the technical support provided. Funding from the Fonds de la Recherche Scientifique is gratefully acknowledged. All errors are mine. Author affiliation: ECARES, Université libre de Bruxelles, Avenue F. Roosevelt 50, 1050 Brussels, Belgium. Email: elisa.navarra[at]ulb.be. Personal website here.

1 Introduction

Industrial policy is on the rise. Governments around the world increasingly employ corporate subsidies, raising concerns about their effects on international trade. Most subsidies are not directly trade-related but are meant to achieve broad economic and social goals (e.g., promote innovation through research and development, tackle climate change). Nevertheless, all subsidies can affect trade flows and in principle generate trade distortions by discriminatorily conferring benefits on producers in some countries (World Bank Group, 2023).[1] These benefits can spill over along supply chains: for example, subsidizing semiconductor producers may indirectly benefit manufacturers of electronic devices (downstream) and suppliers of silicon (upstream).

These concerns are not new; they were raised during the Uruguay Round that paved the way for the World Trade Organization (WTO), in which countries negotiated the Subsidies and Countervailing Measures Agreement (SCMA) to regulate subsidies on a global scale. The SCMA prohibits directly trade-related measures (export and local-content subsidies) and requires states to notify to the WTO specific subsidies (i.e., targeted to a firm, industry, or region). This requirement helps other countries become aware of these subsidies, against which affected countries can impose countervailing duties (CVDs). However, various aspects of the SCMA have been criticized and there have been calls to reform it (e.g., Cosbey & Mavroidis, 2014; IMF, 2022).

In this paper, I empirically study the trade effects of corporate subsidies, both direct (in subsidized industries) and indirect (in industries connected through Input-Output (I-O) linkages). To this end, I use unique data available through the US Freedom of Information Act of 1966 (FOIA) on all federal subsidies introduced by the United States since 2000. I first document a lack of transparency: only a fraction of US federal subsidies have been notified to the WTO. To identify causal effects, building on Bown et al. (2023), I exploit exogenous political shocks driven by changes in the identity of swing states across electoral terms. I find that politically motivated subsidies foster exports (and employment) in industries directly and indirectly exposed to them. In terms of mechanisms, contrary to the existing case law, the positive effects along supply chains stem from increased investments rather than price suppression. My analysis contributes to the debate about reforming multilateral trading rules on subsidies by advocating enhanced transparency and a broader interpretation of pass-through effects.

[1] For example, trade-related concerns have been raised about two recent US subsidy programs: the Inflation Reduction Act, which grants USD 369 billion for green investment, and the CHIPS and Science Act, which grants USD 52.7 billion for investments in the semiconductor industry (Financial Times, 2023).

For my analysis, I use detailed data on US firm-level corporate subsidies from Subsidy Tracker. The advantage of using this data is that it is available through the FOIA and does contain the universe of US subsidies.[2] The United States is the second-largest exporter in the world and the second-largest user of subsidies after China (see Figure A.1).[3] Between 2000 and 2019, US federal and state agencies provided a total of 56 and 116 billion USD in subsidies, equivalent to almost 0.02% and 0.04% of GDP in that period. I aggregate this data at the 6-digit industry level. I consider all categories of corporate subsidies provided by US federal agencies to domestic industries between 2000 and 2019. These subsidies can come in the form of federal grants or tax credits and have various objectives (e.g., R&D, investment promotion, advanced technology programs). Export subsidies are used very rarely (see Figure A.4). Combining the universe of US subsidies with the subsidies notified to the WTO reveals that the United States reports only about 30% of its federal subsidies.

The link between subsidies and exports is complex, given the potential for reverse causality and omitted variables, such as state capacity, market imperfections, and welfare objectives. To study the direct effect of subsidies on exports, I use a shift-share instrument based on swing-state politics, building on Bown et al. (2023). The IV identifies politically motivated subsidies granted by the US federal government and agencies. It leverages political shocks driven by changes in the identity of "swing" states across electoral terms and the historical importance of industries within them. I find that subsidies have large positive effects on exports of the recipient industries. Controlling for industry and time-fixed effects, a 1 standard deviation increase in subsidies leads to a 0.1 standard deviation increase in exports at the intensive margin or a 0.7 standard deviation increase when considering the extensive margin as well. In monetary terms, a 1% increase in subsidies yields nearly a 200 million USD export increase. Moreover, subsidies also increase employment.

To explore the trade effects of subsidies along supply chains, I define measures of downstream and upstream exposure to subsidies using I-O tables. I instrument these variables using measures of downstream and upstream exposure to swing politics. I estimate a positive trade effect of indirect subsidy exposure. Controlling for industry and time-fixed effects, a 1 standard deviation increase in subsidies to inputs of production leads to a 0.11 standard deviation increase in exports. Upstream subsidy exposure shows a milder effect, with a 1 standard devia-

[2] Other datasets, although available at the cross-country level, have a smaller coverage.

[3] The United States is also the country that is most frequently accused of violating WTO subsidy rules. Its subsidies and CVDs have been contested 43 times (see Figure A.2).

tion increase resulting in a 0.02 standard deviation export boost. The employment effects also propagate through supply chains.

To investigate the mechanisms behind the positive direct and indirect effects of subsidy exposure on trade and employment, I explore their effects on several other outcome variables, including industry prices, investment, value-added, and productivity. The existing jurisprudence suggests that the pass-through of subsidies should work through price changes: downstream industries should indirectly benefit from subsidies only if these suppress the prices of their inputs (e.g., Grossman & Mavroidis, 2003; Shadikhodjaev, 2012). Contrary to the existing case law, the results suggest that the transmission of subsidies along supply chains is not driven by price suppression; rather, producer and input prices increase due to subsidies. I find evidence that subsidies stimulate investments, which in turn enhance value-added and productivity of the recipient industries. These effects subsequently ripple upstream and downstream along supply chains, boosting exports and employment. These mechanisms align with the observation that the majority of US federal subsidies (63%) are geared towards promoting investments rather than cutting marginal costs of production.[4]

This paper contributes to the international trade and industrial policy literature by providing novel causal evidence of the effectiveness of corporate subsidies in enhancing exports, both directly and indirectly through supply linkages. It contributes to the ongoing debate about reforming multilateral trading rules on subsidies by spotlighting two primary concerns within the current framework. Firstly, it emphasizes the importance of strengthening transparency acknowledging that a notable issue of under-reporting exists, with only a fraction of US subsidies being notified to the WTO. Secondly, it emphasizes the need to consider the indirect effects of subsidies when exporters themselves are not subsidized, but rather their suppliers or buyers are. Although the SCMA mentions indirect harm resulting from subsidies,[5] it lacks clear guidance on substantiating subsidy pass-through, with the case law traditionally focusing on price suppression alone. This paper demonstrates that subsidy pass-through can also manifest as increased investment. It suggests broadening the interpretation of pass-through effects, accommodating various mechanisms in accordance with different types of subsidy policies.

[4] I classify US federal subsidies into "investment-promoting" and "marginal cost-reducing" subsidies based on their program characteristics.

[5] See footnote 36, pg. 241, SCMA.

2 Literature Review

My paper is related to three main lines of research.

The first strand is a broad literature on subsidies and industrial policy (see Lane (2020) and Bulfone (2023) for an extensive review). Many papers have investigated the effect of government support along several macro and micro-economic dimensions, including aggregate growth (e.g., Pack, 2000; Becker et al., 2010; Manelici & Pantea, 2021), employment (e.g., Bernini & Pellegrini, 2011), and total factor productivity (e.g., Beason & Weinstein, 1996; Lee, 1996; Aghion et al., 2015). Studies that provide causal evidence on the direct effects of subsidies often leverage aspects of quasi-natural experiments in the context of specific policies, such as changes in the eligibility criteria (e.g., Becker et al., 2010; Criscuolo et al., 2019)[6] or funding availability (e.g., Wolff & Reinthaler, 2008; Aguiar & Gagnepain, 2017). I contribute to this literature by looking at a different outcome variable, namely exports, and by providing novel causal evidence on the effects of politically motivated subsidies.

Fewer analyses have delved into the relationship between subsidies and exports, mainly focusing on export promotion policies and export subsidies. These studies provide mixed evidence. Munch and Schaur (2018) and Broocks and Van Biesebroeck (2017), for example, document a positive effect of the Danish and Flemish export promotion policies, respectively, on firms' performance. Defever et al. (2020) find that Nepal's Cash Incentive Scheme for Exports increased the exports of targeted product destinations. China's tax rebate on textile exports was found to boost the growth of textile exports to the US (Bao et al., 2017). By contrast, Bernard and Jensen (2004) find no significant effect of US state export promotion on the probability of exporting. Fewer papers study production subsidies finding positive effects on exports (e.g., Görg et al., 2008; Girma et al., 2020). To the best of my knowledge, this is the first paper to consider the transmission of multiple subsidy policies to downstream industries.

In evaluating the supply chain effects of subsidies, this paper also relates to the literature on firms' networks and intra-industry linkages. This stream of the literature examines the local market impact of vertically transmitted idiosyncratic shocks such as natural disasters (e.g., Barrot & Sauvagnat, 2016; Carvalho et al., 2020), trade policies (e.g., Erbahar & Zi, 2017; Bown et al., 2023), and industrial policies (e.g., Liu, 2019; Rotemberg, 2019). Relatively few

[6] Becker et al. (2010) exploit geographical in the EU Objective 1 scheme for determining the regions that qualify for structural funds transfers. Criscuolo et al. (2019) use exogenous variation in the area-specific eligibility criteria in the Regional Selective Assistance program in the United Kingdom to show job gains from investment subsidies.

works consider the transmission of subsidies to downstream industries and their effect on trade and they focus on specific settings. Blonigen (2016) analyzes industrial policies targeting the steel sector, which entail a wide range of public policies beyond subsidies. He documents that a 1 standard deviation increase in industrial policy interventions is associated with a 3.6% decline in export competitiveness for downstream manufacturing industries. Moerenhout (2020) finds that fossil fuels subsidies have positive downstream trade effects by lowering the cost of production. This paper provides extensive causal evidence of the effects of corporate subsidies along all supply chains, covering the universe of US federal subsidy policies and all tradable industries.

Finally, my paper is related to the literature on swing-state politics. Expanding upon the observation that electoral motives influence policy outcomes (e.g., T. et al., 1997; T. & G., 2004), this body of the literature reveals that US presidential candidates strategically direct their campaign resources towards swing states to optimize their likelihood of winning the election (Stromberg, 2008). This mechanism also leads to a bias in U.S. trade policies favouring swing states (e.g., Muûls & Petropoulou, 2013; Conconi et al., 2017; Bown et al., 2023). This paper shows that the Electoral College system affects corporate subsidies.

3 Data and Variables

I process rich data for the United States by combining several sources of data, including detailed firm-level information on corporate subsidies from Subsidy Tracker, I-O tables from the Bureau of Economic Analysis (BEA), industry-level exports from the United Nations Comtrade database of the World Integrated Trade Solution (WITS), employment from the County Business Patterns (CBP) database of the United States Census Bureau, industry price indexes from the United States Bureau of Labor Statistics (BLS), value-added investment, and productivity from the National Bureau of Economic Research (NBER) and U.S. Census Bureau's Center for Economic Studies (CES) Manufacturing Industry Database. The following subsections provide a more detailed description of the main variables used.

3.1 Corporate Subsidies

Corporate subsidies in the United States are granted by either the federal government and agencies (i.e., federal subsidies) or state and local governments and agencies (i.e., state and local subsidies). Eligibility and selection criteria vary depending on the awarding agency and the specific program. In the following paragraphs, I provide more information on the source of subsidy data, the definition of corporate subsidy, the subsidy variables used in this analysis and aggregation methods, and some descriptive statistics.

Data source and coverage My source for subsidy data is Subsidy Tracker, a search engine developed by the American nonprofit organization Good Jobs First.[7] Leveraging the FOIA, the data are originally drawn from government disclosures via reports and websites, direct data requests to government agencies, corporate press releases, newspaper articles, and academic reports. The database contains the universe of firm-level corporate subsidies granted by the United States. For each subsidy (or portion of a multi-year subsidy), it reports information on the recipient company (e.g., name, headquarters (HQ) location, 6-digit North American Industry Classification System (NAICS) code), subsidy value, subsidy type, award year, and granting agency. In this paper, I focus on federal subsidies granted between 2000 and 2019, which I can causally identify through an IV based on swing politics.

Other existing datasets, although available at the cross-country level, have a smaller coverage.[8] For example, I document that US subsidy notifications to the WTO, suffer from underreporting. In particular, when comparing US corporate subsidies available from the FOIA with web-scraped information from the WTO SCMA Gateway website, only a fraction (around 30%) of federal subsidies have been notified to the WTO (see Appendix A). The same is true for state-level subsidies, with 60% of programs being reported.

Definition of corporate subsidies Based on Subsidy Tracker, I define corporate subsidy as "any financial contribution by a public body awarded to a firm that is engaged in an economic activity." The first element of this definition implies that subsidies must involve transfers of public resources and thus be granted by a government agency. Second, the deployment of public resources does not have to take a specific form for being designated as a subsidy. Federal subsidies are granted in the form of tax credits or federal grants (see Figure B.1 and Table B.1), with grants being more frequent (see Figure B.2).[9] Third, corporate subsidies are awarded to firms engaged in economic activities. Between 2000 and 2019, the largest subsidies were directed to the

[7]This database is used, among others, by Slattery and Zidar (2020) and Slattery (2023) for state subsidies.

[8]An alternative dataset on industrial policies (including subsidies) is maintained by the Global Trade Alert (Evenett & Fritz, 2021). However, this dataset records changes (not stocks) in subsidy policies affecting trading partners.

[9]Subsidy Tracker also reports information on federal insurances, loan guarantees, and tax-exempt bonds. I do not consider these types of intervention since the available amounts refer to the face value and do not indicate whether the loans have been repaid or not. Hence, they are not comparable with other subsidy values.

power generation industry, followed by power systems, and aerospace and military (see Figure 1). The industries receiving the greatest share of subsidies in gross output are the navigational instrument industry, apparel, and spring and wire products manufacturing (see Figure B.3). Within industries, the highest subsidy shares were granted to very large firms, such as Wells Fargo Bank (financial services), Summit Texas Clean Energy LLC and SCS Energy California (energy) (see Table B.2). Within industries, subsidies are highly concentrated, with a limited number of firms being subsidized (on average, 21 firms per industry) (see Figure B.4).

Data aggregation I aggregate firm-level records to 6-digit NAICS industries:

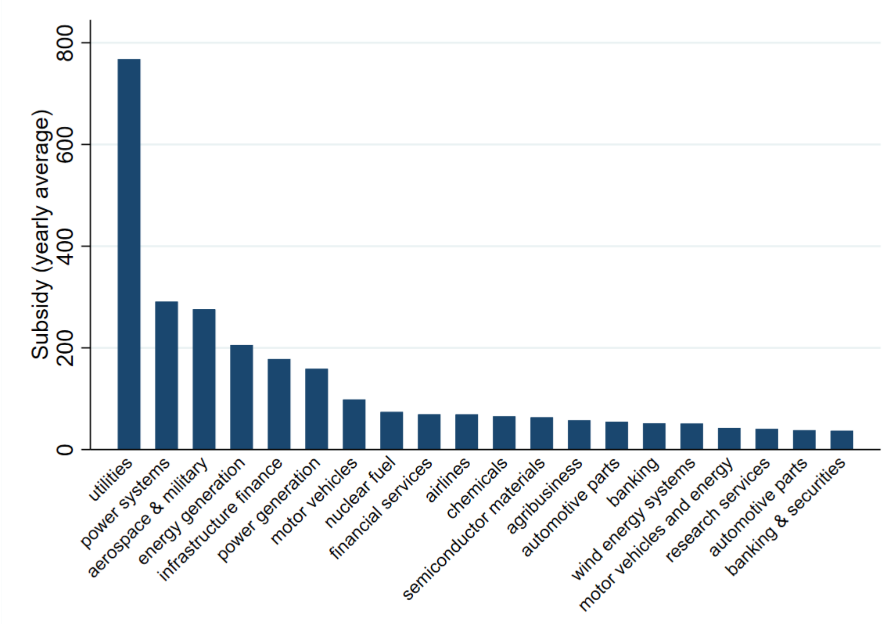
$$Direct\ subsidy\ exposure_{j,t} = \sum_{f}^{F} Subsidy_{f,j,t}. \tag{1}$$

Direct subsidy exposure$_{j,t}$ of industry j in year t is the total value of subsidies granted to firms f belonging to the 6-digit NAICS industry j. The 6-digit NAICS classification is very granular. For example, "Women's and Girls' Cut and Sew Dress Manufacturing" and 315234 "Women's and Girls' Cut and Sew Suit, Coat, Tailored Jacket, and Skirt Manufacturing," belong to two distinct categories, NAICS code 315233 and 315234, respectively. I specify and standardise all data to the 6-digit NAICS 2002 nomenclature, using Census concordance tables and Autor et al. (2013)'s employment weights.[10] For compatibility with the other datasets used in this analysis, I focus on CBP industries.

Descriptive statistics Table B.3 presents some descriptive statistics on federal subsidies granted to tradable and non-tradable industries. On average, tradable industries received almost 1.6 million USD in federal subsidies per year between 2000 and 2019 (non-tradable industries 2.9 million USD), with large heterogeneity across industrie. In Figure 2, I plot the evolution of subsidies over time for all industries and for tradable industries only. Subsidies exhibited a relatively stable trend up to 2008, after which they became more volatile, reaching peaks in 2010 and 2018. Notably, subsidies to non-tradable industries experience a significant increase during periods of high volatility.

[10]Firms' industry codes, and therefore subsidies, are reported by Subsidy Tracker using the NAICS classification in place at the time of the subsidy. When the NAICS code is not available, I assign industry codes from the S&P Compustat Database through the company's name.

Figure 1: Top 20 Broad Industries with the Highest Average Value of Subsidies, 2000-2019



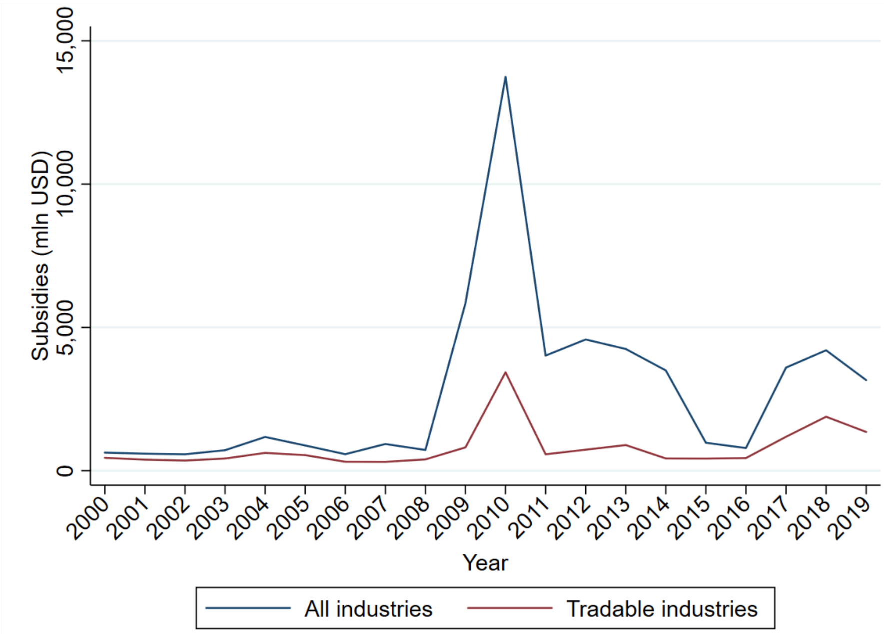
Note: Average yearly federal subsidies to the most subsidized industries, Subsidy Tracker Industry classification (49 industries).

3.2 Other Variables

I-O linkages and indirect subsidy exposure To define downstream and upstream subsidy exposure, I measure industry linkages using the US national I-O tables from the Bureau of Economic Analysis (BEA). I-O tables are extensively used in the literature (e.g., Acemoglu et al., 2009; Alfaro et al., 2019) due to their high level of disaggregation. In particular, I employ the "Use of Commodities by Industries after Redefinitions" tables from 2002, at the beginning of the sample, to guarantee the exogeneity of supply linkages BEA (2002). These I-O tables encompass 439 industries, classified at the 6-digit BEA industry level based on NAICS codes. I use BEA's concordance tables to convert subsidies, expressed in 6-digit NAICS codes, into their equivalent 6-digit BEA industry codes. As BEA industry codes are derived from NAICS, measurement error is reduced to the minimum.[11] When defining supply linkages (upstream and downstream), I use direct requirement coefficients, corresponding to the first tier of the supply chain, to minimize the separation between inputs and outputs. However, I conduct robustness checks incorporating higher-order I-O linkages. Moreover, I exclude the diagonal of the I-O matrix, namely intra-industry supply linkages, to disentangle the indirect effect from the direct

[11] BEA industry codes are coarser than 6-digit NAICS codes. While this approach presents no issues when using the NAICS-to-BEA concordance, it necessitates the establishment of weights when converting the data back to the NAICS classification.

Figure 2: Total Subsidies Over Time, Tradable Industries 2000-2019



Notes: Industry-level federal subsidies, total and tradable industries only. Non-tradable industries are industries that never export in the period considered.

effect.

To define downstream subsidy exposure, I compute the cost share $w_{i,j}$ of input i in the production of j by dividing the commodity input by the total industry output. For every industry pair (i, j), $w_{i,j}$ provides the amount of the commodity i required to produce one dollar of the industry's output j (see Equation 2).

$$Downstream\ subsidy\ exposure_{j,t} = \sum_{i \neq j}^{I} w_{i,j} * Subsidy_{i,t}. \tag{2}$$

Downstream subsidy exposure$_{j,t}$ captures total subsidies granted in year t to industry i (both tradable and non-tradable industries) that are upstream to industry j, excluding industry j. I identify upstream subsidy linkages for 1150 6-digit NAICS industries (out of 1179), 500 of which are tradable.

To define upstream subsidy exposure, instead, I compute the sales share $\theta_{i,j}$ of j that are used as inputs in the production of i by dividing the commodity input j used in the production of the industry output i by its total sales. For every industry pair (i, j), $\theta_{i,j}$ represents the share of industry j's total sales used as inputs in the production of industry i (see Equation 3).

$$Upstream\ subsidy\ exposure_{j,t} = \sum_{i \neq j}^{I} \theta_{i,j} * Subsidy_{i,t}. \tag{3}$$

Upstream subsidy exposure$_{j,t}$ captures total subsidies granted in year t to industry i (both tradable and non-tradable industries) that are downstream to industry j, excluding industry j. I identify downstream subsidy linkages for 1125 6-digit NAICS industries (out of 1179), 500 of which are tradable.

Exports Data on exports are sourced from the United Nations Comtrade database of WITS. I harmonize the data (originally expressed in the 4-digit SIC classification) to the 6-digit NAICS 2002 classification using the Census concordance tables. I define $\text{exports}_{j,t}$ as total exports in year t of tradable industry j, which I define as industries with strictly positive exports for at least one year in the sample.[12]

Employment I source employment from the CBP database, which tracks employment by county (and state) and industry from 1946 to date. I supplement this source with imputed employment data by Eckert et al. (2021), who develop a linear programming method to impute employment data that is suppressed in the CBP dataset for confidentiality reasons. I harmonize data over time to the NAICS 2002 nomenclature using Census concordance tables and Autor et al. (2013)'s employment weights. Some 6-digit NAICS codes are not covered by the CBP and I exclude them from the analysis.[13] The use of employment data in this paper is two-fold. Firstly, I use employment aggregated at the state-industry level for 2000 (at the beginning of the sample) to construct the employment shares used in the shift-share IV (Bartik, 1991). Secondly, I aggregate this data at the federal level for each year from 2000 to 2019 to analyze the direct and indirect effects of subsidies on employment.

Prices To explore the mechanisms through which the effects of subsidy are conveyed along supply chains, I study their effect on industry prices, from the Producer Price Index (PPI) of BLS. The PPI measures monthly price fluctuations in the output of producers (excluding import prices), at the industry level, defined according to the NAICS nomenclature. I employ the PC database of the BLS, which includes current indexes by industry defined according to the NAICS 2022 revision. The database covers most of the United States industries (i.e., around 500 mining and manufacturing 6-digit industries and around 150 service industries). I harmonize industries

[12]The dummy variable resulting from this definition of tradable industries exhibits a high correlation of 0.85 with the one based on Mian and Sufi (2014)'s classification (corr=0.85).

[13]The following industries are excluded from CBP: 111 (Crop Production), 112 (Animal Production), 482 (Rail Transportation), 491 (Postal Service), 5251 (Insurance and Employee Benefit Funds), 52592 (Trusts, Estates, and Agency Accounts), 6111 (Elementary and Secondary Schools - Only private schools are included), 6112 (Junior Colleges - Only private schools are included), 6113 (Colleges, Universities, and Professional Schools - Only private schools are included), 814 (Private Households), 92 (Public Administration).

over time to the NAICS 2002 revision using Census concordance tables and Autor et al. (2013)'s weights. Combining the PPI database with I-O tables, I construct an index for the price of inputs of industry j, $Input\ price_{j,t}$, following the same approach used in Equation (2).

Investment, value-added, and productivity In the analysis of the mechanisms, I use additional data on investment (total capital expenditure in USD), value-added (total value added in USD), and productivity (4-factor total factor productivity index) from the NBER-CES Manufacturing Industry Database. This database only covers manufacturing industries (364 six-digit 2012 NAICS industries) and years up to 2018. I harmonize industries over time to the NAICS 2002 revision using Census concordance tables and Autor et al. (2013)'s weights.

Electoral outcomes To construct the IV for politically motivated subsidies, whose exogenous variation is given by changes in the identity of states classified as swing in presidential elections, I use the vote outcomes of Democratic and Republican candidates from Atlas Election (see Figure D.1). I use data from five Presidential elections, from 2004 to 2020. Moreover, I use the number of electoral votes allocated to each state in 2000 (at the beginning of the sample), to determine the relevance of each swing state in presidential elections.

Trade protection I use the Temporary Trade Barriers (TTBs) database of Bown et al. (2020) database to control for trade protection (most notably, anti-dumping duties). I define Trade protection$_{j,t}$ as the average anti-dumping duty across all 6-digit Harmonized System (HS) products within a 6-digit NAICS industry j. Combining information on anti-dumping duties and the BEA I-O tables and following the same approach used in Equations (2) and (3), I construct two additional variables, namely Downstream trade protection exposure$_{j,t}$ and Upstream trade protection exposure$_{j,t}$. Downstream trade protection exposure$_{j,t}$ is the weighted average of the duties imposed in year t to each industry i that is upstream to industry j. Upstream trade protection exposure$_{j,t}$ is the weighted average of the duties imposed in year t to each industry i that is downstream to industry j.[14] Finally, I harmonize these variables from the 6-digit SIC codes nomenclature to 6-digit 2002 NAICS industry codes using Census concordance tables.

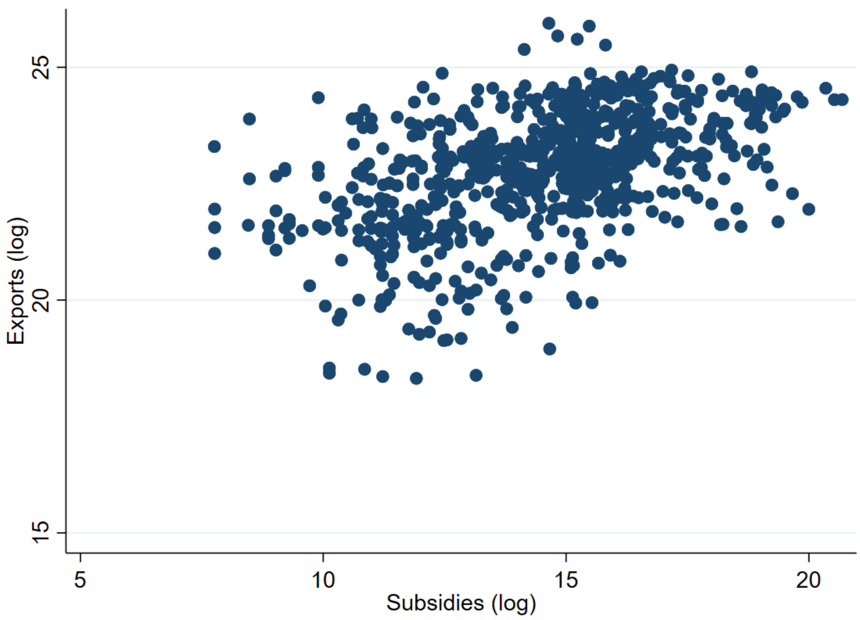
[14]Since duties are expressed in 6-digit HS nomenclature, I use concordance tables provided by the Census Bureau to map the 6-digit HS nomenclature to 6-digit SIC codes. I then rely on the I-O cost and usage shares computed by Acemoglu et al. (2009) from the BEA I-O tables to trace intra-industry linkages and define Downstream trade protection exposure$_{j,t}$ and Upstream trade protection exposure$_{j,t}$.

4 Effects of Subsidies Along supply chains

4.1 Endogeneity Concerns

Previous research in industrial policy has mainly focused on the domestic effects of subsidy policies. By reducing production costs and fostering investment, subsidies have been shown to boost output, sales, and employment. However, even if not explicitly aimed at promoting exports, subsidies can boost the export performance of the recipient industries and industries indirectly exposed to them by lowering production and investment costs. When looking at OLS correlations, US federal subsidies are associated with larger exports of the subsidized industries (see Figure 3 and Table C.1), as well as industries indirectly linked to them through supply linkages (see Table C.2).

Figure 3: Relationship Between Subsidies and Exports, 2000-2019



Notes: Fit of an OLS regression against the explanatory variable. The dependent variable is the logarithm of exports in the tradable industry j in year t. The explanatory variable is the logarithm of subsidies to industry j in year t. The regression includes 6-digit industry j and year t fixed effects. Robust standard errors.

OLS estimations might be subjected to endogeneity bias and reverse causality. As pointed out by Lane (2020): "*Not only is randomization unlikely, by construction industrial policies are meant to promote special industries, products, and places.*" (Lane, 2020, p. 4). The allocation of subsidies within and across industries could reflect government interests in addressing market imperfections and pursuing welfare objectives or be influenced by lobbying efforts. For example, industrial policies might serve to support declining industries or enhance the performance of strategically important industries. To address these issues, I use an IV approach based on swing-state politics that identifies the effects of politically motivated subsidies.

4.2 Instrumental Variable

The instrumental variable approach used in this paper addresses the concern that subsidies could stem from unobservable politically motivated dynamics. The identification is based on swing-state politics, in the spirit of Bown et al. (2023). The IV relies on an industry's importance in political swing (or "battleground") states, which are states in the United States where the two major political parties have similar levels of support among voters. For this reason, swing states have an important influence on the results of presidential elections. The logic of the instrument is that variation in corporate subsidies depends on the incumbent politician's incentives to favour key industries in swing states before presidential elections.

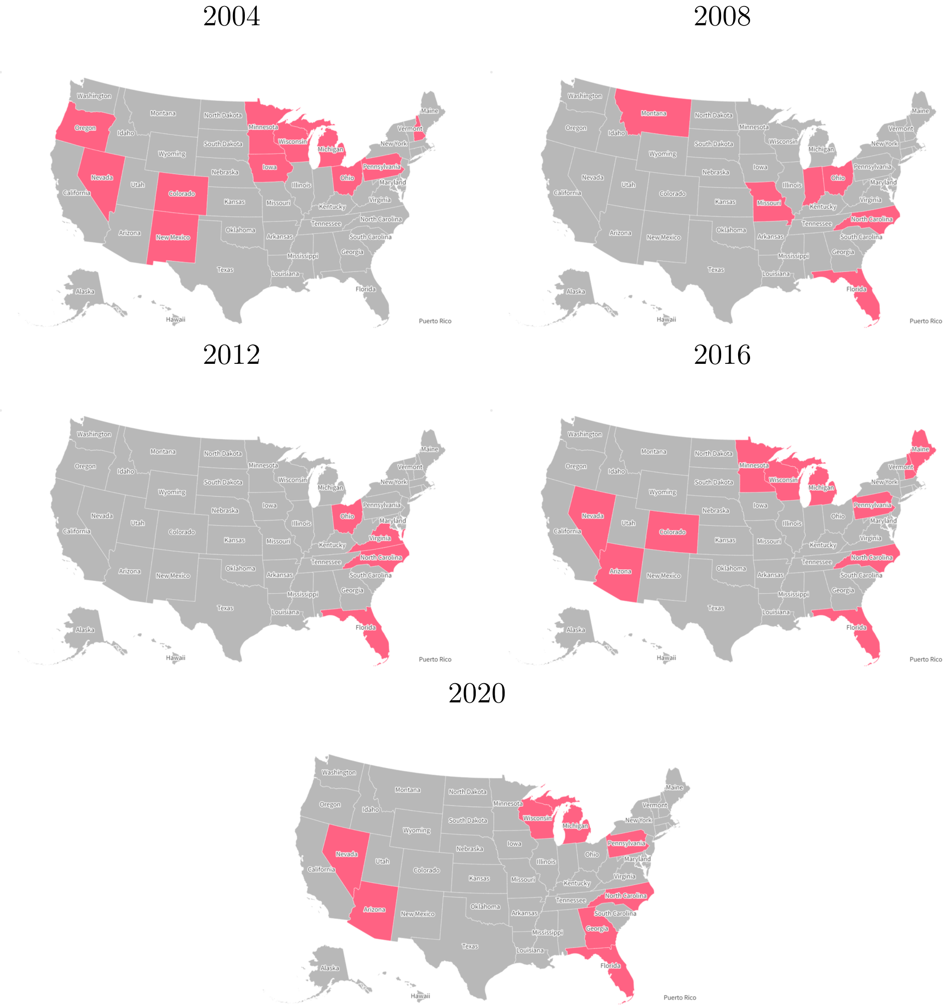
The instrument, IV^{Swing}, is constructed as a shift-share instrument (Bartik, 1991), exploiting exogenous variation arising from the impact of a set of shocks (shifters) on units that are differently exposed to them (shares). Shocks are driven by the identity of states as swing, which varies across electoral terms, whereas exposure depends on the industry's relative importance in each state (as captured by initial employment shares).

Swing states In US presidential elections, some states are politically more important than others. While candidates can count on some states as "safe," the most critical states are those in which no single candidate or party has overwhelming support (i.e., swing or "battleground" states). Following Bown et al., 2023, I identify swing states in the last five presidential elections[15] using the difference in vote shares of Democratic and Republican candidates in presidential elections at the end of the term. The Swing $\text{state}_{s,T}$ dummy classifies a state s as swing during a presidential term T if the difference in the vote margin between the candidates of the two parties in the presidential elections at the end of term T is less than 5%. Variations in the identity of swing states across terms thus identify exogenous shocks in the $\text{IV}^{Swing}_{j,T}$ (shifters). In Figure 4,

[15] I consider elections that occurred in 2004, 2008, 2012, 2016, and 2020. These elections identify five presidential terms, from 2000 to 2019, each term lasting 4 years. Although I exclude 2020 from the analysis, due to possible bias in subsidies and trade during the COVID-related crisis, I use vote outcomes from the 2020 presidential election.

I indicate in pink the states classified as swing during the last five presidential terms, based on the previous presidential elections.[16]

Figure 4: Swing States in US Presidential Elections, 2004-2020



Notes: The maps indicate in pink the states classified as swing during the last five US presidential elections. A state is classified as swing during term T if the difference in the vote shares of Democratic and Republican candidates in the presidential election at the end of that term is below 5%. Swing states in the last five elections were: in 2004, Colorado, Iowa, Michigan, Minnesota, Nevada, New Hampshire, New Mexico, Ohio, Oregon, Pennsylvania, and Wisconsin; in 2008, Florida, Indiana, Missouri, Montana, North Carolina, and Ohio; in 2012, Florida, North Carolina, Ohio, and Virginia; in 2016, Arizona, Colorado, Florida, Maine, Michigan, Minnesota, Nevada, New Hampshire, North Carolina, Pennsylvania, and Wisconsin; in 2020, Arizona, Florida, Georgia, Michigan, Nevada, North Carolina, Pennsylvania, and Wisconsin.

Because states expected to be swing states in Presidential elections, by definition, lack a clear majority favouring one party over the other, incumbent politicians tend to allocate federal resources and and prioritize policies that cater to the interests of these states. (e.g., Muûls & Petropoulou, 2013; Conconi et al., 2017; Bown et al., 2023). Reporting about the 2020

[16]For example, the state of Nevada was swing in terms 2000-2004, 2012-2016, and 2016-2020, and it was not swing in the terms 2004-2008 and 2008-2012.

presidential elections, Politico stated: "Some states that may be competitive in November's election raked in millions in infrastructure grants awarded Wednesday by the Department of Transportation, while blue states like New York got comparatively little.[..] Arizona, Minnesota and North Carolina, all-important swing states, led the pack too, with more than 10 per cent of the $1 billion haul among them" (*Politico*, 2020). To empirically test whether subsidies exhibit a bias towards swing states, I examine the geographical distribution of subsidy recipients. I leverage the richness and detail of the firm-level subsidy data. I aggregate subsidies at the term-state level, based on the HQ location of the recipient firms. Swing states host a greater number of recipient firms compared to others and attract the largest amounts of federal subsidies (see Figure D.2). Most notably, recipient firms are concentrated and more subsidized in states that are swing during that term (see Table D.5).

Electoral votes In the United States electoral system, voters choose their state representatives who vote for the president. In this process, each state appoints as many electors as its congressional delegation. Depending on the number of electoral votes allocated to each state, swing states may hold varying degrees of significance in presidential elections (see Figure D.1)). Hence, the intensity of the swing shifters depends on each state's importance during elections, as measured by the number of electoral votes assigned to each state at the start of the sample, EV_s^{2000}.

Employment shares Exposure to shocks varies by industry, depending on their relative importance within states. To define the relative importance of industries within states I use initial employment shares ($\alpha_{s,j}^{2000}$) in 2000, which is the year at the beginning of the sample. Fixing employment shares at the beginning of the sample dismisses reverse causality concerns (i.e., the fact that subsidies might influence the shares).

$$\alpha_{s,j}^{2000} = \frac{L_{s,j}^{2000}}{\sum_j L_{s,j}^{2000}}. \tag{4}$$

$\alpha_{s,j}^{2000}$ represents the 2000 share of employment in industry j in state s over total employment in both tradable and non-tradable industries in that state. $L_{s,j}^{2000}$ at the numerator measures employment in state s in 6-digit NAICS industry j in 2000 and the denominator represents total employment in state s in 2000.

$\mathbf{IV}_{j,T}^{Swing}$ $\mathrm{IV}_{j,T}^{Swing}$ is a Bartik shift-share instrument in which the shifters are determined by changes in the identity of swing states across electoral terms, weighted by electoral votes, and shares are employment shares from 2000 (see Equation).

$$IV^{Swing}_{j,T} = \sum_{s} \frac{L^{2000}_{s,j}}{\sum_j L^{2000}_{s,j}} * Swing\ state_{s,T} * EV^{2000}_{s}. \tag{5}$$

$\mathrm{IV}^{Swing}_{j,T}$ is the sum of the employment shares of industry j in each state s that is swing during the electoral term T. EV_s represent electoral votes assigned to state s at the beginning of the sample and capture the different relevance of swing states.[17]

Similarly, I define the shift-share IV for downstream subsidy exposure. In this case, I add an additional share, given by the I-O cost shares, $w_{i,j}$. In fact, the downstream exposure to the shocks depends on cost shares of input i in the production of output j. Downstream $\mathrm{IV}^{Swing}_{j,T}$ can also be regarded as the weighted sum of the IVs in vertically related (upstream) industries:

$$Downstream\ IV^{Swing}_{j,T} = \sum_{i \neq j}^{I} w_{i,j} * IV^{Swing}_{i,T}. \tag{6}$$

I also construct the corresponding variable and IV for upstream subsidy exposure, using sales shares, $\theta_{i,j}$, computed from the I-O tables. In fact, upstream exposure to the shocks depends on the sale shares of the commodity input i used in the production of the industry output j. Upstream $\mathrm{IV}^{Swing}_{j,T}$ can also be regarded as the weighted sum of the IVs in vertically related (downstream) industries:

$$Upstream\ IV^{Swing}_{j,T} = \sum_{i \neq j}^{I} \theta_{i,j} * IV^{Swing}_{i,T}. \tag{7}$$

Assumptions Before presenting the results, I briefly discuss the assumptions of the instrumental variable approach, namely exogeneity (i.e., independence and exclusion restriction) and relevance, as well as the possible threats to these assumptions.

First, the IV must be independent, namely uncorrelated with the error term. The independence assumption requires first that the political shocks are exogenous: corporate subsidies granted during a presidential term must not affect whether the difference in vote shares between the Democratic and Republican candidates, at the end of the term, is below the threshold (i.e., whether a state is swing or not). While there is no formal method to test the exogeneity of an IV, Table D.6 shows that the swing identity of a state s is uncorrelated with subsidies that have been granted to industries that are relevant in state s. The coefficients are insignificant, indicating that whether a state is swing or not is independent of the subsidies that have been previously granted to its industries.

Second, the instrument must have no direct effect on exports. The exclusion restriction

[17]Differently from this paper, Bown et al. (2023) use a non-linear transformation of the standard Bartik instrument to instrument trade protection and add anti-dumping experience specific term.

might be threatened if $\text{IV}_{j,T}^{Swing}$ picked up the effects of other federal policies than corporate subsidies. For example, $\text{IV}_{j,T}^{Swing}$ might be correlated with trade protection. To address this concern, in Table E.1, I control for the average anti-dumping duty imposed on all US imports in industry j. The independence and exclusion restrictions must also be satisfied for the second component of $\text{IV}_{j,T}^{Swing}$, namely employment shares. The use of employment data from 2000, at the beginning of the sample, ensures the exogeneity of the employment shares.

Third, each of the instruments must be relevant in predicting the corresponding endogenous variable. I test the relevance of $\text{IV}_{j,T}^{Swing}$, Downstream $\text{IV}_{j,T}^{Swing}$, and Upstream $\text{IV}_{j,T}^{Swing}$ by estimating Equations (8)-(10), which are equivalent to the first stages of the following 2SLS regressions:

$$Direct\ subsidy\ exposure_{j,T} = \alpha + \beta\ IV_{j,T}^{Swing} + \delta_j + \delta_T + \epsilon_{j,T}, \tag{8}$$

$$Downstream\ subsidy\ exposure_{j,T} = \alpha + \beta\ Downstream\ IV_{j,T}^{Swing} + \delta_j + \delta_T + \epsilon_{j,T}, \tag{9}$$

$$Upstream\ subsidy\ exposure_{j,T} = \alpha + \beta\ Upstream\ IV_{j,T}^{Swing} + \delta_j + \delta_T + \epsilon_{j,T}. \tag{10}$$

The definition of the IV at the term level requires aggregating (averaging) the other variables over each term T.[18] Hence, Direct subsidy exposure$_{j,T}$ is the average value of subsidies granted to industry j over term T; Downstream subsidy exposure$_{j,T}$ is the weighted average of total subsidies granted to all the industry i (tradable and non-tradable) that supply industry j over the term T; and Upstream subsidy exposure$_{j,T}$ is the weighted average of total subsidies granted to all the industry i (tradable and non-tradable) that are supplied by industry j over the term T. I define these variables using the cost ($w_{i,j}$) and sales ($\theta_{i,j}$) shares, respectively, from the BEA I-O tables' direct requirements and excluding the diagonal of the I-O matrix. δ_T and δ_j are term and 4-digit industry-level fixed effects to account for time-invariant and industry-specific characteristics. With these fixed effects, the regression coefficient is driven by the variation in subsidies within a term T and within a 4-digit industry j.

All the instrumental variables, for subsidies and subsidies along supply chains, can significantly predict the endogenous variables. The coefficients in the first stage of the 2SLS regressions are positive and significant across different specifications (see Tables D.7 and D.8).

[18] Aggregating subsidies and exports over years in each term T, instead of taking the average, does not change the results. Analogously, the results are robust to considering only subsidies awarded during the last year of the electoral term, namely the election year.

5 Direct and Indirect Effects of Subsidies on Exports

5.1 Main Results

In Section 5.1, I estimate the direct and indirect impacts of subsidies along the supply chains on exports.

First, I examine the effects of politically motivated subsidies on the export performance of the recipient industries. I test the following Equation through a 2SLS model:

$$Exports_{j,T} = \alpha + \beta\ Direct\ subsidy\ exposure_{j,T} + \delta_j + \delta_T + \epsilon_{j,T} \tag{11}$$

The definition of the IV at the term level requires aggregating (averaging) the other variables over each term T. $\text{Exports}_{j,T}$ is the average yearly exports of tradable industry j over the term T. $\text{Direct subsidy exposure}_{j,T}$ is the average yearly subsidies granted to industry j over term T, instrumented by $\text{IV}^{Swing}_{j,T}$ (see Equation (5)). δ_T and δ_j are term and 4-digit industry-level fixed effects to account for time-invariant and industry-specific characteristics that may influence the level of subsidies within an industry or term. With these fixed effects, the regression coefficient is driven by the variation in subsidies within a term T and within a 4-digit industry j. I cluster standard errors at the downstream industry level (defined at the 2-digit NAICS) to account for heteroskedasticity across industries.

Table 1 presents the second stage of the 2SLS regressions from estimating Equation (11). I report three specifications, which should be regarded as complementary and rely on different techniques to account for the skewness of the data (see Figure B.5). On the one hand, the untransformed and IHS models estimate the effects of subsidies on exports at both the extensive and intensive margins. In the untransformed model, I winsorize the independent variable to handle outliers, but my results also prove robust even without this data adjustment.[19] Since working with a transformed scale might be preferred to winsorization, I also estimate the model in the IHS transformed scale. On the other hand, the logarithm transformation measures the intensive margin effect alone. All columns include term and 4-digit industry-level fixed effects and clustered standard errors. The 2SLS estimator performs well in terms of the strength of the instrument in all the specifications, as demonstrated by the high Kleibergen-Paap (KP) Wald

[19]Winsorizing is a statistical technique used to mitigate the impact of potentially spurious outliers that significantly affect variable distribution. It adjusts the statistics by recoding extreme values at the distribution's tail to more moderate values. For example, a 10% winsorization recodes the top 10% of cases in the transformed variable to values corresponding to the 10^{th} and 90^{th} percentiles.

F-statistics above the critical value of 10.[20]

The results uncover novel evidence on the effects of politically motivated federal subsidies, showing that they have a large positive and significant direct impact on exports (see Table 1). When controlling for term and industry fixed effects, a 1 standard deviation increase in subsidies leads to a 0.74 standard deviation increase in exports at both the extensive and intensive margin (see Column (1)).[21] When adjusting for the right-skewness of the data through the IHS transformation of these variables, a 1 standard deviation increase in subsidies leads to a 1.07 standard deviation increase in exports (see Column (3)). At the intensive margin alone, the elasticity is 0.11 (see Column (2)). In monetary terms, a 1% increase in subsidies yields nearly a 200 million USD export increase.

The 2SLS coefficients are larger than the corresponding OLS estimates in Table C.3 when considering the extensive and intensive margins together. This difference could stem from two factors: self-selection in subsidy recipients (subsidies favouring declining industries) and the fact that the 2SLS model estimates the average treatment effect (ATE) locally, while OLS calculates the ATE for the whole population. Notably, the $\text{IV}_{j,T}^{Swing}$ only captures a part of the subsidies, namely politically motivated subsidies, which might have a unique impact on industrial performance.

Then, I study the impact of subsidies on exports along the supply chain by estimating the following 2SLS regressions:

$$Exports_{j,T} = \alpha + \beta \ Downstream \ subsidy \ exposure_{j,T} + \delta_j + \delta_T + \epsilon_{j,T}, \quad (12)$$

$$Exports_{j,T} = \alpha + \beta \ Upstream \ subsidy \ exposure_{j,T} + \delta_j + \delta_T + \epsilon_{j,T}. \quad (13)$$

In Equation (12) I study the trade effects of downstream exposure to subsidies and in Equation (13) those of upstream exposure. $\text{Exports}_{j,T}$ is the average yearly exports of tradable industry j over the term T. Downstream subsidy $\text{exposure}_{j,T}$ captures total subsidies granted in year t to each industry i (both tradable and non-tradable industries) that is upstream to industry j, excluding industry j. I define this variable using the cost shares computed from the BEA I-O direct requirements tables ($w_{i,j}$) and excluding the diagonal of the I-O matrix. The instrument, Downstream $\text{IV}_{j,T}^{Swing}$, is defined in Equation (6). Upstream subsidy $\text{exposure}_{j,T}$ captures total subsidies granted in year t to industry i (both tradable and non-tradable industries) that are

[20] The KP Wald F-statistics is a version of the Cragg-Donald statistic adjusted for clustered standard errors.

[21] I compute standardized coefficients by multiplying the unstandardized coefficient by the ratio of the independent and dependent variable standard deviations. They measure the change in the dependent variable in terms of standard deviations per unit change in the independent variable and can be directly compared across different specifications and variables.

Table 1: Direct Effects of Subsidies on Exports

	Exports$_{j,T}$		
	Untransformed	*Log*	*IHS*
	(1)	(2)	(3)
Direct subsidy exposure$_{j,T}$	397.4***	0.096***	0.406***
	(43.36)	(0.032)	(0.055)
Industry FE	YES	YES	YES
Term FE	YES	YES	YES
Standardized coeff.	0.74	0.11	1.07
Obs.	2,275	438	2,275
KP F-statistic	138.1	69.00	89.29

Notes: 2SLS estimates (second stage) of the direct effect of subsidies on exports (see Equation (11)). I report three specifications: untransformed, logarithmic scales, and IHS transformation of the dependent and independent variables. I winsorize variables in the untransformed model to handle outliers (see Figure B.5), but these results are robust without this adjustment. The dependent variable, Exports$_{j,T}$, is the average export value in tradable industry j in presidential term T. The sample includes five presidential terms, from 2000 to 2019. The subsidy variable captures direct exposure to subsidies, as measured by Equations (1) and instrumented using the corresponding IV variable. Industry-level fixed effects are defined at the 4-digit NAICS level of aggregation. I cluster standard errors at the 2-digit NAICS level. Significance codes: $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$.

downstream to industry j, excluding industry j. I define this variable using the sales shares computed from the BEA I-O direct requirements tables ($\theta_{i,j}$), excluding the diagonal of the I-O matrix. The instrument, Upstream IV$^{Swing}_{j,T}$, is defined in Equation (7). δ_T and δ_j are term and 4-digit industry-level fixed effects to account for time-invariant and industry-specific characteristics that may influence the level of subsidies within an industry or term. With these fixed effects, the regression coefficient is driven by the variation in subsidies within a term T and within a 4-digit industry j. I cluster standard errors at the downstream industry level (defined at the 2-digit NAICS) to account for heteroskedasticity across industries. In Table 2, I present the second stage 2SLS coefficients from estimating Equations (12) and (13). Similar to the direct effects, I report results for three specifications: untransformed variables, logarithmic scales, and the IHS transformation.

The positive effects of politically motivated federal subsidies on exports propagate along supply chains, benefiting both upstream producers and downstream users of subsidized goods and services. The finding is especially interesting as many US subsidies are directed towards non-tradable industries (see Table B.3). Columns (1)-(3) present the second-stage 2SLS coefficients, for different specifications of Equation (12). When including industry and time-fixed effects, a 1 standard deviation increase in subsidies granted to the suppliers of industry j results in a 0.11 standard deviation increase in its exports. The effect is similar when applying the IHS transformation to the data (see Column (3)). When considering the intensive margin alone (see Column (2)), instead, a 1% change in the level of subsidies granted to the suppliers of industry j boosts the industry exports by 0.52%[22]. The magnitude of these coefficients is similar to those of the corresponding OLS model (see Table C.4). Compared to the direct effects of subsidies on exports, the elasticity of exports to downstream subsidy exposure is smaller.

The effects of subsidies also propagate upstream, albeit to a smaller extent. Supplying to subsidized suppliers has positive spillover effects on the exports of upstream industries. A 1 standard deviation increase in subsidies granted to the suppliers of industry j causes a 0.02 standard deviation increase in exports at the intensive and extensive (see Column (4)). I find a non-significant effect at the intensive margin alone (see Column (5)).[23]

Table 2: Indirect Effects of Subsidies on Exports

	Exports$_{j,T}$					
	Untransformed (1)	*Log* (2)	*IHS* (3)	*Untransformed* (4)	*Log* (5)	*IHS* (6)
Downstream subsidy exposure$_{j,T}$	25.37***	0.520***	0.473***			
	(2.264)	(0.088)	(0.079)			
Upstream subsidy exposure$_{j,T}$				22.80***	0.047	0.119***
				(4.14)	(0.052)	(0.038)
Industry FE	YES	YES	YES	YES	YES	YES
Term FE	YES	YES	YES	YES	YES	YES
Standardized coeff.	0.11	0.42	0.32	0.02	0.06	0.18
Obs.	2,280	2,273	2,280	2,280	2,213	2,280
KP F-statistic	213.2	2,374	1,124	13,238	2755	13519

Notes: 2SLS estimates of the indirect effect of subsidies on exports (second stage). Columns (1)-(3) display the coefficients from estimating Equation (12). Columns (1)-(3) display the coefficients from estimating Equation (13). I report three specifications: untransformed, logarithmic scales, and IHS transformation of the dependent and independent variables. I winsorize variables in the untransformed model to handle outliers (see Figure B.5),but these results are robust without this adjustment. The dependent variable, Exports$_{j,T}$, is the total export value in tradable industry j, averaged over term T. Downstream subsidy exposure$_{j,T}$ measures the average subsidies allocated to each industry i (tradable and non-tradable) that supplies industry j. Upstream subsidy exposure$_{j,T}$ measures the average subsidies allocated to each industry i (tradable and non-tradable) that buys from industry j. I define these variables using the cost and sales shares from the BEA I-O tables, excluding the diagonal of the matrix and considering only first-order linkages. Industry-level fixed effects are defined at the 4-digit NAICS level of aggregation. The sample includes five presidential terms, from 2000 to 2019. I cluster standard errors at the 2-digit NAICS level. Significance codes: $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$.

[22]However, in the case of indirect linkages the intensive margin is less informative as only a few industries have zero indirect exposure to subsidies.

[23]However, when including higher-order linkages from the Inverted Leontief Matrix in the definition of Upstream subsidy exposure$_{j,T}$, all three specifications show positive and significant results (see Table E.3).

5.2 Robustness Checks

The results on the direct and indirect effects of subsidies on exports, presented in Tables 1 and 2, respectively, are corroborated by a battery of robustness checks.

Identification The first set of robustness checks is related to the IV^{Swing}. In Table E.1, I address concerns about the exclusion restriction of the instrument by controlling for trade protection in subsidized industries. This robustness check accounts for the possibility that trade protection, which might affect exports through reduced import competition, may also be skewed towards swing states (Bown et al., 2023). I define Trade protection$_{j,T}$ as the average anti-dumping duty across all 6-digit HS products within a 6-digit NAICS industry j in term T. Accordingly, Downstream trade protection exposure$_{j,t}$ is the weighted average of the duties imposed to each industry i that is upstream to industry j during term T. Upstream trade protection exposure$_{j,t}$ is the weighted average of the duties imposed to each industry i that is upstream to industry j during term T. To construct these variables, I use direct coefficients from the BEA I-O tables and I exclude the diagonal of the I-O matrix. When controlling for trade protection, the direct and indirect impacts of subsidies on exports are similar to the coefficients of the baseline specification.

In a second robustness check related to the identification strategy, I exclusively consider executive first terms in states where presidential reelection is possible as the criterion for defining swing states (see Table E.2). In particular, I exclude the second election of Obama (2012) and the second election of Bush (2004). This choice stems from the underlying idea that incumbent presidents may be less inclined to provide subsidies when they are ineligible for reelection. I show that, even when focusing on the first terms only, the results remain positive and significant.[24]

Intra-industry linkages The second set of robustness checks refers to the I-O coefficients (see Table E.3). I prove that results are robust to the inclusion of the diagonal of the I-O matrix in the construction of the Downstream subsidy exposure$_{j,T}$ (see Columns (1)-(6)). Including the diagonal of the I-O matrix implies that Downstream subsidy exposure$_{j,T}$ also entails subsidies granted to suppliers that belong to the same 6-digit NAICS industry as j. Consequently, this approach does not distinguish between indirect and direct subsidy exposure, since the latter

[24] Due to the limited number of Presidents between 2000 and 2019, there is insufficient variation to conduct an analysis exclusively on the second terms. However, in such cases, I would expect the instrument to be not relevant in predicting subsidies, as politicians typically lack incentives to allocate political subsidies during their second terms.

would be part of the former. The indirect effects of subsidies are larger than in the baseline specification, as downstream and upstream subsidy exposure now also incorporate direct exposure. The results are also robust to the use of total requirements from the inverted Leontief matrix in the construction of cost ($w_{i,j}$) and sales ($\theta_{i,j}$) shares, which then incorporate higher-order I-O linkages (see Columns (7)-(12)). The coefficients show a minor increase when considering higher-order linkages. The comparison underscores the predominant role of first-tier linkages and indicates that the effects primarily stem from subsidies directed to suppliers or buyers.

6 Additional Results

Having documented the positive direct and indirect effects of subsidies on exports, Section 6 explores some additional dimensions of their impact. Section 6.1 presents the results on the direct and indirect effects of subsidies on employment. Section 6.2 delves into the mechanisms through which subsidies are passed-through along the supply chain.

6.1 Direct and Indirect Effects of Subsidies on Employment

To assess the direct and indirect effects of politically motivated subsidies on employment, I employ a 2SLS model and estimate the following equations:

$$Employment_{j,T} = \alpha + \beta \ Direct\ subsidy\ exposure_{j,T} + \delta_j + \delta_T + \epsilon_{j,T}, \tag{14}$$

$$Employment_{j,T} = \alpha + \beta \ Downstream\ subsidy\ exposure_{j,T} + \delta_j + \delta_T + \epsilon_{j,T}, \tag{15}$$

$$Employment_{j,T} = \alpha + \beta \ Upstream\ subsidy\ exposure_{j,T} + \delta_j + \delta_T + \epsilon_{j,T}. \tag{16}$$

The dependent variable, $\text{Employment}_{j,T}$, is the total employment in the tradable industry j, averaged over term T. Direct subsidy $\text{exposure}_{j,T}$ is the total USD value of subsidies granted to industry j, averaged over term T. Downstream subsidy $\text{exposure}_{j,T}$ captures total subsidies granted to each industry i (both tradable and non-tradable industries) that is upstream to industry j. Upstream subsidy $\text{exposure}_{j,t}$ captures total subsidies granted to each industry i that is downstream to industry j. I define these variables using the BEA I-O tables for the sample of both tradable and non-tradable industries, with only direct linkages and without the diagonal of the matrix. δ_j and δ_T are industry and term-fixed effects, respectively, to control for industry-invariant and term-invariant unobservable characteristics. With these fixed effects, the regression coefficients are driven by the variation in subsidies within a term and a 4-digit industry.

The increase in exports in subsidized industries is accompanied by an increase in employment (see Table 3). The direct impact of subsidies on employment is statistically significant and considerable. At the extensive and intensive margin together, β is equal to 0.76 in the specification with industry and time-fixed effects and IHS-transformed variables (see Column (3)). At the intensive margin alone, a 1% increase in subsidies generates a 1.59% increase in jobs (see Column (2)).

Similarly to the results on exports, the effects of politically motivated subsidies on employment propagate upward and downward along the supply chain (see Table 4). In a model with fixed effects and log-transformed variables, the elasticity of employment to downstream subsidy exposure capturing the intensive margin alone is 0.62 (see Column (2)), almost 20% higher than the corresponding export elasticity. The impact at the extensive and intensive margin is comparable (see Column (3)). Upstream exposure to subsidies has a more modest effect on employment, with an elasticity of 0.12 at both the extensive and intensive margins, and an elasticity of 0.05 at the intensive margin alone (see Column (5)).

Table 3: Direct Effects of Subsidies on Employment

	Employment$_{j,T}$		
	Untransformed	*Log*	*IHS*
	(1)	(2)	(3)
Direct subsidy exposure$_{j,T}$	0.018***	1.594***	0.760***
	(0.002)	(0.047)	(0.078)
Industry FE	YES	YES	YES
Term FE	YES	YES	YES
Standardized coeff.	3.76	2.74	3.37
Obs.	2,275	440	2,275
KP F-statistic	138.1	68.95	89.29

Notes: 2SLS estimates (second stage) of the direct effect of subsidies on employment (see Equation (14)). I report three specifications: untransformed, logarithmic scales, and IHS transformation of the dependent and independent variables. I winsorize variables in the untransformed model to handle outliers (see Figure B.5),but these results are robust without this adjustment. The dependent variable, Employment$_{j,T}$, is total employment in tradable industry j, averaged over term T. Industry fixed effects are defined at the 4-digit NAICS level of aggregation. I cluster standard errors at the 2-digit NAICS level. Significance codes: $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$.

Table 4: Effects of Subsidies on Employment Along supply chains

	Employment$_{j,T}$					
	Untransformed (1)	*Log* (2)	*IHS* (3)	*Untransformed* (4)	*Log* (5)	*IHS* (6)
Downstream subsidy exposure$_{j,T}$	0.001***	0.625***	0.638***			
	(0.0001)	(0.041)	(0.034)			
Upstream subsidy exposure$_{j,T}$				0.003***	0.150***	0.209***
				(0.0006)	(0.021)	(0.018)
Industry FE	YES	YES	YES	YES	YES	YES
Term FE	YES	YES	YES	YES	YES	YES
Standardized coeff.	0.36	0.72	0.74	0.24	0.28	0.53
Obs.	2,275	440	2,275	2,275	2,275	2,275
KP F-statistic	213.9	2,231	1,127	13,266	2,628	13,523

Notes: 2SLS coefficients (second stage) from estimating Equation (12) (see Columns (1)-(3)) and Equation (13) (see Columns (4)-(6)). I report three specifications: untransformed, logarithmic scales, and IHS transformation of the dependent and independent variables. I winsorize variables in the untransformed model to handle outliers (see Figure B.5),but these results are robust without this adjustment. The dependent variable, The dependent variable, Employment$_{j,T}$, is total employment in tradable industry j, averaged over term T. Downstream subsidy exposure$_{j,T}$ captures subsidies to the suppliers of industry j. Upstream subsidy exposure$_{j,T}$ captures subsidies to the buyers of industry j. I define these variables using BEA I-O tables, considering only the first tier and excluding the diagonal. The sample includes five presidential terms, from 2000 to 2019. Industry-level fixed effects are defined at the 4-digit NAICS level of aggregation. I cluster standard errors at the 2-digit NAICS level. Significance codes: $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$.

6.2 Mechanisms

Two main types of mechanisms, which are not exclusive, can explain the positive direct and indirect effects of subsidy exposure on trade and employment.

On the one hand, subsidies can lead to lower marginal costs of production for the beneficiary industries. I label these subsidies as "marginal-cost reducing" subsidies. When these cost reductions are passed through downstream, they can result in cheaper inputs for downstream industries, enhancing their competitiveness in the domestic and foreign markets. For example, subsidizing the steel industry may lead to reduced car prices and increased exports. Moreover, by lowering marginal costs, subsidies increase production and scale in subsidized industries, thereby increasing the demand for inputs. This, in turn, extends benefits to upstream industries as well. With increasing returns to scale, higher local production can lead to lower marginal costs in export markets, improving overall export performance.

On the other hand, subsidies can reduce the investment and financing costs of the beneficiary industries, even if they don't directly affect marginal costs. I label these subsidies as "investment promoting" subsidies. Subsidy programs that lower financing costs and encourage fixed-scale investments boost production in recipient industries. This, in turn, can lead to product scale expansion, improved quality, and innovation, benefiting vertically-related industries both upstream and downstream (Møllgaard, 2005). For example, subsidies aimed at fostering innovation in clean energy efficiency[25] often require awardees to commercialize their inventions, having effects on downstream industries that would use these innovate inputs. As a second example, R&D subsidies can lead to the production of higher-quality outputs and increased demand for higher-quality inputs, having indirect effects upstream. Quality enhancements and efficiency improvements resulting from these investments can be transmitted along the supply chain, ultimately benefiting related industries within the supply chain. Consequently, the effects related to scale and quality can ripple through supply chains in both directions.

Indirect subsidies in the SCMA In the SCMA, indirect harm from subsidies is mentioned as a potential reason for imposing CVD on the imports of (indirectly) subsidized products. More specifically, the SCMA mentions that "the term countervailing duty shall be understood to mean a special duty levied for the purpose of offsetting any subsidy bestowed directly or indirectly upon the manufacture, production or export of any merchandise, as provided for in paragraph 3 of Article VI of GATT 1994" (footnote 36, pg. 241, SCMA). Yet, the Agreement lacks clear guidance on substantiating subsidy pass-through (Shadikhodjaev, 2012).

In the existing jurisprudence, the traditional approach to indirect harm from subsidies has primarily revolved around the establishment of "price suppression."[26] First, the case law stemming from the Lead Bismuth cases (DS138) determined that indirect harm could be established as long as pass-through could be demonstrated. Through various cases, panel and appellate body decisions, the proof of pass-through has then been primarily focused on the transmission of benefits to downstream industries.[27] To prove the pass-through of subsidies downstream in arm-length relationships, the complaining country was asked to ascertain the actual extent to which the input subsidy resulted in a cost advantage for the downstream producer. For example, in the US-Canada Pork GATT case, the panel ruled that the United States could have imposed CVDs on Canadian pork only by proving that Canadian swine subsidies caused below-market swine prices for pork producers.

The lack of clear guidance on how to price indirect harm from subsidies has posed difficul-

[25] An example is the "National Industrial Competitiveness Through Energy, Environment, and Economics" by the U.S. Department of Energy and the U.S. Environmental Protection Agency.

[26] A legal interpretation of this term in relation to the pass-through term is provided in Panel Report, US–Upland Cotton, para. 7.1279.

[27] Or to the persistence of subsidies to state-owned firms after privatization, as in the Lead Bismuth case.

ties to member states in proving indirect harm from subsidies, primarily stemming from their inability to substantiate the concept of pass-through. For example, in the United States – Softwood Lumber III case (DS236), the Appellate Body concluded that the investigating authority must calculate the precise amount (part) of the subsidy transmitted. However, in the US-Brazil Upland Cotton case (DS267), the Appellate Body considered this analysis not critical.

Prices Following the existing case law, I first study whether the positive indirect effects of subsidy exposure on trade and employment are driven by price suppression. I examine two distinct but related questions: whether subsidies affect industry prices and whether downstream exposure to subsidies affects input prices.

$$PPI_{j,T} = \alpha + \beta \; Direct\ subsidy\ exposure_{j,T} + \delta_j + \delta_T + \epsilon_{j,T}, \tag{17}$$

$$Input\ price_{j,T} = \alpha + \beta \; Downstream\ subsidy\ exposure_{j,T} + \delta_j + \delta_T + \epsilon_{j,T}. \tag{18}$$

The dependent variable, $\text{PPI}_{j,T}$, is the average Producer Price Index (PPI) in tradable industry j during term T.[28] Direct subsidy $\text{exposure}_{j,T}$ is the average USD value of subsidies granted to industry j in term T. Downstream subsidy $\text{exposure}_{j,T}$ captures total subsidies granted in year t to industry i (both tradable and non-tradable industries) that are upstream to industry j, excluding industry j. I define this variable using the cost shares from the BEA I-O tables' direct requirements ($w_{i,j}$) and excluding the diagonal of the I-O matrix. δ_j and δ_T are industry and term-fixed effects, respectively, to control for industry-invariant and term-invariant unobservable characteristics. With these fixed effects, the regression coefficient is driven by the variation in subsidies within a term T and within a 4-digit industry j. Table 5 reports 2SLS coefficients from estimating Equations (17) and (18). Subsidies increase PPI in the recipient industries, which, in turn, results in an increase in input prices. Therefore, in the case of US federal subsidies, subsidies do not translate into reduced prices of inputs.

Investment and value added The effects of subsidies might propagate along supply chains even in the absence of price suppression. In an analysis of the US–Lead and Bismuth II case, Grossman and Mavroidis (2003) highlight that "non-recurring" subsidies[29] aim to support fixed-scale investments and can have complex effects within industries, with effects on competition, investment size, and market entry that can potentially affect trade dynamics. As a second

[28] The focus on tradable industries enables straightforward comparisons with the results on exports.

[29] The difference between "recurring" and "non-recurring" subsidies relates to the nature and duration of the policy. "Non-recurring" subsidies involve initiatives like research and development for new product design or the construction of manufacturing facilities operating at their most efficient scale.

Table 5: Effects of Subsidies on Prices

	$\text{PPI}_{j,T}$			Input $\text{prices}_{j,T}$		
	Untransformed	*Log*	*IHS*	*Untransformed*	*Log*	*IHS*
	(1)	(2)	(3)	(4)	(5)	(6)
Direct subsidy $\text{exposure}_{j,T}$	3.94e-07***	0.022*	0.004***			
	(1.76e-08)	(0.012)	(0.0004)			
Downstream subsidy $\text{exposure}_{j,T}$				7.34e-06***	0.968***	0.950***
				(4.06e-07)	(0.008)	(0.005)
Industry FE	YES	YES	YES	YES	YES	YES
Term FE	YES	YES	YES	YES	YES	YES
Obs.	1,210	293	1,210	2,280	2,280	2,280
KP F-statistic	15,479	205.7	140.7	13,238	2,231	1,124

Notes: 2SLS coefficients, second-stage. Columns (1)-(3) estimate the direct effects of subsidies on PPI. The dependent variable, $\text{PPI}_{j,T}$, is the average producer price index in tradable industry j in term T. Columns (4)-(6) estimate the indirect effects of downstream subsidy exposure on input prices. The dependent variable, Input $\text{prices}_{j,T}$, is the average producer price index of inputs used by the tradable 6-digit NAICS industry j in term T. I report three specifications: untransformed, logarithmic scales, and IHS transformation of the dependent and independent variables. The subsidy variables capture direct and downstream exposure to subsidies. I winsorize variables in the untransformed model to handle outliers (see Figure B.5),but these results are robust without this adjustment. The sample includes five presidential terms, from 2000 to 2019. Industry-level fixed effects are defined at the 4-digit NAICS level of aggregation. I cluster standard errors at the 2-digit NAICS level. Significance codes: $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$.

strategy to explore the mechanisms through which subsidies affect exports and employment, I examine their effects on investment, value-added, and productivity (to proxy the quality of domestic products, which is not directly observable). I exclusively focus on the direct effects, recognizing that these can inherently translate into enhanced input or output quality, as the latter is unobservable. I estimate the following equations with a 2SLS model:

$$Investment_{j,T} = \alpha + \beta \ Direct\ subsidy\ exposure_{j,T} + \delta_j + \delta_T + \epsilon_{j,T}, \tag{19}$$

$$Value\ added_{j,T} = \alpha + \beta \ Direct\ subsidy\ exposure_{j,T} + \delta_j + \delta_T + \epsilon_{j,T}, \tag{20}$$

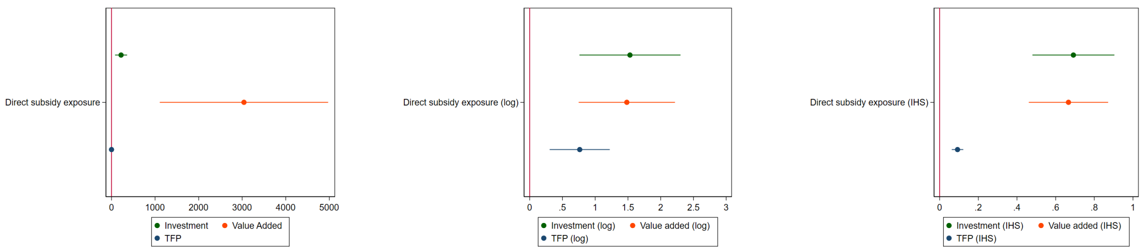
$$TFP_{j,T} = \alpha + \beta \ Direct\ subsidy\ exposure_{j,T} + \delta_j + \delta_T + \epsilon_{j,T}. \tag{21}$$

The dependent variable in Equation (19), $\text{Investment}_{j,T}$, represents the total capital expenditure in tradable manufacturing industry j, averaged over term T. The dependent variable in Equation (20), Value $\text{added}_{j,T}$, represents the total value-added in tradable manufacturing industry j, averaged over term T. The dependent variable in Equation (21), $\text{TFP}_{j,T}$, represents the 4-factor productivity index in tradable manufacturing industry j, averaged over term T. Direct subsidy $\text{exposure}_{j,T}$ is the average USD value of subsidies granted to industry j in term T. δ_j and δ_T are industry and term-fixed effects, respectively, to control for industry-invariant and term-invariant unobservable characteristics. With these fixed effects, the regression coefficient is driven by the variation in subsidies within a term T and within a 4-digit industry j.

Politically motivated subsidies increase investment, value-added, and productivity in the recipient industries (see Figure 5 and Table 6). These positive and significant effects also hold among non-tradable industries (see Table E.4), whose subsidisation might affect exporters through supply chain effects. These results suggest that the positive effects of subsidies along supply chains are driven by investment-promoting subsidies (e.g., subsidies for the adoption of new technologies, R&D tax credits, and investment funding). When analyzing the program characteristics of US federal subsidies, "investment-promoting" subsidies are the vast majority of US federal programs (63%) implemented between 2000 and 2019. By contrast, marginal cost-reducing subsidies such as recurring subsidies conditional on quantity-produced or workers employed are only a minority (see Table 7 for some examples).

Figure 5: Direct Effects of Subsidies on Investment, Value Added, and TFP

(a) Untransformed variables ***(b)*** Logartihm transformation ***(c)*** IHS transformation



Notes: The coefplots display the 2SLS coefficients (second stage) and confidence intervals for the effect of Direct subsidy exposure$_{j,T}$ on Investment, Value Added$_{j,T}$, and TFP$_{j,T}$. I group the coefficients by specification: untransformed, logarithmic scales, and IHS transformation of the dependent and independent variables. I winsorize variables in the untransformed model to handle outliers (see Figure B.5), but these results are robust without this adjustment. Industry-level fixed effects are defined at the 4-digit NAICS level of aggregation. Since the sample only includes manufacturing industries, robust standard errors are included (clustering the standard errors at the 2-digit NAICS codes, as in the other specifications, generates singleton clusters).

Table 6: Effects of Subsidies on Investment, Value Added, and TFP

	Investment$_{j,T}$			*Value added$_{j,T}$*			*TFP$_{j,T}$*		
	Untransformed	*Log*	*IHS*	*Untransformed*	*Log*	*IHS*	*Untransformed*	*Log*	*IHS*
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Direct subsidy exposure$_{j,T}$	270.8***	1.531***	0.692***	3,786***	1.483***	0.666***	9.13e-08***	0.764***	0.092***
	(79.28)	(0.394)	(0.108)	(1,147)	(0.375)	(0.105)	(2.76e-08)	(0.234)	(0.015)
Industry FE	YES	YES	YES	YES	YES	YES	YES	YES	YES
Term FE	YES	YES	YES	YES	YES	YES	YES	YES	YES
Obs.	1,668	338	1,668	1,668	338	1,668	1,668	338	1,668
KP F-statistic	9.347	11.33	25.20	9.347	11.33	25.20	9.347	11.33	25.20

Notes: 2SLS coefficients, second stage. Columns (1)-(3) estimate the direct effect of subsidies on investment. The dependent variable, Investment$_{j,T}$, is the total capital expenditure in tradable manufacturing 6-digit NAICS industry j averaged over the presidential term T. Columns (4)-(6) estimate the direct effects on value-added. The dependent variable, VA$_{j,T}$, is the total value-added in tradable manufacturing 6-digit NAICS industry j averaged over the presidential term T. Columns (7)-(9) estimate the direct effects on productivity. The dependent variable, TFP$_{j,T}$, is the index for total factor productivity in tradable manufacturing 6-digit NAICS industry j averaged over the presidential term T. I report three specifications: untransformed, logarithmic scales, and IHS transformation of the dependent and independent variables. I winsorize variables in the untransformed model to handle outliers (see Figure B.5),but these results are robust without this adjustment. The sample includes five presidential terms starting from 2000 to 2016 (since NBER data stops in 2018, I exclude the last term). The subsidy variables capture direct and indirect exposure to subsidies, as measured by Equations (1) and (2), respectively, and instrumented using the corresponding IV variables. Industry-level fixed effects are defined at the 4-digit NAICS level of aggregation. Since the sample only includes manufacturing industries, robust standard errors are included (clustering the standard errors at the 2-digit NAICS codes, as in the other specifications, generates singleton clusters). Significance codes: $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$.

Table 7: Classification of Subsidies Into Marginal Cost Reducing and Investment Promoting, Examples

Program	**Category**	**Description**
Bioenergy program for advanced biofuels	Marginal-cost reducing	Quarterly payments made for the actual quantity of eligible advanced biofuel produced during the quarter.
Oil recovery demonstration program	Marginal-cost reducing	Multi-year cost-shared enhanced oil-recovery contracts with the aim of increasing production.
Payments for essential air services	Marginal-cost reducing	Per passenger subsidy
Small Shipyards Grant Program	Investment promoting	Funding to make capital improvements to foster efficiency and quality ship construction and repair in small shipyards.
Advanced energy manufacturing tax credit (48cprogram)	Investment promoting	Tax credit for investments in advanced energy projects.
Biomedical Resource and Technology Development Grants	Investment promoting	For researchers who want to develop new technologies and tools (including informatics tools and software).

Note: Own-constructed classification based on the subsidy program description, as available in Subsidy Tracker or on federal agencies' websites.

7 Conclusions

The interplay between subsidies and trade is a salient topic in the current international policy debate. This paper provides novel causal evidence on the impact of politically motivated subsidies on the exports of recipient industries and vertically-related industries. To address concerns of endogeneity, this study employs an instrumental variable approach that lingers on a political source of exogenous variation between industries and swing states in the US.

In a regression of federal subsidies on exports, with industry and time fixed effects, I estimate that a 1% increase in subsidies results in a 0.74% increase in exports at the extensive and intensive margins, and 0.11% at the intensive margin alone. The positive effects of subsidies on exports propagate through supply chains both downstream and, to a lesser extent, upstream. Subsidies also lead to higher employment in subsidized industries and in industries connected to them through I-O linkages. When investigating the mechanisms, contrary to the existing WTO case law, I find that the positive effects along supply chains stem from increased investments, value-added, and productivity, rather than price suppression.

This paper contributes to the industrial policy and international trade literature by providing novel causal evidence of the effectiveness of corporate subsidies in enhancing exports, both directly and through supply chain spillovers. Moreover, my analysis contributes to the ongoing policy debate about reforming multilateral trading rules on subsidies by spotlighting two primary concerns with the current framework. On the one hand, the paper sheds light on the need for strengthening transparency in subsidy reporting to the WTO. On the other hand, it emphasises the importance of considering the supply chain effects in trade-related questions and broadening the interpretation of pass-through effects. Traditionally, in SCMA-related disputes, countries have focused on the price suppression channel to prove indirect harm from subsidies. However, this paper suggests that the pass-through effects of subsidies can extend beyond prices, encompassing increased investments, value-added, and productivity. This broader impact calls for an approach that accommodates various mechanisms in accordance with different types of subsidy policies.

References

Acemoglu, D., Johnson, S., & Mitton, T. (2009). Determinants of Vertical Integration: Financial Development and Contracting Costs. *Journal of Finance*, *64*(3), 1251–1290. https://EconPapers.repec.org/RePEc:bla:jfinan:v:64:y:2009:i:3:p:1251-1290 (cit. on pp. 8, 11, 53).

Aghion, P., Cai, J., Dewatripont, M., Du, L., Harrison, A., & Legros, P. (2015). Industrial Policy and Competition. *American Economic Journal: Macroeconomics*, *7*(4), 1–32. https://www.aeaweb.org/articles?id=10.1257/mac.20120103 (cit. on p. 4).

Aguiar, L., & Gagnepain, P. (2017). European Cooperative R&D and Firm Performance: Evidence Based on Funding Differences in Key Actions. *International Journal of Industrial Organization*, *53*(100), 1–31. https://ideas.repec.org/a/eee/indorg/v53y2017icp1-31.html (cit. on p. 4).

Alfaro, L., Antras, P., Chor., D., & Conconi, P. (2019). Internalizing Global Value Chains: A Firm-Level Analysis. *Journal of Political Economy*, *127*(2), 508–559. https://www.nber.org/papers/w21582 (cit. on p. 8).

Autor, D. H., Dorn, D., & Hanson, G. H. (2013). The China Syndrome: Local Labor Market Effects of Import Competition in the United States. *American Economic Review*, *103*(6), 2121–68. https://www.aeaweb.org/articles?id=10.1257/aer.103.6.2121 (cit. on pp. 7, 10, 11).

Bao, Q., Hou, J., Li, K., & Wang, X. (2017). The Impact of Tax Rebates on Export Performance: China's Textile Exports to the USA. *Asian-Pacific Economic Literature*, *31*(1), 79–89. https://EconPapers.repec.org/RePEc:bla:apacel:v:31:y:2017:i:1:p:79-89 (cit. on p. 4).

Barrot, J. N., & Sauvagnat, J. (2016). Input Specificity and the Propagation of Idiosyncratic Shocks in Production Networks. *The Quarterly Journal of Economics*, *131*(3), 1543–1592. https://dspace.mit.edu/handle/1721.1/111134 (cit. on p. 4).

Bartik, T. J. (1991). Who Benefits from State and Local Economic Development Policies? *WE Upjohn Institute for Employment Research*. https://www.jstor.org/stable/j.ctvh4zh1q (cit. on pp. 10, 13).

BEA. (2002). Supplementary make, use and direct requirements tables at the detailed level. *Bureau of Economic Analysis*. https://www.bea.gov/industry/benchmark-input-output-data (cit. on p. 8).

Beason, R., & Weinstein, D. (1996). Growth, Economies of Scale, and Targeting in Japan (1955-1990). *The Review of Economics and Statistics*, *78*(2), 286–95. https://EconPapers.repec.org/RePEc:tpr:restat:v:78:y:1996:i:2:p:286-95 (cit. on p. 4).

Becker, S., Egger, P., & Von Ehrlich, M. (2010). Going NUTS: The Effect of EU Structural Funds on Regional Performance. *Journal of Public Economics*, *94*(9-10), 578–590. https://EconPapers.repec.org/RePEc:eee:pubeco:v:94:y:2010:i:9-10:p:578-590 (cit. on p. 4).

Bernard, A., & Jensen, J. B. (2004). Why Some Firms Export. *The Review of Economics and Statistics*, *86*(2), 561–569. https://EconPapers.repec.org/RePEc:tpr:restat:v:86:y:2004:i:2:p:561-569 (cit. on p. 4).

Bernini, C., & Pellegrini, G. (2011). How are Growth and Productivity in Private Firms Affected by Public Subsidy? Evidence From a Regional Policy. *Regional Science and Urban Economics*, *41*(3), 253–265. https://www.sciencedirect.com/science/article/pii/S0166046211000111 (cit. on p. 4).

Blonigen, B. A. (2016). Industrial Policy and Downstream Export Performance. *The Economic Journal*, *126*(595), 1635–1659. https://onlinelibrary.wiley.com/doi/abs/10.1111/ecoj.12223 (cit. on p. 5).

Bown, C., Cieszkowsky, M., Erbahar, A., & Signoret, J. (2020). Temporary Trade Barriers Database. *Database* (cit. on p. 11).

Bown, C., Conconi, P., Erbahar, A., & Trimarchi, L. (2023). Politically Motivated Protection. *mimeo*, (15648). https://conconi.ulb.be/BCET.pdf (cit. on pp. 1, 2, 4, 5, 13, 14, 16, 22).

Broocks, A., & Van Biesebroeck, J. (2017). The Impact of Export Promotion on Export Market Entry. *Journal of International Economics*, *107*(100), 19–33. https://EconPapers.repec.org/RePEc:eee:inecon:v:107:y:2017:i:c:p:19-33 (cit. on p. 4).

Bulfone, F. (2023). Industrial Policy and Comparative Political Economy: A Literature Review and Research Agenda. *Competition & Change*, *27*(1), 22–43. https://doi.org/10.1177/10245294221076225 (cit. on p. 4).

Carvalho, V. M., Nirei, M., Saito, Y. U., & Tahbaz-Salehi, A. (2020). Supply Chain Disruptions: Evidence From the Great East Japan Earthquake. *The Quarterly Journal of Economics*, *136*(2), 1255–1321. https://doi.org/10.1093/qje/qjaa044 (cit. on p. 4).

Conconi, P., De Remer, D., Kirchsteiger, G., Trimarchi, L., & Zanardi, M. (2017). Suspiciously Timed Trade Disputes. *Journal of International Economics*, *105*(100), 57–76. https://EconPapers.repec.org/RePEc:eee:inecon:v:105:y:2017:i:c:p:57-76 (cit. on pp. 5, 14).

Cosbey, A., & Mavroidis, P. C. (2014). A Turquoise Mess: Green Subsidies, Blue Industrial Policy, and Renewable Energy: The Case for Redrafting the Subsidies Agreement of the WTO. *mimeo*. https://ideas.repec.org/p/rsc/rsceui/2014-17.html (cit. on p. 1).

Criscuolo, C., Martin, R., Overman, H. G., & Van Reenen, J. (2019). Some Causal Effects of an Industrial Policy. *American Economic Review*, *109*(1), 48–85. https://www.aeaweb.org/articles?id=10.1257/aer.20160034 (cit. on p. 4).

Defever, F., Reyes, J. D., Riaño, A., & Varela, G. (2020). The effectiveness of cash subsidies to export in nepal. *European Economic Review*, *128*(103494–103494), AFMD-93–58BR (cit. on p. 4).

Eckert, F., Fort, T. C., Schott, P. K., & Yang, N. J. (2021). *Imputing missing values in the us census bureau's county business patterns* (tech. rep.). National Bureau of Economic Research. (Cit. on p. 10).

Erbahar, A., & Zi, Y. (2017). Cascading trade protection: Evidence from the US. *Journal of International Economics*, *108*(100), 274–299. https://www.sciencedirect.com/science/article/abs/pii/S0022199617300727 (cit. on p. 4).

Evenett, S., & Fritz, J. (2021). [dataset] Subsidies and Market Access Towards an Inventory of Corporate Subsidies by China, the European Union, and the United States. *The 28th Global Trade Alert*. https://www.globaltradealert.org/reports/gta-28-report (cit. on pp. 6, 39).

Financial Times. (2023, July). *A global subsidy war? keeping up with the americans*. https://www.ft.com/content/4bc03d4b-6984-4b24-935d-6181253ee1e0 (cit. on p. 1).

Girma, S., H., G., & Stepanok, I. (2020). Subsidies, Spillovers, and Exports. *Kiel Centre for Globalization (KCG)*, *186*(20). http://hdl.handle.net/10419/206647 (cit. on p. 4).

Görg, H., Henry, M., & Strobl, E. (2008). Grant Support and Exporting Activity. *The Review of Economics and Statistics*, *90*(1), 168–174. https://econpapers.repec.org/RePEc:tpr:restat:v:90:y:2008:i:1:p:168-174 (cit. on p. 4).

Grossman, G., & Mavroidis, P. (2003). Us – lead and bismuth ii: United states – imposition of countervailing duties on certain hot-rolled lead and bismuth carbon steel products originating in the united kingdom: Here today, gone tomorrow? privatization and the injury caused by non-recurring subsidies. *World Trade Review*, *2*, 170–200. https://doi.org/10.1017/S1474745603001113 (cit. on pp. 3, 27).

IMF. (2022). Subsidies, trade, and international cooperation. *International Monetary Fund*. https://steg.cepr.org/publications/who-what-when-and-how-industrial-policy-text-based-approach (cit. on p. 1).

Lane, N. (2020). The New Empirics of Industrial Policy. *Journal of Industry, Competition, and Trade*, *20*(2), 209–234. https://ideas.repec.org/a/kap/jincot/v20y2020i2d10.1007_s10842-019-00323-2.html (cit. on pp. 4, 12).

Lee, J. W. (1996). Government Interventions and Productivity Growth. *Journal of Economic Growth*, *1*(3), 391–414. https://link-springer-com.ezproxy.ulb.ac.be/article/10.1007/BF00141045 (cit. on p. 4).

Liu, E. (2019). Industrial Policies in Production Networks. *The Quarterly Journal of Economics*, *134*(4), 1883–1948. https://doi.org/10.1093/qje/qjz024 (cit. on p. 4).

Manelici, I., & Pantea, S. (2021). Industrial policy at work: Evidence from Romania's income tax break for workers in IT. *European Economic Review*, *133*, 103674. https://www.sciencedirect.com/science/article/pii/S0014292121000271 (cit. on p. 4).

Mian, A., & Sufi, A. (2014). What Explains the 2007-2009 Drop in Employment? *Econometrica*, *82*(6), 2197–2223. https://onlinelibrary.wiley.com/doi/10.3982/ECTA10451 (cit. on pp. 10, 45).

Moerenhout, T. (2020). Trade Impacts of Fossil Fuel Subsidies. *World Trade Review*, *19*(S1), s1–s17. https://EconPapers.repec.org/RePEc:cup:wotrrv:v:19:y:2020:i:s1:p:s1-s17_1 (cit. on p. 5).

Møllgaard, P. (2005). Competitive effects of state aid in oligopoly. *mimeo*. http://www.fep.up.pt/conferences/earie2005/cd_rom/Session%5C%20VI/VI.H/Mollgaard.pdf (cit. on p. 26).

Munch, J., & Schaur, G. (2018). The Effect of Export Promotion on Firm-Level Performance. *American Economic Journal: Economic Policy*, *10*(1), 357–87. https://EconPapers.repec.org/RePEc:aea:aejpol:v:10:y:2018:i:1:p:357-87 (cit. on p. 4).

Muûls, M., & Petropoulou, D. (2013). A swing state theory of trade protection in the electoral college. *Canadian Journal of Economics*, *46*(2), 705–724. https://EconPapers.repec.org/RePEc:cje:issued:v:46:y:2013:i:2:p:705-724 (cit. on pp. 5, 14).

Pack, H. (2000). Industrial Policy: Growth Elixir or Poison? *World Bank Research Observer*, *15*(1), 47–67. https://ideas.repec.org/a/oup/wbrobs/v15y2000i1p47-67.html (cit. on p. 4).

Rotemberg, M. (2019). Equilibrium Effects of Firm Subsidies. *American Economic Review*, *109*(10), 3475–3513. https://www.aeaweb.org/articles?id=10.1257/aer.20171840 (cit. on p. 4).

Shadikhodjaev, S. (2012). How to Pass a Pass-Through Test: The Case of Input Subsidies. *Journal of International Economic Law*, *15*(2), 621–646. https://doi.org/10.1093/jiel/jgs026 (cit. on pp. 3, 26).

Slattery, C. (2023). Bidding for Firms: Subsidy Competition in the US. *forthcoming in Journal of Political Economy*. https://ssrn.com/abstract=3250356 (cit. on p. 6).

Slattery, C., & Zidar, O. (2020). Evaluating State and Local Business Incentives. *Journal of Economic Perspectives*, *34*(2), 90–118. https://EconPapers.repec.org/RePEc:aea:jecper:v:34:y:2020:i:2:p:90-118 (cit. on p. 6).

Stromberg, D. (2008). How the electoral college influences campaigns and policy: The probability of being florida. *American Economic Review*, *98*(3), 769–807. https://doi.org/10.1257/aer.98.3.769 (cit. on p. 5).

T., P., G., R., & G., T. (1997). Separation of Powers and Political Accountability. *Quarterly Journal of Economics*, *112*, 1163–1202 (cit. on p. 5).

T., P., & G., T. (2004). Constitutional Rules and Fiscal Policy Outcomes. *mimeo*, *94*, 25–45 (cit. on p. 5).

Politico. (2020). Potential Swing States Cash in With DOT's Latest Grant Round. https://www.politico.com/news/2020/09/17/potential-swing-states-cash-in-with-dots-latest-grant-round-417057 (cit. on p. 15).

Wolff, G., & Reinthaler, V. (2008). The Effectiveness of Subsidies Revisited: Accounting for Wage and Employment effects in Business R&D. *Research Policy*, *37*(8), 1403–1412. https://EconPapers.repec.org/RePEc:eee:respol:v:37:y:2008:i:8:p:1403-1412 (cit. on p. 4).

World Bank Group. (2023). Unfair advantage: Distortive subsidies and their effects on global trade. *Equitable Growth, Finance and Institutions Insight Washington*, *183314*. https://doi.org/http://documents.worldbank.org/curated/en/099062623130526530/P17047207d942a01e0b07a091ffe0c1e9ac (cit. on p. 1).

Appendices

A The SCMA and the Gap in Subsidy Notifications

In the context of globalization and international competition, discriminatory industrial policies can distort the allocation of resources and generate friction in international trade. Subsidies policies, which are globally widespread (see A.1), can undermine the "level playing field" in international markets by providing competitive advantages based on the support received. On the one hand, if government support is granted to exporting firms, subsidized firms would be favoured when competing in foreign markets. On the other hand, if subsidies are awarded to domestic firms in import-competing industries, foreign exporters could face "unfair local competition."

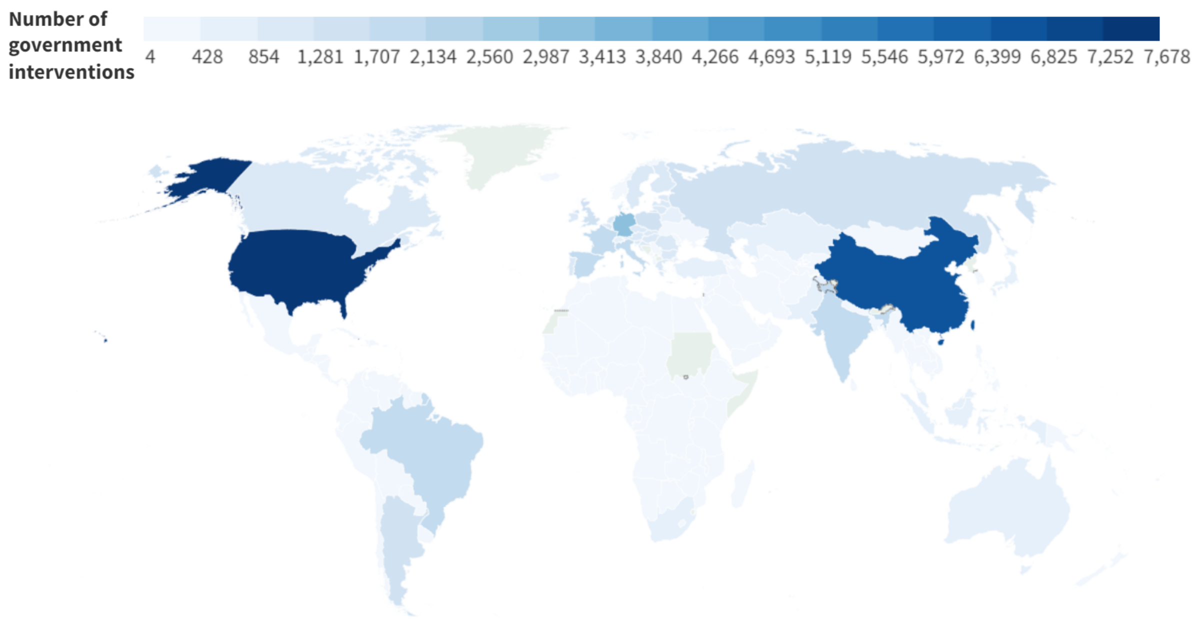
Subsidies are regulated at the multilateral level by the SCMA. The Agreement prohibits export subsidies and local content subsidies, while it requires member states to notify "specific subsidy", which are instead considered actionable (art 25.1, SCMA). In particular, Article 25.1 requires that all WTO Members submit a new and full notification of all specific subsidies every three years. The Agreement defines specific subsidies as financial contributions (see art. 1.1, SCMA) by any public body within the territory of a WTO Member which confers a benefit and can be deemed to be specific to an enterprise (i.e., enterprise-specificity), industry (i.e., industry-specificity), or specified parts of the territory (i.e., regional-specificity). Specific subsidies that cause adverse effects on another member can be offset by imposing CVD on the imports of subsidized products (see Figure A.2).[30]

The mechanisms and notification systems of the SCMA have been highly contested. The 17-year-old WTO Boeing case is only one example of a very long subsidy dispute that cost the airline company a fine of 244 mln USD and resulted in a trade war between the United States and the EU. Most notably, the SCMA does not apply to subsidies related to trade in services, subsidies related to the establishment and operation of undertakings abroad that do not entail any trade in goods, subsidies facilitating the acquisition of local undertakings, and subsidies for which no causal link can be proved with the injury to domestic industries. There have also been claims about the lack of transparency by member states in notifying subsidies.

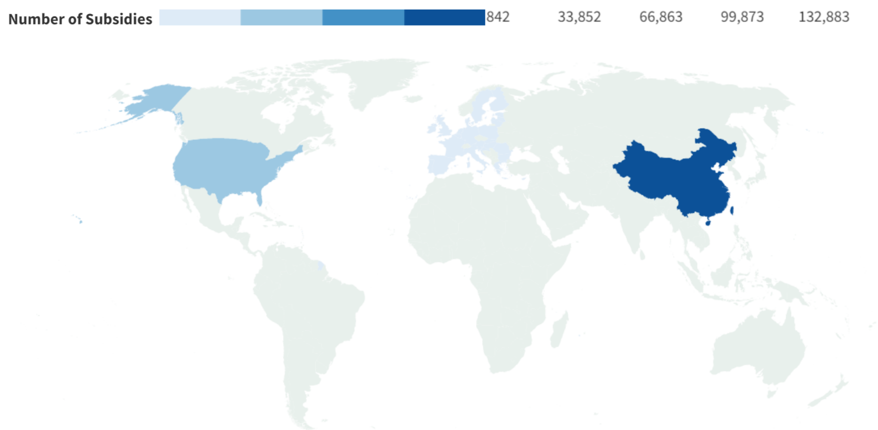
[30] The full text of the SCMA is available at here.

Figure A.1: Cross-Country Comparisons of Government Interventions

(a) Number of government interventions by awarding country in 2008-2019.

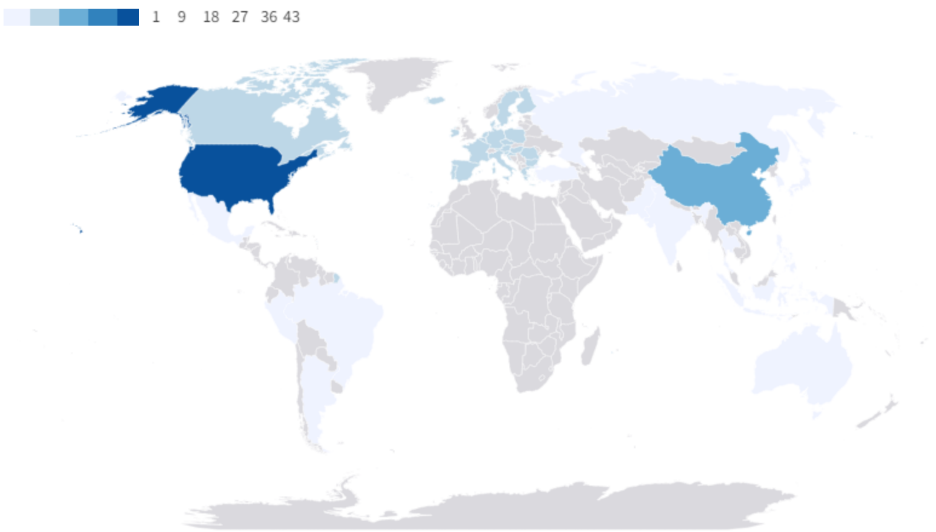


(b) Number of subsidies awarded by China, the EU, and the United States in 2008-2019.



Notes: US, China, Germany, India, the United Kingdom, France, and Italy award subsidies most frequently (Evenett & Fritz, 2021). For China, the US, and the EU, Evenett and Fritz (2021) provide a more specific measure of subsidy interventions at the extensive level.
Source: Own construction based on Evenett and Fritz (2021).

Figure A.2: Number of WTO Subsidy-Related Cases by Alleged Country



Source: Own construction based on the dispute settlement cases involving the SCMA, from the WTO.

Subsidy notifications to the WTO To verify the completeness of subsidy notifications to the WTO for the United States, I constructed a new dataset of US subsidy notifications to the WTO. First, I web-scraped information from the WTO SCMA Gateway website, through a text mining algorithm using Python. For each subsidy notification, I coded information on the subsidy program, awarding authority, year of notification, and type of subsidy. Figure A.3 displays an example of the information available on the WTO SCMA Gateway website for some US state-level subsidy notifications.[31] Secondly, I employed natural language processing techniques and a fuzzy matching algorithm to merge this data with the universe of US federal subsidy programs, based on similarity in the description of subsidy programs, type of subsidy and granting authority. I do not consider the year to account for possible administrative delays.

I shed light on a gap in US subsidy notifications to the WTO. Only around 30% of US subsidy programs are notified, the largest ones (Table A.1). The same is true for state subsidies, with 60% of programs being reported. To understand the reasons for this gap, I classify subsidies into *prohibited*, *specific*, and *non-specific* based on their program description. In fact, the notification requirement only applies to specific subsidies. I find that 1.3% of federal subsidies would be considered prohibited subsidies according to the SCMA, whereas almost 80% of them entail elements of specificity (see Figure A.4).

[31] Recently, this information has also been coded by the WTO and made available on their website.

Figure A.3: Example of Subsidy Notifications to the WTO

Attachment III (revised)
Notification of State-Level Measures

State	Programme Title	Programme Authority	Form of Subsidy	Policy Objective	To Whom	Amount
Alabama	Property Tax Abatement		Tax Exemption (state/county/ municipal property tax)	To encourage economic growth.	Manufactures of aluminum, aluminum products, or calcium cyanamide.	The maximum period of an abatement of non-educational property taxes is ten years.
Alabama	Poultry Environmental Enhancement Project	Agricultural Development Authority	Loans	To support environmental projects.	Poultry Industry	$750,000 environmental enhancement programme. Project provides low-interest loans for construction of poultry compost structures and installation of freezer units to be used for the disposal of dead birds.

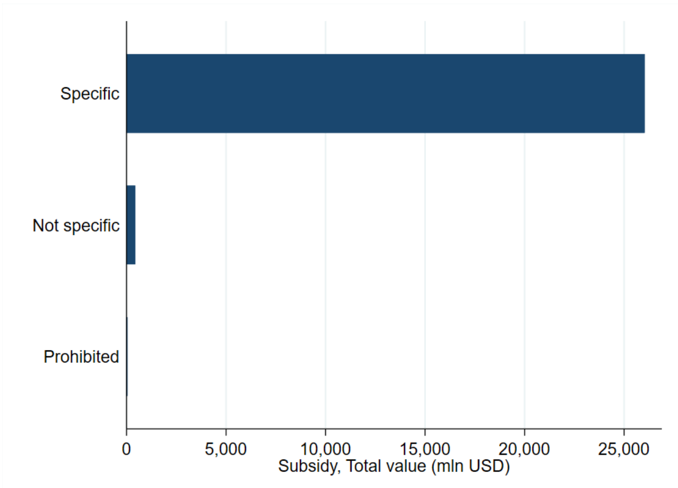
Source: Own data collection via web-scraping of the WTO SCMA Gateway website.

Table A.1: Subsidies and WTO Notifications: Summary Statistics, 2000-2019

Variables	Obs.	Mean (mln USD)	Std. Dev.	Min	Max
Notified subsidies	3,756	218	2,850	0	167,000
Non-notified subsidies	4,308	85.9	648	0	13,200

Note: Unit of observation: 4-digit NAICS.

Figure A.4: US Federal Subsidies According to the SCMA Taxonomy, 2000-2019



Notes: Own classification of US subsidies resulting from a text analysis of the descriptions of US federal subsidies in Subsidy Tracker.

B Data and Variables

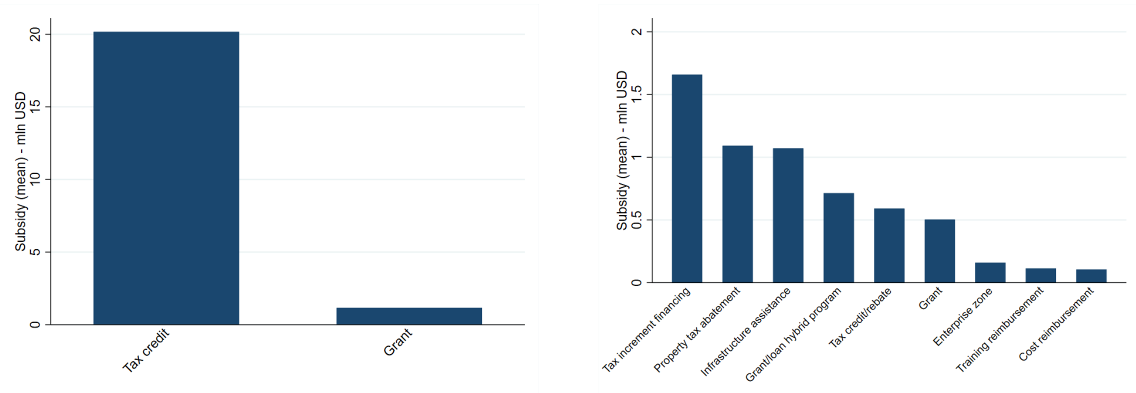
Table B.1: Federal Subsidies by Type

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 financing that needs to be repaid.
Federal insurance	E.g., Political risk insurance.
Federal tax-exempt bonds	E.g., Gulf Opportunity Zone bonds. Corporation.

Notes: Subsidy types of federal subsidies as classified by Subsidy Tracker. I exclude federal loans, loan guarantees, federal insurance, and bond financing from the analysis because the reported amounts represent the face value or principal, without indicating whether the loans have been repaid or if the government had to fulfil a loan guarantee.

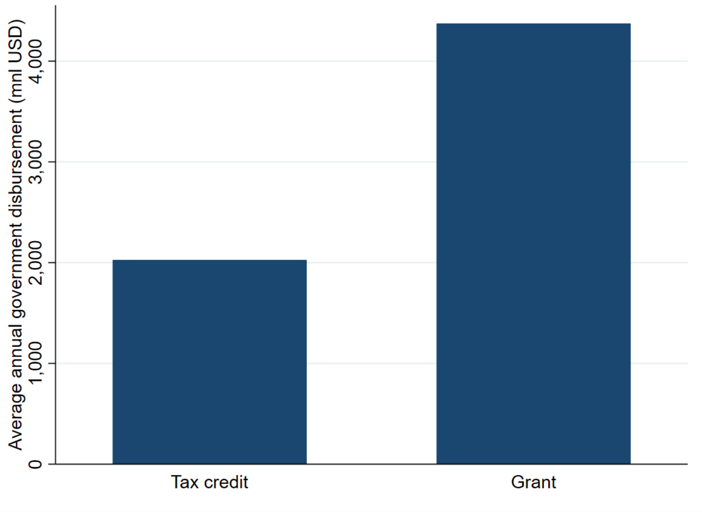
Figure B.1: Average Industry Subsidy, by Type and Granting Agency, 2000-2019

(a) Federal subsidies ***(b)*** State subsidies



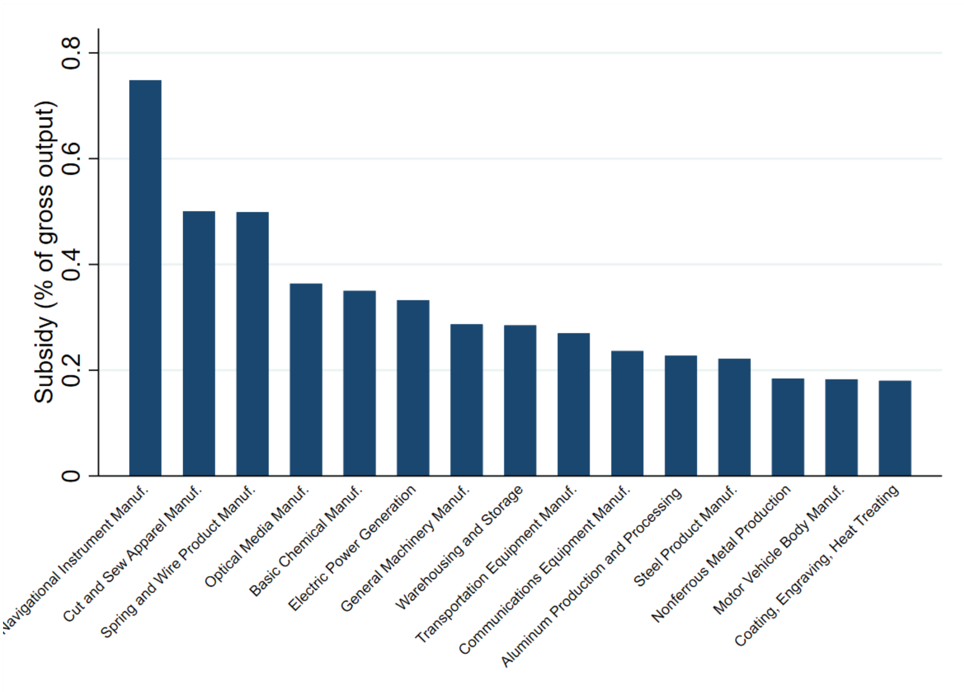
Notes: Industry-level subsidies are averaged by type and granting agency. State subsidies include subsidies granted by state and local authorities. Compared to federal subsidies, state subsidies exhibit greater heterogeneity in terms of their types. Period of analysis: 2000-2019.

Figure B.2: Total Federal Subsidies Granted in a Year by Type, Average, 2000-2019.



Note: Total subsidies granted in a year by type, average over the period 2000-2019.

Figure B.3: Top 15 Mayor Industries with the Highest Value of Subsidies over Output, Average, 2000-2019



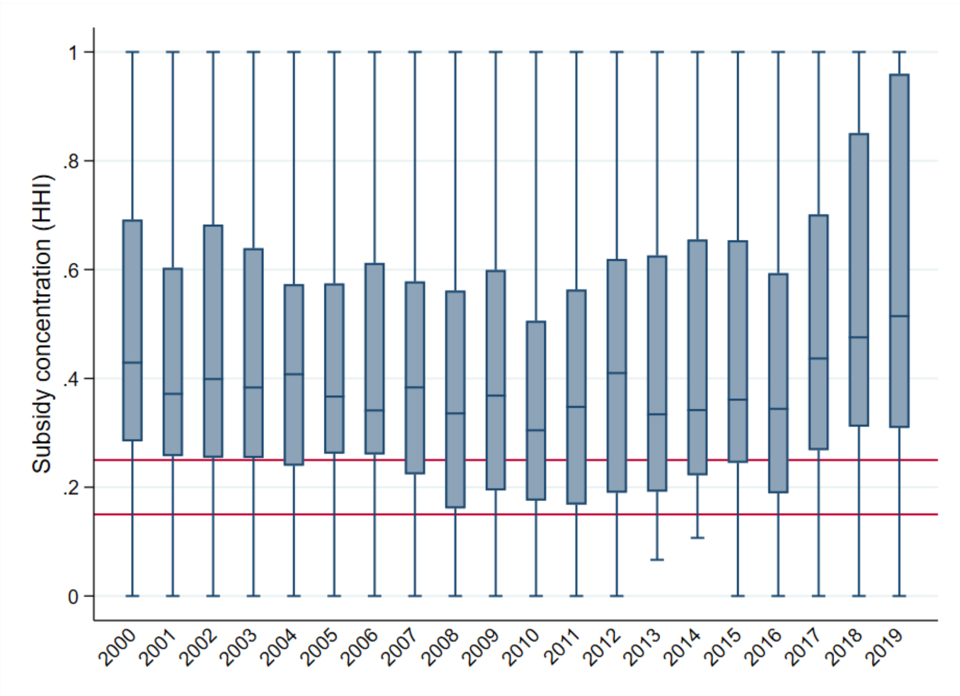
Note: Total annual subsidies as a share in gross output by 4-digit NAICS, averaged over the period from 2000 to 2019. Gross industry output, available only at the 4-digit NAICS level, is sourced from the United States Bureau of Labor Statistics (BLS).

Table B.2: Companies with the Highest Average Yearly Subsidies, 2000-2019

Company	Avg. subsidy per year (mln USD)
Wells Fargo Bank, NA	402.90
Summit Texas Clean Energy, LLC	404.60
SCS Energy California, LLC	334.50
Mojave Solar LLC	376.80
JPMorgan Chase subsidiaries	435.30
Bank of America N.A.	417.10
Arizona Solar One LLC	464.00
America Electric Power Service Corp.	492.50
American Energy Resources Company	589.70

Notes: Companies receiving the highest average yearly subsidies by the federal government and agencies, between 2000 and 2019.

Figure B.4: Subsidies' concentration within industries, 2000-2019



Notes: Subsidies' concentration as measured by the HHI for each 4-digit NAICS industry (the sample includes only recipient firms). The red bars represent the thresholds for highly concentrated (above 0.25) and moderately concentrated (above 0.15) industries, respectively. The average number of recipient firms in a 4-digit NAICS per given year is 21 firms.

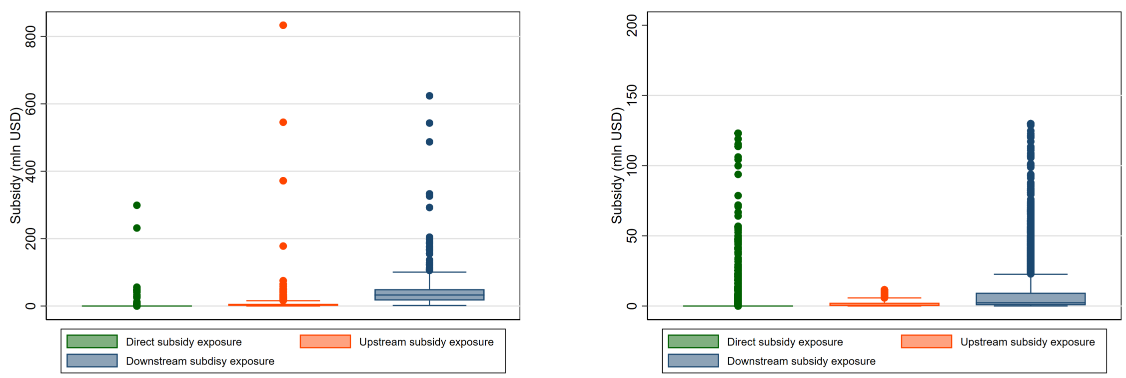
Table B.3: Descriptive Statistics for Subsidy Exposure, 2000-2019

Variable	Obs.	Mean (USD)	Std. Dev.	# 0s	% 0s
		All industries (1179)			
Direct subsidy exposure$_{j,t}$	21,360.00	2,584,655.00	32,800,000.00	17,931.00	83.95
Downstream subsidy exposure$_{j,t}$	21,360.00	1,328,865.00	6,569,044.00	80.00	0.37
Upstream subsidy exposure$_{j,t}$	21,360.00	3,721,750.00	30,400,000.00	563.00	2.64
		Tradable industries (456)			
Direct subsidy exposure$_{j,t}$	9,120.00	1,747,313.00	19,900,000.00	7,823.00	85.78
Downstream subsidy exposure$_{j,t}$	9,120.00	5,273,686.00	38,800,000.00	20.00	0.22
Upstream subsidy exposure$_{j,t}$	9,120.00	1,203,317.00	6,110,789.00	268.00	2.94
		Non-tradable industries (612)			
Direct subsidy exposure$_{j,t}$	12,240.00	3,208,557.00	39,700,000.00	10,108.00	82.58
Downstream subsidy exposure$_{j,t}$	12,240.00	1,422,410.00	6,889,463.00	60.00	0.49
Upstream subsidy exposure$_{j,t}$	12,240.00	2,565,405.00	22,100,000.00	295.00	2.41

Notes: The unit of observation is a 6-digit NAICS code (for tradable and non-tradable industries). Industries are defined according to the 6-digit NAICS codes included in the CBP dataset, using the 2002 nomenclature. Downstream subsidy exposure$_{j,t}$ captures total subsidies granted in year t to industries i_s (both tradable and non-tradable industries) that are upstream to industry j, excluding industry j. I define this variable using the cost shares from the BEA I-O tables' direct requirements ($w_{i,j}$) and excluding the diagonal of the I-O matrix. Non-tradable industries are industries that never export in the period considered. This definition is highly correlated (0.85) with that of Mian and Sufi (2014).

Figure B.5: Distribution of Subsidies, Boxplots, 2000-2019

(a) Non-winsorized variables ***(b)*** Winsorized variables



Notes: The boxplots display the distributions of Direct subsidy exposure$_{j,T}$, Upstream subsidy exposure$_{j,T}$, and Downstream subsidy exposure$_{j,T}$, with intervals indicating the 25th percentile (bottom line), the median (middle line), and the 75th percentile (top line) of the distributions. Panel (a) pictures non-transformed variables. Large subsidy packages can significantly influence the results and may appear as outliers in the data. For instance, in the case of upstream subsidy exposure, the NAICS code 212112 (coal industry) stands out. Its primary customer, the electricity sector, received a substantial 7.7 million USD in 2010, accounting for 64.7% of coal sales, well above the industry average. Panel (b) represents winsorized variables. The most conservative winsorization thresholds are applied, given the variables' distributions, namely 0.005 for Direct subsidy exposure$_{j,T}$ and Downstream subsidy exposure$_{j,T}$, and 0.05 for Downstream subsidy exposure$_{j,T}$, but results are robust to different thresholds. A 0.5 threshold means that winsorization will recode the bottom and the top 5 per cent of the cases to the values corresponding to the 5th and the 95th percentile, respectively.

C OLS Regressions

Table C.1: Subsidies and Exports, OLS estimates, Yearly Level

	Exports$_{j,t}$		
	Untransformed	*Log*	*IHS*
	(1)	(2)	(3)
Direct subsidy exposure$_{j,t}$	16.87***	0.0916***	0.0480***
	(2.077)	(0.00332)	(0.000815)
Industry FE	YES	YES	YES
Year FE	YES	YES	YES
Obs.	9,120	1,295	9,120
R^2	0.380	0.758	0.341

Notes: OLS coefficients from estimating the equation: $Exports_{j,t} = \alpha + \beta\ Direct\ subsidy\ exposure_{j,t} + \delta_j + \delta_t + \epsilon_{j,t}$. The dependent variable, Exports$_{j,t}$, is the total export of tradable industry j in year t. Direct subsidy exposure$_{j,t}$ is the total federal subsidies granted to industry j in year t. δ_j and δ_t are industry and time-fixed effects, respectively, to absorb industry-invariant and time-invariant unobservable characteristics. Industry fixed effects are defined at the 4-digit NAICS level. Standard errors are clustered at the 2-digit NAICS level. Significance codes: $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$.

Table C.2: Subsidies Along the Value Chains and Exports, OLS estimates, Yearly Level

	Exports$_{j,t}$					
	Direct effects			*Indirect effects*		
	Untransformed	*Log*	*IHS*	*Untransformed*	*Log*	*IHS*
	(1)	(2)	(3)	(4)	(5)	(6)
Downstream subsidy exposure$_{j,t}$	3.300***	0.397***	0.438***			
	(0.829)	(0.0190)	(0.111)			
Upstream subsidy exposure$_{j,t}$				11.78***	0.0404***	0.0463***
				(2.036)	(0.00880)	(0.00948)
Industry FE	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES
Obs.	9,120	9,075	9,120	9,120	8,807	9,120
R^2	0.376	0.465	0.465	0.382	0.446	0.335

Notes: Columns (1)-(3) report the OLS coefficients from estimating the equation: $Exports_{j,t} = \alpha + \beta\ Downstream\ subsidy\ exposure_{j,t} + \delta_j + \delta_t + \epsilon_{j,t}$. Columns (4)-(6) report OLS coefficients from estimating the equation: $Exports_{j,t} = \alpha + \beta\ Upstream\ subsidy\ exposure_{j,t} + \delta_j + \delta_t + \epsilon_{j,t}$. The dependent variable, Exports$_{j,t}$, is the total export of tradable industry j in year t. Downstream subsidy exposure$_{j,t}$ is the weighted average of subsidies granted to all the industries i (tradable and non-tradable) that supply industry j in year t (see Equation (3)). Upstream subsidy exposure$_{j,t}$ is the weighted average of subsidies granted to all the industries i (tradable and non-tradable) that are supplied by industry j in year t (see Equation (2)). These two variables are constructed using BEA I-O direct requirements and excluding the diagonal of the I-O tables. δ_j and δ_t are industry and time-fixed effects, respectively, to absorb industry-invariant and time-invariant unobservable characteristics. Industry fixed effects are defined at the 4-digit NAICS level. Standard errors are clustered at the 2-digit NAICS level. Significance codes: $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$.

Table C.3: Direct Subsidy Exposure and Exports, OLS estimates, Term Level

	Exports$_{j,T}$		
	Untransformed	*Log*	*IHS*
	(1)	(2)	(3)
Direct subsidy exposure$_{j,T}$	24.16***	0.121***	0.0390***
	(3.221)	(0.00359)	(0.0009)
Industry FE	YES	YES	YES
Term FE	YES	YES	YES
Obs.	2,280	439	2,280
R^2	0.4259	0.7399	0.3687

Notes: OLS coefficients from estimating the equation: $Exports_{j,T} = \alpha + \beta\ Direct\ subsidy\ exposure_{j,T} + \delta_j + \delta_T + \epsilon_{j,T}$. The dependent variable, Exports$_{j,T}$, is the average export of tradable industry j over term T. Direct subsidy exposure$_{j,T}$ is the average value of subsidies granted to industry j over term T. δ_j and δ_T are industry and time-fixed effects, respectively, to absorb industry-invariant and time-invariant unobservable characteristics. Five presidential terms from 2000 to 2019 are considered. Industry fixed effects are defined at the 4-digit NAICS level. Standard errors are clustered at the 2-digit NAICS level. Significance codes: $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$.

Table C.4: Indirect Subsidy Exposure and Exports, OLS estimates, Term Level

	Exports$_{j,T}$					
	Untransformed	*Log*	*IHS*	*Untransformed*	*Log*	*IHS*
	(1)	(2)	(3)	(4)	(5)	(6)
Downstream subsidy exposure$_{j,T}$	4.850**	0.450***	0.455***			
	(1.439)	(0.0553)	(0.108)			
Upstream subsidy exposure$_{j,T}$				17.75***	0.0507***	0.0504***
				(4.105)	(0.0108)	(0.00684)
Industry FE	YES	YES	YES	YES	YES	YES
Term FE	YES	YES	YES	YES	YES	YES
Obs.	2,280	2,273	2,280	2,280	2,213	2,280
R^2	0.4205	0.4624	0.3718	0.428	0.443	0.364

Notes: Columns (1)-(3) OLS coefficients from estimating the equation: $Exports_{j,T} = \alpha + \beta\ Downstream\ subsidies\ exposure_{j,T} + \delta_j + \delta_T + \epsilon_{j,T}$. Columns (4)-(6) OLS coefficients from estimating the equation: $Exports_{j,T} = \alpha + \beta\ Upstream\ subsidies\ exposure_{j,T} + \delta_j + \delta_T + \epsilon_{j,T}$. The dependent variable, Exports$_{j,T}$, is the average export of tradable industry j over term T. Downstream subsidy exposure$_{j,T}$ is the weighted average of subsidies granted to all the industries i (tradable and non-tradable) that supply industry j in term T (see Equation (2)). Upstream subsidy exposure$_{j,T}$ is the weighted average of subsidies granted to all the industries i (tradable and non-tradable) that are supplied by industry j in term T (see Equation (3)). δ_j and δ_T are industry and time-fixed effects, respectively, to absorb industry-invariant and time-invariant unobservable characteristics. Five presidential terms from 2000 to 2019 are considered. Industry fixed effects are defined at the 4-digit NAICS level. Standard errors are clustered at the 2-digit NAICS level. Significance codes: $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$.

D Swing Statistics and IV Assumptions

Figure D.1: US states' congressional delegation, electoral votes in 2000.

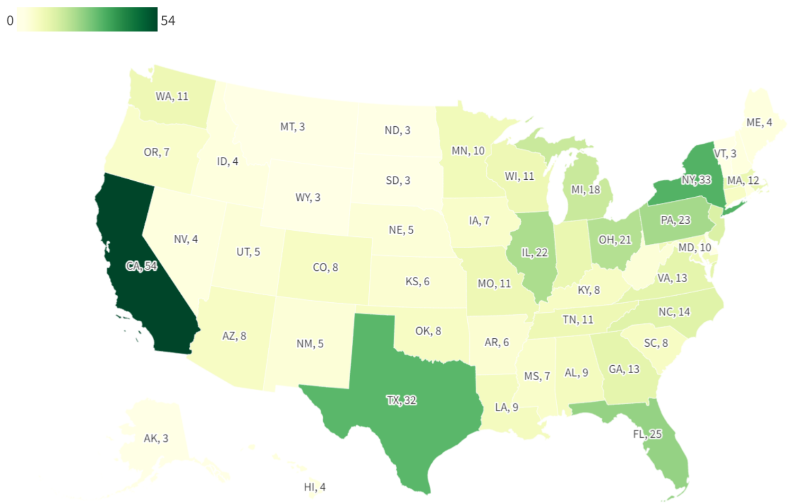
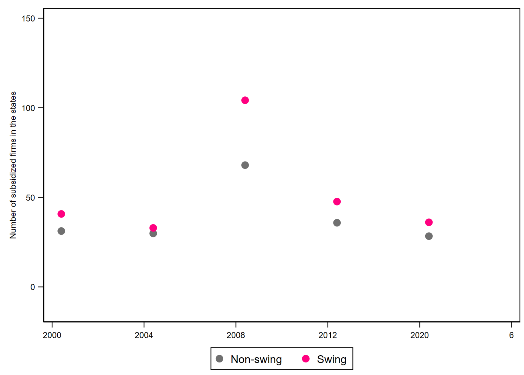
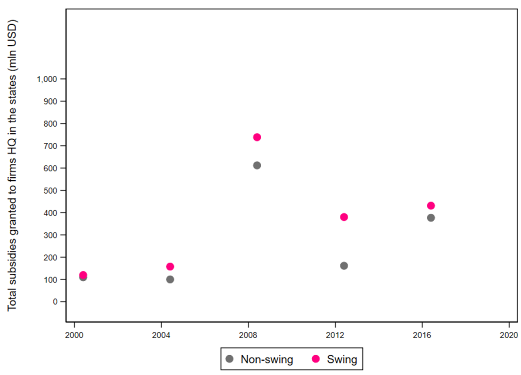


Figure D.2: Subsidies to Firms Located in Swing States, 2000-2019

(a) Number of Subsidized Firms



(b) Average Subsidies in Swing States



Notes: Sub-figure A: Total number of subsidized firms over a term T in the HQ states, average by state group (swing vs non-swing). Sub-figure B: Total value of subsidies granted to firms by HQ state over a term T in the HQ states, average by state group (swing vs non-swing). A state is classified as swing during term T if the difference in the vote shares of Democratic and Republican candidates in the presidential election at the end of that term is below 5%. Swing states in the last five elections were: in 2004, Colorado, Iowa, Michigan, Minnesota, Nevada, New Hampshire, New Mexico, Ohio, Oregon, Pennsylvania, and Wisconsin; in 2008, Florida, Indiana, Missouri, Montana, North Carolina, and Ohio; in 2012, Florida, North Carolina, Ohio, and Virginia; in 2016, Arizona, Colorado, Florida, Maine, Michigan, Minnesota, Nevada, New Hampshire, North Carolina, Pennsylvania, and Wisconsin; in 2020, Arizona, Florida, Georgia, Michigan, Nevada, North Carolina, Pennsylvania, and Wisconsin. I winsorize variables in the untransformed model to handle outliers (see Figure B.5), but my results also prove robust without this adjustment. Period of analysis: 2000-2019.

Table D.5: Subsidies to Firms and Swing States

	Subsidies to firms$_{s,T}$			Number of subsidized firms$_{s,T}$		
	Untransformed	*Log*	*IHS*	*Untransformed*	*Log*	*IHS*
	(1)	(2)	(3)	(4)	(5)	(6)
Swing shifter$_{s,T}$	9.805e+06*	0.213***	0.878***	6.914***	0.863***	0.187***
	(5.453e+06)	(0.0563)	(0.224)	(1.965)	(0.118)	(0.0371)
Obs.	255	255	40	255	40	255
R^2	0.013	0.026	0.288	0.031	0.559	0.038

Notes: Columns (1)-(3) report OLS coefficients from estimating the equation: $Subsidies\ to\ firms_{s,T} = \alpha + \beta\ Swing\ shifter_{s,T} + \epsilon_{s,T}$. Columns (4)-(6) report OLS coefficients from estimating the equation: $Number\ of\ subsidized\ firms_{s,T} = \alpha + \beta\ Swing\ shifter_{s,T} + \epsilon_{s,T}$. Swing shifter$_{s,T}$ is definied as the interaction between the Swing state$_{s,T}$ dummy (equal to 1 if the difference in the candidates' vote shares in the is $< 5\%$) and electoral votes EV$_s$ that are assigned to that state. The dependent variable in Columns (1)-(3), Subsidies to firms$_{s,T}$, is the total value of subsidies granted to firms headquartered in state s over term T. The dependent variable in Columns (4)-(6), Number of subsidized firms$_{s,T}$, is the total number of subsidized firms headquartered in state s over term T. In Columns (1) and (4), I winsorize variables in the untransformed model to handle outliers (see Figure B.5), but my results also prove robust without this adjustment. Robust standard errors in parenthesis. Significance codes: $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$.

Table D.6: Identity of Swing States and Direct Subsidy Exposure

	Swing state dummy$_{s,T}$	Difference in vote shares$_{s,T}$
	(1)	(2)
Direct subsidy exposure$_{s,T}$	4.53e-09	-3.63e-09
	(1.03e-08)	(2.60e-09)
State FE	YES	YES
Term FE	YES	YES
Obs.	255	255
R^2	0.441	0.843

Notes: Column (1) reports OLS coefficients from estimating the equation: $Swing\ state_{s,T} = \alpha + \beta\ Direct\ subsidy\ exposure_{s,T} + \delta_s + \delta_T + \epsilon_{s,T}$. Swing state$_{s,T}$ is a dummy equal to 1 if state s is classified as swing in term T (i.e., if the difference in the candidates' vote shares in the is $< 5\%$). The dependent variable, Direct subsidy exposure$_{j,T}$, is the average subsidy granted to the tradable 6-digit NAICS industry j during term T. Column (2) reports coefficients from estimating the equation: $Votes\ difference_{s,T} = \alpha + \beta\ Direct\ subsidy\ exposure_{s,T} + \delta_s + \delta_T + \epsilon_{s,T}$. Votes difference$_{s,T}$ is the difference in the candidates' vote shares in presidential elections held at the end of term T. Five presidential terms from 2000 to 2019 are considered. Industry fixed effects are defined at the 4-digit NAICS level. Standard errors are clustered at the 2-digit NAICS level. Significance codes: $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$.

Table D.7: Relevance of the IV for Direct Subsidy Exposure, First Stage

	Direct subsidy exposure$_{j,T}$		
	Untransformed	*Log*	*IHS*
	(1)	(2)	(3)
$\text{IV}^{Swing}_{j,T}$	4.368e+07***	0.359***	17.34***
	(3.818e+06)	(0.0433)	(1.835)
Industry FE	YES	YES	YES
Term FE	YES	YES	YES
Obs.	2,275	440	2,275
R^2	0.108	0.569	0.353

Notes: OLS estimates, corresponding to the first stage of the 2SLS regression (see Equation (8)). Three specifications are reported: non-transformed, logarithmic scales, and inverse IHS transformation of the dependent and independent variables. I winsorize variables in the untransformed model to handle outliers (see Figure B.5), but my results also prove robust without this adjustment. The dependent variable, Direct subsidy exposure$_{j,T}$, is the average subsidy granted to the tradable 6-digit NAICS industry j during term T. $\text{IV}^{Swing}_{j,T}$ is defined in Equation (5). Five terms from 2000 to 2019 are considered. Industry fixed effects are defined at the 4-digit NAICS level. Standard errors are clustered at the 2-digit NAICS level. Significance codes: $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$.

Table D.8: Relevance of the IVs for Indirect Subsidy Exposure, First Stage

	Downstream subsidy exposure$_{j,T}$			Upstream subsidy exposure$_{j,T}$		
	Untransformed	*Log*	*IHS*	*Untransformed*	*Log*	*IHS*
	(1)	(2)	(3)	(4)	(5)	(6)
Downstream $\text{IV}^{Swing}_{j,T}$	3.841e+07***	0.973***	2.503***			
	(4.989e+06)	(0.0206)	(0.0746)			
Upstream $\text{IV}^{Swing}_{j,T}$				5.165e+06***	0.869***	2.266***
				(49,498)	(0.0170)	(0.0195)
Industry FE	YES	YES	YES	YES	YES	YES
Term FE	YES	YES	YES	YES	YES	YES
Obs.	2,280	2,280	2,280	2,280	2,220	2,280
R^2	0.395	0.955	0.939	0.670	0.804	0.767

Notes: OLS estimates, corresponding to the first stage of the 2SLS regression. Three specifications are reported: untransformed, logarithmic scales, and inverse IHS transformation of the dependent and independent variables. I winsorize variables in the untransformed model to handle outliers (see Figure B.5), but my results also prove robust without this adjustment. Columns (1)-(3) report OLS coefficients from estimating Equation (9). The dependent variable, Downstream subsidy exposure, is the average subsidy granted during term T to all the industries supplying the tradable 6-digit NAICS industry j. Columns (4)-(6) report OLS coefficients from estimating Equation (10). The dependent variable, Upstream subsidy exposure, is the average subsidy granted during term T to all the tradable industries supplied by the 6-digit NAICS industry j. The variables Downstream $\text{IV}^{Swing}_{j,T}$ and Upstream $\text{IV}^{Swing}_{j,T}$ are defined in Equations (6) and (7). Five terms from 2000 to 2019 are considered. Industry fixed effects are defined at the 4-digit NAICS level. Standard errors are clustered at the 2-digit NAICS level. Significance codes: $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$.

E Robustness Checks

Table E.1: Effects of Subsidies on Exports, Controlling for Trade Protection

	Exports$_{j,T}$								
	Direct effect			*Indirect effects*					
	Untransformed	*Log*	*IHS*	*Untransformed*	*Log*	*IHS*	*Untransformed*	*Log*	*IHS*
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Direct subsidy exposure$_{j,T}$	19,801***	0.609***	0.341***						
	(644.6)	(0.0566)	(0.0650)						
TP$_{j,T}$	2.511e+08***	0.00718	0.398***						
	(1.493e+07)	(0.00619)	(0.118)						
Downstream subsidy exposure$_{j,T}$				82.31***	0.386***	0.387***			
				(2.911)	(0.0101)	(0.0182)			
Downstream TP exposure$_{j,T}$				2.467e+09***	0.404***	2.085***			
				(7.107e+07)	(0.0660)	(0.0741)			
Upstream subsidy exposure$_{j,T}$							149.6***	-0.0344***	0.0572***
							(11.52)	(0.0117)	(0.00658)
Upstream TP exposure$_{j,T}$							1.137e+08	0.198***	0.463
							(1.770e+08)	(0.0135)	(0.308)
Industry FE	YES	YES	YES	YES	YES	YES	YES	YES	YES
Term FE	YES	YES	YES	YES	YES	YES	YES	YES	YES
Obs.	2,208	215	2,208	2,245	1,795	2,245	2,245	1,730	2,245
KP F-statistic	178.2	32.36	142.0	2405	10141	4677	12702	20264	17222

Notes: 2SLS coefficients, second-stage, from the estimation of Equations (11), (12) and (13) with the inclusion of controls for direct and indirect exposure to trade protection (TP). Trade protection is measured by the average antidumping duty across all products in an industry. Direct subsidy exposure$_{j,T}$ is instrumented by IV$_{j,T}^{Swing}$. Downstream subsidy exposure$_{j,T}$ and Upstream subsidy exposure$_{j,T}$ are instrumented by Upstream IV$_{j,T}^{Swing}$, and Downstream IV$_{j,T}^{Swing}$, respectively. Industry-level fixed effects are defined at the 4-digit NAICS level of aggregation. Standard errors are clustered at the 2-digit NAICS level. Significance codes: $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$.

Table E.2: The Effects of Subsidies on Exports, First Terms

	Exports$_{j,T}$								
	Untransformed	*Log*	*IHS*	*Untransformed*	*Log*	*IHS*	*Untransformed*	*Log*	*IHS*
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Direct subsidy exposure$_{j,T}$	21,820***	0.167***	0.430***						
	(2,017)	(0.0324)	(0.0727)						
Downstream subsidy exposure$_{j,T}$				72.19***	0.543***	0.529***			
				(2.828)	(0.0776)	(0.0794)			
Upstream subsidy exposure$_{j,T}$							213.3***	0.0460	0.144***
							(9.317)	(0.0529)	(0.0339)
Industry FE	YES	YES	YES	YES	YES	YES	YES	YES	YES
Term FE	YES	YES	YES	YES	YES	YES	YES	YES	YES
Obs.	1,365	253	1,365	1,365	1,360	1,365	1,365	1,328	1,365
KP F-statistic	113.1	35.62	119.5	1283	2275	1702	6185	2113	14452

Notes: 2SLS coefficients, second-stage, from the estimation of Equations (11), (12) and (13). Three specifications are reported: untransformed, logarithmic scales, and inverse IHS sine transformation of the dependent and independent variables. I winsorize variables in the untransformed model to handle outliers (see Figure B.5), but my results also prove robust without this adjustment. The dependent variable, Exports$_{j,T}$, is the average export value in tradable 6-digit NAICS industry j in presidential term T. Only first terms (Obama, 2008; Trump, 2016; Biden, 2020) are considered. Industry fixed effects are defined at the 4-digit NAICS level. Standard errors are clustered at the 2-digit NAICS level. Significance codes: $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$.

Table E.3: The Indirect Effects of Subsidies on Exports, I-O Robustness

	Exports$_{j,T}$											
	Including the I-O Diagonal						*Leontief Inverse Matrix*					
	Untransformed	*Log*	*IHS*	*Untransformed*	*Log*	*IHS*	*Untransformed*	*Log*	*IHS*	*Untransformed*	*Log*	*IHS*
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Downstream subsidy exposure$_{j,T}$	105.1***	0.521***	0.475***				16.83***	0.634***	0.617***			
	(1.501)	(0.0877)	(0.0788)				(1.662)	(0.0932)	(0.0864)			
Upstream subsidy exposure$_{j,T}$				175.5***	0.0509	0.120***				115.1***	0.312***	0.357***
				(7.272)	(0.0533)	(0.0381)				(2.818)	(0.0110)	(0.0583)
Industry FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Term FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Obs.	2,280	2,273	2,280	2,280	2,233	2,280	2,280	2,273	2,280	2,280	2,178	2,280
KP F-statistic 12933	2393	1129	10803	2514	13613	288.8	5683	1907	51.01	46756	16.30	

Notes: 2SLS coefficients, second-stage, from the estimation of Equations (12) and (13). Two robustness checks and three specifications for each of them: untransformed, logarithmic scales, and inverse IHS of the dependent and independent variables. I winsorize variables in the untransformed model to handle outliers (see Figure B.5), but my results also prove robust without this adjustment. The dependent variable, Exports$_{j,T}$, is the average export value in tradable 6-digit NAICS industry j in presidential term T. Downstream subsidy exposure$_{j,T}$ and Upstream subsidy exposure$_{j,T}$ are instrumented by Upstream IV$_{j,T}^{Swing}$, and Downstream IV$_{j,T}^{Swing}$, respectively. In Columns (1)-(6), I remove the diagonal of the I-O tables when constructing Downstream subsidy exposure$_{j,T}$ and Upstream subsidy exposure$_{j,T}$ and their instruments. In Columns (1)-(6), I take a full-value chain approach, including higher-order linkages. Downstream subsidy exposure$_{j,T}$ and Upstream subsidy exposure$_{j,T}$ are then computed using the Leontief Inverse Matrixes, excluding the diagonal. For the cost shares, I use the total requirements from the BEA I-O tables, specified in BEA-equivalent to 6-digit NAICS codes. For the sales shares, I rely on the total sales shares computed by Acemoglu et al. (2009) from the BEA I-O. Industry fixed effects are defined at the 4-digit NAICS level. Standard errors are clustered at the 2-digit NAICS level. Significance codes: $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$.

Table E.4: Effects of Subsidies on Investment, Value Added, and TFP, Tradable and Non-Tradable Industries

	Investment$_{j,T}$			*Value added$_{j,T}$*			*TFP$_{j,T}$*		
	Untransformed	*Log*	*IHS*	*Untransformed*	*Log*	*IHS*	*Untransformed*	*Log*	*IHS*
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Direct subsidy exposure$_{j,T}$	228.6***	1.706***	0.749***	3,195***	1.649***	0.723***	7.70e-08***	0.892***	0.0997***
	(73.77)	(0.487)	(0.119)	(1,038)	(0.463)	(0.115)	(2.49e-08)	(0.292)	(0.0161)
Industry FE	YES	YES	YES	YES	YES	YES	YES	YES	YES
Term FE	YES	YES	YES	YES	YES	YES	YES	YES	YES
Obs.	1,888	356	1,888	1,888	356	1,888	1,888	356	1,888
KP F-statistic	8.262	9.366	24.80	8.262	9.366	24.80	8.262	9.366	24.80

Notes: Columns (1)-(3) estimate the direct effect of subsidies on investment. The dependent variable, Investment$_{j,T}$, is the total capital expenditure in manufacturing 6-digit NAICS industry j averaged over the presidential term T. Columns (4)-(6) estimate the direct effects on value-added. The dependent variable, VA$_{j,T}$, is the total value-added in manufacturing 6-digit NAICS industry j (both tradable and non-tradable) averaged over the presidential term T. Columns (7)-(9) estimate the direct effects on productivity. The dependent variable, TFP$_{j,T}$, is the index for total factor productivity in tradable manufacturing 6-digit NAICS industry j (both tradable and non-tradable) averaged over the presidential term T. I report three specifications: untransformed, logarithmic scales, and IHS transformation of the dependent and independent variables. I winsorize variables in the untransformed model to handle outliers (see Figure B.5), but my results also prove robust without this adjustment. The sample includes five presidential terms starting from 2000 to 2016 (since NBER data stops in 2018, I exclude the last term). The subsidy variables capture direct and indirect exposure to subsidies, as measured by Equations (1) and (2), respectively, and instrumented using the corresponding IV variables. Industry-level fixed effects are defined at the 4-digit NAICS level of aggregation. Since the sample only includes manufacturing industries (both tradable and non-tradable), robust standard errors are included (clustering the standard errors at the 2-digit NAICS codes like in the other specifications would lead to singleton clusters). Significance codes: $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$.