FUNDAÇÃO GETULIO VARGAS ESCOLA DE ADMINISTRAÇÃO DE EMPRESAS DE SÃO PAULO

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CONSEQUENCES OF STEEL TARIFFS ON IMPORTED VEHICLES: THE CASE OF US

SÃO PAULO

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Thesis presented to Escola de Administração de Empresas de São Paulo of Fundação Getulio Vargas, as a requirement to obtain the title of Master in International Management (MPGI).

Knowledge Field: Economia e Finanças Internacionais

Adviser : Prof. Dr. Rafael F. Schiozer

SÃO PAULO
2018

Angeli, Silvia.
Consequences of steel tariffs on imported vehicles : the case of US / Silvia Angeli. - 2018.
41 f.

Orientador: Rafael Felipe Schiozer
Dissertação (MPGI) – Fundação Getulio Vargas, Escola de Administração de Empresas de São Paulo.

1. Tarifas alfandegárias – Estados Unidos. 2. Aço – Comércio – Estados Unidos. 3. Automóveis estrangeiros. I. Schiozer, Rafael Felipe. II. Dissertação (MPGI) - Escola de Administração de Empresas de São Paulo. III. Fundação Getulio Vargas. IV. Título.

CDU 339.543.4::669.1(73)

Ficha catalográfica elaborada por: Isabele Oliveira dos Santos Garcia CRB SP-010191/O
Biblioteca Karl A. Boedecker da Fundação Getulio Vargas – SP

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SÃO PAULO
2018

AKNOWLEDGMENT

I would like to express my sincere gratitude to my advisor Prof. Rafael for the continuous support of my research, for his patience, motivation, and immense knowledge.

ABSTRACT

This thesis analyses the effect of US steel tariffs on the volume of vehicles imported from the European Union from April 2002 to August 2005. The intent is to fill part of the gap left by the literature on the effect of tariffs imposed on raw materials on downstream industries. I use an import tax imposed by the US government to apply a difference-in-differences analysis exploring data obtained from "Harmonized System (HS) District-level Data" database developed by US Census Bureau. My difference in differences analysis indicates that while imports of products made mainly of steel react to changes in tariff levels, the flow of vehicles imports is not affected in the same way, showing no significant change between the two periods taken into consideration. My results are robust the introduction of country, commodity and time fixed effects. Finally, robustness checks provide further support to the findings, showing outcome independency from the control group used and the link between the variation in import volumes and the removal of tariffs.

KEYWORDS: imports, tariffs, protectionism, Trump, steel, vehicles

RESUMO

Esta tese analisa o efeito das tarifas de aço nos EUA sobre o volume de veículos importados da União Européia desde abril de 2002 até agosto de 2005. A intenção é preencher parte da lacuna deixada pela literatura sobre o efeito das tarifas aplicadas às matérias-primas a jusante. indústrias. Eu uso tarifas de importação imposto pelo governo dos EUA para aplicar uma *Difference in Differences analysis* explorando dados obtidos a partir do banco de dados "Harmonized System (HS) District-level Data" desenvolvido pelo US Census Bureau. Minha *Difference in Differences analysis* indica que, enquanto as importações de produtos feitos principalmente de aço reagem a mudanças nos níveis tarifários, o fluxo de importação de veículos não é afetado da mesma maneira, não mostrando nenhuma mudança significativa entre os dois períodos considerados. Meus resultados são robustos depois da introdução de efeitos fixos (país, commodity e tempo). Finalmente, as verificações de robustez fornecem suporte adicional aos resultados, mostrando a independência do resultado do grupo de controle usado e a ligação entre a variação nos volumes de importação e a remoção de tarifas.

PALAVRAS CHAVE: importações, tarifas, protecionismo, Trump, aço, veículos

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1. INTRODUCTION

In the recent months Donald Trump's import policy has been a topic of great interest in the world stage. The US President's unexpected decision to impose a 25% tariff on steel imported from almost every country, European States included, caused divergent reactions in corporate America. Indeed, while domestic steelmakers have largely applauded the trade action, the American International Automobile Dealers Association (AIADA) has published a statement against the plan, highlighting the adverse effect that this decision may have on industry competitiveness:

> "*We are concerned with the unintended consequences the proposals would have, particularly that it will lead to higher prices for steel and aluminum here in the United States, compared to the price paid by our global competitors. [...] This would place the U.S. automotive industry, which supports more than 7 million American jobs, at a competitive disadvantage*" (Blunt, 2018).

Global Automakers, a US association representing international motor vehicle manufacturers, has the same line of thought: "A tariff is a tax and this action will raise prices and hurt American auto producers and their customers" (Bozzella, 2018).

The knowledge about the effects of the introduction of tariffs is largely based on empirical studies that investigate their effect on imports. The studies performed by Piquet (1953), Krause (1959), Kreinin (1961) and Finger (1976) shed light on the relationship between tariffs and imports. Despite some misalignments in the results, the resulting common opinion was towards the existence of a negative relationship between tariffs and imports. A second relevant group of studies, represented by Balassa (1965), Corden (1971), Basevi (1966) and Finger (1969), focused instead on the limits of the commonly adopted practice of considering the duties applied on outputs as the only basis for assessing the effectiveness of the adoption of a trade policy. From their point of view, in order to carry out this evaluation, a broader approach would be necessary, which would take into account not only the tariffs applied on outputs but also those applied on raw materials and intermediate products. Finally, recent literature has focused on the different effect of trade and non-trade barriers, as well the consequences of supranational free trade agreements. The studies of Leamer (1989), Trefler (1993) and Haveman, Nair-Reichert and Thursby (2003) focused on non-trade barriers, while those of Felbermayr and Kohler (2007), Feenstra and Kee (2007), Frensch (2010) and Ruhl (2013) discussed trade agreements.

Despite the well-developed theoretical framework, so far little empirical research has been done on the effect that input tariffs have on imports of products that use the duties-subjected inputs as raw materials or intermediate goods in the production process. This study seeks to fill part of this gap by providing empirical evidence on the effect of tariffs imposed on raw materials on downstream industries. This dissertation provides an important opportunity to achieve a more in-depth understanding of the possible consequences of the recent US actions on trade flow and industry competitiveness, taking the point of view of automakers and the automotive industry. The findings of the research make a contribution to the field of trade policy evaluation, allowing for the improvement of the decision making process due to a more comprehensive interpretation and greater awareness of the consequences of tariffs' adoption.

The rest of the thesis will be developed according to the following structure. Section 2 will introduce the current environment, focusing on US trade policy under Bush and Trump's administration, as well as the dynamics of the steel market. In section 3, I will provide a summary of the existing literature, and, in section 4, I will illustrate the methodology. Section 5 will show the results obtained, and finally, in section 6, I will state the main conclusions.

2. THE STEEL INDUSTRY AND IMPORT TARIFFS

In this session, I first describe the decision adopted under Bush's government to introduce a steel restrictive trade policy in 2002. After that, I summarize the similar trade policy approved during Trump's administration in 2018. Finally, I move to the description of the dynamics that have characterized steel market in the recent years.

2.1 Steel tariffs under Bush's administration

In June 2001, the International Trade Commission (USITC) started an investigation aimed at establishing whether the US steel sector had been hurt by foreign low-priced imports, with European, Japanese and Chinese steel under great scrutiny. According to USITC report (2001), steel imports were provoking serious damages to local industry since a relevant number of firms were found in bankruptcy conditions with great losses due to the persistent downward trend of prices.

Based on this statement and with the purpose of protecting the US steel industry, in March 2002 George W. Bush's administration imposed steel tariffs ranging between 8% and 30%. The restrictive

policy applied to the majority of the countries, the EU included, but with the exclusion of Canada, Mexico and some developing countries.

The support for the introduction of steel tariffs was not unanimous. A number of steel-consuming firms took a position against the protective manoeuvre, claiming that trade restrictions would lead to an increase of the cost of production, making it harder for firms to compete internationally and causing a greater loss in jobs than they would protect in the steel industry itself (Read, 2005).

These concerns showed up at the beginning of 2002, with steel prices going up fast during the first half of 2002 and slowing down afterwards (Francois and Baughman, 2003). Talking about the effect that steel price increases had on steel-consuming industries, Read (2005) stated that "steel price rises had a severe impact on costs, profit margins, and employment, shifting demand towards imported manufacture."

In response to complaints by steel-consuming companies, the US Government started excluding products previously affected by the imposition. The situation worsened after the submission of a complaint made by the EU to the World Trade Organization (WTO), accusing the US of breaching several obligations reported in the General Agreement on Tariffs and Trade (GATT) and the Agreement on Safeguards (Commission of the European Communities, 2002). Furthermore, the EU threatened retaliatory actions targeting US core export products (Read, 2005).

Under the pressure of steel-consuming industries internally and the WTO externally, the Bush administration decided to lift the steel tariff in December 2003, a year and a half earlier than what had been initially planned. In a public statement, Bush explained "I took action to give the industry a chance to adjust to the surge in foreign imports and to give relief to the workers and communities that depend on steel for their jobs and livelihoods. These safeguard measures have now achieved their purpose, and as a result of changed economic circumstances it is time to lift them" (Bush, 2003).

2.2 Trump's trade policy

A number of similarities can be found between the 2002 US steel policy and the one implemented recently by the Trump administration. From the beginning of his presidential campaign in 2016, President Donald Trump has accused globalization policies and international agreements of being responsible for the huge and increasing manufacturing trade deficit of US, as well as the outward overseas flow of American jobs occurring in the last fifteen years. Trump stated that due to politicians' support of free trade markets that had occurred in the past years, "America changed its

policy from promoting the development in America, to promoting the development of other Nations" (Donald Trump Speech on Trade, 2016). These statement support the view that free trade agreements have hindered US growth, moving decision-making power from the United States to supranational bodies and, as a consequence, preventing the country from exercising the veto power on decisions that directly affect Americans' welfare.

Among the various globalization policies implemented, there is one that Trump has repeatedly targeted as a direct cause of the increase in US job loss and trade deficit: the entry of China into the WTO and the subsequent opening of the US market to Chinese products (Mohsin, 2008). According to the US President, opening markets to Chinese imports has led to a decrease in the GDP growth rate, which has been translated into a failure to create new jobs. In addition, Trump accused China of being a "currency manipulator", taking advantage of currency devaluation to make Chinese products cheaper to sell in America and other countries.

The US administration proposal to solve this problem is divided into two principal lines of action. First, it intends to put the US first through the negotiation of "fair, bilateral trade deals that bring jobs and industry back onto American shores" (Donald Trump Speech on Trade, 2016). On the other hand, it aims to protect the US from countries that are taking advantage of currency devaluation through the creation of trade barriers in the forms of tariffs and taxes.

The proposal did not remain a mere speech. On the first of March 2018, the US president announced the intention to impose a 25% tariff on steel and after seven days, the US government published the provision to apply the tariffs indiscriminately, with the estimated starting date fixed for 15 days afterwards. Initially, some countries had been temporarily excluded from the order, namely the EU, Australia, Canada, Argentina, Mexico, Brazil, and South Korea. However, while South Korea, Argentina, Australia and Brazil were able to negotiate their permanent exception from the policy, the same cannot be said for Europe, Canada, and Mexico, which became officially subjected to the steel tariff in May of 2018.

2.3 The US steel industry

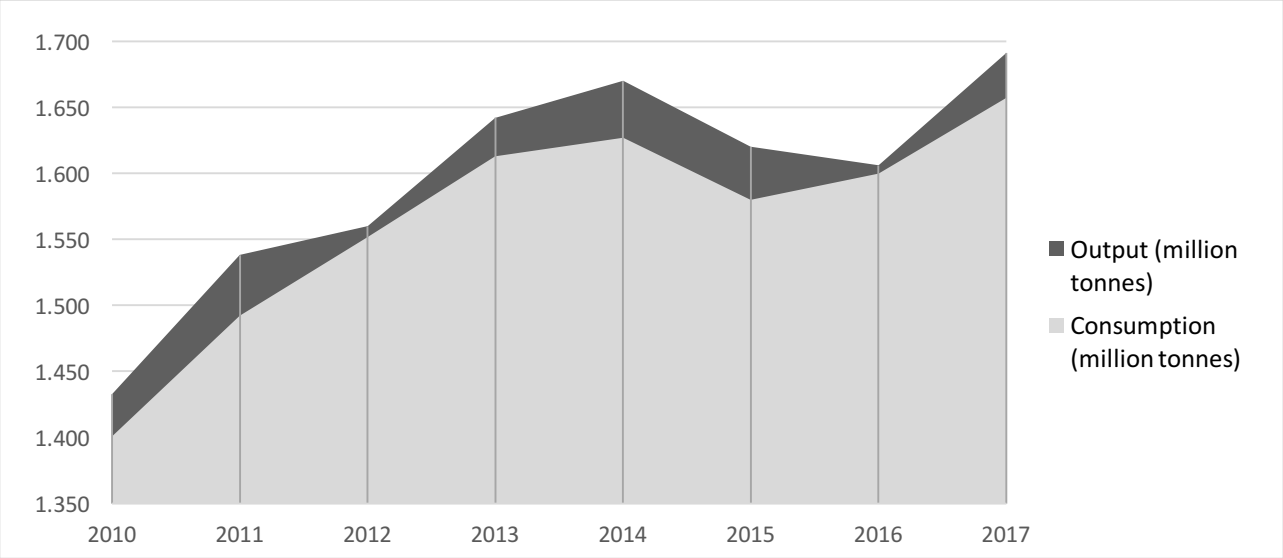
The introduction of the import tariff may be seen as a response to the reversal of the trend that has characterized the steel industry in the recent years. While the early 2000s have been a lucrative period for steelmakers worldwide, characterized by growing demand driven mainly by the Chinese economy, the landscape changed completely starting from 2014 (Deloitte, 2018). The unexpected

slowdown of Chinese growth caught the global market by surprise. Due to the inertia of capital increase, firms have continued to increase their production capacity, causing excess supply. The main consequence of surplus steel capacity was a market crisis in 2016, with excess production, falling demand, and decreasing profits.

Figure 1 shows that from 2010 to 2012 total production had been characterized by high growth, the with total output increasing from 1433 to 1642 million tonnes. The following years, by contrast, the average growth rate declined gradually, touching negative values in 2015 and 2016. By contrast, the situation reversed in 2017 with a booming rate of production of 5,3%, more than one percentage point higher compared to expectations (Deloitte, 2018). The recent growing trend was in some measure due to the Chinese industry, which ran at record levels for all of 2017, with a yearly production growth rate of 5.7%. This increase appears even more relevant when taking into account the fact that the Chinese steel industry is currently number one globally in terms of total production, covering a market share of approximately 50%, followed by other Asian countries and the EU with a share of 19% and 10%, respectively (Deloitte, 2018).

Figure 1. **Global Steel Trends.**

The figure plots global steel output production and consumption from 2010 to 2017 (million tonnes).



Note**.** Adapted from "Overview of steel and iron market - 2018" by Deloitte CIS Research Centre, 2018. Copyright 2018 by AO Deloitte & Touche CIS.

As far as consumption is concerned, from 2010 to 2015 global steel consumption growth rate followed a decreasing path with a five-year low of -2.9% in 2015. By contrast, 2016 and 2017 saw a partial recovery with consumption level exceeding the expectations, hitting a growth rate of 1.3% the first year and 3.6% the second year. According to Deloitte (2018), the improvement was affected by the 5.2% increase in Chinese steel consumption. Indeed, similarly to total output production, also for consumption China currently leads the market covering 43% of the total demand, while the remaining part is mainly shared between other Asian countries and Europe. Despite the positive results of the last years, nowadays steel market persists in a state of over-supply and excess of inventories, putting a downward pressure on prices. According to the analysis performed by McKinsey & Company (2018), the current condition of excess production capacity it is likely to persist in the coming years, but the gap between supply and demand is expected to decrease to 2.2 billion metric tons by 2020.

3. LITERATURE REVIEW

From a theoretical point of view, the introduction of tariffs are principally to discourage the importation of products from foreign companies, and instead incentivize domestic firms to produce these products. Indeed, the application of duties increase the cost of foreign imported goods compared to the one that would result in absence of tariff imposition, making them too expensive or not competitive for local customers to buy. Domestic industry will, as a consequence, gain from the policy due to the reduction of competition in the home market and a shift in consumption of local consumers from imported goods to domestic goods (Krugman,2011). The following sessions has the purpose to briefly summarize how scholars have analysed this topic, subdividing the literature in two big blocks: classic and current literature.

3.1 Classic literature

The usage of tariffs as a means to protect companies from worldwide competition has been broadly adopted in the past, with a general tendency to set tariffs to prohibitive levels. By contrast, starting in the 1930s, a wave of trade liberalization characterized the global environment, leading to the relaxation of governments' regulation concerning tariff imposition. As a consequence, a plurality of scholars has used this period to test the relationship between tariffs, imports prices and employment.

In 1953, Piquet made an attempt to quantify the effect on the overall amount of US imports that would be produced by the elimination of import tariffs between 1947 and 1956. In his paper, Piquet compares the increase of imports between dutiable and dutiable- free imports and, based on the fact that dutiable imports have been growing more rapidly than dutiable-free imports, he reached the conclusion that "the fact that dutiable imports have been increasing more rapidly than free imports since the inauguration of the trade agreements program would support the view that reductions of tariffs by trade agreements have been moderately effective."

His results, however, have been the centre of discussion among scholars for years and have been finally invalidated due to a problem with the methodology (Krause, 1959). Indeed, the research methodology used by Piquet was based on the assumption that the behaviour of the two groups of products would have been substantially the same in the case of the absence of tariffs. This assumption has been invalidated because the commodity composition among the groups was non-random, as the group subjected to taxation was composed mostly of foodstuff and raw material while the other contained mainly manufactures and semi-manufactures.

Krause (1959) tried to overcome this limitation by performing a similar experiment but selecting the pool of products in such a way as to make them comparable from the point of view of commodity composition and base value of imports. The experiment had the purpose of estimating the effects of tariff concessions on the volume of imports resulting from cuts approved by the Torquay Agreement in 1951. In order to run the analysis, Krause estimated the growth index of both the control and the treated group, plus an aggregate index of the two. He was able to observe that all the indexes went up during the period taken into consideration; however, he could not conclude that the difference in growth was due to the liberalization of trade. Indeed, while the comparison between the growth of the group subjected to tariff cuts and the aggregate one seemed to push the result in such a direction, the difference in the differences analysis did not show significant results. Krause concluded that "The possibility of the observed differences in the means occurring by chance is so large for all the years that the null hypothesis cannot be rejected."

A broader perspective has been adopted by Kreinin (1961), which investigated the effects of tariff reductions, not only on the volume of import, but also on the price. He did this by estimating the share of the tariff cut that would be passed to the U.S. customer and the remaining part that would be absorbed by foreign suppliers in the form of price increase. The investigation performed by Krenin takes into consideration the GATT negotiations occurred between 1954 and 1956 and involves the analysis of changes in volume and prices of imports of two groups of immediate substitute products, where just one was subjected to tariff cuts, before and after the introduction of concessions.

According to the Kreinin's findings, "close to a half of the benefit from tariff concession granted by the United States accrued to foreign exporters in the form of increased export prices". In addition, his results appear not to confirm the ones presented by Krause, as a significant differential in the volumes of imports have been found. To sum up, Kreinin concluded that lowering tariffs caused a significant decline in import prices, as well as an increase of volumes.

Further evidence on the relationship between tariffs and imports has been provided by Finger (1974) in his paper "Finger, J. Michael (1974), "GATT Tariff Concessions and the Exports of Developing Countries: United States Concessions at the Dillon Round." In this paper, he tried to estimate the difference effect that tariff reduction had on imports from developed and less developed countries. Similarly to Krause and Kreinin, he compared two different groups of goods, of which just one was subjected to tariff cuts. His results confirmed the significant relationship between tariffs and imports previously found by Kreinin. When focusing on the difference between countries, he found that exports to the United States of products on the concession list coming from developed countries were significantly affected by the tariff concessions. By contrast, when considering less developed countries, he observed that the significance of the effect varied amongst goods. Finally, he found that "the net increase of imports, or increase attributable to the concession (value and quantity), was considerably larger for materials (75-80%) than for manufacturers (20%)."

In order to provide further support to his conclusions, Finger (1976) ran a second experiment similar to the previous one but took into consideration a different round of tariff concessions, the so-called Kennedy Round, which was implemented by the EEC, US and Japan. Consistent with his first findings, he reported a significant increase in imports following the implementation of the policy for each of the three states from developed countries. In addition, different from the previous study, the same significant increase was also obtained for developing countries. Further, no significant difference in the effect of tariff cuts was found between of developed and developing countries. Indeed, "Developing countries exports to the EEC, the United States and Japan of both the developed and developing country baskets responded significantly and as strongly as developed country exports on those products on which tariffs were reduced".

Around the 60s and 70s a second line of studies concerning trade policy began to develop. Researchers such as Balassa (1965), Corden (1971), Basevi (1966) and Finger (1969) started an investigation related to the concept of effective rate of protection (ERP) as an alternative to nominal tariff rates when measuring the resource-allocation effects of a tariff structure and, as a consequence, how protective the trade policy is. According to Corden (1971) "the effective rate of protection is the percentage increase in value added per unit in an economic activity which is made possible by the

tariff structure relative to the situation in absence of tariff but with the same exchange rate." This value does not depend only on the duty imposed on a product but also on the tariff applied on the inputs and the share of input on the overall cost of the final good. Since the percentage increase in value added is negatively related to the tariff rate imposed on intermediate products, it follows that the bigger the duty applied to an intermediate product, the lower the level of protection provided by the policy. However, when the share of input on the overall cost of the final product is very small, the effect of input tariff on the ERP of output product decreases. In the limited case where the share tends to zero, the ERP is completely independent from the duty applied to intermediate products.

Once developed, the ERP methodology gained fast recognition due to the introduction of the importance of the implications of tariff not only on the product on which they are imposed, but also on intermediate goods. Finger (1969), for example, stated that "the major advantage of effective rates includes the effects of the profitability of the domestic industry (or activity) of tariffs on input prices as well as of tariffs on output prices". However, the ERP methodology has been also subjected to criticism because of some distortions embedded in its assumptions. For instance, from the point of view of Anderson (1970), the estimation of the ERP provided by Corden should also include the ability of a firm to substitute high priced inputs. Despite this, Anderson (1998) defined the ERP as "the ranch house of trade policy construction – ugly but apparently too useful to disappear".

3.2 Current literature

Due to the wave of liberalization which started at the beginning of 1980s and continued the following decades, recent scholars turned their attention to two main topics: the analysis of non-tariff barriers (NTB) and the consequences of supranational free trade agreements. In the following section, I summarize the studies of Leamer (1989), Trefler (1993) and Haveman, Nair-Reichert and Thursby (2003) for what concerns NTB, moving to Felbermayr and Kohler (2007), Feenstra and Kee (2007), Frensch (2010) and Ruhl (2013) who discuss trade agreements.

Among the first authors interested in the difference between the impact of tariff and nontariff barriers is Leamer (1989), who wanted to estimate the impact of trade barriers and rank countries according to their degree of openness. In accordance to what has been already stated in previous literature, his estimates indicated the existence of a clear and substantial effect of duties on trade flow. For what concerns nontariff barriers, divided into quotas, quality controls and threats, the research highlighted that quality controls usually had the greatest impact, while threats appeared to be the weakest form of protection.

A similar topic has been studied by Trefler (1993), who used data from the manufacturing industry to evaluate the consequences of the elimination of all US nontariff barriers on manufacturing imports. In his paper, he ran two different models. In the first one, he treated NTB as an exogenous variable, while in the second, protection was considered endogenously. In both cases, his results reported a significant reduction in imports; however, the magnitude of the impact changed according to how the variable was treated. Indeed, following the exogenous theory, the impact was small and in line with the result obtained in previous studies. By contrast, the estimate derived from the exogenous model was considerably bigger.

Haveman, Nair-Reichert and Thursby (2003) focused on the effectiveness of tariff and non-tariff barriers across industries, identifying three different ways in which trade barriers can affect imports: a reduction of the overall trade between countries, the concentration of the source of imports into exporters of larger size, and a shift in trade pattern across exporters not connected to their size. Their findings suggest that both the introduction of tariffs and nontariff barriers lower the volume of imports, but generally the impact of the former is greater compared to the second. In addition, they observed the existence of a significant diversion effect of trade, as well as a preference to shift towards larger exporters at the expenses of smaller ones.

Moving to the analysis of supranational trade agreements, the research of Feenstra and Kee (2007) focused on the North American Free Trade Agreement (NAFTA). It had the purpose of linking the effect of US tariff liberalization to the variety of goods imported from Mexico, one of its recent major trading partners, taking into account the distortion that the fast development of China had on trade. Their findings stipulate that tariff reductions significantly increased the range of products traded between the US and Mexico. Furthermore, the estimate remains significant and even more relevant when the effect of market competition from other countries' exports, China in particular, is taken into account.

Trade implications of the World Trade Organization have been studied by Felbermayr and Kohler (2007). In particular, their study aimed to determine the effect of trade liberalization on both the intensive import margin (changes in volumes of product imported) and the extensive import margin (changes in variety of product imported). Consistent with Feenstra and Kee (2007), their results suggest that being part of the WTO have led to an increase of the variety of products traded across parties. By contrast, no evidence of a significant change in the volumes of goods traded have been found.

Frensch (2010) used data from 1992 to 2004 to estimate the effect of European emerging economies trade liberalization on both import volume and variety. According to his results, the extensive margin of intermediate and capital goods is more sensitive to changes in trade policies compared to consumer goods. Furthermore, he found out that the removal of duties affects both the intensive and extensive import margin, but that the impact on the first is smaller than on the second. It follows that the less products are substitutable, the bigger the impact of tariffs on imports and the higher the weight of variation in the set of goods imported compared to the change in volume.

Similar research is performed by Ruhl (2013), who analysed the importance of extensive margin in international trade, taking into consideration the relevance of a good in a country's import and export pattern. In line with his assumptions, the author found the existence of a relationship between the growth of international trade made possible by international agreements and the increase of the variety of goods imported. This result is significant for products that were not traded before the liberalization, but also those traded in small quantities. Furthermore, he noticed that the greater the scale of the liberalization, the stronger the effect of the policy[1].

To sum up, a number of researchers have reported the existence of a significant relationship between duties and the import of goods to which the restrictions apply. The centres of interest of the studies published between 1950s and 1970s are mainly the effect of duties on volumes and importance of taking into account all of the tariff structure when evaluating the pattern of outcome of an economy. Subsequently, the wave of liberalization that hit the global environment in 1980s defined the beginning of a period characterized by the birth of international trade agreements and consequent tariff cuts. As a consequence, scholars moved their attention to the effect of NTB as well as massive trade liberalization. However, so far there has been little quantitative analysis related to the effect that input tariffs have on imports of products that use those duties-subjected inputs as intermediate goods in the production process. In general terms, this thesis intends to determine the extent to which input tariffs affect the level of imports of produced with those inputs. More specifically, the paper investigated the effect of steel duties on the import of vehicles in the United States under Bush presidency, providing suggestions on what is expected to happen as a consequence of the recent trade policy approved by Trump.

[1] Large-scale trade liberalizations such as the North American Free Trade Agreement, the Canada-United States Free Trade Agreement and China's accession to the World Trade Organization led to the best results.

4. METHODOLOGY

4.1 Analytic Approach

The design used for this dissertation is the natural experiment. According to Dunning (2012), research can be defined as a natural experiment when it shares these two attributes:

1. there is a comparison of outcome across the treatment and control group;
2. the assignment of subjects to treatment is as good as random.

This type of design differs from common experiment because it occurs in natural environments where randomized manipulation is not under the control of the researcher. By contrast, common experiments take place in a controlled setting. The design method diverges also from pure observational studies, in which subjects' allocation into control or treatment group is not random.

Natural experiments are broadly adopted to study situations in which the phenomenon of interest is difficult or impossible to manipulate experimentally, as happens frequently in social science research. Appropriate circumstances for the application of this methodology are, for instance, the ones in which there is the possibility to divide the population in subgroups, based on the exposure or the absence of exposure to a defined treatment. In such cases the analysis of the changes in outcome between groups can be associated, under proper controls and conditions, to the exposure to the treatment itself.

However, there are two major issues related to this methodology that are worth mentioning. First of all, in order to guarantee the as-if random condition to be true, "the relevant confounding variables must be identified and measured" (Brady, 2010). "In a natural experiment we should find that potential confounders are balanced across the treatment and control group, just as they would be in expectation in a true experiment. [...] Statistical adjustment for potential confounders is assumed to produce the conditional independence of treatment assignment and unobserved causes of the outcome being explained yet very difficult to achieve" (Dunning, 2012). Not including them in the analysis may lead to a distortion of the experiment´s results, to omitted variables bias, or endogeneity bias.

In this study, the question under discussion is whether steel tariff implemented by Bush's administration influenced or not US imports of steel related goods from European Countries, with a greater focus on vehicles. This is a clear example of a situation in which controlled experimentation is not possible, as the exposure to the policy cannot be assigned by the experimenter. At the same time, there is a "natural division" of goods: the ones subjected to the tariff and the ones that are not. Because of the presence of both conditions, the application of a natural experiment as research methodology is an appropriate option.

In this dissertation the analytic approach used is known as difference in differences estimator. In this case, it consists of the comparison of changes in US imports coming from European Countries of products that contain steel as raw material before and after the removal of the tariff (1st difference), with changes pre and post tariff's removal in US imports of goods that are steel-free (2nd difference).

4.2 Statistical model

I run two different statistical models, both of them having the natural logarithm of US imports as the dependent variable. This first model includes as independent variables a dummy variable for time, indicating pre or post treatment (imposition of tariff), a dummy variable representing whether the observation was related to a commodity included in the control group or in the treated group and an interaction of time and commodity dummies. The interaction terms represent the difference in differences estimator that captures the average differential change in the monthly import level from the tariff and no-tariff period for the treatment group relative to the change in monthly imports for the untreated group.

The resulting estimated equation is

$$ln\ (US\ imports_{i,c,t}) = \beta_0 + \beta_1 Post_t + \beta_2 Treated_{i,c} + \beta_3 Post*Treated_{i,c,t} + u_{i,c,t} \qquad (1)$$

where:

$ln\ (US\ imports_{i,c,,t})$ is the natural logarithm of the amount in US dollar value of imports of commodity i from country c for month t;

$Post_t$ is a dummy variable coded as 0 for the period in which tariff was effective and 1 for the period after its removal;

$Treated_{i,c}$ is a dummy variable coded as 0 for the products in the untreated group and 1 for the products in the treated group;

$Post*Treated_{i,t}$ is the interaction (multiplication) of the two variables above;

$u_{i,c,t}$ is the error term.

The second model introduces to the previous one a set of control variables: country dummies, product dummies and time dummies. These dummies control for any country, commodity, and time specific shocks that might have occurred, influencing the difference in differences estimator.

The estimated equation is

$$ln\ (US\ imports_{i,c,,t}) = \beta_0 + \beta_3 Post*Treated_{i,c,t} + M_t + C_i + S_z + u_{i,c,t} \quad (2)$$

where:

M_t is a month fixed effect;

C_i is a commodity fixed effect;

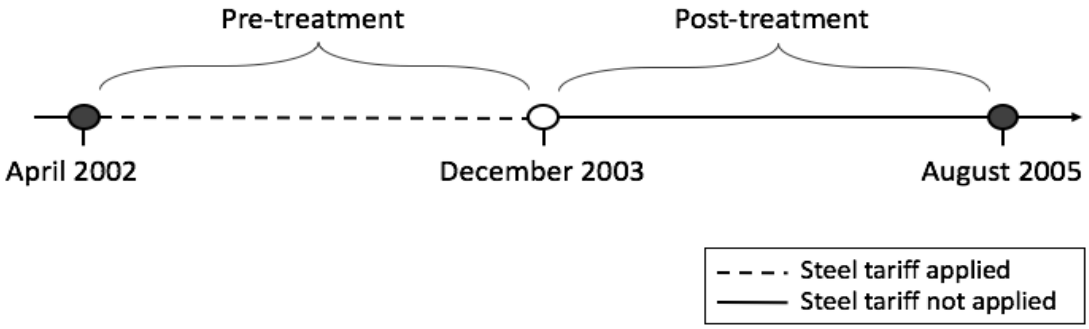
S_z is a country fixed effect;

All the other variables are the same described in the previous model.

4.3 Data

US import data has been retrieved from the "Harmonized System (HS) District-level Data" of the US Census Bureau database.

Figure 2. **Pre-treatment and Post-treatment timeline**



Information is gathered through censuses and official surveys by the US Census Bureau itself, which is part of the US Department of Commerce, and overseen by the Economics and Statistics Administration (ESA). The database provides information on the dollar amount of imports of a given

commodity of interest, country of origin and additional information on US import and export dating back to 1992.

The study is run with monthly data on US imports collected during and after the trade policy implemented under Bush's presidency. This decision is justified by the fact that from 1992 until 2001 US imports were recorded on an annual basis, while monthly data are available from 2002 on. The time frame considered, starting in April 2002 and ending in August 2005, is divided into two groups: pre-treatment period and post-treatment period. The pre-treatment period is defined as the period in which tariffs on steel were applied, with the exclusion of the first and last months[2]. It has a length of 20 months, starting from April 2002 and ending in November 2003. The post-treatment period is the period that follows steel tariff removal. It begins in January 2004 and ends in August 2005, having the same length of 20 months (see Figure 2).

Table 1

List of commodities belonging to the control group

04 Dairy Prods; Birds Eggs; Honey; Ed Animal Pr Nesoi	38 Miscellaneous Chemical Products
07 Edible Vegetables & Certain Roots & Tubers	39 Plastics And Articles Thereof
14 Vegetable Plaiting Materials & Products Nesoi	45 Plastics And Articles Thereof
18 Cocoa And Cocoa Preparations	49 Printed Books, Newspapers Etc,; Manuscripts Etc
22 Beverages, Spirits and Vinegar	52 Cotton, Including Yarn And Woven Fabric
27 Mineral Fuel, Oil Etc, Bitumin Subst; Mineral Wax	56 Wadding, Feit Etc; Sp Yarn; Twine, Ropes Etc.
30 Pharmaceutical products	61 Apparel Articles And Accessories, Knit Or Crochet
32 Tanning & Dye Ext Etc; Dye, Paint Putty Etc; Inks	64 Footwear, Gaiters Etc. And Parts Thereof
33 Essential Oils Etc; Perfumery, Cosmetic Etc Preps	70 Glass And Glassware
36 Explosives; Pyrotechnics; Matches; Pyro Alloys	74 Copper And Articles Thereof

[2] President Bush notified the imposition of steel tariff in March 2002 and its removal in December 2003. Since both the decisions have been taken in the middle of the month, it has been decided not to include them in the analysis.

Further, the difference in differences analysis requires the definition of a control group, also called untreated group, and a treated group. For the purpose of the study, I define one control group and two treated groups. In order to be part of the control group, a commodity is expected not to contain steel in its components. Among the list of 99 2-digit commodities provided by the US Census just 80 satisfy this requirement. As a consequence, from the 80-member list a pool of 20 commodities has been drawn randomly. The full list of commodities entering in the untreated group is provided in Table 1.

Table 2

List of commodities belonging to the treated group "Iron & Steel"

72_others	7220 Fl-rl Stainless Steel Producys, Under 600mm Wide
7211 Fl-rl Iron & Na Steel Un 600mm Wd, Not Clad Etc	7221 Bars And Rods, Stnls Stl, Ht-rld Irreg Coils
7212 Fl-rl Iron & Na Steel Un 600mm Wd, Clad Etc	7222 Bars & Rods St Steel Nesoi; Angles Etc, St Steel
7213 Bars&Rods, Iron&Na Dteel Nesoi H-r Irreg Coils	7223 Wide r Stainless Steel
7214 Bars&Rods, Iron&Na Dteel Nesoi H-r Etc	7224 Alloy Steel Nesoy In Ingots, Oth Pr Frm & Semif Pr
7215 Bars&Rods, Iron&Na Dteel Nesoi	7225 Fl-rl Alloy Steel Nesoi Nun 600mm Wide
7216 Angles, Shapes & Sections Or Iron & Nonalloy	7226 Fl-rl Alloy Steel Nesoy Un 600mm Wide
7217 Wire Of Iron & Nonalloy Steel	7227 Bars & Rods Alloy Steel Nesoy, H-r Irreg Coils
7218 Stainless Steel In Ingots Etc & Semifin Products	7228 Al Steel Nesoy Bars, Ang Etc; Hoi Dr St Bars Etc
7219 Fl-rl Stainless Steel Products, Not Und 600mm Wide	7229 Wire Or Alloy Steel Nesoi

The first treated group is composed exclusively by commodities grouped by the US Census under the code "72 – Iron And Steel". This category comprehends 29 4-digit commodities made completely of steel or, at most, a combination of iron and steel. In order to have a balanced amount

of observation between treated and untreated groups, but at the same time not to lose data, the first 10 products have been aggregate together under the name "72_others" (details provided in the Appendix 1). The complete pool of products is available in Table 2.

The second treatment group is composed of vehicles. For the purpose of the thesis, vehicles are defined as "any means moving on wheels, runners or tracks, excluding railways, tramways and cycles, as well as all the singular parts and bodies that made vehicles up". All the means of transport that are represented in the definition can be found among the products classified under the 2-digit code "87 – Vehicles, except railway or tramway, and parts etc." of US database. As a consequence of this definition, in the treated group I include vehicles for the transportation of goods and persons, trucks, motorcycles, trailers, and carriages, while parts and bodies are excluded (see Table 3).

Finally, the Country of origin must be selected. In order to run the analysis, not all the European Countries are taken into account, just the ones whose yearly amounts of exports are positive for all the years taken into consideration and all the categories of commodities mentioned above. As a consequence, the resulting nations entering in the analysis are: France, Germany, Italy, Netherlands, and the United Kingdom. It is relevant to notice that the United Kingdom has been included in the analysis, as in the timeframe it was considered part of the European Union and consequently subjected to the tariff.

Table 3

List of commodities belonging to the treated group "Vehicles"

8701 Tractors (other Than Works Trucks Or Heading 8709)	8706 Chas W Eng F Trac, Mtr Veh F Pass/ gd & Special Pur
8702 Motor Vehicle F Trnsp >ten Persons Included Driver	8709 Works Trucks, Self-prop, No lift; Stat Tractrs; Pt
8703 Motor Cars & Vehicles For Transporting Persons	8711 Motorcycles & Cycles With Aux Motor
8704 Motor Vehicles For Transport Of Goods	8713 Carriages For Disabled Persons, motorized or not
8705 Special Purpose Motor Vehicles Nesoi	8716 Trailer Etc; Other Vehicles, Not Mech Propeld, Pt

5. RESULTS

5.1 Basic Estimates

Table 4 reveals the estimation results obtained from the difference in differences analysis using Iron & Steel commodities for the treated group, both with and without fixed effects. Starting from the model without fixed effects, the analysis shows that during the two periods taken into consideration, US imports per month have been characterized by an upward trend. Indeed, I find a significant increase of 14.5% between the pre- and the post-treatment period, indicating a general expansion of the flow of all the commodities considered imported from Europe.

Second, it can be observed a significant difference at the 5% level between the monthly amount of imports of the control group and the treated group. The dollar value of imports belonging to the Steel and Iron group is, on average, much lower compared to the one of the control group during the timeframe considered. While this difference is large, with a value of approximately 92[3]%, the result is not unexpected since the control group includes a much larger pool of commodities.

Moving to the core of the analysis, the results suggest that tariff removal generates a significant decline in the monthly level of imports of steel-made commodities. The change in US imports of commodities that contain steel as raw material before and after the removal of the tariff is reported to be 31.2% lower than changes pre- and post- tariff removal in US imports of commodities that are steel-free. Considering the *Iron & Steel Model* with fixed effects, the addition of the country, commodity, and time dummies modifies slightly the difference in differences coefficient, increasing the R-squared as expected. The explanation to these findings are attributable to the introduction of the three fixed effects, which have absorbed part of the variability of the dependent variable

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[3] As true $\%\Delta y$ becomes larger, $\Delta ln\,(y) \approx \%\Delta y$ becomes a worse approximation. As a consequence, large log values must be "corrected" according to the formula

$\ln(y) = \alpha + \beta x + u$

$\ln(y') - \ln(y) = \beta(x' - x)$

$\ln(y'/y) = \beta(x' - x)$

$y'/y = \exp(\beta(x' - x))$

$[(y' - y)/y] = \left[\exp\left(\beta(x' - x)\right) - 1\right]$

for $x' - x = 1$

$[(y' - y)/y] = [\exp(\beta) - 1]$

in this case

$[(y' - y)/y] = [\exp(-2.5) - 1] = -91.79\%$

increasing its predictability in relation to the independent variables. Despite these small discrepancies, my inference remains virtually unchanged: it is possible to reject the null hypothesis of a zero effect of the tariffs on imports with a statistical significance of 5%, indicating a reduction in the change in imports between treated and untreated groups of 38.2%.

The analysis so far has concentrated on the effect of tariffs on pure and almost pure steel products, ignoring the effect of the policy on the level of imports of steel-intensive industrial goods and, in particular, on vehicles. This second question is now investigated and its estimated values are presented in *Vehicles Model* (Table 4).

Table 4

Difference in Differences analysis of Iron & Steel and Vehicles Models

The table reports regression coefficients, t-statistics and robust standard errors of the difference in differences analysis for the Iron & Steel Model (first and second column) and Vehicles Model (third and fourth column). For both Models are reported the coefficients without fixed effect (1) and with fixed effects (2). *t* statistics in parenthesis. Robust standard errors in brackets. * p <0.05, ** p <0.01, *** p <0.001

	Iron & Steel Model		**Vehicles Model**	
	(1)	(2)	(1)	(2)
Constant	15.500***	15.685***	15.634***	15.272***
	(288.766)	(187.515)	(261.375)	(166.129)
	[0.054]	[0.084]	[0.059]	[0.092]
Post	0.145*		0.068	
	(1.886)		(0.817)	
	[0.077]		[0.084]	
Treated	-2.519***		-2.003***	
	(-35.949)		(-14.902)	
	[0.070]		[0.134]	
Post*Treated	-0.312	-0.382***	-0.008	-0.004
	(-3.056)	(-6.022)	(-0.045)	(-0.040)
	[0.102]	[0.063]	[0.185]	[0.107]
Sample Size	7166	7166	5423	5423
R^2	0.227	0.726	0.107	0.729
Adjusted R^2	0.227	0.726	0.106	0.727

According to the results, it is possible to confirm that there is a statistically significant difference in the monthly mean value of imports for the control group and the treated group equal to – 86.03%[4]. The point-estimate of the coefficient for the *Post* variable is identical to the estimation of the previous regression, but only significant at the 10% level. However, the same cannot be stated for the *Post*treated* variable (the difference in differences coefficient), which is not statistically significant, meaning that it is not possible to refuse the null hypothesis of zero effect of the tariff on the imports of vehicles.

The same test has been repeated with the introduction of time, country, and commodity. The regression outputs confirm our previous results. These results suggest that, on average, the reduction of import tariffs on steel does not affect the volume of vehicles imported from Europe[5].

The comparison between *Iron & Steel* and *Vehicles Models* is particularly interesting. The different result obtained in the difference in differences estimator highlights the discrepancies of behaviour of the two treated groups. While the removal of steel tariffs affects significantly the volume of imports of steel based commodities, the same cannot be stated for vehicle imports. As a consequence, it is possible to conclude that the removal of steel tariff does not have a homogeneous effect on downstream industries.

5.2 Validity of Results

In order to examine the validity of the result obtained from the difference in differences analysis, several approaches are used. First, I apply fixed effects in the regression to control for any country, commodity, and time specific shocks that might have occurred. Second, ex-post robustness checks should be run to evaluate the appropriateness of the inferences drawn throughout the experiment. In the following section, two different robustness checks are completed: the placebo falsification test and the substitution of the control group. The first test is aimed at verifying the relationship among tariff, imports, and timing. The second has the purpose of detecting linkages between the results and the control group used.

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[4] As true $\%\Delta y$ becomes larger, $\Delta ln\,(y) \approx \%\Delta y$ becomes a worse approximation. As a consequence, large log values must be "corrected" according to the formula shown in footnote 3.

in this case we obtain

$[(y' - y)/y] = [\exp(-1.968) - 1] = -86.03\%$

[5] Since the independent variable embeds both price changes and volume changes, it is possible that the two effects compensate one another. However, since the price of vehicles tends to remain stable over time, it is reasonable to assume that the absence of change analyzed corresponds to the absence of change in volume of imports.

The placebo falsification test has the purpose to test the causal relation between tariff removal and the change in import through the randomization of the timing considered. In this test the timeframe considered is a period in which no change in steel tariff occurred, as a consequence the difference in differences estimator is expected not to be significant independently from the pool of commodities considered. For the placebo falsification test for both the *Iron and Steel* and the *Vehicles Models* has been run again, maintaining all the variables with the exception of *Post*. The new timeframe considered is from January 2004 to December 2006, where January 2004-June 2005 constitutes the pre-treatment period and July 2005-December 2006 the post-treatment period. Since the variable *Post* is no longer related to the imposition of the treatment (therefore it is a *placebo*), the use of the terminology "pre-treatment" and "post treatment" has the mere purpose to distinguish the two periods entering in the analysis.

Table 5

Difference in Differences analysis of Iron & Steel and Vehicles Models – placebo test

The table reports regression coefficients, t-statistics and robust standard errors of the difference in differences analysis for the Iron & Steel Model – placebo test (first and second column) and Vehicles Model – placebo test (third and fourth column). For both Models are reported the coefficients without fixed effect (1) and with fixed effects (2). *t* statistics in parenthesis. Robust standard errors in brackets. * p <0.05, ** p <0.01, *** p <0.001

	Iron & Steel Model		**Vehicles Model**	
	(1)	(2)	(1)	(2)
Constant	15.634***	15.623***	15.634***	15.398***
	(261.375)	(167.781)	(261.375)	(151.106)
	[0.059]	[0.065]	[0.059]	[0.102]
Post	0.068		0.068	
	(0.817)		(0.817)	
	[0.084]		[0.084]	
Treated	-2.209***		-2.003***	
	(-27.559)		(-14.902)	
	[0.080]		[0.134]	
Post*Treated	-0.003	-0.031	-0.008	-0.088
	(-0.031)	(-0.065)	(-0.045)	(-0.147)
	[0.112]	[0.065]	[0.185]	[0.112]
Sample Size	6497	6497	5552	4882
R^2	0.189	0.724	0.192	0.733
Adjusted R^2	0.189	0.723	0.192	0.732

Table 5 reveals the results of the *Iron & Steel Model* with and without the addition of controls for country, time, and commodity variables. What is interesting in this output is the change, or absence of change, related to the coefficient of the variables *Post* and *Post*Treated*.

When considering the model without fixed effects, Table 5 appears to be quite revealing in this sense. In accordance with the expectations, the variable *Post* is not significant at the 5% level, suggesting that no significant change in imports occurred between the pre- and post- treatment periods. I find the same result in the model with fixed effects. Furthermore, the difference in differences estimator is not significant for both the models containing with and without fixed effects, indicating that it is not possible to refuse the hypothesis that no change in import level between treated and untreated group happened in the two periods taken into account. Again, this is consistent with the expectations.

Moving to *Vehicles Model* (Table 5), a similar conclusion can be drawn. The results obtained from the regression performed with and without fixed effects indicate the absence of significant difference between "pre-treatment" and "post-treatment" periods. In addition, the difference in difference estimator is not significant at the 5% level for both with and without fixed effects models. Again, these results are in line with the expectations.

The second validity check has the purpose to analyse the independence of results obtained in Session 5.1 from the choice of the control group. In order to test this alternative, both *Iron & Steel* and *Vehicles Models* have been run with a completely different control group, while maintaining all the other variables. Table 6 illustrates all the elements entering in the robustness check control group.

Once I have defined the control group, I apply the difference in differences analysis again. From this regression, I expect to obtain outputs similar to the ones seen in Session 5.1: a difference in differences estimator that is significant for the steel group and not significant for the vehicles group.

Table 7 reveals the estimate of the difference in differences coefficient performed for the *Iron &Steel* group before and after controlling for country, product, and time variables. It is apparent from this table that the dollar value of US imports has changed significantly between the two periods of time and the two groups taken into consideration. The model without fixed effect reports a negative change of 31,2%, while the introduction of control variables increases the estimated negative change to 36,8%.

Table 6

List of commodities belonging to the robustness check control group

13 Lac; Gum, Resins & Others; Vegetable Sap & Extract	41 Raw Hides And Skins (no Furskins) And Leather
19 Prep Cereal, Flour, Starch Or Milk; Bakers Wares	42 Leather Art; Saddlery Etc; Handbags Etc; Gut Art
21 Miscellaneous Edible Products	44 Wood And Articles Of Wood; Wood Chacoal
27 Mineral Fuel, Oil Etc; Bitumin Subst; Mineral Wax	48 Paper & Paperboard & Articles (inc Paper Pulp Artl)
28 Inorg Chem; Precc & Rare-earth Met & Radioact Compd	54 Manmade Filaments, Including Yarns & Woven Fabrics
29 Organic Chemicals	62 Apparel Articles And Accessories, Not Knit Etc.
34 Soap Etc; Waxes, Polish Etc; Candles; Dental Compd	68 Art of Stone, Plaster, Cement, Asbestos, Mica etc.
35 Albuminoidal Subst; Modified Starch; Glue; Enzymes	69 Ceramic Products
37 Photographic Or Cinematographic Goods	71 Nat Etc Pearls, Prec Etc Stones, Pr Met Etc; Coin
40 Rubber And Articles Thereof	76 Aluminium And Articles Thereof

When performing the same test on the Vehicle group, the difference in difference estimator turns not significant for both the models with and without fixed effects (see Table 7). This implies that no significant change has occurred between the pre- and post- treatment difference of the dollar value of vehicles imported and the pre- and post- treatment difference of the robustness check control group.

Comparing the results shown in Session 5.2 with the robustness check ones, it can be observed that no change in significance or sign of the difference in differences estimator has occurred after the alteration of the control group. This absence of alterations suggests the independence of the relationship observed between tariffs and import from the choice of the untreated group, supporting the validity of the results.

Table 7

Difference in Differences analysis of Iron & Steel and Vehicles Models – different control group

The table reports regression coefficients, t-statistics and robust standard errors of the difference in differences analysis for the Iron & Steel Model – different control group (first and second column) and Vehicles Model – different control group (third and fourth column). For both Models are reported the coefficients without fixed effect (1) and with fixed effects (2). *t* statistics in parenthesis. Robust standard errors in brackets. * p <0.05, ** p <0.01, *** p <0.001

	Iron & Steel Model		**Vehicles Model**	
	(1)	(2)	(1)	(2)
Constant	15.873***	13.982***	15.837***	13.540***
	(426.666)	(189.682)	(427.547)	(151.610)
	[0.037]	[0.074]	[0.037]	[0.089]
Post	0.146**		0.153**	
	(2.746)		(2.899)	
	[0.053]		[0.058]	
Treated	-2.877***		-2.304***	
	(-49.242)		(-20.355)	
	[0.085]		[0.113]	
Post*Treated	-0.312***	-0.368***	-0.016	-0.361
	(-3.652)	(-5.982)	(-0.098)	(-0.293)
	[0.085]	[0.062]	[0.162]	[0.105]
Sample Size	7295	7295	5552	5552
R^2	0.366	0.685	0.192	0.670
Adjusted R^2	0.366	0.682	0.192	0.668

6. Conclusions

The research unveils the effects that government decision of imposing tariffs on steel have on imports of both products made completely of steel or, at most, a combination of iron and steel and on vehicles. My difference in differences analysis indicates that while imports of mainly steel made product react to changes in tariff levels, the flow of import of vehicles apparently is not affected in the same way, showing no significant change between the two periods taken into consideration.

According to the statistical analysis carried out, the comparison between import of products that contain steel as raw material before and after the removal of the tariff and imports of goods that are

steel-free before and after the removal of the tariff have highlighted a significant difference that ranges between 31.2% and 38.2%. By contrast, the comparison between the control group and *Vehicles Model* one suggests that there is not enough empirical evidence to reject the null hypothesis of the absence of a relationship between the two variables taken into account.

The results appear to be sufficiently strong as both the models reacted in accordance to the assumptions after robustness checks were made. In the placebo falsification test, which was run comparing two periods in which none of the two was subjected to the alteration of tariff structure, the difference in difference estimators were both not significant, in accordance with expectations. This result provides further support to the existence of a relationship between import of steel products and duties. The second robustness test, instead, was conducted to prove that the outputs obtained from the analysis of the two models were independent from the choice of the control group. The test reported the values expected, with a significant p-value in the case of steel model and a non-significant p-value in the vehicle case

From the analysis performed it is possible to predict that, under similar circumstances, the introduction of steel tariffs under Trump's administration will not affect the inflow of imported vehicles in the US. As a consequence, the automotive industry should not worry about the possibility of a higher level of competition in the US market deriving from the increase of imports of vehicles from the European Union. By contrast, the same cannot be concluded for the market of steel-made commodities. Indeed, European firms producing steel-made commodities are expected to exploit the restrictive policy, allocating a higher percentage of sales in the US market. As a consequence, US firms should rapidly find a strategy to defend themselves from foreign competition in order not to lose local market share.

A second interesting insight is connected to the fact that, apparently, tariffs on intermediate products affect the imports of final goods in different ways. Reconnecting to what was stated by Corden (1971), the difference in behaviour could depend on the fact that the two groups analysed are unbalanced in terms of the importance of the steel, where importance in this case stands for share of input on the overall cost of the final product. An interesting continuation of the research would be to examine the effect of the duties on different categories of products divided according to the importance of the raw material.

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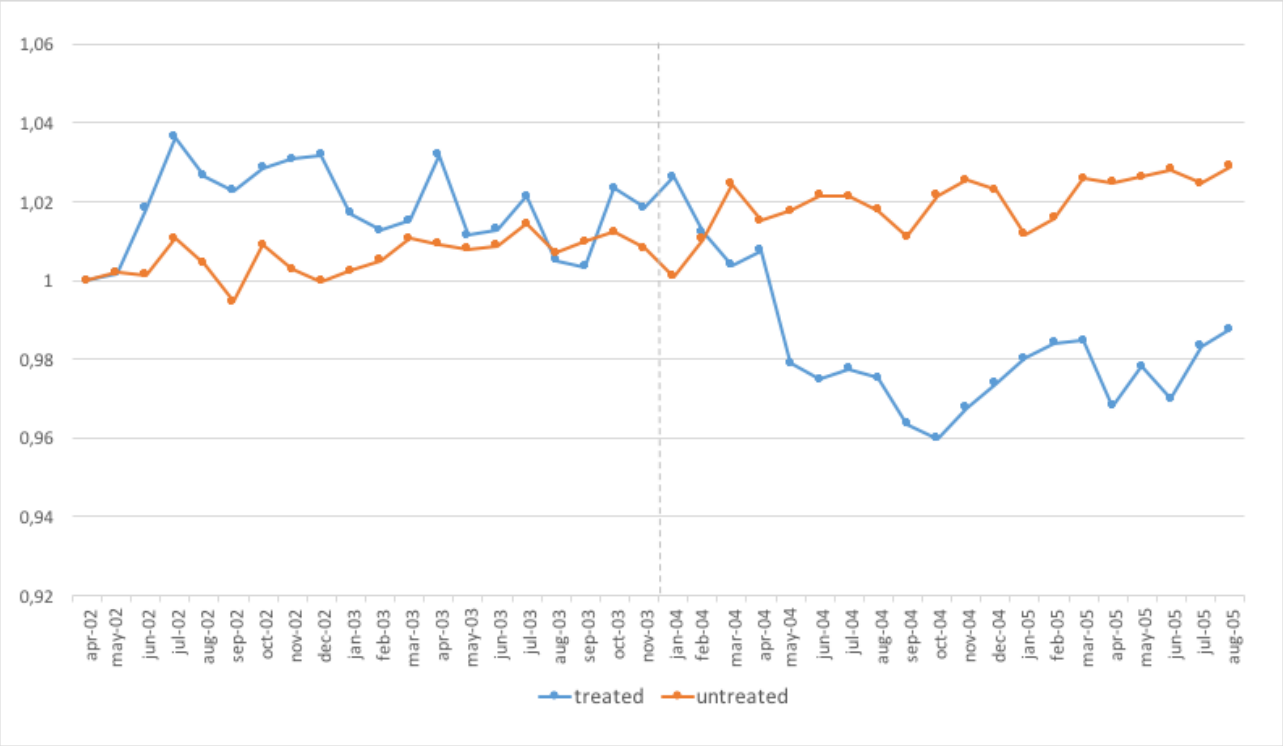
Appendix

Appendix 1. List of commodities belonging to "72_others"

7201 Pig Iron & Spiegeleisen in Pigs, Blocks etc.	7206 Iron & Nonalloy Steel In Ingots
7202 Ferroalloys	7207 Semifinished products of Iron Or Nonalloy Steel
7203 Spongy Ferrous Prod & Iron	7208 Fl-rl Iron Na Steel Nun600mm Wd Hot-rl not Clad
7204 Ferrous Waste & Scrap	7209 Fl-rl Iron Na Steel Nun600mm Wd Hot-rl no Clad
7205 Pig Iron Or Steel Granules	7210 Fl-rl Iron Na Steel Nun600mm Wd Hot-rl Clad etc

Appendix 2. Mean values of ln(imports), Iron & Steel Model.

The figure plots the monthly mean value of ln(imports) for the Iron & Steel Model. The orange line represents the untreated group, while the blue line represents the treated group. Treated and untreated group monthly values are expressed as a percentage of April 2002 values. The vertical line divides pre-treatment period (on the left side) from post treatment period (on the right side).



Appendix 3. Mean values of ln(imports), Vehicles Model.

The figure plots the monthly mean value of ln(imports) for the Iron & Steel Model. The orange line represents the untreated group, while the blue line represents the treated group. Treated and untreated group monthly values are expressed as a percentage of April 2002 values. The vertical line divides pre-treatment period (on the left side) from post treatment period (on the right side).