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The Impact of Tariff Protectionism on FDI: Empirical Evidence from The United States

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Abstract

In 2018, President Trump arbitrarily instituted import tariffs on various manufactured goods with the purpose of protecting domestic industries from trading partners' presumably unfair trade practices. This paper investigates the possible effects of Trump's tariffs on FDI inflows through import tariff protection in horizontal, upstream, downstream and foreign industry sectors. The analysis uses a panel of US manufacturing industry sectors for the period spanning from 2016 to 2020 and implements a Difference-in-Difference methodology with a continuous treatment. The study shows that The United States' manufacturing industry sectors experience a significant decrease in FDI inflows through import tariff protection in horizontal and foreign industry sectors. Conversely, The United States' manufacturing industry sectors do not experience significant changes in FDI inflows through import tariff protection in upstream and downstream industry sectors. Such findings constitute further evidence of the byproducts of Trump's tariffs and can be implemented by policy makers to develop cost-benefit analyses concerning trade policies directed at protecting domestic industries.

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1. Introduction

1.1 Motivation

In 1607, the Virginia Company underwent a strategic expansion into the United States (US) in search of silver and gold, all whilst the company's stockholders remained in Britain. In order to finance its first North American settlement, the company sent capital to the British Colony of Virginia; in doing so, it made the first recorded foreign direct investment (FDI) into the United States (Craven, 1993). Not only did this investment prove to be fruitful, but it also marked the beginning of an era characterized by the flow of transatlantic FDI to the North American continent.

By 1914, the US had become the world's biggest debtor nation; its broad consumer base, skilled workforce, and favourable business environment had turned it into the most attractive market for FDI (Wilkins, 2004). During the epoch following the Great Depression, the US' economy progressively opened, and its public policies became increasingly investor-friendly, allowing it to prevail as the globe's leading FDI destination. The US' market openness seems to have culminated in 1983 when president Reagan published his *Statement on International Investment Policy*. With this statement, Reagan set a precedent by proclaiming that the US would continuously adopt investment promotion strategies and a non-discriminatory treatment of foreign investors (Reagan, 1983). Reagan ensured that FDI would persistently flow into the economy and enhance it with new technologies, management skills and productivity. All successive presidents have seemingly abided by the ideal of market-openness, with one clear exception: former president Donald J. Trump.

In January 2018, the Trump administration imposed discriminatory tariffs on washing machines and solar panels varying from 30 to 50 percent. These initial tariffs were then followed by various additional tariffs as part of Trump's 'America First' economic policy. In the course of his mandate, Trump went as far as to impose and escalate tariffs on products imported from China, causing an unforeseen trade war. The Trump administration promoted these tariffs as a mechanism that would decrease the US's current account deficit by shifting the nation's trade policy from multilateral free trade agreements to bilateral trade agreements. Trump additionally argued that these tariffs would support the US' manufacturing industry by safeguarding it from, what were regarded as, the predatory trade practices of trading partners (Flaaen & Pierce, 2019).

Although Trump upheld that tariff protectionism would benefit domestic industries, various researchers have proven that, in reality, these tariffs have had a detrimental impact on US industries. For instance, Faaen and Pierce (2019) find that those manufacturing sectors that were most exposed to Trump's tariffs suffered from increases in producer prices and decreases in employment. Likewise, Fajgelbaum et al. (2019) and Amiti et al.(2019) determine that US tariff increases fully translated into domestic price increases via rising input costs, representing welfare losses for domestic consumers. Moreover, Handley, Kamal and Monarch (2020) find that domestic firms impacted by Trump's import tariffs reacted by decreasing their exports to other markets. Fajgelbaum and Khandelwal (2021) also determine that there has been a total pass-through of tariffs to tariff-inclusive import prices, whilst trade has reallocated away from tariffed trading partners.

These studies provide concrete evidence that Trump's sporadic tariffs significantly impacted different segments of the US economy. However, they solely focus on the effects of tariffs on the US' product market and current account, whilst few examine the impact of tariffs on the US' financial account. Thus, this paper aims to complement the aforementioned literature by examining the effects of Trump's tariffs on one of the main elements of the financial account, namely foreign direct investment.

1.2 Relevance

In 2018, President Trump arbitrarily instituted tariffs on various manufactured goods. The objective of these tariffs was to protect domestic firms from trading partners' presumably unfair trade practices. It is commonly thought that tariffs provide an edge to domestic import competing industries; based on this notion, the Trump administration imposed tariffs without having sound empirical evidence to back them up. Academic such as Blonigen (2002) have argued that, in many occasions, foreign firms avoid this trade protection barrier by investing in their own operations within their destination market and thereby increase competition within this market. Unfortunately, this may lead to instances where governments offset the possible firm-level benefits from protection by increasing the competition between foreign and domestic firms (Blonigen, 2002). Thus, in this case, the Trump administration may have exposed the industries that they strived to protect to greater competition. This in turn could reduce, eliminate or reverse the (expected) positive impacts of the original trade policy on the sheltered domestic firms and industries (Blonigen, 2002).

Critically examining and testing the effects of import tariffs is highly relevant because, by means of econometric analysis, it can be established how tariffs and their contrastive protection channels affect domestic industries. By analyzing this matter, the economically pertinent results and evidence needed to generate prudent trade policies are assembled and examined. Various studies have gathered evidence concerning the effects of Trump's import tariffs on domestic and foreign economic outcomes. Such papers include Faaen and Pierce (2019); Amiti, Redding and Weinstein (2019); Fajgelbaum et al. (2019); Waugh (2019); and Fajgelbaum and Khandelwal (2021). Nonetheless, these papers focus exclusively on tariffs' impacts on the real economy without considering their possible impacts on the international flow of capital.

Notably, other papers have studied the effects of trade protectionism on the financial economy and FDI in contrastive contexts. For example, Gastanaga, Nugent and Pashamova (1998) developed a multivariate analysis through which they found that the effects of import tariffs on FDI are positive in a time-series context. Contrastively, Steinbach and Kim (2021) implemented a gravity model framework to demonstrate that increased protectionism, in the form of terminated international investment agreements, negatively impacts FDI flows. Although pertinent, these papers fail to consider the vertical channels through which tariff protectionism may impact firms.

Flaaen and Pierce (2019) emphasize that tariffs presently generate impacts through channels beyond their usual horizontal effect of restricting import competition. These new impact channels come about through firms' transnational supply chain linkages. These impact channels are vertical in nature and entail effects through backward and forward linkages.[1] Papers such as Javorcik (2004) highlight the importance of taking these vertical supply linkages into account when studying the different channels through which FDI may impact or be impacted. Hence, this study incorporates the aforementioned vertical channels to generate integrated estimates of import tariffs' effects. These vertical channels are of importance considering that 67% of upstream, intermediate inputs sourced from China were tariffed by Trump (Fajgelbaum & Khandelwal, 2021).

Research concerning these tariff channels is also highly relevant for comprehending how tariffs impact the investment behaviour of specific firms. A clear example of this is the case of the Taiwan Semiconductor Manufacturing Company (TSMC). Following Trump's tariffs on semiconductor imports from China, TSMC announced that it would invest approximately 12 billion USD to construct a manufacturing cite in Arizona (TSMC, 2020). Motivated by the constraints imposed on the multinational's subsidiaries and factories in mainland China, and the suspicion that Trump's tariffs would extend to other trading partners, TSMC decided to make a considerable foreign direct investment into the US. Not only is this research relevant for firms, but it is also crucial for trade policy makers. This is because it may be used to reassure or refute protectionist trade policies targeted at safeguarding specific industries or market segments.

Although highly relevant, this kind of research is limited. Ergo, this study will examine the different horizontal and vertical channels through which tariff protection may impact the flow of FDI into manufacturing industry sectors. For this purpose, US manufacturing industry-level data for the years 2016 to 2020 has been chosen and the following research question is developed:

[1] In the context of this study, backward linkages refer to the contact between upstream suppliers with downstream purchasers that have experienced tariff increases. Similarly, forward linkages refer to the contact between suppliers of intermediate inputs that have experienced tariff increases and their downstream clients.

Did the United States' manufacturing industry sectors experience a significant increase in FDI inflows through import tariff protection in horizontal, upstream, downstream and foreign industry sectors?

1.3 Structure

Following the Introduction, the Theoretical Framework and Literature Review will be presented in Section 2. In this section, the theoretical evidence underlying the subject matter will be expounded and prior literature will be implemented to formulate hypotheses. Subsequently, the data used in the analysis will be introduced in Section 3; the data sources, sample selection procedure and descriptive statistics will be discussed.

Thereafter, the methodology chosen for the analysis will be described and substantiated in Section 4. The rationale behind the selected methodology will be illustrated and its statistical legitimacy will be examined by means of statistical tests. In the subsequent section (Section 5), the study's empirical analysis and results will be developed and discussed. In this section, pertinent findings will be linked to each hypothesis. Finally, the conclusion will be presented in Section 6, in which a concise summary will be developed, leading to a comprehensive answer to the research question. This will be followed by an examination and discussion of the study's main limitations, policy implications and suggestions for future research.

2. Literature Review

2.1 Theoretical Framework

Foreign direct investment (FDI) is defined by the IMF as an investment made by a financier into a foreign business or enterprise with the intention of holding 10 percent or more of the incorporated enterprise's voting power (Graham, 1995). Academics and policy makers both acknowledge that FDI plays an integral and expanding role in the world economy; not only does FDI further the intertwinement of economies, but it also serves as a catalyst for growth and transnational spillovers (Javorcik, 2004). Both developing and developed nations strive to attract FDI as it is commonly accompanied by new technologies and management skills, whilst also improving productivity and employment (Blonigen, 2005). It therefore comes as no surprise that there is a large body of literature examining the factors that determine the magnitude and destination of FDI flows. Some of the determinants of FDI that have been studied include exchange rate movements, tax levels, the quality of institutions and trade protectionism (Blonigen, 2005).

Although highly relevant, few studies have explored the relationship between trade protectionism and FDI; one of the most pertinent to do so is the paper written by Blonigen (2002). In this study, the author investigates the relationship between antidumping (AD) duties and the inflow of FDI. With this purpose, Blonigen implements a sample consisting of all US AD cases from 1980 through 1990 in combination with firm-level data. Blonigen uses a probit estimation model to discover a positive and statistically significant effect of AD duties on firms' FDI probability. Blonigen accredits this significant result to, what is commonly referred to in the trade literature as, tariff-jumping FDI. According to Blonigen, tariff-jumping FDI occurs when a firm makes a foreign direct investment into a host nation in order to avoid the host nation's trade protection barriers and the costs they entail (Blonigen, 2002). Firms commonly undertake this form of FDI by locating production within the destination market. Even though Blonigen stresses that tariff-jumping is only a realistic option for multinationals from industrialized nations, his findings are indicative of the potential impact of protectionism on FDI.

Tariff-jumping FDI has also been investigated by previous studies, such as Gastanaga, Nugent and Pashamova (1998). In this paper, the authors examine the impacts of various host country policies and institutional characteristics on FDI inflows. Some of the main institutional variables studied include, corporate tax rates, tariff rates and the degree of openness to international capital flows. To investigate these variables' effects, the authors implement pooled cross-section and time-series data for 49 least developed countries (LDCs), spanning from the year 1970 to 1995. Based on their multivariate OLS regressions, Gastanaga, Nugent and Pashamova find that tariffs have a positive and significant effect on FDI inflows. Based on this finding, the paper concludes that FDI flows to LDCs were considerably influenced by investors' tariff-jumping motive.

Both Blonigen (2002) and Gastanaga, Nugent and Pashamova (1998) demonstrate that tariff-jumping FDI is an important option for foreign firms. This form of FDI allows firms to maintain substantial presence in horizontal industry sectors within their export markets. Horizontal industry sectors are those sectors in which firms produce the same product lines and directly compete for market power (Steiner, 2008). Therefore, in the context of international trade, these sectors are characterized by direct import competition and substitution. Taking these findings into consideration, it is initially hypothesized that:

US manufacturing industry sectors experience an increase in FDI inflows, through horizontal import tariff protection.

Tariffs may directly influence FDI inflows in a horizontal manner, nonetheless, they may also indirectly impact FDI inflows in a vertical manner. These vertical impacts refer to the vertical FDI channels commonly studied in the FDI productivity spillover literature. Vertical FDI spillover channels were first investigated in Javorcik's (2004) seminal paper. Unlike other studies, Javorcik (2004) recognized that productivity spillovers may occur vertically in addition to horizontally, meaning that spillovers are also likely to occur through backward and forward linkages.[2]

Influenced by Javorcik (2004), Du, Harris and Jefferson (2014) implement a similar framework and independent variables to investigate how tariff liberalization and tax subsidies impact the direction and magnitude of FDI spillovers. With this purpose, a panel of Chinese manufacturing firms from 71 industry sectors is used by the authors. Furthermore, three proxy variables are generated: *Horizontal*, *Backward* and *Forward*, in addition to interaction terms for tariffs and sectoral FDI. The effect of these variables on firms' total factor productivity is then tested by means of ordinary least squares regressions (OLS) and non-linear least squares regressions with the Olley and Pakes semiparametric correction. Du, Harris and Jefferson (2014) find that tariff reductions increase the FDI productivity impacts of backward spillovers.

Du, Harris and Jefferson's (2014) focus on contrastive spillover channels has a considerable influence on the purpose and methodology of this paper. Thus, this study uses similar independent variables to explore how tariffs may vertically impact FDI through backward and forward linkages with upstream and downstream industry sectors. In the context of this paper, upstream protection through backward linkages refers to the contact between suppliers of inputs that have been imposed tariff increases and their downstream clients. Similarly, downstream protection through forward linkages refers to the contact between upstream suppliers with downstream purchasers that have been imposed tariff hikes.

According to Du, Harris and Jefferson (2014) and Amiti and Konings (2007), tariff increases appointed to upstream sectors make imported inputs for downstream purchasers more expensive. This in turn makes production for downstream sectors more costly and less profitable. It is therefore theorized that a decrease in profitability may drive away FDI from these downstream sectors. Moreover, tariff increases imposed on downstream sectors may increment these sectors' FDI inflows and competition by means of foreign firms' tariff-jumping motive (Blonigen, 2002). This may then increase the demand for, and profitability of, intermediate goods supplied by upstream sectors. This could consequently attract greater FDI flows into these upstream sectors. Intuitively, this leads to the second and third hypotheses:

[2] In Javorcik (2004), backward linkages refer to the contact between domestic suppliers of intermediate inputs and their multinational purchasers (Javorcik, 2004). Forward linkages refer to the contact between multinational suppliers of intermediate inputs and their domestic clients.

Downstream US manufacturing industry sectors experience a decrease in FDI inflows, through import tariff protection in upstream manufacturing industry sectors.

And,

Upstream US manufacturing industry sectors experience an increase in FDI inflows, through import tariff protection in downstream manufacturing industry sectors.

It may be the case that local industries are impacted both horizontally and vertically by domestic tariffs on imports. However, numerous papers have proven that it is not only domestic tariffs that impact local industries; foreign import tariffs have also been found to influence domestic industries. When Trump imposed his discriminatory tariffs in 2018, he angered many trading partners who reacted by instituting retaliatory tariffs on US exports. These retaliatory tariffs motivated papers such as Waugh (2019), Carter and Steinbach (2020) and Flaaen and Pierce (2019) to investigate the possible effects of such retaliation. Waugh (2019) implements a panel of county-level US automobile sales to estimate the elasticity of consumption growth to China's retaliatory tariffs. A Difference-in-Difference (DiD) methodology is used by the author to determine that those counties that were most exposed to retaliatory tariffs suffered from decreases in sales and consumption growth.

Furthermore, Carter and Steinbach (2020) examine the short-run impacts of retaliatory tariffs on US agri-food exports. The authors use a monthly panel dataset consisting of tariff-line level US exports and the retaliatory tariffs set by the US' trading partners. By means of an event study and fixed effects regression analysis, Carter and Steinbach find that retaliatory tariffs caused a significant decrease in US agri-food exports and led to a reorientation of trade towards non-retaliatory countries (Carter & Steinbach 2020).

On the other hand, Flaaen and Pierce (2019) also explore the additional channels through which tariffs may impact employment in US manufacturing sectors. Besides the effect of retaliatory tariffs on export competitiveness, the authors also investigate domestic tariffs' opposing impacts via increased protection and increased input costs (Flaaen & Pierce, 2019). The authors implement a DiD regression model with a continuous treatment to estimate these effects. Moreover, Flaaen and Pierce implement time-varying export and import shares of domestic absorption as weights for their independent variables. The authors find that retaliatory tariffs and domestic tariffs' input costs have a significantly negative impact on manufacturing employment. Additionally, tariffs' rising input costs are also found to increase producer prices.

Taking the abovementioned findings into consideration, it may be the case that FDI is repulsed from those sectors that have been retaliated against. These sectors' potential decreases in consumption and exports could discourage multinationals' market-seeking and export-seeking FDI (Wadhwa & Reddy, 2011)[3]. Thus, the fourth hypothesis is construed as follows,

US manufacturing industry sectors experience a decrease in FDI inflows, through retaliatory import tariff protection in foreign manufacturing industry sectors.

Analogous to Flaaen and Pierce (2019), this paper also utilizes a sample of US manufacturing industries. Furthermore, akin to Waugh (2019) and Flaaen and Pierce (2019), a Difference-in-Difference methodology with a continuous treatment is also implemented. As will be explained in the Methodology Section, weights similar to Flaaen and Pierce's (2019) are also utilized to generate more representative estimates of tariffs' degree of protection.

2.2 Previous Research into the Effects of Trump's Tariffs

In the previous section, research on the effects of trade protectionism on FDI and other market outcomes was implemented to generate four hypotheses. In the coming sections, these four hypotheses will be evaluated in order to arrive at a comprehensive answer to the research question. Nevertheless, this paper also focuses on the specific impacts of the tariffs instituted by Trump during his time in office. Thus, in addition to the aforestated literature, it is also important to review prior research that evaluates these particular tariff effects.

In their paper, Fajgelbaum and Khandelwal (2021) present a clear and encompassing overview of the literature that examines the contrastive market effects of Trump's import tariffs. The authors mainly review the literature that has studied the price and distributional consequences of Trump's tariffs, with the purpose of estimating the tariffs' aggregate welfare effects. Initially, the papers that investigate the pass-through of Trump's tariffs to import prices are presented, the first one being Fajgelbaum et al. (2019).[4] Fajgelbaum et al. (2019) use within product-line variations to examine whether China decreased its export prices relative to other exporters in response to Trump's tariffs. To do so, they implement publicly available US import and export data at the HS10 product level matched with tariff variations, at a monthly frequency. The authors ultimately find that Chinese exporters do not absorb tariff changes and allow tariff costs to pass-through to tariff-inclusive import prices.

[3] These forms of FDI focus on market-seeking and export-seeking FDI focus on factors such as domestic and export market size, domestic and export market growth, and structure of domestic and export markets. These modes of FDI aim at penetrating the domestic and export markets of host countries.

[4] Tariff pass-through occurs when a large importing country increases its tariff rate on a product line, and foreign exporting firms absorb part of the tariff change by decreasing their exporting prices (Ludema & Yu, 2016).

Likewise, Amiti et al. (2019) implement Fajgelbaum et al.'s (2019) same data and estimation strategy, albeit with yearly variations instead of monthly, to find that the pass-through of tariffs to tariff-inclusive import prices is virtually complete. Moreover, Cavallo et al. (2021) use classified micro-level data on import prices from the US Bureau of Labor Statistics to investigate tariff and exchange rate pass-through. The authors exploit monthly variations across products and exporters to the US, and implement a fixed effects methodology with a lag structure, to determine that there is a nearly complete tariff pass-through and an incomplete exchange rate pass-through. These results are found to have an overall negative effect on welfare. Hence, Fajgelbaum and Khandelwal (2021) highlight that this empirical work has proven a complete pass-through of Trump's tariffs to tariff-inclusive import prices.

Subsequently, Fajgelbaum and Khandelwal (2021) introduce the literature that evaluates tariffs' effects on domestic producers via export prices and reallocations. Firstly, the authors consider that foreign retaliatory tariffs could dampen foreign demand and consequently decrease US producer and export prices (Fajgelbaum and Khandelwal, 2021). This is validated by Cavallo et al. (2021), who find that those US products that were retaliated against by China experienced relative price decreases. Furthermore, Fajgelbaum et al. (2019) also demonstrate that those sectors that were imposed retaliatory tariffs suffered from falls in export price indices.

Secondly, Fajgelbaum and Khandelwal (2021) consider the papers that study whether Trump's tariffs increased or decreased imported input costs. Flaaen and Pierce (2019), Benguria and Saffie (2019), and Handley et al. (2020) implement sector-level data and contrastive methodologies to assess this impact of Trump's tariffs. These studies largely find that tariffed US sectors experience rising export prices through rising costs for imported inputs.

Thirdly, Fajgelbaum and Khandelwal (2021) present the literature that examines the trade and employment reallocations of the US tariffs set on Chinese imports. Amiti et al. (2019) and Fajgelbaum et al. (2019) both find that imports decrease in those sectors that experience tariff hikes. Furthermore, as previously presented, Flaaen and Pierce (2019) investigate the different channels through which tariffs may reallocate domestic employment. Based on their DiD regression design, the authors find that the positive effect of tariff import protection on employment is more than offset by the negative impact of tariffs' rising input costs and foreign retaliation on employment.

The studies presented by Fajgelbaum and Khandelwal (2021) provide concrete evidence that Trump's tariffs had significant welfare decreasing impacts on different segments of the US economy. Thus, Fajgelbaum and Khandelwal (2021) conclude that US consumers and producers are the ones that suffer the most considerable aggregate welfare consequences from the tariffs instituted in 2018.

3. Data

3.1 Sources & Content

The data used for the methodology comes from various sources. To begin with, industry-level FDI data is extracted from the United States Bureau of Economic Analysis' (BEA) online directory. The BEA is part of the US Department of Commerce and is the US' official collector and provider of economic statistics and indicators. BEA administers state, local and national statistics, in addition to foreign trade and investment figures. From the BEA's Direct Investment database, annual FDI flows into US manufacturing industries are extracted for the period spanning from 2016 to 2020. These FDI inflows are monetary values presented in millions of US dollars. Moreover, these flows are identified by their corresponding industry's NAICS (North American Industry Classification System) 4-digit industry code.[5] As will be explained in Section 3.1.1, the yearly FDI inflows excerpted are used as the dependent variable in the upcoming regression analysis.

Secondly, additional industry-level data is extracted from the United States International Trade Commission's (USITC) online repository. The USITC is an independent federal agency tasked with a range of trade-related mandates. One of these mandates is the provision of international trade statistics and analyses to the US presidency, congress and public. Yearly industry-specific import, export, production and import tariff statistics are gathered from the USITC's online databases. Akin to the FDI flow data, this data is extracted for manufacturing industries for the period spanning from 2016 to 2020. The import, export and production statistics are monetary values presented in millions of US dollars. These values are also identified by their corresponding industry's NAICS 4-digit industry code. Furthermore, the ad-valorem import tariffs are percentages that are characterized by their industry's Harmonized Tariff System's (HTS) tariff codes.[6] These tariff identification codes are at the 8-digit level of aggregation. This import, export, production and tariff data are used to generate the study's independent variables.

Thirdly, industry level input-output data is also extracted from the BEA's Input-Output Accounts database. This database contains input-output matrixes covering all North American industry sectors for the years 2007 to 2012. US sector-specific data is excerpted for the year 2012 and is used to calculate the proportion of output supplied from one sector to another. These proportions are then implemented to generate the *Forwards* and *Backwards* proxy variables, as will be explained in Section 3.1.2. Furthermore, the Peterson Institute for International Economics' (PIIE) Trump Trade War

[5] NAICS codes are an economic classification system used by the US' Federal Statistics Agencies to characterize industries at different levels of aggregation.
[6] The Harmonized Tariff System is a standardized numerical classification system internationally used to classify tariffs on internationally traded products.

Timeline database is also used. The PIIE is an independent, nonprofit research institute dedicated to the study of international trade with the purpose of formulating practical policy solutions. The Trump Trade War Timeline database presents a clear timeline of all of Trump's tariff disputes in addition to the lists of products that were affected. Thus, this database is implemented to identify the product lines that were assigned tariffs by the Trump administration and those that were imposed retaliatory tariffs in other markets.

Finally, import tariffs faced in export markets are extracted from the World Trade Organization's (WTO) Tariff Analysis Online (TAO) facility. The TAO is responsible for all data processing and statistical aspects of the WTO's trade and tariff databases. The TAO's Duties Faced in Export Markets database presents the MFN and non-MFN ad-valorem import tariffs that exports from a given country encounter when being imported into other nations. Hence, the annual tariffs faced by the US' industries when exporting to all other trading partners are extracted for the period 2016-2020. These tariffs are also percentages and are identified by their corresponding industry's HTS tariff codes. These tariffs are implemented to generate the *Foreign retaliation* proxy variable, as will be explained in Section 3.1.2.

It is important to note that the tariff rates extracted from the USITC and the TAO are at the same level of aggregation and are identified by the same HTS codes; however, these codes differ from the NAICS codes that characterize all other industry-specific data collected. Hence, a concordance of the two code classification systems (provided by the BEA) is used to match the HTS tariff rates with the NAICS manufacturing industries. The HTS tariff rates are at the 8-digit (HTS8) code level of aggregation whilst the NAICS industry data is at the 4-digit (NAICS4) code level of aggregation. This signifies that the NAICS product categories are at a higher level of aggregation. Thus, a many-to-one matching process is developed in which HTS8 product codes are grouped and matched to their corresponding NAICS aggregated product category. These manufacturing industries and their corresponding NAICS codes can be visualized in Table A.1 in Appendix A.

3.2 Sample Selection & Data Description

The data observations incorporated into the analysis were included based on a strict but simple selection criteria. As previously mentioned, the United States was chosen for this study because it has historically been the largest open-market economy and destination for FDI. Moreover, the time span chosen for the analysis ranges from the year 2016 until 2020. This time span was selected because it encompasses the entirety of Donald Trump's presidency, in addition to the year preceding it. During his presidency, Trump instituted unforeseen import tariffs, setting the first and last ones within the same year, namely 2018. Additionally, all retaliatory tariffs on US exports were also imposed within this time frame. This comes in an era where there have been virtually no other modern episodes of a large, developed economy raising import tariffs in such a sizeable and abrupt manner. It should be noted that earlier years were excluded from the sample in order to avoid the noise caused by previous trade policies and to avoid the effects of the 2008 financial crisis on the volatility of FDI. Therefore, the time span and sample nation selected present an opportunity for analyzing the effect of import tariffs on FDI inflows in a contemporary, large and developed economy.

Influenced by Faaen and Pierce (2019) and Du, Harris and Jefferson (2014), this paper solely focuses on manufacturing industry sectors (NAICS codes 3111 to 3399). These industry sectors were initially selected because protecting manufacturing sectors and employment was one of Trumps's main purposes for setting these tariffs. It is therefore important to focus on manufacturing sectors in order to determine whether Trump's tariff protection aided or limited these sectors' development. Furthermore, these industry sectors were also selected because firms within these sectors are the most capable to conduct tariff-jumping FDI by setting up manufacturing plants in their export markets (Blonigen, 2002). Moreover, after inspecting all industries' input-output proportions, it was made evident that the manufacturing sectors have the largest and most apparent vertical supply linkages. Whilst manufacturing sectors have an average of 0.8 missing and 35 non-zero vertical linkage values, nonmanufacturing sectors have on average 12 missing vertical linkage values and only 22 non-zero values. These vertical linkages are a requisite for analyzing the vertical channels through which tariffs may affect FDI flows into upstream or downstream industry sectors.

Thus, manufacturing industries' ability to set up foreign plants and their clear vertical linkages make them appropriate for the study of tariffs' horizontal and vertical impacts on FDI. Excluding all non-manufacturing industries reduced the sample size from 238 to 74 industry sectors per year. The selection criteria yielded in 74 manufacturing industry sectors with values for the period 2016-2020, producing a total of 370 observations for each variable. Descriptive statistics for the final sample will be presented in Section 4.3 after the dependent and independent variables have been explained.

4. Methodology

4.1 Intended Method & Reasoning

The general statistical method chosen for this analysis is a Difference-in-Differences (DiD) methodology with a continuous treatment. DiD is a quasi-experimental design most used with panel data to estimate the effects of binary treatments. DiD is also commonly implemented to study large-scale program implementation. It does so by comparing the average change in outcomes over time between a population that has been treated (treatment group) and a population that has not been treated (control group). Therefore, this methodology is utilized to estimate the average treatment effect on the treated (ATT). By tacking cross-sectional and time-series differences, the approach withdraws biases between the treatment and control group that could be the result of persistent differences between the two groups and biases from comparisons across time that could be driven by time trends (Lechner, 2011).

In order to estimate the ATT, one imperative assumption is required, namely the Parallel Trends Assumption. The Parallel Trends Assumption states that in the absence of treatment, the difference between the treatment and control groups is consistent over time (Lechner, 2011). In other words, the assumption entails that the trajectories of the control and treatment groups are parallel in the pre-treatment period. This assumption is frequently proven by plotting the means of the outcome variable over time for the treatment and control groups and visually comparing their pre-treatment trends. In addition to the Parallel Trends Assumption, all the OLS model assumptions apply equally to the DiD approach.

The general DiD regression model is defined as follows:

$$Y_{it} = \alpha + \beta_1\gamma_i + \beta_2\lambda_t + \beta_3(\gamma_i \, . \, \lambda_t)_{it} + \varepsilon_{it} \quad i = 1, \dots, n \quad t = 1, \dots, T$$

Where Y_{it} is the dependent variable for individual i at time t, and α is the constant term. Furthermore, γ_i is the treatment group dummy which is equal to 1 if an observation is in the treatment group and 0 otherwise. Thus, β_1 captures the treatment group-specific effect. λ_t is the time dummy which takes a value of 1 when observations are in a post-treatment period and 0 otherwise. β_2 therefore represents the treatment period-specific effect. Moreover, $(\gamma_i \, . \, \lambda_t)_{it}$ is an interaction term between the treatment group and time dummies. This interaction term is equal to 1 when an observation is both in the treatment group and in a post-treatment period, and is equal to 0 otherwise. Hence, β_3 is the DiD estimator for individual i at time t. Lastly, ε_{it} is the error term.

The standard DiD model presented above is used to test binary treatment effects; contrastively, this study's DiD model uses a continuous treatment. DiD designs with continuous treatments are commonly referred to as dose-response DiD designs and are used to study variations in treatment intensity. Alike the standard DiD design, no observations are treated in the pre-treatment periods and some observations remain untreated in the post-treatment period. Nonetheless, in this DiD model, some observations receive different doses/intensities of the treatment in the post-treatment period. Hence, this model's variation in treatment intensity allows for the evaluation of treatments that lack untreated comparison observations because all observations may be treated to some extent (Callaway, Goodman-Bacon & Sant'Anna, 2021).

Analogous to all other DiD designs, the DiD model with a continuous treatment also estimates the average treatment effect on the treated (ATT). In this context, the ATT refers to the effect of a given dosage among the observations that experienced this given dosage (Callaway, Goodman-Bacon & Sant'Anna, 2021). Furthermore, this design must also abide by an adjusted Parallel Trends Assumption. In this framework, the assumption states that the trajectories of the treated and those that received any dose of treatment are parallel in the pre-treatment period (Callaway, Goodman-Bacon & Sant'Anna, 2021). This is the same as the binary case with the exception that the treatment now can have numerous nonbinary values instead of just being treated or untreated.

In addition to estimating the ATT, this model can also be used to estimate the average causal response for the treatment group (ACRT). The ACRT is defined as the variation in the ATT between two given treatment dosages. In other words, the ACRT encompasses the causal response of a marginal change in dosage among units that experienced a given dose (Callaway, Goodman-Bacon & Sant'Anna, 2021). As pointed out by Callaway, Goodman-Bacon & Sant'Anna (2021), in order to estimate the ACRT it must be additionally assumed that there are equal ATTs across treatment levels. This assumption is used to correct for the selection bias caused by differences in average treatment groups for a given intensity of treatment (Callaway, Goodman-Bacon & Sant'Anna, 2021). Nonetheless, it is arduous and complex to credibly prove this assumption, making it difficult to accurately estimate the ACRT.

The DiD with a continuous treatment model is generally identified by the following two-way fixed effects regression model:

$$Y_{it} = \alpha_i + \gamma_t + \beta_1 (D_i \, . \, Post_t)_{it} + \varepsilon_{it} \qquad i = 1, \dots, n \qquad t = 1, \dots, T$$

Where Y_{it} is the dependent variable for individual i at time t, and α_i is a unit fixed effect which acts as a unit-specific intercept. Furthermore, γ_t is the time fixed effect used to control for time-specific heterogeneity. Most importantly, $(D_i \, . \, Post_t)_{it}$ is the interaction of a continuous variable that measures the treatment intensity for unit i and a dummy for the post-treatment period. The interaction term's coefficient β_1 is thus the DiD estimator for individual i at time t. Finally, ε_{it} is the error term.

Implementing this method brings about a series of limitations that must be considered. The first being that it estimates an ATT that is specific to distinct doses or treatment intensities. This may limit the economic relevance of results as most applications are interested in the marginal effects of dosage increment. Moreover, this approach is also limited by the fact that it can only be used to estimate the effect of time-varying variables. Hence, the effect of time-invariant variables, such as cultural aspects, cannot be identified.

4.2 Variables

4.2.1 Dependent Variable

The dependent variable chosen for this analysis is the natural logarithm of the flows of FDI ($\mathrm{Ln}FDI_{it}$) into US manufacturing industry sectors (i) at a given year (t). Therefore, the dependent variable is interpreted in percentage terms and coefficients are interpreted as semi-elasticities. As previously stated, this variable measures the monetary value of foreign direct investment into the United States made by foreign investors. Observations for this dependent variable are in millions of US dollars and were collected from the BEA's Direct Investment database.

4.2.2 Independent Variables

The first independent variable generated is the *horizontal average weighted tariff protection*, hereinafter referred to as $Horizontal\ Protection_{it}$. This variable functions as a proxy for the degree of import protection provided by the average weighted tariffs imposed on imports that horizontally compete with US manufacturing industries. Hence, $Horizontal\ Protection_{it}$ captures the level of horizontal import tariff protection experienced by manufacturing industry sector i at time t. Furthermore, this variable embodies the horizontal effect of import tariffs on the FDI flows into import-competing manufacturing industry sectors. As depicted in the equation below, $Horizontal\ Protection_{it}$ is defined as the average weighted tariff set on an industry's imports multiplied by the industry's share of domestic absorption.

$$Horizontal\ Protection_{it} = av.\ weighted\ tariff_{it} * \left(\frac{imp_{it}}{Q_{it} + imp_{it} - exp_{it}}\right)$$

The first element of $Horizontal\ Protection_{it}$'s equation is industries' average weighted tariffs. These tariffs are defined as follows:

$$av.weighted\ tariff_{it} = \sum_{pc\ \in \delta^{I}} \left[tariff_{pct} * \left(\frac{imp_{pc2017}}{imp_{i2017}}\right)\right]$$

Where $tariff_{pct}$ is the tariff rate assigned to the imported product p from country c at the HTS8 code level. Defining δ^{I} to be the list of of U.S. imported product-country pairs, imp_{pct} is the monetary value of imports of this product-country pair at the HTS8 level. imp_{it} is the total value of all imports into industry i from all nations at the NAICS4 code level. As previously explained in the Data Section, HTS8 product lines are grouped and matched to their corresponding NAICS4 industry using the BEA's industry code concordance. By diving the HTS8 imports by the (more aggregated) NAICS4 industrywide imports, the import share is generated. This import share is solely calculated for the pre-treatment year 2017; this ensures that the tariff measure estimated becomes a weighted average instead of being a simple average. Subsequently, HTS8-level tariffs are weighted by this import share and are aggregated to arrive at industry i's average weighted tariff at time t.

Once generated, the average weighted tariff is multiplied by $Horizontal\ Protection_{it}$'s second element, namely the share of domestic absorption. Following Flaaen and Pierce (2019), the share of domestic absorption is defined as industry i's imports (imp_{it}) divided by the industry's level of domestic absorption (the total value of products available within an industry). The level of domestic absorption is calculated by summing an industry's total production, Q_{it}, with imports, imp_{it}, and subtracting its exports, exp_{it}. The share of domestic absorption is multiplied by the average weighted tariff in order to account for the scale of imports relative to the level of domestic absorption. By doing so, the relative size and penetrative power of imports are used to weigh the average weighted tariff and generate a more representative estimate of the degree of horizontal tariff protection.

It is important to highlight that the share of domestic absorption is not fixed to its 2017 value and is allowed to vary on a yearly basis. This is because the level of tariff protection not only depends on yearly tariffs but also depends on the time-varying scale and penetrative power of the imports that have been tariffed. Furthermore, the value of the $Horizontal\ Protection_{it}$ variable rises with industries' average weighted tariffs and their share of domestic absorption. Observations for this independent variable are identified by their corresponding industry's NAICS 4-digit industry code.

The study's second variable of interest is the proxy for industries' degree of upstream tariff protection. $Upstream\ Protection_{it}$ functions as a proxy for the weighted tariff protection provided in manufacturing industry sector i's upstream industry sectors. These upstream industry sectors are those sectors (j) that supply sector i with inputs. Thus, $Upstream\ Protection_{it}$ is defined as supplying industry sectors' average weighted tariff protection at time t. The variable is described by the following equation:

$$Upstream\ Protection_{it} = \sum_{j\ if\ j \neq i} \alpha_{ij} * \ Horizontal\ Protection_{jt}$$

In which α_{ijt} is the proportion of inputs sourced by sector i from sector j, relative to the total inputs sourced by sector i, at time t. As previously explained, the proportion α_{ij} is calculated using the BEA's 2012 input-output matrixes. Furthermore, $Horizontal\ Protection_{jt}$ is the upstream sector j's level of horizontal import tariff protection. Inputs supplied within sector i are not included, since this effect is already incorporated in the $Horizontal\ Protection$ variable. Therefore, $Upstream\ Protection_{it}$ embodies the potential effect of import protection through supply linkages with upstream industry sectors. The value of this variable increases, the higher the share of inputs purchased by sector i from sectors with import tariffs, and the greater the horizontal import tariff protection in these upstream sectors. Analogous to the previous independent variable, $Upstream\ Protection_{it}$ is also at the NAICS4 level of aggregation.

The third independent variable is the proxy for industries' level of downstream tariff protection. $Downstream\ Protection_{it}$ functions as a proxy for the weighted tariff protection provided in manufacturing industry sector i's downstream industry sectors. These downstream industry sectors are those sectors (j) that are being supplied by sector i with inputs. Hence, $Downstream\ Protection_{it}$ is defined as downstream industry sectors' average weighted tariff protection at time t. This is characterized by the following equation:

$$Downstream\ Protection_{it} = \sum_{j\ if\ j \neq i} \alpha_{ji} * \ Horizontal\ Protection_{jt}$$

Where α_{jit} is the proportion of output supplied by sector i to sector j relative to the total output sold by sector i , at time t. Akin to the $Upstream\ Protection_{it}$ variable, the inputs supplied within sectors are not included and the same BEA dataset is used to generate the proportion α_{ji}. Moreover, $Horizontal\ Protection_{jt}$ is the downstream sector j's level of horizontal import tariff protection.

$Downstream\ Protection_{it}$ represents the potential effect of import protection through supply linkages with downstream industry sectors. The value of this variable increases the higher the share of inputs supplied by sector i to sectors with import tariffs and the greater the horizontal import tariff protection in these downstream sectors. Observations for this independent variable are also identified by their corresponding industry's NAICS 4-digit industry code.

The fourth and final independent variable is the level of foreign tariff retaliation experienced by a given NAICS4-level industry, hereinafter referred to as $Foreign\ Retaliation_{it}$. This variable functions as a proxy for a domestic industry i's exposure to tariff retaliation via foreign average weighted tariffs set on exports. Therefore, this variable embodies the retaliatory effect of foreign import tariffs on the FDI flows into US manufacturing industry sectors. As shown in the equation below, $Foreign\ Retaliation_{it}$ is defined as trading partners' average weighted tariff set on US industry i's exports at time t, multiplied by the industry's share of exports.

$$Foreign\ Retaliation_{it} = foreign\ av\ weighted\ tariff_{it}^{*} * \left(\frac{exp_{it}}{Q_{it}}\right)$$

Akin to the first independent variable, this variable is comprised by two sector-specific elements. The first element is foreign industries' foreign average weighted tariffs, defined as follows:

$$foreign\ av\ weighted\ tariff_{it}^{*} = \sum_{pc \in \delta^E} tariff_{pct}^{*} * \left(\frac{exp_{pc2017}}{exp_{i2017}}\right)$$

$tariff_{pct}^{*}$ is the tariff rate assigned to the product p exported to country c, at the HTS8 code level of aggregation. As explained in the Data Section, these foreign tariff rates are extracted from the TAO's Duties Faced in Export Markets database. δ^E is defined to be the list of U.S. exported product-country pairs. Moreover, exp_{pct} is the monetary value of exports of this product-country pair, at the HTS8 level. exp_{it} is the total value of all goods being exported from industry i to all trading partners, at the NAICS4 code level. The HTS8 product-country exports are divided by the NAICS4 industrywide exports to all nations to generate the export share. This export share is solely calculated for the pre-treatment year 2017. This ensures that the tariffs estimated are an average weighted by domestic exports instead of being a simple average. Thereafter, the HTS8-level tariffs are multiplied by this export share and summated to arrive at industry i's foreign average weighted tariff at time t.

The foreign average weighted tariff is then multiplied by the share of domestic exports to generate the $Foreign\ Retaliation_{it}$ variable. Inspired by Flaaen & Pierce (2019), the share of domestic exports is construed as industry i's exports (exp_{it}) divided by the industry's total output (Q_{it}). This domestic export share is used to account for the relative scale of exports when estimating the effect of retaliatory tariffs on domestic export industries. The value of the $Foreign\ Retaliation_{it}$ variable rises with industries' foreign average weighted tariffs and their share of domestic exports. This variable's observations are also identified by their corresponding industry's NAICS 4-digit industry code.

It is pertinent to note that, whilst the input-output proportions calculated remain unchanged, all other variable components vary considerably during the period in question. Thus, the proxies generated for the horizontal, upstream, downstream and foreign tariff effects are both sector-specific and time-varying variables. Ergo, the time-varying nature of these variables makes them appropriate for the methodology chosen. Moreover, within the study's regressions, these tariff protection variables inherently capture the abrupt and exogenous increase in tariffs experienced in 2018. Hence, it is not necessary to interact the proxies with dummies for the treatment and post-treatment periods. These independent variables embody unit i's intensities of tariff protection in the treatment and post-treatment periods, and therefore produce the paper's DiD estimators.

4.3 Descriptive Statistics

Table 1 gives statistical insight into all the variables incorporated in the panel dataset used. Over a period of 5 years, between 2016 and 2020, a total of 74 US manufacturing industries are analyzed. *NAICS code* and *Year* are categorical variables that uniquely identify each industry sector and present the year of observation. Furthermore, the variable *FDI* has a mean of 1703.683. The natural logarithm of this variable is the study's dependent variable and has a considerably smaller mean of 10.03434 and a proportionately smaller standard deviation of 0.4077899. Likewise, the variable *Output* also varies considerably from 1.419 billion to 665 billion. Both variables are in monetary terms and are measured in millions of US dollars.

Table 1
Descriptive Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
NAICS code	370	-	-	3111	3399
Year	370	-	-	2016	2020
FDI	356	1703.683	7122.09	-21975	77869
Ln (FDI)	356	10.03434	0.4077899	3.218876	11.51161
Output	370	7.948e+10	8.725e+10	1.419e+09	6.650e+11
Ln (Output)	370	24.63432	1.029845	21.07322	27.22301
Horizontal	370	.01648	.0456	0	.42252
Downstream	370	.01621	.04207	0	.38619
Upstream	370	.01692	.04367	0	.40449
Retaliation	370	.01687	.05143	0	.63544

Notes: Values that are not calculated due to the categorical nature of the variable are represented by a slash (-). The monetary variables, *FDI* and *Output* are in millions of US dollars.
Source: Bureau of Economic Analysis' (BEA) and the United States International Trade Commission's (USITC) online databases and the author's calculations thereof.

The first independent variable generated, *Horizontal*, has a mean value of 0.01648. Similarly, *Downstream*, *Upstream* and *Retaliation* have mean values of 0.01621, 0.01692 and 0.01687, respectively. Although their averages are very much alike, the independent variables' maximum values vary markedly. *Retaliation*'s maximum value of 0.63544 is nearly twice as large as *Downstream*'s maximum value of 0.38619. It therefore comes as no surprise that the *Retaliation* variable also has the largest standard deviation of 0.05143. Moreover, *Downstream* has the smallest mean among the four independent variables, but it also has the smallest standard deviation of 0.2207.

4.4 Method & Explanation

In order to determine how the flows of FDI into different industry sectors have been affected by import tariffs, four hypotheses were formulated. To test for these four hypotheses, a Difference-in-Difference

(DiD) model with a continuous treatment is used. This DiD design is regressed using the following two-way fixed effects regression model:

$$\text{Ln}FDI_{it} = \alpha_i + \gamma_t + \beta_1 Horizontal_{it} + \beta_2 Upstream_{it} + \beta_3 Downstream_{it} + \beta_3 Foreign_{it} + \varepsilon_{it} \qquad i = 1, \dots, n \quad t = 1, \dots, T$$

The four proxy variables depicted in the regression above function as the model's independent variables. As previously expounded, these independent variables capture the abrupt and exogenous increase in tariff protection experienced in 2018. The four independent variables $Horizontal_{it}$, $Upstream_{it}$, $Downstream_{it}$ and $Foreign_{it}$ each test the first, second, third and fourth hypotheses, respectively.[7] These variables represent the different gradations of exposure to import tariff protection across industries and over time. As explained in the previous section, $Horizontal_{it}$ proxies for the level of horizontal protection provided by weighted import tariffs for manufacturing industry sector i at time t. All tariffs in question were set in 2018, therefore 2018 is the year of treatment. This first independent variable tests for the horizontal protection effect of tariff increases on FDI flows into US manufacturing industry sectors.

Furthermore, $Upstream_{it}$ is a proxy for the weighted tariff protection provided in upstream manufacturing industry sectors. Hence, this second independent variable tests for the effect of increased import tariff protection in upstream manufacturing industry sectors. Similarly, $Downstream_{it}$ proxies for the weighted tariff protection provided in downstream manufacturing industry sectors. This third independent variable tests for the impact of increased import tariff protection in downstream manufacturing industry sectors.

Lastly, $Foreign_{it}$ proxies for domestic industry sectors' exposure to tariff retaliation by means of foreign average weighted tariffs set on exports. This fourth and final independent variable tests for the effect of increased import tariff protection in foreign manufacturing industry sectors. The beforementioned independent variables are all sector specific (i) and time specific (t). The coefficients for these variables embody the ATT; the effect of a given tariff protection increase among the observations that experienced this protection increment.

All four independent variables are used to test for tariff protection effects on FDI inflows; naturally, the regression's dependent variable is the inflows of FDI into US manufacturing sector i at time t. As previously explained, FDI_{it} measures the monetary value of foreign direct investment into the United States made by foreign investors. The natural logarithm of FDI_{it} is calculated and implemented as the

[7] $Horizontal_{it}$ represents the $Horizontal\ Protection_{it}$ variable; $Upstream_{it}$ represents the $Upstream\ Protection_{it}$ variable; $Downstream_{it}$ represents the $Downstream\ Protection_{it}$ variable; and $Foreign_{it}$ represents the $Foreign\ Retaliation_{it}$ variable.

regression's dependent variable. This allows for the dependent variable to be interpreted in percentage terms and coefficients to be interpreted as semi-elasticities. Moreover, α_i is the industry sector fixed effect. Using this fixed effect is statistically valuable for this model as it adopts a different value for each sector and therefore controls for all sector-specific and time-invariant heterogeneity. Similarly, γ_t is a time fixed effect used to control for unobserved heterogeneity driven by time trends. Finally, ε_{it} is the error term, depicting the amount by which the equation may differ during this analysis.

Initially, this model will be run with each independent variable separately. Thereafter, the model will be regressed with all independent variables. Following Flaaen and Pierce (2019), standard errors will be clustered at the industry sector level.

5. Results

The validity of all DiD approaches rely on the Parallel Trends Assumption. Thus, it is imperative that this assumption is taken into account before regressing the formulated model. In their study, Flaaen and Pierce (2019) factor in this assumption by generating a detrended measure of their dependent variable. The authors first evidence that certain industries' outcome variables followed different trends prior to the imposition of tariffs. In order to correct for these differing pre-trends, they detrend their dependent variable based on its pre-treatment (2017) linear trend (Flaaen & Pierce, 2019).

Following Faaen and Pierce (2019), industry sectors' $\mathrm{Ln}FDI_{it}$ trends are grouped and plotted to determine whether their pre-treatment trends differ considerably. Industries are initially grouped into two groups based on the median *Horizontal* value, and their trends are subsequently plotted. [8] As depicted in Graph B.1 in Appendix B, industry sectors' outcome trends differ markedly before tariffs were instituted in 2018. Interestingly, both trend lines experienced a considerable decrease in $\mathrm{Ln}FDI_{it}$ when tariffs were imposed in 2018. Although the *Lower Horizontal* trend line encountered the steepest decrease in $\mathrm{Ln}FDI_{it}$, it also experienced a starker recovery thereafter, surpassing *Upper Horizontal* in 2019. This signals that those sectors that were least protected experienced the largest decrease and recovery of $\mathrm{Ln}FDI_{it}$.

In order to correct for sectors' differing pre-treatment trends, the dependent variable $\mathrm{Ln}FDI_{it}$ is detrended based on its pre-treatment linear trend. This is initially done by fitting a multivariate regression model to the pre-treatment data; this model is then used to generate $\mathrm{Ln}FDI_{it}$ predicted

[8] Trend lines are grouped based on the median *Horizontal* value. That is, industry sectors with *Horizontal* values below the median *Horizontal* value are grouped together and their group trend line is plotted. Industry sectors with *Horizontal* values above the median *Horizontal* value are amassed and their group trend line is then plotted. These trend lines can be viewed in Figure XX in Appendix B.

values for the whole sample period. Thereafter, residuals are calculated by subtracting the predicted values from the original outcome variable. These residuals are then implemented as the detrended dependent variable.

It is important to note that, akin to Flaaen and Pierce (2019), time trends are treated as resulting from independent random shocks that impact each industry sector's outcomes in the short term, instead of being long-term trends driven by industry characteristics (Flaaen & Pierce, 2019). This is a reasonable assumption to be made considering the study's focus on a relatively short sample period.

Table 2
Regression Results

	(1) Diff-in-Diff without Detrending	(2) Detrended Diff-in-Diff	(3) Diff-in-Diff Placebo	(4) Diff-in-Diff 1st Differences	(5) Diff-in-Diff 1st Differences Placebo
$Horizontal_{it}$	-0.0632	-0.0041**	-0.1002	-0.0013*	31.5437
	(1.8663)	(0.0019)	(0.0966)	(0.0006)	(30.2211)
$Upstream_{it}$	0.7048	0.0117	-0.9650	0.0155	-14.9793
	(1.4251)	(0.0141)	(0.9147)	(0.0106)	(28.2252)
$Downstream_{it}$	-0.5149	0.0340	0.2138	-0.0107	-17.6743
	(1.8953)	(0.0398)	(0.1354)	(0.0381)	(30.0656)
$Retaliation_{it}$	-0.0915	-0.0043*	0.0618	-0.0039	-3.1219
	(0.1655)	(0.0026)	(0.3103)	(0.0027)	(21.8964)
Sector fixed effect	Yes	Yes	Yes	Yes	Yes
Time fixed effect	Yes	Yes	Yes	Yes	Yes
Constant	10.0754***	0.0326	0.0573	-0.0134***	-0.0101
	(.0321)	(0.0308)	(0.0706)	(0.0031)	(0.0361)
Observations	356	356	356	356	356
R-squared	0.0176	0.0168	0.0192	0.0007	0.0177

Robust standard errors are in parentheses and are clustered at the industry sector level
**** p<.01, ** p<.05, * p<.1*

The four hypotheses formulated in the Theoretical Framework were initially tested using separate regressions for each independent variable. Results for these regressions are depicted in Appendix A, Tables A.2 and A.3. Subsequently, the hypotheses were tested using a single two-way fixed effects regression. Results for this process are shown in Table 2 above.

5.1 Horizontal Protection

The first hypothesis assumes that US manufacturing industry sectors experience an increase in FDI inflows through horizontal import tariff protection. At first, the hypothesis was examined using a separate two-way fixed effects regression in which $Horizontal_{it}$ is the only regressor and $\text{Ln}FDI_{it}$ is not detrended and is the regressand. Results are shown in Appendix A, Table A.2. The table's fifth row demonstrates that an industry sector fixed effect was implemented to control for sector-specific heterogeneity. Additionally, the table's sixth row shows that a time fixed effect was used to control for any time trends that may generate biases. Furthermore, it is important to keep in mind that the regression's standard errors are clustered at the industry sector level.

As explained in Section 4.2.2, the proxy variable $Horizontal_{it}$ portrays the level of horizontal import tariff protection experienced in post-treatment periods. The coefficient for this independent variable, depicted in the first row of Table A.2, represents the average treatment effect on tariffed horizontal industry sectors. Thus, $Horizontal_{it}$ was used to test for the first hypothesis and its coefficient was expected to have a significantly positive value. The coefficient's actual value is 0.1687 but is found to be statistically insignificant at the 10% level. This signifies that, when using a simple linear regression without detrending, horizontal import tariff protection does not have a statistically significant effect on the FDI flows into import-competing manufacturing industry sectors.

Subsequently, the separate two-way fixed effects regression was run using the detrended dependent variable. Results are depicted in Appendix A, Table A.3. As shown in the first row of the table's first column, the independent variable is found to have a similar coefficient of 0.1280. Nevertheless, the significance of the coefficient did not rise; hence, the same insignificant horizontal protection effect still holds once the dependent variable is detrended.

As an alternative for testing the first hypothesis, $Horizontal_{it}$ was regressed in combination with all other proxy variables of interest. Results for this process are shown in Table 2 above. The regression was initially run using the dependent variable without detrending. As depicted in rows five and six, this regression was also regressed with sector and time fixed effects. As can be seen in the first row, this produced a negative but statistically insignificant coefficient for the independent variable. Thereafter, the detrended dependent variable was implemented. In this case, the $Horizontal_{it}$ coefficient is found to be negative and statistically significant at the 5% significance level, with a value of -0.0041. Thus, considering that the dependent variable is log transformed, a one-standard-deviation increase in horizontal import tariff protection is associated with a 0.41 percentage decrease in FDI flows into tariffed horizontal industry sectors. By dividing this coefficient by $\mathrm{Ln}FDI_{it}$'s standard deviation, it can be stated that 0.01% of the dependent variable's variation can be explained by this result.

Subsequently, with the purpose of conducting a preliminary robustness check, a placebo test is carried out by shifting the detrended regression's treatment period to 2017. The shift in treatment period is developed by interacting the independent variable with a placebo dummy which takes a value of 1 for the years 2017, 2018, 2019 and 2020. The placebo test regression is therefore expected to generate insignificant coefficients for the variables of interest. As highlighted by Eggers, Tunon and Dafoe (2021), placebo tests are imperative for checking the soundness of regression results and improving causal inference, especially when samples are limited in size, as is the case. Results for this placebo test can be seen in the third column of Table 2. The placebo test was developed using the same two-way fixed effects regression without any time-varying control variables. This produced a negative and statistically insignificant $Horizontal_{it}$ coefficient.

Therefore, the final multivariate regression's negative and significant coefficient indicates that increased horizontal tariff protection serves a significant decelerator of FDI inflows. This finding is corroborated by the placebo test's insignificant coefficient. Nevertheless, these findings contradict the positive effect theorized in the first hypothesis. Thus, the first hypothesis is rejected by stating that horizontal tariff protection has a significantly negative impact on FDI flows into tariffed manufacturing industry sectors.

5.2 Upstream Protection

The second hypothesis assumes that downstream US manufacturing industry sectors experience a decrease in FDI inflows, through import tariff protection in upstream manufacturing industry sectors. Analogous to the first hypothesis, the same process and regressions were used to test this hypothesis. The proxy variable $Upstream_{it}$ was used to test for the possible tariff protection effects through backward linkages with upstream sectors. As explained in Section 4.2.2, this proxy variable is the independent variable that represents the level of upstream import tariff protection experienced in post-treatment periods. Hence, this independent variable embodies the average treatment effect of tariffed upstream industry sectors.

Initially, the DiD model was regressed with the un-detrended dependent variable and with the $Upstream_{it}$ independent variable as the sole regressor. As shown in the second column and second row of Table A.2 in Appendix A, a positive and insignificant coefficient is found for the variable of interest. Moreover, as seen in Table A.3, Once $\mathrm{Ln}FDI_{it}$was detrended, $Upstream_{it}$ increased in magnitude but remained insignificant at the 10% significance level. This signifies that, when implementing a simple linear regression, upstream import tariff protection does not have a significant effect on the FDI flows into downstream manufacturing industry sectors.

Subsequently, the aforementioned multivariate regression model was run with and without detrending the dependent variable. As seen in Table 2, this process had a considerable impact on the magnitude of the $Upstream_{it}$ coefficients. Nonetheless, these coefficients remained statistically insignificant. Thereafter, the placebo test regression, shown in the table's third column, also produced an insignificant coefficient. Notably, this coefficient was now found to be negative. Based on the insignificant coefficients found, the second hypothesis is rejected by asserting that upstream tariff protection does not have a significant effect on FDI flows into downstream manufacturing industry sectors.

5.3 Downstream Protection

The third hypothesis assumes that upstream US manufacturing industry sectors experience an increase in FDI inflows, through import tariff protection in downstream manufacturing industry sectors. The same process and regressions were used to test this hypothesis. The proxy variable $Downstream_{it}$ was used to test for the possible tariff protection effects through forward linkages with downstream sectors. As expounded in Section 4.2.2, this proxy variable functions as the independent variable that embodies the level of downstream import tariff protection experienced in post-treatment periods. Therefore, this independent variable represents the average treatment effect of tariffed downstream industry sectors.

At first, the DiD regression model was run without detrending the dependent variable and with the $Downstream_{it}$ independent variable as the sole regressor. As depicted in the third column and third row of Table A.2 in Appendix A, this independent variable is found to have a positive and insignificant coefficient of 0.1754. Subsequently, the regression was run using the detrended dependent variable; nonetheless, this regression also generated an insignificant $Downstream_{it}$ coefficient. Thus, when using a simple linear DiD regression, downstream import tariff protection does not have a significant effect on the FDI flows into upstream manufacturing industry sectors.

Thereafter, the third hypothesis was tested using the multivariate DiD regression model with and without detrending the dependent variable. As can be seen in the first column of Table 2, without detrending, this process initially generated a negative and insignificant $Downstream_{it}$ coefficient. Once $\text{Ln}FDI_{it}$ was detrended, this coefficient became positive but remained insignificant. Furthermore, the subsequent placebo test regressions also produced insignificant coefficients. The insignificant $Downstream_{it}$ coefficients found throughout the analysis contradict the study's third hypothesis. Hence, the third hypothesis is also rejected by stating that downstream tariff protection does not have a significant effect on FDI flows into upstream manufacturing industry sectors.

5.4 Foreign Retaliation

The fourth and final hypothesis theorizes that US manufacturing industry sectors experience a decrease in FDI inflows, through retaliatory import tariff protection in foreign manufacturing industry sectors. Akin to all other hypotheses, the same fixed effects regressions were used to test the fourth hypothesis. The proxy variable $Foreign_{it}$ was implemented to test for the possible retaliatory tariff protection effects through export linkages with foreign industry sectors. This proxy variable functions as the independent variable that represents the retaliatory effect of foreign import tariffs experienced in post-treatment periods. Ergo, this independent variable represents the average treatment effect of foreign tariffs on domestic industry sectors.

Initially, the DiD model was regressed with the $Foreign_{it}$ independent variableas the sole regressor and without detrending the dependent variable. As shown in the fourth column and fourth row of Table A.2 in Appendix A, a negative and insignificant coefficient is found for the variable of interest. Afterwards, once $\text{Ln}FDI_{it}$ was detrended, the magnitude of the $Foreign_{it}$ coefficient decreased; nevertheless, the coefficient was still found to be insignificant. Results for this can be seen in the fourth column of Table A.3 in Appendix A. Hence, when $Foreign_{it}$ is used as the only regressor, foreign import tariff protection does not have a significant effect on the FDI flows into domestic manufacturing industry sectors.

Subsequently, the previously mentioned multivariate regression model was initially run without detrending; as seen in Table 2, the $Foreign_{it}$ coefficient remained negative and insignificant. Surprisingly, once the dependent variable was detrended, the independent variable's coefficient became significant (at the 10% level) whilst also maintaining its same sign. This coefficient is found to have a value of -0.0043; therefore, a one-standard-deviation increase in retaliatory tariff protection in foreign sectors is associated with a 0.43 percentage decrease in FDI flows into exporting domestic industry sectors. By dividing this coefficient by $\text{Ln}FDI_{it}$'s standard deviation, it can be stated that this result explains 0.01% of the dependent variable's variation. Thereafter, the placebo test regression produced an insignificant coefficient for $Foreign_{it}$, as was expected. Moreover, the placebo coefficient is found to be positive, whereas all other coefficients are negative.

Thus, the final multivariate regression's negative and significant coefficient signal that increased retaliatory tariff protection in foreign industry sectors is significantly associated with decreased FDI flows into domestic sectors. These findings are consistent with the fourth hypothesis and reaffirm that domestic manufacturing industry sectors experience a decrease in FDI inflows through foreign retaliatory tariffs.

5.5 Robustness Checks

In order to further check the robustness of the model specified and results found, the aforementioned regression model is regressed using first differences. Implementing first differences is appropriate because it detrends the variables of interest, in addition to controlling for unobserved, time-invariant omitted variables. Furthermore, as pointed out by Javorcik (2004), using differences is beneficial because more weight is assigned to enduring changes in the dependent and independent variables, thereby decreasing the influence of noise. Nonetheless, it must be noted that first differences reduce sample sizes and results must therefore be treated with greater caution. Firstly, the separate two-way fixed effects regressions were differenced with and without detrending the dependent variable. Results are shown in Tables A.4 and A.5 of Appendix A. This process reduced the sample size to 279 observations for all the variables of interest. Akin to the results in Table A.2, first differences produce statically insignificant coefficients for all variables of interest. Subsequently, the multivariate regression model with all independent variables was differenced with and without detrending. The multivariate regression model is differenced using the following DiD design:

$$\mathrm{Ln}FDI_{it} - \mathrm{Ln}FDI_{it-1} = \beta_1(Horizontal_{it} - Horizontal_{it-1}) + \beta_2(Upstream_{it} - Upstream_{it-1}) + \beta_3(Downstream_{it} - Downstream_{it-1}) + \beta_3(Foreign_{it} - Foreign_{it-1}) + (\varepsilon_{it} - \varepsilon_{it-1}) \qquad i = 1, \dots, n \quad t = 1, \dots, T$$

Results for the regression without detrending are shown in the last column of Table A.4 in Appendix A. In this case, all coefficients are found to be statistically insignificant. Furthermore, results for the detrended regression are depicted in the fourth column of Table 2. Once $\mathrm{Ln}FDI_{it}$was detrended, the $Horizontal_{it}$ and $Foreign_{it}$ coefficients maintained their negative signs. Nevertheless, whilst $Horizontal_{it}$'s significance level persists (at the 10% level), $Foreign_{it}$is found to be statistically insignificant. This significant result constitutes evidence of horizontal tariff protection possibly occurring with a lagged effect. The impact of horizontal tariff protection may take longer to arise due to the time needed for foreign investors to identify the specific sectors that have been tariffed, to assess their strategic positions within these sectors, and to react accordingly. Moreover, $Upstream_{it}$and $Downstream_{it}$ remain insignificant throughout all the regressions.

With the purpose of additionally investigating robustness, a second placebo test is conducted using the differenced regression. This placebo test is developed by once again shifting the regression's treatment period to 2017. The last column of Table 2 demonstrates that all coefficients are found to be insignificant. It is important to keep in mind that these results are generated based on a smaller number of observations and should therefore be treated with caution.

Moreover, to further examine $Horizontal_{it}$'s possible lagged effect, detrended separate and multivariate regressions are run without differencing but with dummies for post-treatment periods ($Post_t$). $Horizontal_{it}$ and other variables of interest are interacted with a post-treatment dummy that takes a value of 1 for the years 2019 and 2020 and is equal to 0 otherwise. Hence, these interaction terms are the independent variables used to study lagged effects by means of the following regression specification:

$$\text{Ln}FDI_{it} = \alpha_i + \gamma_t + \beta_1(Horizontal_{it}.Post_t)_{it} + \beta_2(Upstream_{it}.Post_t)_{it} + \beta_3(Downstream_{it}.Post_t)_{it} + \beta_3(Foreign_{it}.Post_t)_{it} + Output_{it} + \varepsilon_{it} \quad i = 1, \dots, n \quad t = 1, \dots, T$$

Initially, the separate two-way fixed effects regression, in which $Horizontal_{it}$'s interaction term is the sole regressor, generated a negative but statistically insignificant coefficient. Results are shown in the first column of Table A.6 of Appendix A. Thereafter, the multivariate regression depicted above also produced a negative and insignificant coefficient for $(Horizontal_{it}.Post_t)_{it}$, as can be seen in the table's second column. Thus, the $Horizontal_{it}$ lagged effect indicated by the differenced regression is not robust to this alternative specification.

6. Conclusion & Discussion

In this paper four hypotheses were tested in order to answer the initial research question. The first hypothesis predicted that US manufacturing industry sectors would experience an increase in FDI inflows, through horizontal import tariff protection. By means of a multivariate DiD regression model, horizontal tariff protection was proven to negatively impact the flow of FDI into US manufacturing industry sectors. It was significantly demonstrated that a one-standard-deviation increase in horizontal import tariff protection is associated with a 0.41 percentage decrease in FDI flows into tariffed horizontal industry sectors. This finding is robust to an alternative detrending procedure and placebo tests; therefore, horizontal tariff protection effects are found to be the most statistically pertinent relative to other tariff protection effects.

This negative effect contradicts existing tariff-jumping FDI literature which predicts that FDI flows into host nations increase as trade protection barriers increment. This contradictory finding can be economically justified by the overall shift in investor sentiment that correlates with tariff increases. Increases in US import tariffs have been proven to increment estimates of trade policy uncertainty; whilst trade policy uncertainty has also been found to significantly decrease firm-level investment (Benguria et al. ,2022). Hence, tariff increments in horizontal import-competing sectors, and their accompanying trade policy uncertainty, can be treated as signals of a broader deterioration in the openness of the US economy. Multinationals and foreign investors picked up these signals and acted accordingly by decreasing their investments to horizontally tariffed sectors. It is in this sense that, during Trump's time in office, trade investment became uncertain and politicized at the expense of FDI.

Furthermore, the second hypothesis assumed that downstream US manufacturing industry sectors would experience a decrease in FDI inflows, through import tariff protection in upstream manufacturing industry sectors. By means of the same regression analysis, it was proven that upstream tariff protection had no significant effect on FDI inflows. Hence, impacts on FDI inflows through the forward linkage channel are found to be statistically insignificant. This insignificant tariff protection effect is of economic relevance as it demonstrates that upstream tariff protection does not attract or repel FDI from downstream sectors, even if it makes imported inputs more expensive. This indicates that upstream tariffs' potential increases in input costs do not alter the attractiveness of downstream sectors for FDI.

Moreover, the third hypothesis predicted that upstream US manufacturing industry sectors would experience an increase in FDI inflows, through import tariff protection in downstream manufacturing industry sectors. By implementing the previously mentioned regressions, it was demonstrated that downstream tariff protection had no significant impact on FDI inflows. Therefore, impacts on FDI inflows through the backward linkage channel are found to be statistically insignificant. This insignificant finding is economically justified by the fact that tariffs instituted in downstream sectors (on final goods) do not directly change these sectors' need for upstream suppliers in the short term (Amiti & Konings, 2007). Therefore, the attractiveness of upstream, supplying sectors for FDI is not modified by tariffs set on their purchasers.

Lastly, the fourth hypothesis anticipated that US manufacturing industry sectors would experience a decrease in FDI inflows, through retaliatory import tariff protection in foreign manufacturing industry sectors. As expected, retaliatory tariff protection in foreign sectors was proven to negatively impact the flow of FDI into US manufacturing industry sectors. It was significantly proven (at the 10% significance level) that a one-standard-deviation increase in retaliatory tariff protection in foreign sectors is associated with a 0.43 percentage decrease in FDI flows into exporting domestic industry sectors.

This significant finding is economically justified by retaliatory tariffs' signaling power. When conducting foreign investments, multinationals commonly consider market seeking factors of FDI such as market growth and export penetration (Wadhwa & Reddy, 2011). Once retaliatory tariffs are set in foreign export markets, foreign investors are signaled that tariffed US exports will experience dampened foreign demand, and decreased market and export access (Fajgelbaum and Khandelwal, 2021). Therefore, investors are demotivated from conducting market-seeking and export-seeking FDI into those US sectors that have been retaliated against.

To conclude, the findings presented above are combined to develop the following answer to the research question: The United States' manufacturing industry sectors experience a significant decrease in FDI inflows through import tariff protection in horizontal and foreign industry sectors. Among these two tariff protection effects, horizontal tariff protection has the most statistically important impact on FDI inflows. Conversely, The United States' manufacturing industry sectors do not experience significant changes in FDI inflows through import tariff protection in upstream and downstream industry sectors.

There are various limitations that arise from this study that must be taken into consideration. One of the main drawbacks is the low frequency data implemented. Whilst other studies such as Flaaen and Pierce (2019) implement higher-frequency, monthly data, this paper implements yearly data with a limited number of observations. This being the case because sector-specific FDI inflow data is only available on a yearly basis. Even though an appropriate methodology is used, in certain cases, the limited number of observations drove up the standard errors for specific variables of interest. This in turn limits the study's robustness and external validity.

Another pertinent drawback arises from the fact that only manufacturing industry sectors were taken into account. These sectors were considered to be the most suitable for this analysis as they have the largest and clearest vertical linkages and are the most likely to conduct tariff-jumping FDI (Blonigen, 2002). Nevertheless, certain manufacturing sectors rely heavily on particular upstream and downstream nonmanufacturing industry sectors. The potential effects of tariff protection on nonmanufacturing sectors and the vertical linkages with these sectors are also pertinent for such an analysis; however, they are not estimated. This limits the study's external validity and the possibility of extrapolating results to other nonmanufacturing sectors. Moreover, the input-output proportions, used to generate the *Upstream Protection* and *Downstream Protetion* proxy variables, are only calculated for the year 2012. Even though these proportions might be representative, it would be preferable to generate proportions for each year. Unfortunately, input-output matrices are unavailable for the time span studied.

Furthermore, the average treatment effect on the treated (ATT) estimated is highly localized and is specific to tariffed industry sectors. This limits the interpretation of results to sectors that have received particular intensities of tariff protection. This hinders the results' external validity and economic relevance, considering that most applications are interested in the marginal effects of tariff increases. Additionally, when estimating this ATT, there are other time-varying variables that possibly correlate with FDI inflows and are not considered. For example, variables such as sector-specific tax rates are known to influence FDI inflows and may therefore generate an omitted variable bias if not incorporated. Unfortunately, data on sector-specific tax rates is unavailable at an appropriate level of aggregation.

Even though numerous drawbacks exist, findings concerning the subject studied may still be pertinent for policymakers. This is because they help establish how tariffs and their diverse protection channels impact the FDI received by domestic industries. In consequence, they illustrate how tariff protectionism may indirectly affect nations' financial accounts. Policymakers may implement such findings to develop cost-benefit analyses concerning trade policies directed at protecting domestic industries. They may also be adopted as the theoretical backbone for the formulation of policies that promote trade liberalism as a tool for attracting foreign funds.

Moreover, the study's findings also constitute further evidence of the byproducts generated by former president Trump's tariffs. The negative impacts on FDI signal that domestic industries did not experience greater foreign competition via FDI; nonetheless, they also indicate that domestic industries experienced a decrease in productivity and technological spillovers from FDI. In order to establish the overall welfare effects of the negatively impacted FDI inflows, policymakers must weigh and evaluate these two competing forces.

The results from this research could be built upon by implementing firm-level data that depicts firms' share of time-varying foreign ownership and describes firms as purchasers or suppliers to multinationals. Based on this data, the firm-level impacts of tariff protection could be estimated. Moreover, an alternative method could also be implemented to detrend the data used within this analysis. In addition to detrending via model fitting and first differencing, it would also be compelling to follow Finkelstein (2007) by differencing out pre-trend paths for each coefficient. In doing so, point estimates of particular tariff protection channels could be approximated. It would also be of interest to study the effects of tariff protection in combination with other policies that have been instituted to attract FDI. For instance, in this context, tariff protection could be studied in conjunction with decreasing corporate tax rates. Furthermore, it could also be interesting to examine the effect of other sectoral characteristics, such as industry turnover, on the inflows of FDI.

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8. Appendix A

Table A.1
All Manufacturing Industry Sectors Used in the Analysis

NAICS Sector Code	Sector Description
3111	Animal foods
3112	Grain and oilseed milling
3113	Sugar and confectionery products
3114	Fruit and vegetable preserving and specialty foods
3115	Dairy products
3116	Animal slaughtering and processing
3117	Seafood product preparation and packaging
3118	Bakery products and tortillas
3119	Other food products
3121	Beverages
3122	Tobacco products
3131-3132-3133	Textile mills
3141-3149	Textile product mills
3151-3152-3159	Apparel
3161-3162-3169	Leather and allied products
3211-3212-3219	Wood products
3221	Pulp, paper, and paperboard mills
3222	Converted paper products
3231	Printing and related support activities
3241	Petroleum and coal products
3251	Basic chemicals
3252	Resins and synthetic rubber, fibers, and filaments
3254	Pharmaceuticals and medicines
3256	Soap, cleaning compounds, and toilet preparations
3259	Other chemicals
3261	Plastics products
3262	Rubber products
3271	Clay products and refractories
3272	Glass and glass products
3273	Cement and concrete products
3274	Lime and gypsum products
3279	Other nonmetallic mineral products
3311	Iron and steel mills
3312	Steel products from purchased steel
3313	Alumina and aluminum production and processing
3314	Nonferrous metal (except aluminum) production and processing
3315	Foundries
3321	Forging and stamping
3322	Cutlery and hand tools
3323	Architectural and structural metals
3324	Boilers, tanks, and shipping containers
3325	Hardware
3326	Spring and wire products
3327	Machine shop products, turned products, and screws, nuts, and bolts
3328	Coating, engraving, heat treating, and allied activities
3329	Other fabricated metal products
3331	Agriculture, construction, and mining machinery
3332	Industrial machinery
3333	Commercial and service industry machinery

3334	Ventilation, heating, air-conditioning, and commercial refrigeration
3335	Metalworking machinery
3336	Engines, turbines, and power transmission equipment
3339	Other general purpose machinery
3341	Computers and peripheral equipment
3342	Communications equipment
3343	Audio and video equipment
3344	Semiconductors and other electronic components
3345	Navigational, measuring, and other instruments
3346	Magnetic and optical media
3351	Electric lighting equipment
3352	Household appliances
3353	Electrical equipment
3359	Other electrical equipment and components
3361	Motor vehicle manufacturing
3362	Motor vehicle bodies and trailer manfucaturing
3363	Motor vehicle parts manufacturing
3364	Aerospace products and parts
3365	Railroad rolling stock
3366	Ship and boat building
3369	Other transportation equipment
3371-3372-3379	Furniture and related products
3391	Medical equipment and supplies
3399	Other miscellaneous manufacturing

Source: Bureau of Economic Analysis' (BEA) Direct Investment Database

Table A.2
Regression Results for Separate Regressions Without Detrending

	(1) Horizontal Diff-in-Diff	(2) Upstream Diff-in-Diff	(3) Downstrea m Diff-in- Diff	(4) Retaliation Diff-in-Diff
$Horizontal_{it}$	0.1687 (0.6352)			
$Upstream_{it}$		0.1989 (0.6493)		
$Downstream_{it}$			0.1754 (0.7076)	
$Retaliation_{it}$				-.0960 (0.1591)
Sector fixed effect	Yes	Yes	Yes	Yes
Time fixed effect	Yes	Yes	Yes	Yes
Constant	10.0752*** (.0313)	10.0748*** (.0312)	10.0752*** (.0316)	10.0772*** (.028)
Observations	356	356	356	356
R-squared	0.0001	0	0	0.0001

Robust standard errors are in parentheses and are clustered at the industry sector level
**** p<.01, ** p<.05, * p<.1*

Table A.3
Regression Results for Separate Detrended Regressions

	(1) Horizontal Diff-in-Diff	(2) Upstream Diff-in-Diff	(3) Downstrea m Diff-in- Diff	(4) Retaliation Diff-in-Diff
$Horizontal_{it}$	0.1280 (0.6322)			
$Upstream_{it}$		0.2072 (0.6347)		
$Downstream_{it}$			0.1037 (0.6260)	
$Retaliation_{it}$				-.0430 (0.0971)
Sector fixed effect	Yes	Yes	Yes	Yes
Time fixed effect	Yes	Yes	Yes	Yes
Constant	0.0362 (.0879)	0.0352 (0.0906)	.0351 (.0892)	0.0377 (0.0383)
Observations	356	356	356	356
R-squared	0.0001	0	0	0.0001

Robust standard errors are in parentheses and are clustered at the industry sector level
**** p<.01, ** p<.05, * p<.1*

Table A.4

Regression Results for Regressions Without Detrending in First Differences

	(1) Horizontal Diff-in-Diff	(2) Upstream Diff-in-Diff	(3) Downstream Diff-in-Diff	(4) Retaliation Diff-in-Diff	(5) Multivariate Diff-in-Diff
$Horizontal_{it}$	-0.3529				0.2791
	(0.3983)				(0.3099)
$Upstream_{it}$		-0.3658			0.1171
		(0.3971)			(0.1039)
$Downstream_{it}$			-0.4037		-0.5001
			(0.4369)		(0.3739)
$Retaliation_{it}$				-0.4876	0.3465
				(0.6917)	(0.2696)
Sector fixed effect	Yes	Yes	Yes	Yes	Yes
Time fixed effect	Yes	Yes	Yes	Yes	Yes
Constant	-0.0091	-0.0091	-0.009	-0.0102	-0.0134***
	(0.0244)	(0.0244)	(0.0244)	(0.0240)	(0.0030)
Observations	279	279	279	279	279
R-squared	0.0001	0	0	0.0002	0.0005

Robust standard errors are in parentheses and are clustered at the industry sector level

**** p<.01, ** p<.05, * p<.1*

Table A.5

Regression Results for Detrended Separate Regressions in First Differences

	(1) Horizontal Diff-in-Diff	(2) Upstream Diff-in-Diff	(3) Downstream Diff-in-Diff	(4) Retaliation Diff-in-Diff
$Horizontal_{it}$	-0.3701			
	(0.3974)			
$Upstream_{it}$		-0.3719		
		(0.3931)		
$Downstream_{it}$			-0.4092	
			(0.4324)	
$Retaliation_{it}$				-0.4171
				(0.6822)
Sector fixed effect	Yes	Yes	Yes	Yes
Time fixed effect	Yes	Yes	Yes	Yes
Constant	-0.0056	-0.0055	-0.0054	-0.0067
	(0.0249)	(0.0249)	(0.0249)	(0.0383)
Observations	279	279	279	279
R-squared	0.0004	0.0001	0.0001	0.0003

Robust standard errors are in parentheses and are clustered at the industry sector level

**** p<.01, ** p<.05, * p<.1*

Table A.6

Regression Results for Detrended Regressions with Lagged Effects

	(1) Horizontal Diff-in-Diff	(2) Multivariate Diff-in-Diff
$(Horizontal_{it} \times Post_{it})_{it}$	-0.1280	-0.0011
	(0.6322)	(0.0012)
$(Upstream_{it} \times Post_{it})_{it}$		0.0339
		(0.0318)
$(Downstream_{it} \times Post_{it})_{it}$		0.0215
		(0.0689)
$(Retaliation_{it} \times Post_{it})_{it}$		-0.0048
		(0.0033)
Sector fixed effect	Yes	Yes
Time fixed effect	Yes	Yes
Constant	0.0362	-0.0563
	(.0879)	(0.0781)
Observations	356	356
R-squared	0.0004	0.0007

Robust standard errors are in parentheses and are clustered at the industry sector level

**** p<.01, ** p<.05, * p<.1*

9. Appendix B

Graph B.1