NOVA SCHOOL OF BUSINESS & ECONOMICS

A Work Project presented as part of the requirements for the Award of a Master's degree in Finance from the Nova School of Business and Economics.

How a tariff-based trade policy affects domestic prices, import volumes and welfare:

An Empirical Analysis of the EU's Retaliatory Tariffs on the US

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04-01-2021

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Abstract: This Project examines how the retaliatory tariffs imposed by the EU in response to the US steel and aluminum tariffs affect EU prices and welfare over the period from June 2018 to May 2020. Using a partial equilibrium model that assumes perfect competition, the graphical analysis and the regression show that the prices of the goods subject to the tariffs are fully passed on to EU producers and consumers, suggesting that they bear the full burden of the tariff increase. Consequently, the EU suffers a deadweight welfare loss of almost €144 million over the two years considered.

Keywords: EU, US, trade, tariffs, retaliation, prices, national welfare

This work used infrastructure and resources funded by Fundação para a Ciência e a Tecnologia (UID/ECO/00124/2013, UID/ECO/00124/2019 and Social Sciences DataLab, Project 22209), POR Lisboa (LISBOA-01-0145-FEDER-007722 and Social Sciences DataLab, Project 22209) and POR Norte (Social Sciences DataLab, Project 22209).

I Introduction

As free trade is a main driver of economic growth and innovation (WTO 2020a), trade has been liberalized on the global level in recent decades. A multilateral approach to trade liberalization was pursued with the completion of the General Agreement on Tariffs and Trade (GATT), under which member countries grant each other reciprocal tariff reductions in regular rounds. Today these rounds are conducted by the World Trade Organization (WTO) (WTO 2020b). The creation of Customs Unions and Free Trade Areas, which completely remove tariffs between member countries[1], and the conclusion of Preferential Trade Agreements, which reduce tariffs between partner countries for a set of product categories, have also contributed to a change in trade patterns (Suranovic 2010). Recently, efforts to liberalize trade were disrupted by the US when it moved to a protectionist policy of "America First", marked by a tariff wave in 2018 that has a negative impact on the US itself, its trading partners and third parties (Li, He, and Lin 2018).

The European Union (EU)[2], in particular, was affected when the US announced the imposition of steel and aluminum tariffs on several trading partners. The two proclamations issued by President Trump on March 8, 2018, provided a 25% tariff on steel and a 10% tariff on aluminum, both to come into force on March 23, 2018. The White House justified this measure citing Section 232 of the Trade Expansion Act (Executive Office of the President 2018a; 2018b). On March 22, 2018, the President proclaimed a temporary exemption for several countries, including the EU, based on the condition that alternative measures had to be worked out until May 1 to ensure that exports from the targeted countries to the US would no longer pose a threat to national security (Executive Office of the President 2018c; 2018d). After negotiations were prolonged for another 30 days, the tariffs on steel and aluminum products

[1] While the members of a Custom Union agree on a common external tariff on imports from the rest of the world, the countries in a free trade area set an external tariff independently (Suranovic 2010).

[2] I will hereinafter refer to the EU as 'country'.

came into force on June 1, 2018. As a retaliatory measure, the EU imposed tariffs on US imports[3] including steel and agricultural products on June 20, 2018. These counter tariffs can be extended to other products if the WTO Dispute Settlement Body declares the US' action to impose tariffs as safeguard measures incompatible with WTO rules. Otherwise, the initial tariffs remain in place until March 23, 2021 (WTO 2018). On January 24, 2020, President Trump proclaimed to expand the range of products subject to the tariffs by including certain steel and aluminum derivatives valid from February 8, 2020 (Executive Office of the President 2020). The EU responded by announcing ad valorem tariffs to come into effect on May 8, 2020 (European Commission 2020a). At that time, its initial counter tariffs were in place for almost 23 months.

The EU is the world's largest trading bloc with 27 members and maintains the most advanced relationship with the US in terms of bilateral trade and investment as well as economic integration (European Commission 2020b). The tariffs imposed on the EU as part of "America First" have disrupted this relationship and led to counter tariffs by the EU. Therefore, this Project attempts to examine the impact of those tariffs on the EU's domestic prices, import volumes and aggregate economic welfare. The remainder of the Project is structured as follows. Section II reviews the main findings on this topic in the literature. In Section III, the model is outlined. Section IV describes the data used and provides a graphical analysis of the impact of retaliatory tariffs on domestic prices and import values. Section V presents the empirical results and Section VI discusses these results including potential limitations. Finally, Section VII concludes and provides an outlook on future research.

[3] Note that from Section III onwards, the term "import" is to be understood from the perspective of EU producers and consumers, whereas the term "foreign exporters" represents the perspective of American producers.

II Literature Review

The assumption that free trade is the best approach for countries to maximize their national welfare (Ricardo 1817) was discussed controversially in the literature early on. Bickerdike (1906), for example, argues that a country can benefit from the imposition of an optimal tariff, as this forces foreign suppliers to absorb a significant proportion of the costs that would otherwise be borne by the consumers of the country imposing the tariff. This argument is based on the assumption that the supply elasticity of foreign exporters is not perfectly elastic, so that if domestic prices of dutiable products increase and the import volumes decrease, foreign producers are forced to reduce their output and adjust their prices to remain competitive. As noted by Broda, Limão, and Weinstein (2008), countries that influence the world price when applying such trade policy tend to be large in international trade. This results form less elastic export supply curves, which give large countries more market power. Following above findings, a large country benefits when imposing an optimal tariff, as the gains from positive terms of trade will offset its total deadweight losses and thereby maximize the country's national welfare. As noted by De Scitovszky (1942), this implies that the country's trading partner loses from negative terms of trade and will retaliate by imposing a tariff optimal for itself to offset some of its losses. The two countries will end up in a non-cooperative Nash equilibrium where they are worse off compared to free trade.[4] In more recent literature, the positive terms-of-trade argument in favor of import protection is attributed to market imperfections abroad rather than to the large country approach. (Lipsey and Lancaster 1956) Irrespective of the approach, Feenstra (2004) challenges this theory by pointing out that few studies empirically investigate export supply elasticities. One of these few is Feenstra (1989) himself, who, in an attempt to answer the question of who bears the cost of a tariff, examines whether tariffs and exchange rates follow an identical pass-through pattern, relying on US data

[4] However, Johnson (1953) finds that a country may also benefit from an optimal tariff in the event of retaliation.

related to the tariff increase on Japanese motorcycles and trucks. He finds evidence of a symmetrical pass-through but notes that the pass-through relation varies across sectors; from unity for motorcycles, suggesting that the deadweight loss is fully borne by US consumers, to a pass-through relation of 0.58 for trucks, implying a gain for the US from positive terms of trade. Likewise, Irwin (2014) notes that increased tariffs are only partially passed on, meaning that the costs are borne by domestic consumers, but also by foreign exporters, which implies positive terms of trade for the tariff-imposing country.

The imposition of protectionist tariffs by the US in 2018 has set a precedent as it is the first time in recent history that a large country has imposed substantial tariffs in a non-cooperative manner (Amiti, Redding, and Weinstein 2020). This has led to a wave of literature attempting to measure the impact of these tariffs on the US itself, its trading partners and third parties, and on global trade. Amiti, Redding and Weinstein (2019), for example, find that the prices charged by foreign exporters for their dutiable products to the US do not fall in the short run. This implies that the tariffs are passed on to the domestic prices of the dutiable goods and are fully borne by domestic importers in the affected sectors, who face higher input costs, and domestic consumers. In addition, Bellora and Fontagne (2020) point out that the increase in prices of dutiable goods used as intermediates by US producers has led to higher final prices for these goods, implying a loss of competitiveness vis-à-vis foreign producers and thus leading to a loss of market share in export markets. Above findings are supported by Fajgelbaum et al. (2020), who measure the short-term impact of the US tariffs by estimating respective trade elasticities and embedding them in a general equilibrium model. Their estimation yields a loss of $51 billion (0.27% of GDP) for US consumers and firms that purchase dutiable goods. As this loss is partially offset by a domestic producer surplus, resulting from a rise in domestic prices and an expansion of output due to the drop in demand for foreign products, and by tariff revenues collected by the government, the total real income loss amounts to $7.2 billion (0.04% of GDP).

Interestingly, all these studies find that the tariffs were passed on to the domestic prices of dutiable goods, while foreign prices remained unchanged. An exception is found by Amiti, Redding, and Weinstein (2020), who, after adding almost one year of 2019 data to their model, observe heterogenous behavior for the steel sector where foreign exporters have lowered their prices to remain competitive and thus bear almost 50% of the tariff burden. Still, this allows them to export a large amount of steel products to the US, providing an explanation why US steel production has only increased by 2% in that period (Fefer et al. 2019). This supports Feenstra's (1989, 20) conclusion that due to the heterogeneous behavior across products, one “cannot make general statements about the extent of pass through” and therefore empirical evidence is required for each industry.

Another interesting finding by Amiti, Redding, and Weinstein (2020) is that the EU is one of the US trading partners that bear the bulk of the tariff burden associated with steel and aluminum products. This is intuitive as the EU, unlike other major trading partners, has not been exempted from the tariffs. In line with this, Salotti et al. (2019) et al conduct a study comparing how the steel and aluminum tariffs affect the base metals sector and the aggregate economy of the US trading partners concerned when the EU is exempt from these tariffs and when it is subject to them. If the latter applies, they find negative effects on the EU’s basic metal sector (-1.2% fall in exports), and on the EU itself (-0.039% fall in exports). From this finding it can be derived that import tariffs also have a negative impact on the national welfare of US trading partners, at least in the case of the EU. To compensate for these welfare losses, relevant literature argues that a trading partner considered large in international trade should then retaliate (Suranovic 2010). Indeed, retaliation in the form of tariffs on US imports has been the response of trading partners such as the EU, with negative consequences for US consumers and industries affected by those measures (Fefer et al. 2020). Fajgelbaum et al. (2020), for example, measure a 9.9% decline in US exports due to retaliatory measures and Li and

Wbhalley (2020), who analyze the US-China trade war, find that US welfare losses increase when China imposes counter tariffs. However, it should be borne in mind that retaliation harms trading partners in the same way as US tariffs have harmed the US, as their counter tariffs are passed on to domestic prices and thus to domestic consumers to the same extent (Amiti, Redding, and Weinstein 2019; Fajgelbaum et al. 2020). This suggests that both the initial trade policy and the retaliatory measure are not beneficial for either trading party involved.

Three assumptions can be derived from recent literature. Firstly, it appears that, at least in the short term, tariffs on imported goods are passed on to the domestic prices of these goods in the tariff-imposing country, while in the longer-term, heterogeneous behavior may be observed for some sectors, e.g., the steel sector. Second, a pass-through of tariffs into domestic prices has a negative impact on the economy of the respective country and can lead to a reduction in aggregate economic welfare. Third, the (negative) effect on the economy of the tariff-imposing country is worsened by retaliatory measures taken by the trading partners concerned.

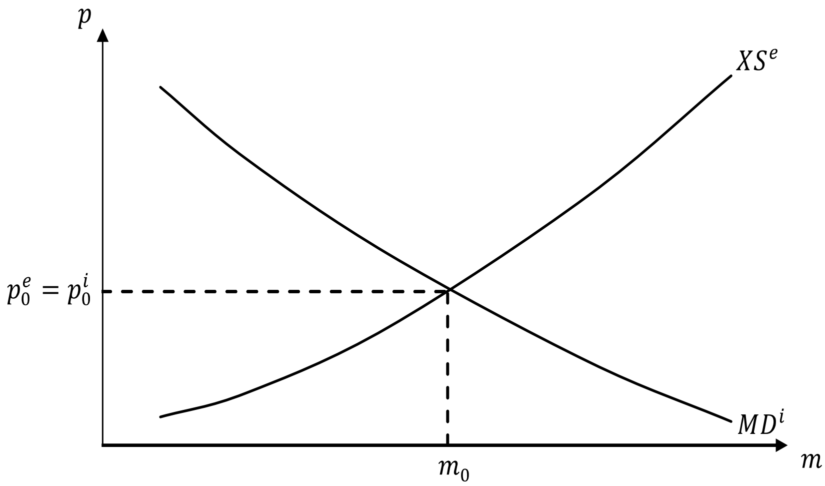
While recent literature has focused on the impact of US tariffs and retaliation by trading partners on the US, major trading partners as the EU tend to be neglected in this respect. However, these parties may also provide valuable insights on the effect that a tariff, whether imposed as a safeguard or retaliatory measure, has on the tariff-imposing country. Therefore, this Project investigates whether the above assumptions about tariff pass-through into domestic prices and its impact on domestic welfare also hold in the case of the tariffs imposed by the EU in response to the “America First” tariffs. Specifically, using the 23-month period between the first imposition of tariffs in June 2018 and the second imposition in May 2020, it is analyzed whether the EU’s counter tariffs are fully borne by domestic producers[5] and consumers, as recent literature suggests, and whether and to what extent this has led to a loss in aggregate economic welfare.

[5] This refers to EU producers who continue to import dutiable products from the US after the imposition of tariffs, as these are essential for their production. Accordingly, these producers are hereinafter referred to as “importers”.

III Methodology – A Conventional Trade Model

To examine the impact of the counter tariffs on EU prices and national welfare, a partial equilibrium model is applied, which draws on earlier work by Feenstra (2004) and Suranovic (2010) in their textbooks and on work by Amiti, Redding, and Weinstein (2019). The model assumes that markets are perfectly competitive, goods are homogenous (Suranovic 2010) and that the home country is large in international trade, which is accompanied by less elastic export supply curves and thus market power vis-à-vis the rest of the world (Broda, Limão, and Weinstein 2008).

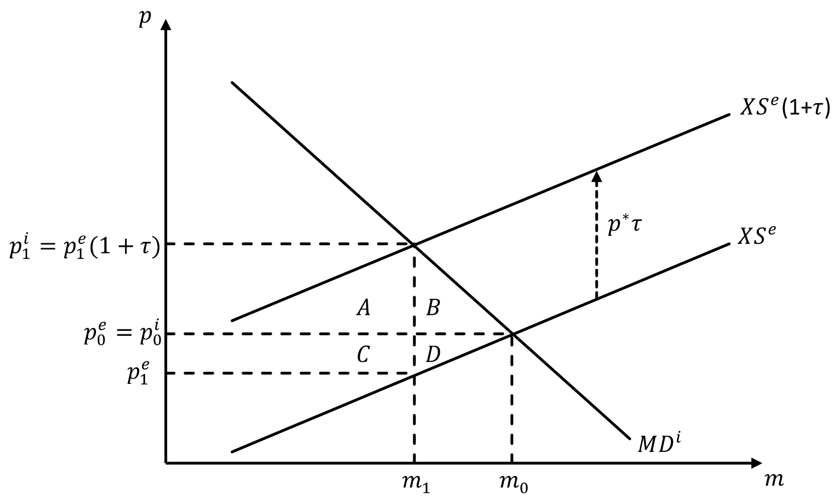
Figure 1. **Initial Equilibrium under Free Trade**



Source: Replicated by author from Amiti, Redding, and Weinstein (2019).
Note: The horizontal axis shows the quantity of imported goods and the vertical axis displays the respective price; MD^{i} presents the import demand curve and XS^{e} is the export supply curve.

Figure 1 illustrates the initial situation in which the home country has not yet imposed a protective trade policy, e.g., a tariff on its foreign trading partner. Because the home country is large and can therefore influence the world price through changes in global supply and demand when applying such protective policy, it can be assumed that its trading partner is the rest of the world (Suranovic 2010). Since the model is initially in free trade equilibrium, the price p^e demanded by foreign exporters for their goods corresponds to the price p^i paid by domestic importers and consumers, so that $p_0^e = p_0^i$, as shown on the vertical axis. Accordingly, the quantity of goods m imported by the home country is shown on the horizontal axis. The equilibrium price and quantity depend on the point where the upward sloping export supply curve XS^e and the downward sloping import demand curve MD^i intersect. Thereby, it can be derived that the export supply curve rises with prices, as foreign producers seek to benefit from higher prices by exporting more goods and will therefore increase production. In turn, foreign consumer demand falls with higher prices. In the domestic market, too, consumer demand for a good decreases when the price rises, indicating that the import demand curve falls with prices, while domestic producers benefit from a higher price (Amiti, Redding, and Weinstein 2019).

Figure 2. **Impact of an Import Tariff on a Large Country with Inelastic Export Supply**

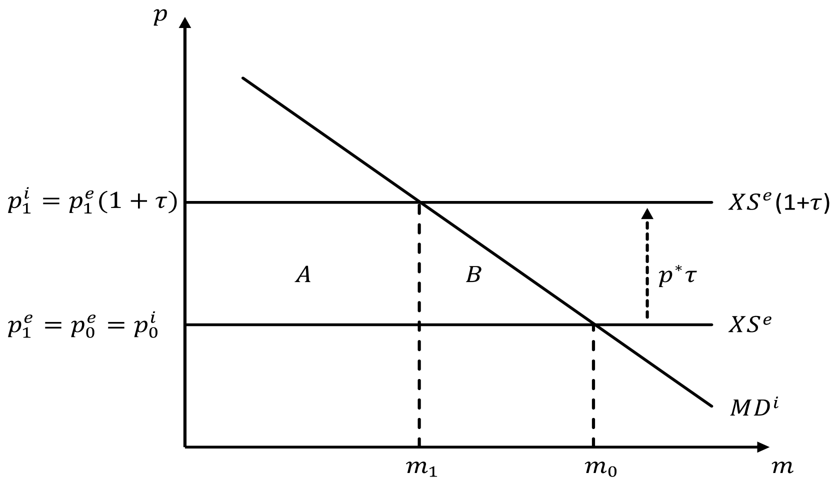


Source: Replicated by author from Amiti, Redding, and Weinstein (2019).
Note: The horizontal axis shows the quantity of imported goods and the vertical axis displays the respective price; MD^i presents the import demand curve and XS^e is the export supply curve.

For the sake of simplicity, it is now assumed that both the export supply curve and the import demand curve have a constant slope. Figure 2 shows the model after the home country has imposed an *ad valorem* tariff τ, which is a fixed percentage applied to the value of imported goods (Suranovic 2010). This shifts the export supply curve upwards, as the foreign producers concerned are now obliged to make a payment equal to the tariff τ to the government of the home country. Thus, the equilibrium point under free trade disappears and the curves representing import demand and export supply intersect at a point further to the left and further up. This causes the price charged by foreign exporters to fall below its equilibrium price, so that $p_0^e > p_1^e$, and the domestic price to rise from its equilibrium price p_0^i to p_1^i, which is equal to the export price p_1^e plus the amount of the tariff τ on the price p_1^e, so that $p_1^i = p_1^e(1+\tau)$ (Amiti, Redding, and Weinstein 2019). Hence, the gap between foreign and domestic price corresponds to the per unit tariff τ. As domestic consumers face an increase in domestic prices of goods subject to tariff τ, domestic demand for these goods decreases and shifts m_0 to m_1, indicating that less of these goods are imported (Amiti, Redding, and Weinstein 2019).

Rectangle A captures the extent of the loss due to higher prices for domestic consumers and triangle B illustrates their deadweight welfare loss (Amiti, Redding, and Weinstein 2019). Together, A and B represent the total welfare loss incurred by domestic consumers due to the tariff, while the tariff revenue includes rectangles A and C. The welfare loss in A is thus offset by the tariff revenue collected in A, indicating a redistribution from domestic consumers to their government. In addition, the negative producer surplus of the exporting country is captured in rectangle C, which indicates the redistribution from foreign producers to the domestic government in the form of the tariff τ, and in triangle B, which represents their deadweight loss due to fewer exports (Amiti, Redding, and Weinstein 2019). Since triangle D is negligible when analyzing the impact of the tariff τ on the home country and A is compensated, C and B remain. Thus, it depends on the respective size of B and C whether the tariff τ represents a gain or a loss in the country's terms of trade. To obtain a gain, the country must offset the deadweight loss in B with the tariff revenue collected in C. Figure 2 shows that rectangle C becomes larger the more foreign producers lower their prices, the latter depending on the elasticity of their export supply curve. It applies that the steeper (less elastic) the curve is, the more export prices are lowered and the more the home country benefits. Hence, imposing a tariff is particularly advantageous for large countries, as they have more market power due to less elastic supply curves and are thus more likely to induce their trading partners to lower their export prices (Broda, Limão, and Weinstein 2008). Accordingly, the lower the pass-through of the tariff to domestic consumers, the higher a country should set its (optimal) tariff (Feenstra 2004).

Figure 3. **The special case – Perfectly Elastic Export Supply**



Source: Replicated by author from Amiti, Redding, and Weinstein (2019.)
Note: The horizontal axis shows the quantity of imported goods and the vertical axis displays the respective price; $\mathrm{MD^i}$ presents the import demand curve and $\mathrm{XS^e}$ is the export supply curve.

There exists a special case when the export supply curve runs horizontal. This implies perfect elasticity and means that foreign producers are not affected by the imposition of the tariff τ and therefore do not lower their prices. With C removed, the home country cannot gain from the tariff, as the revenue collected in A is offset by the loss incurred by the domestic consumers. Hence, only B is left, reflecting the deadweight welfare loss for consumers (Amiti, Redding, and Weinstein 2019). According to relevant literature, this case occurs when small countries without market power impose a tariff (Feenstra 2004). However, recent literature shows that horizontal supply curves occur with US tariffs from 2018 have appeared, at least in the short term.

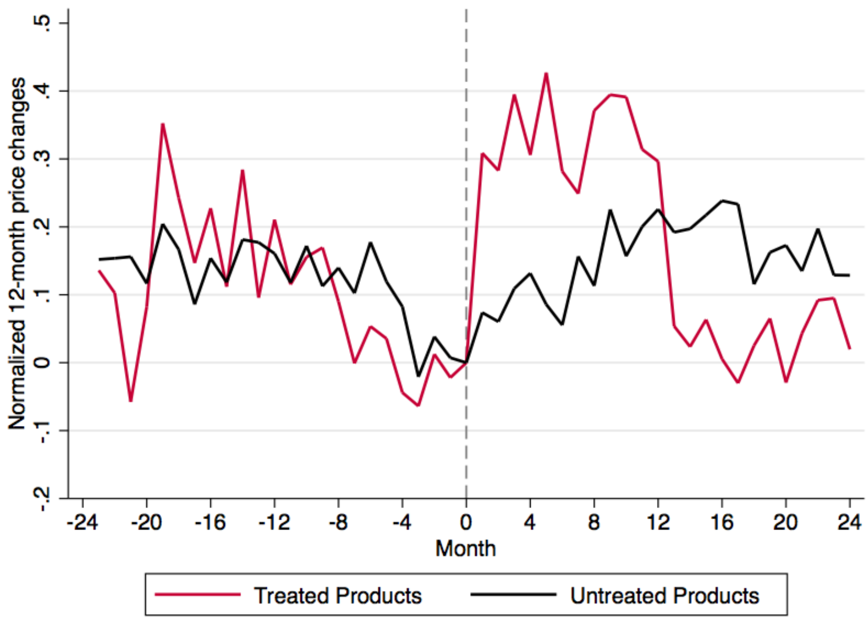
IV Data – Graphical Analysis of the Tariff Increase on Prices and Quantities

Using the catalogue of counter tariffs imposed by the EU in response to the 2018 steel and aluminum tariffs by the US, this section examines whether EU prices and import values change in line with the predictions of above model when a tariff is imposed by the home country. As can be derived from Appendix Table 1, this catalogue comprises 182 eight-digit product codes based on the Combined Nomenclature (CN), known as CN8. The CN, used by the EU to collect detailed trade data, is based on the international Harmonized System (HS), which groups products at the two- (HS2), four- (HS4) and six-digit (HS6) level according to their nature (Eurostat 2020). Accordingly, the individual goods in the catalogue are assigned to 17 different HS2 sections. Interestingly, only 106 of these goods, classified under HS2 sections 72, 73 and 76, concern the steel and aluminum industry. Since the remaining goods belong to other industries and thus affect a broader range of US industries, the scope of the tariffs increases from an economic perspective (Fefer et al. 2020). Also, it should be noted that in the year prior to the tariff imposition, 2017, the products listed in the catalogue accounted for a non-negligible 1.1% of total trade, while the HS2 sections concerned account for an average of 9.5% of total trade over the entire period under consideration from June 2016 to May 2020. From this perspective, the tariff catalog is considered appropriate for the purpose of this analysis.

Nonetheless, it is important to consider the possibility that the time lag with which the EU imposed counter tariffs gave the affected industries leeway to anticipate the tariffs, allowing US producers to take appropriate measures to evade the tariff payments. However, this argument can be weakened as the EU was exempt from the tariffs until June 1, which may have led to a high degree of uncertainty about future counter tariffs in the industries already affected. Furthermore, the EU imposed counter tariff on industries that were not initially targeted and thus did not necessarily expect to be affected by these tariffs. Such pre-trends can be identified in the following graphical analysis.

To examine the extent to which the counter tariffs are passed on to domestic prices, the prices paid by EU producers for US imports are considered. For this purpose, US export values and quantities of all CN8 product codes imported by the EU-27 and provided by Eurostat on a monthly basis are used. This is beneficial in that the eight-digit product codes correspond to the format of the products listed in the tariff catalogue and that unit values (prices) can be calculated for narrowly defined products (Amiti, Redding, and Weinstein 2019). To obtain the unit value, the export value of a product is divided by its quantity. The resulting price p^e is that charged by US exporters exclusive of tariffs. The dutiable price p^i paid by EU importers is thus calculated by multiplying the price p^e by its tariff rate, i.e. $p^i = p^e(1+\tau)$ (Amiti, Redding, and Weinstein 2019). Tariffs are constructed using EU Regulation 2017/1925 (European Commission 2016), which provides tariff rates for all eight-digit codes in line with the WTO tariff rates. For dutiable products, the additional tariff rates are added to the initial tariff rates.

Figure 4. **Twelve-month Proportional Change in Prices Paid by EU Importers**



Source: Euorstat Comext (2020); European Commission (2016); author's calculations.
Note: 12-month proportional changes in dutiable unit values of EU imports, weighted by their relative importance within their product group over 12 month. Product groups are divided into treated products affected and untreated products not affected by the tariffs. For both series, the month before the tariff imposition equals 0. Unit values of are set to 0 in this month.

In Figure 4, the twelve-month relative change in prices paid by domestic importers is shown, which is appropriate for the purpose of this analysis in that seasonality can be avoided (Amiti, Redding, and Weinstein 2019). By denoting the price of an import good j at time t as p_{jt}^{i}, the relative price change is calculated by dividing j's unit value in t by its unit value in $t-12$, so that $\hat{p}_{jt}^{i} = p_{jt}^{i} / p_{j,t-12}^{i}$ (Amiti, Redding, and Weinstein 2019). If z denotes all goods subject to the new tariffs (treated products), a price index can be calculated for this category such that

(1) $$\hat{p}_{zt} = \prod_{j \in z} \left(\hat{p}_{jt}^{i}\right)^{s_j}$$

This ensures that relevant price changes are included in the price index on the basis of their relative importance in imports, s_j, which corresponds to the twelve-month logarithmic mean of the import share of the individual good in the share of all goods subject to the new tariffs. Similarly, for the goods that are not affected by the new tariffs (untreated products), a price index is calculated to generate a baseline scenario (Amiti, Redding, and Weinstein 2019).

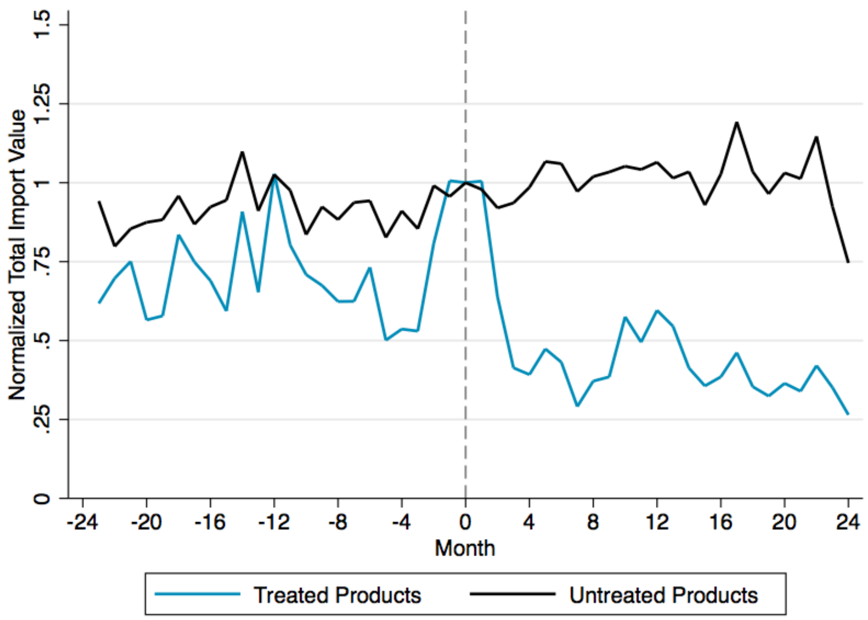
Figure 4 shows the price movements in the two years prior to the tariff increase and plots potential effects until May 2020. While the 0 on the horizontal axis corresponds to the month prior to the tariff wave, May 2018, the 0 on the vertical axis is obtained by setting the price index of May equal to 1 and then subtracting 1 from the price indices of May and the following months to express them as proportional changes (Amiti, Redding, and Weinstein 2019). Accordingly, a price index of 0 implies that there was no price change due to the tariff increase.[6]

Figure 4 provides a number of interesting findings. Looking at the period before the tariff imposition, the first thing that stands out is the absence of pre-trends for the treated group. Also, the price movements of the treated group are already more volatile than those of the untreated group, which move rather stable until they dip from late 2017 to May 2018. Still, it can be seen that the treated group is moving in the same direction as the untreated group until May 2018.

[6] This interpretation does not apply to untreated products, as these are not affected by the tariffs.

After the tariff imposition, a price increase of up to 40% is observed for the treated group, while the movements of the untreated group remain at a comparable level as before the tariff imposition. This suggests that the price increase of the treated group from May 2018 is due to the new tariffs. That the price increase exceeds the imposed tariffs of 25% can be justified by the observation that the treated group continues to move in the same direction as the untreated group, whose price level increases by about 15%, which is thus also assumed for the treated group. The resulting price increase of about 25% for the treated group in the first year after the tariff imposition suggests that the tariffs have been fully passed on to domestic producers and consumers. From June 2019, the price changes of the treated group already include the 2018 tariff increase. As the price change falls in the second year at a similar rate as it had risen the year before, this suggests that tariffs continue to be passed on to domestic prices to a large extent. Hence, the export supply curve is almost horizontal (perfectly elastic) in the two years following the tariff imposition, implying that foreign export prices hardly change.

Figure 5. **Twelve-month Proportional Change in Total Import Values**



Source: Euorstat Comext (2020); European Commission (2016); author's calculations.
Note: Distinction between 12-month proportional changes in total values of EU imports affected by 2018 tariff (treated) and not affected (untreated). For both series, the month before the tariff imposition equlals 0. Import values are set to 1 in this month.

To also gain insight into the extent to which the quantities of imported US goods change with the tariff imposition, Figure 5 plots the twelve-month change in import values, for which the same conditions apply as in Figure 4. Again, the 0 on the horizontal axis corresponds to the month prior to the tariffs imposition, namely May 2018 (Amiti, Redding, and Weinstein 2019). In contrast to Figure 4, this month's import values are set to 1 for all goods. This ensures that the change in import values after the tariff imposition is expressed in relation to the change in import values in May 2018 (Amiti, Redding, and Weinstein 2019). Once again, the treated group's import values in the months before the tariff introduction are more volatile than the import volumes of the untreated group.

As of February 2018, a drastic increase in imports of the treated group can be observed, while the untreated group shows considerably less change. Since the US steel and aluminum tariffs were introduced in March 2018, it can be concluded that EU importers anticipated possible counter tariffs and stocked up on the products they needed in advance. To clarify the comparable import volumes of May and June 2018, note that the tariffs were imposed by the EU on June 20 instead of June 1, so import values did not fall immediately. In the following months, however, a large decline in imports of treated products, at times by more than 50%, can be observed. In turn, imports of untreated products increase slightly, which may be a sign of import substitution, as it seems likely that some of the treated products were imported via the untreated product group (Amiti, Redding, and Weinstein 2019). Note that the drop in the last two months can be attributed to the Coronavirus and is therefore negligible. Furthermore, all petroleum imports have been removed from the graphs in Section IV and the regression results in V due to the high volatility of their prices.

V Set Up of the Empirical Analysis and Evaluation of the Results

The graphical analysis in Section IV provides an insight into the impact of a tariff increase on dutiable prices and imported quantities of goods affected by such an increase. However, one of the underlying assumptions of the conventional model is that the price p^e will fall after the imposition of new tariffs (Amiti, Redding, and Weinstein 2019), suggesting that foreign producers bear part of the burden resulting from the new tariff (Cf. Figure 2, Section III). Therefore, this section examines how the tariff increase in June 2018 has affected the price p^e charged by US exporters exclusive of tariffs. This is advantageous in that it not only provides evidence on whether the model's predictions are true, but also on the course of the export supply curve, making it possible to estimate the impact on domestic welfare (Amiti, Redding, and Weinstein 2019). For a more comprehensive understanding, the impact of the tariff increase on import quantities and values is also investigated. Since all regression variables correspond to their twelve-month logarithmic changes based on the data set from Section IV over the period from June 2016 to May 2020, this yields the specification

(2) $$\Delta \ln\left(z_{jt}\right) = \mu_j + \beta \Delta \ln\left(1 + \tau_{jt}\right) + \varepsilon_{jt}$$

where z_{jt} refers to each of the dependent variables, μ_{jt} implies a product fixed effect and ε_{jt} is the error term. The applied tariffs τ_{jt} are defined as the independent variable, thereby affecting the estimated coefficient (β) exogenously. By assuming that the tariffs are not correlated with unobserved price shocks, β accounts for the tariff effect on the prices p^e (Amiti, Redding, and Weinstein 2019). Again, j refers to the goods imported from the US and t denotes time. Note also that the regression controls for time and uses a difference-in-difference approach. The results are presented in Table 1. Column 1 estimates the effect of the twelve-month log change of one plus the applied tariff rate, $(1 + \tau_{jt})$, on the twelve-month log change in foreign exporters' prices exclusive of tariffs, corresponding to $\Delta \ln\left(p_{jt}\right)$. The regression estimates a coefficient of 0.019.

Table 1. **Estimating the Impact of the EU Tariff Increase on US Imports**

	(1)	(2)	(3)	(4)	(5)
	log change p_e	log change quantities		log change total values	
	$\Delta\ln(p_{jt})$	$\Delta\ln(m_{jt})$	$\Delta\ln(m_{jt})$	$\Delta\ln(p_{jt}\times m_{jt})$	$\Delta\ln(p_{jt}\times m_{jt})$
log change tariff	0.019	-1.892***	-1.916***	-2.390***	-2.504***
$\Delta\ln(1+\tau_{jt})$	(0.063)	(0.158)	(0.270)	(0.209)	(0.472)
N	204,488	204,488	238,317	289,016	345,995
R_2	0.054	0.062	0.188	0.046	0.160

Note: Observations include monthly data at the CN8-level from June 2016 to May 2020. Variables are expressed in log changes over 12 months and include a product fixed effect. The dependent variable is respectively the change in foreign exporters' prices exclusive of tariffs (1), the change in quantities without (2) and with 0 quantities (3), and the change in import values exclusive of tariffs without (4) and with 0 quantities (5). Further explanations on this behalf can be found in the text. In columns 1 to 3, all observations whose 12-month change in unit values is below 1/3 or above 3 are sorted out. Standard errors are clustered in parentheses. Significance level: *** $p < 0.01$; ** $p < 0.05$; * $p < 0.10$

Since the associated standard error is very low, it can be concluded that the result is precisely estimated and that the tariff increase thus has an immaterial impact on foreign exporter prices. In terms of the model, this implies that foreign exporters' prices do not fall when tariffs are imposed, suggesting that the exporters' supply curve is almost perfectly elastic, and the tariff burden is thus borne by EU importers and consumers. This is consistent with the finding of Amiti, Redding, and Weinstein (2020) that the tariff burden in most sectors is still fully borne by domestic importers and consumers even when these tariffs have been in place for more than a year. Conversely, this indicates that foreign exporters do not lower their prices even over a longer period of time, as usually assumed in the literature. Amiti, Redding, and Weinstein (2020) find an exception for the steel sector, where foreign producers bear about half of the tariff burden after one year as they lower their prices to remain competitive. In light of the result in column 1, this finding is particularly interesting, as almost 60% of the goods subject to the

2018 tariffs are steel products and yet the tariff burden is still mainly borne by EU importers and consumers after more than one year.

Column 2 illustrates the extent to which the independent variable affects the change in import quantities $\Delta \ln(m_{jt})$, excluding those quantities that fell to 0 in the wake of the tariff increase. Given that tariffs are treated as an exogenous factor and that the coefficient in column 1 indicates that the tariff increase is exclusively borne by EU importers and consumers, the estimated coefficient captures the import demand elasticity, reflecting the shape of the import demand curve in the model (Amiti, Redding, and Weinstein 2019). Consequently, a 1% increase in tariffs is equivalent to a 1.89% drop in import quantities, which is already fairly close to the decrease in import values following the imposition of counter tariffs, as shown in Figure 5 (Amiti, Redding, and Weinstein 2019). In column 3, the regression estimating the effect on import quantities is repeated, including those quantities reported as 0. To adequately account for these quantities, the inverse hyperbolic sine, defined as $\ln(x + \sqrt{x^2 + 1})$, is used instead of the logarithmic change, which is considered more appropriate when x is rather small, as it then replicates the slope of $\ln(x)$ better than $\ln(1 + x)$ (Amiti, Redding, and Weinstein 2019). It can be observed that the coefficient drops slightly steeper than the one estimated in column 2 and thus fits even better with Figure 5. Furthermore, the number of observations has increased, suggesting that some quantities fell to 0 after the tariff increase and thus less was imported.

Columns 4 and 5 repeat the regressions from 2 and 3, respectively, exchanging the dependent variable for the twelve-month log change in import values exclusive of tariffs, so that $\Delta \ln(m_{jt} \times p_{jt})$. Again, the independent variable has a stronger effect on the coefficient in column 5, which includes import values of 0, than on the coefficient in column 4. It is striking that the number of observations further increases, indicating that import quantities are reported less frequently than import values. As quantities are reported in units of 100 kg, one explanation may be that some quantities are too small to be considered. Hence, it is assumed that the larger number of observations is the reason why the coefficients in 4 and 5 fall more steeply than those in 2 and 3, suggesting that the difference between the coefficients is not due to a price effect. The estimated coefficients in columns 2 to 5 underline the finding that foreign exporters' prices do not fall and thus the tariffs are fully borne by EU importers and consumers. Using the model, or Figure 2 and 3, and the estimated coefficients for import quantities and values obtained in column 3 and 5, the deadweight welfare loss (DWL) associated with the tariff increase can be calculated for the EU. Since a core assumption of the model is that the import demand curve is constant, area B in Figure 2, which reflects the DWL, corresponds to a 90° triangle. Therefore, the formula $\frac{1}{2} * h * w$ is applied, where h equals the dutiable price paid by EU producers, derived from the data, while w represents the decrease in quantity from m_0 to m_1 in line with the tariffs, captured by the coefficient β_3 in column 3 of Table 1 (Amiti, Redding, and Weinstein 2019). To estimate the percentage change in import quantities due to the tariff change, β_3 or -1.916 is multiplied by the log change of one plus the applied tariff rate in t relative to one plus the applied tariff rate in $t - 12$.[7] Over the 24-month period, this results in an average change in import quantities of about 63%, which is consistent with the decline in import quantities observed in Figure 5. To calculate the DWL per month, dutiable import values are multiplied by the percentage change in quantities calculated above, so that the formula is

$$(3) \qquad -\frac{1}{2}(p_1^i * m_1)\tau_{jt}\beta_3 ln((1 + \tau_{jt}) \,/\, (1 + \tau_{jt-12}))$$

Summing up the monthly results over the period of twelve months, this yields the deadweight loss for one year (Amiti, Redding, and Weinstein 2019). As shown in Table 2, this is done for the period from June 2018 to May 2019 and for the subsequent period. Correspondingly, the total DWL equals the sum of these two periods and amounts to almost € 144 million. Here, it is striking that the DWL in the second period is almost €23 million lower than in the first period.

[7] Hence, this corresponds to the term $\beta_3 ln((1 + \tau_{jt}) \,/ (1 + \tau_{jt-12}))$.

Table 2. **Estimating the Implications for the EU's National Welfare**

Period	Deadweight Loss	Tariff Revenue	Total Cost Importers
Jun 18 - May 19	83.1	398.4	481.5
Jun 19 - May 20	60.5	293.6	354.1
Total	**143.6**	**692.0**	**835.6**

Note: DWL, tariff revenue and total cost to importers calculated over the 48-month period following the tariff increase. Numbers correspond to current prices in millions of euros. Detailed explanations on the calculations can be found in the text.

The same pattern can be observed for the tariff revenue, which slumps by more than €100 million in the second period. As this can be interpreted as a sign of tariff evasion by foreign exporters, it will be discussed again in the next section.

Consistent with the above finding that foreign exporters do not lower their prices after the imposition of the 2018 tariffs, the tariff revenue, calculated by multiplying the total import values by the applied tariff rates, can be considered a pure transfer to the domestic government (Amiti, Redding, and Weinstein 2019). Assuming that the government uses these revenues completely for social purposes, the aggregate welfare loss for the EU is equal to the deadweight loss calculated in Table 2, or triangle B in the model. Consequently, the cost to domestic producers and consumers equals the sum of tariff revenue and deadweight loss, i.e., rectangle A plus triangle B in the model (Amiti, Redding, and Weinstein 2019). These calculations are in line with Feenstra's (2004) social welfare equation which equals the sum of producer surplus and tariff revenue collected by the government and holds under both perfect and imperfect competition. For the sake of simplicity, note that all calculations were undertaken as if the tariffs had already been imposed on June 1 and not on June 20. The monthly results for DWL, tariff revenue and cost to importers are shown in Table 2 of the Appendix.

VI Discussion of the Results and Potential Limitations

The regression results confirm what was already suspected in the graphical analysis, namely that the costs arising from the tariff increase are fully borne by domestic importers and consumers in the first two years, since US exporters do not lower their prices, and that this results in a non-negligible deadweight welfare loss for the EU. In this regard, the results are in line with many other studies in recent literature, e.g. Amiti, Redding, and Weinstein (2019), Bouët and Laborde (2018), Cavallo et al. (2019) and Fajgelbaum et al. (2020). It must be noted, however, that unlike this Project, the studies cited here examine the impact of the 2018 US tariff wave on the US. The reason for referring to these studies is that there are hardly any studies in recent literature that deal with the EU's retaliatory tariffs against the US. In this context, an important fundamental assumption of the above mentioned studies is that the US is a large country, which according to Broda, Limão, and Weinstein (2008) gives a country market power and thus the ability to influence world prices. Since the EU can also be considered large in international trade, the studies are considered comparable and thus appropriate.

Nevertheless, the question arises why a complete pass-through of tariffs to domestic prices is observed in the EU and also in the US, at least in the short run, despite the fact that relevant literature often argues that foreign exporters lower their prices and absorb part of the tariff burden when a (protectionist) tariff is imposed, e.g. Irwin (2014). One factor to consider could be that, as in Amiti, Redding, and Weinstein (2019), a set of simplifying assumptions have been made that distort the impact of tariffs on prices, quantities and welfare. These assumptions include a model in partial equilibrium and perfect competition, although market imperfections may exist in reality. Also, the imposition of tariffs in June 2018 is considered an exogenous shock (Amiti, Redding, and Weinstein 2019). Another aspect could be that the ongoing pandemic distorts the data analysis from March 2020 onwards by incorrectly assuming that zero quantities have fallen to 0 due to the tariff increase, although the actual reason was the pandemic. If this were the case, it could negatively affect the graphical analysis and the regression results, making the impact on import volumes and values and on national welfare appear more severe than it truly is.

Regarding the first argument, it should be pointed out that it is reasonable to make simplifying assumptions, as such models would otherwise be too complex and thus incomprehensible (Suranovic 2010). Concerning the possible data distortion due to the pandemic, it should be noted that only the last three months of the observation period are affected and that the treated group changes only slightly compared to the untreated group, as Figure 5 shows. Accordingly, these limitations are considered negligible and therefore the results are suitable for analysis.

Nevertheless, there are possible other reasons why foreign exporters do not lower their prices in the short run. In line with this, one argument considered by Amiti, Redding, and Weinstein (2019) is that the prices charged by foreign exporters, in this case US exporters, may be sticky in the short run, so that their prices remain at the same level. However, this does not exclude the possibility, considered by Broda, Limão, and Weinstein (2008), that respective trade elasticities may change over a longer time horizon and thus prices for foreign exports may decline in the medium to long term. Amiti, Redding, and Weinstein (2019) consider another possible reason why the prices charged by foreign exporters do not fall in the short term in the high degree of uncertainty that has initially accompanied the rather unexpected US tariffs. This suggests that foreign exporters were unwilling to lower their prices without knowing whether the tariffs would be short-term or longer-term in nature. As the uncertainty disappeared over a longer period of time, affected consumers and industries at home and abroad had the possibility to adjust to the new circumstances, which eventually led foreign exporters to lower their prices in order to remain competitive (Amiti, Redding, and Weinstein 2019). This argument can also be applied to the counter tariffs imposed by the EU.

In addition to the behavior of foreign export prices, the evolution of tariff revenues over the two years following the imposition of the tariffs is of particular interest, as the government revenues for the EU fall significantly by over €100 million in the second period from June 2019 to May 2020. This finding is consistent with Fefer et al. (2019), who observe that US government revenues associated with US steel and aluminum tariffs decline over time, suggesting that trading partners affected by the tariff increase have found ways to circumvent the tariffs. This can therefore be seen as a sign of tariff evasion by US exporters. Such circumventions often lead to shifts in supply chains, e.g. exporting US products to countries other than the EU or to the EU via product groups not affected by the tariffs (Amiti, Redding, and Weinstein 2019). As Sequeira (2016) notes, it can also happen that the actual quantity of a dutiable product is disguised by reporting a lower quantity. Accordingly, it is very likely that part of the tariff revenue to the EU was lost through tariff evasion in the second period.

VII Conclusion and Future Research

This Project provides evidence that the EU retaliatory tariffs imposed in response to the US steel and aluminum tariffs are fully passed on to EU producers and consumers in the period from June 2018 to May 2020, suggesting that the tariff burden is not partially absorbed by US exporters. While this results in a total deadweight loss for the EU of almost €144 million, the total costs to EU importers exceed €830 million. Although US exporters do not charge lower prices in sectors affected by the retaliatory tariffs, they also suffer losses, as the import quantities of these products fall noticeably (Cf. Figure 5). Amiti, Redding, and Weinstein (2019; 2020) have found comparable results for the impact of the US tariffs on the US, except that EU steel and aluminum producers lowered the prices of their exports to the US one year after the US tariff imposition to remain competitive. As it can be concluded that both the EU and the US are negatively affected by the initial US tariffs on steel and aluminum and by the EU retaliatory tariffs, this suggests that free trade is preferable to a protectionist trade policy, at least in the short term.

Depending on how long the EU counter tariffs remain in force, it is reasonable to examine the impact of such tariffs in the medium and also in the long term. In this respect, it will be of particular interest for researchers to track whether foreign exporters lower their prices in the medium and long term to remain competitive and to what extent the effect of a protectionist tariff diminishes over the years. Furthermore, this Project does not examine the impact of US 2018 and 2020 tariffs on EU exports to the US, as Amiti, Redding, and Weinstein (2019) have done vice versa for the US. Therefore, an analysis on the impact of the US tariffs on EU exports is also of interest for future research. Finally, the analysis of imported product varieties and whether its diversity decreases with the imposition of a tariff was considered outside the scope of this Project. Hence, this could also be the subject of future research.

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IX Appendix

Table 1. **Catalogue of Product Codes affected by EU Counter Tariffs**

HS2 Section	CN 2018 (CN8)	Description	Additional Tariff Rate
07	07104000	Sweetcorn, uncooked or cooked by steaming or by boiling in water, frozen	25%
07	07119030	Sweetcorn provisionally preserved, e.g. by sulphur dioxide gas, in brine, in sulphur water or in other preservative solutions, but unsuitable in that state for immediate consumption	25%
07	07133390	Dried, shelled kidney beans "Phaseolus vulgaris", whether or not skinned or split (excl. for sowing)	25%
10	10059000	Maize (excl. seed for sowing)	25%
10	10063021	Semi-milled round grain rice, parboiled	25%
10	10063023	Semi-milled medium grain rice, parboiled	25%
10	10063025	Semi-milled long grain rice, length-width ratio > 2 but < 3, parboiled	25%
10	10063027	Semi-milled long grain rice, length-width ratio >= 3, parboiled	25%
10	10063042	Semi-milled round grain rice (excl. parboiled)	25%
10	10063044	Semi-milled medium grain rice (excl. parboiled)	25%
10	10063046	Semi-milled long grain rice, length-width ratio > 2 but < 3 (excl. parboiled)	25%
10	10063048	Semi-milled long grain rice, length-width ratio >= 3 (excl. parboiled)	25%
10	10063061	Wholly milled round grain rice, parboiled, whether or not polished or glazed	25%
10	10063063	Wholly milled medium grain rice, parboiled, whether or not polished or glazed	25%
10	10063065	Wholly milled long grain rice, length-width ratio > 2 but < 3, parboiled, whether or not polished or glazed	25%
10	10063067	Wholly milled long grain rice, length-width ratio >= 3, parboiled, whether or not polished or glazed	25%
10	10063092	Wholly milled round grain rice, whether or not polished or glazed (excl. parboiled)	25%
10	10063094	Wholly milled medium grain rice, whether or not polished or glazed (excl. parboiled)	25%
10	10063096	Wholly milled long grain rice, length-width > 2 but < 3, whether or not polished or glazed (excl. parboiled)	25%
10	10063098	Wholly milled long grain rice, length-width ratio >= 3, whether or not polished or glazed (excl. parboiled)	25%
10	10064000	Broken rice	25%
19	19041030	Prepared foods obtained by swelling or roasting cereals or cereal products based on rice	25%
19	19049010	Rice, pre-cooked or otherwise prepared, n.e.s. (excl. flour, groats and meal, food preparations obtained by swelling or roasting or from unroasted cereal flakes or from mixtures of unroasted cereal flakes and roasted cereal flakes or swelled cereals)	25%
20	20019030	Sweetcorn "Zea Mays var. Saccharata", prepared or preserved by vinegar or acetic acid	25%
20	20049010	Sweetcorn "Zea Mays var. Zaccharata", prepared or preserved otherwise than by vinegar or acetic acid, frozen	25%
20	20058000	Sweetcorn "Zea Mays var. Saccharata", prepared or preserved otherwise than by vinegar or acetic acid (excl. frozen)	25%
20	20081110	Peanut butter	25%
20	20091200	Orange juice, unfermented, Brix value <= 20 at 20°C, whether or not containing added sugar or other sweetening matter (excl. containing spirit and frozen)	25%
20	20091911	Orange juice, unfermented, Brix value > 67 at 20°C, value of <= 30 € per 100 kg, whether or not containing added sugar or other sweetening matter (excl. containing spirit and frozen)	25%

20	20091919	Orange juice, unfermented, Brix value > 67 at 20°C, value of > 30 € per 100 kg, whether or not containing added sugar or other sweetening matter (excl. containing spirit and frozen)	25%
20	20091991	Orange juice, unfermented, Brix value > 20 but <= 67 at 20°C, value of <= 30 € per 100 kg, containing > 30% added sugar (excl. containing spirit and frozen)	25%
20	20091998	Orange juice, unfermented, Brix value > 20 but <= 67 at 20°C, whether or not containing added sugar or other sweetening matter (excl. containing spirit and frozen, with a value of <= 30 € per 100 kg and with > 30% added sugar)	25%
20	20098111	Cranberry "Vaccinium macrocarpon, Vaccinium oxycoccos, Vaccinium vitis- idaea" juice, unfermented, whether or not containing added sugar or other sweetening matter, Brix value > 67 at 20°C, value of <= € 30 per 100 kg (excl. containing spirit)	25%
20	20098119	Cranberry "Vaccinium macrocarpon, Vaccinium oxycoccos, Vaccinium vitis- idaea" juice, unfermented, whether or not containing added sugar or other sweetening matter, Brix value > 67 at 20°C, value of > € 30 per 100 kg (excl. containing spirit)	25%
20	20098131	Cranberry "Vaccinium macrocarpon, Vaccinium oxycoccos, Vaccinium vitis- idaea" juice, unfermented, Brix value <= 67 at 20°C, value of > € 30 per 100 kg, containing added sugar (excl. containing spirit)	25%
20	20098159	Cranberry "Vaccinium macrocarpon, Vaccinium oxycoccos, Vaccinium vitis- idaea" juice, unfermented, Brix value <= 67 at 20°C, value of <= € 30 per 100 kg, containing <= 30% added sugar (excl. containing spirit)	25%
20	20098195	Juice of fruit of the species Vaccinium macrocarpon, unfermented, Brix value <= 67 at 20°C (excl. containing added sugar or spirit)	25%
20	20098199	Cranberry "Vaccinium oxycoccos, Vaccinium vitis-idaea" juice, unfermented, Brix value <= 67 at 20°C (excl. containing spirit or added sugar)	25%
22	22083011	Bourbon whiskey, in containers holding <= 2 l	25%
22	22083019	Bourbon whiskey, in containers holding > 2 l	25%
22	22083082	Whisky, in containers holding <= 2 l (other than Bourbon whiskey and Scotch whisky)	25%
22	22083088	Whisky, in containers holding > 2 l (other than Bourbon whiskey and Scotch whisky)	25%
24	24021000	Cigars, cheroots and cigarillos containing tobacco	25%
24	24022010	Cigarettes, containing tobacco and cloves	25%
24	24022090	Cigarettes, containing tobacco (excl. containing cloves)	25%
24	24029000	Cigars, cheroots, cigarillos and cigarettes consisting wholly of tobacco substitutes	25%
24	24031100	Water-pipe tobacco (excl. tobacco-free. See subheading note 1.)	25%
24	24031910	Smoking tobacco, whether or not containing tobacco substitutes in any proportion, in immediate packings of a net content of <= 500 g (excl. water- pipe tobacco containing tobacco)	25%
24	24031990	Smoking tobacco, whether or not containing tobacco substitutes in any proportion, in immediate packings of a net content of > 500 g (excl. water- pipe tobacco containing tobacco)	25%
24	24039100	Tobacco, "homogenised" or "reconstituted" from finely-chopped tobacco leaves, tobacco refuse or tobacco dust	25%
24	24039910	Chewing tobacco and snuff	25%
24	24039990	Manufactured tobacco and tobacco substitutes, and tobacco powder, tobacco extracts and essences (excl. chewing tobacco, snuff, cigars, cheroots, cigarillos and cigarettes, smoking tobacco whether or not containing tobacco substitutes in any proportion, "homogenised" or "reconstituted" tobacco, nicotine extracted from the tobacco plant and insecticides manufactured from tobacco extracts and essences)	25%
33	33042000	Eye make-up preparations	25%

33	33043000	Manicure or pedicure preparations	25%
33	33049100	Make-up or skin care powders, incl. baby powders, whether or not compressed (excl. medicaments)	25%
61	61091000	T-shirts, singlets and other vests of cotton, knitted or crocheted	25%
61	61099020	T-shirts, singlets and other vests of wool or fine animal hair or man-made fibres, knitted or crocheted	25%
61	61099090	T-shirts, singlets and other vests of textile materials, knitted or crocheted (excl. of wool, fine animal hair, cotton or man-made fibres)	25%
62	62034231	Men's or boys' trousers and breeches of cotton denim (excl. knitted or crocheted, industrial and occupational, bib and brace overalls and underpants)	25%
62	62034290	Men's or boys' shorts of cotton (excl. knitted or crocheted, swimwear and underpants)	25%
62	62034311	Men's or boys' trousers and breeches of synthetic fibres, industrial and occupational (excl. knitted or crocheted and bib and brace overalls)	25%
62	62046231	Women's or girls' cotton denim trousers and breeches (excl. industrial and occupational, bib and brace overalls and panties)	25%
62	62046290	Women's or girls' cotton shorts (excl. knitted or crocheted, panties and swimwear)	25%
63	63023100	Bedlinen of cotton (excl. printed, knitted or crocheted)	25%
64	64035995	Men's footwear with outer soles and uppers of leather, with in-soles of >= 24 cm in length (excl. covering the ankle, incorporating a protective metal toecap, made on a base or platform of wood, without in-soles, with a vamp or upper made of straps, indoor footwear, sports footwear, and orthopaedic footwear)	25%
72	72101220	Tinplate of iron or non-alloy steel, of a width of >= 600 mm and of a thickness of < 0,5 mm, tinned [coated with a layer of metal containing, by weight, >= 97% of tin], not further worked than surface-treated	25%
72	72101280	Flat-rolled products of iron or non-alloy steel, of a width of >= 600 mm, hot- rolled or cold-rolled "cold-reduced", plated or coated with tin, of a thickness of < 0,5 mm (excl. tinplate)	25%
72	72191210	Flat-rolled products of stainless steel, of a width of >= 600 mm, not further worked than hot-rolled, in coils, of a thickness of >= 4,75 mm but <= 10 mm, containing by weight >= 2,5 nickel	25%
72	72191290	Flat-rolled products of stainless steel, of a width of >= 600 mm, not further worked than hot-rolled, in coils, of a thickness of >= 4,75 mm but <= 10 mm, containing by weight < 2,5 nickel	25%
72	72191310	Flat-rolled products of stainless steel, of a width of >= 600 mm, not further worked than hot-rolled, in coils, of a thickness of >= 3 mm but <= 4,75 mm, containing by weight >= 2,5 nickel	25%
72	72191390	Flat-rolled products of stainless steel, of a width of >= 600 mm, not further worked than hot-rolled, in coils, of a thickness of >= 3 mm but <= 4,75 mm, containing by weight < 2,5 nickel	25%
72	72193210	Flat-rolled products of stainless steel, of a width of >= 600 mm, not further worked than cold-rolled "cold-reduced", of a thickness of >= 3 mm but <= 4,75 mm, containing by weight >= 2,5% nickel	25%
72	72193290	Flat-rolled products of stainless steel, of a width of >= 600 mm, not further worked than cold-rolled "cold-reduced", of a thickness of >= 3 mm but <= 4,75 mm, containing by weight < 2,5% nickel	25%
72	72193310	Flat-rolled products of stainless steel, of a width of >= 600 mm, not further worked than cold-rolled "cold-reduced", of a thickness of > 1 mm but < 3 mm, containing by weight >= 2,5% nickel	25%
72	72193390	Flat-rolled products of stainless steel, of a width of >= 600 mm, not further worked than cold-rolled "cold-reduced", of a	25%

		thickness of > 1 mm but < 3 mm, containing by weight < 2,5% nickel	
72	72193410	Flat-rolled products of stainless steel, of a width of >= 600 mm, not further worked than cold-rolled "cold-reduced", of a thickness of >= 0,5 mm but <= 1 mm, containing by weight >= 2,5% nickel	25%
72	72193490	Flat-rolled products of stainless steel, of a width of >= 600 mm, not further worked than cold-rolled "cold-reduced", of a thickness of >= 0,5 mm but <= 1 mm, containing by weight < 2,5% nickel	25%
72	72193590	Flat-rolled products of stainless steel, of a width of >= 600 mm, not further worked than cold-rolled "cold-reduced", of a thickness of < 0,5 mm, containing by weight < 2,5% nickel	25%
72	72222021	Bars and rods of stainless steel, not further worked than cold-formed or cold- finished, of circular cross-section measuring >= 25 mm but < 80 mm and containing by weight >= 2,5% nickel	25%
72	72222029	Bars and rods of stainless steel, not further worked than cold-formed or cold- finished, of circular cross-section measuring >= 25 mm but < 80 mm and containing by weight < 2,5% nickel	25%
72	72222031	Bars and rods of stainless steel, not further worked than cold-formed or cold- finished, of circular cross-section measuring < 25 mm and containing by weight >= 2,5% nickel	25%
72	72222081	Bars and rods of stainless steel, not further worked than cold-formed or cold- finished, containing by weight >= 2,5% nickel (excl. such products of circular cross-section)	25%
72	72222089	Bars and rods of stainless steel, not further worked than cold-formed or cold- finished, containing by weight < 2,5% nickel (excl. such products of circular cross-section)	25%
72	72224010	Angles, shapes and sections of stainless steel, only hot-rolled, only hot-drawn or only extruded	25%
72	72224050	Angles, shapes and sections of stainless steel, not further worked than cold- formed or cold-finished	25%
72	72224090	Angles, shapes and sections of stainless steel, cold-formed or cold-finished and further worked, or not further worked than forged, or forged, or hot- formed by other means and further worked, n.e.s.	25%
72	72230011	Wire of stainless steel, in coils, containing by weight 28% to 31% nickel and 20% to 22% chromium (excl. bars and rods)	25%
72	72230019	Wire of stainless steel, in coils, containing by weight >= 2,5% nickel (excl. such products containing 28% to 31% nickel and 20% to 22% chromium, and bars and rods)	25%
72	72230091	Wire of stainless steel, in coils, containing by weight < 2,5% nickel, 13% to 25% chromium and 3,5% to 6% aluminium (excl. bars and rods)	25%
72	72269200	Flat-rolled products of alloy steel other than stainless, of a width of < 600 mm, not further worked than cold-rolled "cold-reduced" (excl. products of high-speed steel or silicon-electrical steel)	25%
72	72283020	Bars and rods of tool steel, only hot-rolled, only hot-drawn or only extruded (excl. semi-finished products, flat-rolled products and hot-rolled bars and rods in irregularly wound coils)	25%
72	72283041	Bars and rods of steel containing by weight 0,9 to 1,15% of carbon and 0,5 to 2% of chromium, and, if present, <= 0,5% of molybdenum, only hot-rolled, hot-drawn or hot-extruded, of a circular cross-section of a diameter of >= 80 mm (excl. semi-finished products, flat-rolled products and hot-rolled bars and rods in irregularly wound coils)	25%
72	72283049	Bars and rods of steel containing by weight 0,9 to 1,15% of carbon and 0,5 to 2% of chromium, and, if present, <= 0,5% of molybdenum, only hot-rolled, only hot-drawn or hot-extruded (other than of circular cross-section, of a diameter of >= 80 mm and excl. semi-finished products, flat-rolled products and hot-rolled bars and rods in irregularly wound coils)	25%
72	72283061	Bars and rods of alloy steel other than stainless steel, only hot-rolled, hot- drawn or hot-extruded, of circular cross-section, of	25%

		a diameter of >= 80 mm (other than of high-speed steel, silico-manganese steel, tool steel, articles of subheading 7228.30.41 and excl. semi-finished products, flat-rolled products and hot-rolled bars and rods in irregularly wound coils)	
72	72283069	Bars and rods or alloy steel other than stainless steel, only hot-rolled, hot- drawn or hot-extruded, of circular cross-section, of a diameter of < 80 mm (other than of high-speed steel, silico-manganese steel, tool steel and articles of subheading 7228.30.49 and excl. semi-finished products, flat-rolled products and hot-rolled bars and rods in irregularly wound coils)	25%
72	72283070	Bars and rods of alloy steel other than stainless steel, of rectangular "other than square" cross-section, hot-rolled on four faces (other than of high-speed steel, silico-manganese steel, tool steel, articles of subheading 7228.30.41 and 7228.30.49 and excl. semi-finished products, flat-rolled products and hot-rolled bars and rods in irregularly wound coils)	25%
72	72283089	Bars and rods of alloy steel other than stainless steel, only hot-rolled, hot- drawn or hot-extruded, of other than rectangular [other than square] cross- section, rolled on four faces, or of circular cross-section (other than of high- speed steel, silico-manganese steel, tool steel, articles of subheading 7228.30.49 and excl. semi-finished products, flat-rolled products and hot-rolled bars and rods in irregularly wound coils)	25%
72	72285020	Bars and rods of tool steel, only cold-formed or cold-finished (excl. semi- finished products, flat-rolled products and hot-rolled bars and rods in irregularly wound coils)	25%
72	72285040	Bars and rods of steel containing 0,9% to 1,15% of carbon, 0,5% to 2% of chromium and, if present <= 0,5% of molybdenum, only cold-formed or cold- finished (excl. semi-finished products, flat-rolled products and hot-rolled bars and rods in irregularly wound coils)	25%
72	72285069	Bars and rods of alloy steel, other than stainless steel, not further worked than cold-formed or cold-finished, of circular cross-section, of a diameter of < 80 mm (excl. of high-speed steel, silico-manganese steel, tool steel, articles of subheading 7228.50.40, semi-finished products, flat-rolled products and hot- rolled bars and rods in irregularly wound coils)	25%
72	72285080	Bars and rods of alloy steel, other than stainless steel, not further worked than cold-formed or cold-finished (excl. of circular cross-section and products of high-speed steel, silico-manganese steel, tool steel, articles of subheading 7228.50.40, semi-finished products, flat-rolled products and hot-rolled bars and rods in irregularly wound coils)	25%
72	72299020	Wire of high-speed steel, in coils (excl. bars and rods)	25%
72	72299050	Wire of steel containing by weight 0,9% to 1,1% of carbon, 0,5% to 2% of chromium and, if present, <= 0,5% of molybdenum, in coils (excl. rolled bars and rods)	25%
72	72299090	Wire of alloy steel other than stainless, in coils (excl. rolled bars and rods, wire of high-speed steel or silico-manganese steel and articles of subheading 7229.90.50)	25%
73	73012000	Angles, shapes and sections, of iron or steel, welded	25%
73	73043120	Precision tubes, seamless, of circular cross-section, of iron or non-alloy steel, cold-drawn or cold-rolled "cold-reduced" (excl. line pipe of a kind used for oil or gas pipelines or casing and tubing of a kind used for drilling for oil or gas)	25%
73	73043180	Tubes, pipes and hollow profiles, seamless, of circular cross-section, of iron or non-alloy steel, cold-drawn or cold-rolled "cold-reduced" (excl. cast iron products, line pipe of a kind used for oil or gas pipelines, casing and tubing of a kind used for drilling for oil or gas and precision tubes)	25%
73	73044100	Tubes, pipes and hollow profiles, seamless, of circular cross-section, of stainless steel, cold-drawn or cold-rolled "cold-reduced" (excl. line pipe of a kind used for oil or gas pipelines, casing and tubing of a kind used for drilling for oil or gas)	25%

73	73063011	Precision tubes, welded, of circular cross-section, of iron or non-alloy steel, with a wall thickness of <= 2 mm	25%
73	73063019	Precision tubes, welded, of circular cross-section, of iron or non-alloy steel, with a wall thickness of > 2 mm	25%
73	73063041	Threaded or threadable tubes "gas pipe", welded, of circular cross-section, of iron or non-alloy steel, plated or coated with zinc	25%
73	73063049	Threaded or threadable tubes "gas pipe", welded, of circular cross-section, of iron or non-alloy steel (excl. products plated or coated with zinc)	25%
73	73063072	Other tubes, pipes and hollow profiles, welded, of circular cross-section, of iron or non-alloy steel, of an external diameter of <= 168,3 mm, plated or coated with zinc (excl. line pipe of a kind used for oil or gas pipelines or casing and tubing of a kind used in drilling for oil or gas)	25%
73	73063077	Other tubes, pipes and hollow profiles, welded, of circular cross-section, of iron or non-alloy steel of an external diameter of <= 168,3 mm (excl. plated or coated with zinc and line pipe of a kind used for oil or gas pipelines, casing and tubing of a kind used in drilling for oil or gas, precision tubes and threaded or threadable tubes "gas pipe")	25%
73	73063080	Tubes, pipes and hollow profiles, welded, having a circular cross-section, of iron or steel, of an external diameter of > 168,3 mm but <= 406,4 mm (excl. line pipe of a kind used for oil or gas pipelines or casing and tubing of a kind used in drilling for oil or gas, or precision steel tubes, electrical conduit tubes or threaded or threadable tubes "gas pipe")	25%
73	73064020	Tubes, pipes and hollow profiles, welded, of circular cross-section, of stainless steel, cold-drawn or cold-rolled "cold-reduced" (excl. products having internal and external circular cross-sections and an external diameter of > 406,4 mm, and line pipe of a kind used for oil or gas pipelines or casing and tubing of a kind used in drilling for oil or gas)	25%
73	73064080	Tubes, pipes and hollow profiles, welded, of circular cross-section, of stainless steel (excl. products cold-drawn or cold-rolled "cold-reduced", tubes and pipes having internal and external circular cross-sections and an external diameter of > 406,4 mm, and line pipe of a kind used for oil or gas pipelines or casing and tubing of a kind used in drilling for oil or gas)	25%
73	73071110	Tube or pipe fittings of non-malleable cast iron, of a kind used in pressure systems	25%
73	73071190	Tube or pipe fittings of non-malleable cast iron (excl. products of a kind used in pressure systems)	25%
73	73071910	Tube or pipe fittings of malleable cast iron	25%
73	73071990	Cast tube or pipe fittings of steel	25%
73	73083000	Doors, windows and their frames and thresholds for doors, of iron or steel	25%
73	73084000	Equipment for scaffolding, shuttering, propping or pit-propping (excl. composite sheetpiling products and formwork panels for poured-in-place concrete, which have the characteristics of moulds)	25%
73	73089051	Panels comprising two walls of profiled "ribbed" sheet, of iron or steel, with an insulating core	25%
73	73089059	Structures and parts of structures, of iron or steel, solely or principally of sheet, n.e.s. (excl. doors and windows and their frames, and panels comprising two walls of profiled "ribbed" sheet, of iron or steel, with an insulating core)	25%
73	73089098	Structures and parts of structures of iron or steel, n.e.s. (excl. bridges and bridge-sections; towers; lattice masts; doors, windows and their frames and thresholds; equipment for scaffolding, shuttering, propping or pit-propping, and products made principally of sheet)	25%
73	73090010	Reservoirs, tanks, vats and similar containers, of iron or steel, for gases other than compressed or liquefied gas, of a capacity of > 300 l (excl. containers fitted with mechanical or thermal	25%

		equipment and containers specifically constructed or equipped for one or more types of transport)	
73	73090051	Reservoirs, tanks, vats and similar containers, of iron or steel, for liquids, of a capacity of > 100.000 l (excl. containers lined or heat-insulated or fitted with mechanical or thermal equipment and containers specifically constructed or equipped for one or more types of transport)	25%
73	73090059	Reservoirs, tanks, vats and similar containers, of iron or steel, for liquids, of a capacity of <= 100.000 l but > 300 l (excl. containers lined or heat-insulated or fitted with mechanical or thermal equipment and containers specifically constructed or equipped for one or more types of transport)	25%
73	73102910	Tanks, casks, drums, cans, boxes and similar containers, of iron or steel, for any material, of a capacity of < 50 l and of a wall thickness of < 0,5 mm, n.e.s. (excl. containers for compressed or liquefied gas, or containers fitted with mechanical or thermal equipment, and cans which are to be closed by soldering or crimping)	25%
73	73102990	Tanks, casks, drums, cans, boxes and similar containers, of iron or steel, for any material, of a capacity of < 50 l and of a wall thickness of >= 0,5 mm, n.e.s. (excl. containers for compressed or liquefied gas, or containers fitted with mechanical or thermal equipment, and cans which are to be closed by soldering or crimping)	25%
73	73110013	Containers of iron or steel, seamless, for compressed or liquefied gas, for a pressure >=165bar, of a capacity >=20 l to <=50 l (excl. containers specifically constructed or equipped for one or more types of transport)	25%
73	73110019	Containers of iron or steel, seamless, for compressed or liquefied gas, for a pressure >=165bar, of a capacity >50 l (excl. containers specifically constructed or equipped for one or more types of transport)	25%
73	73110099	Containers of iron or steel, seamless, for compressed or liquefied gas, of a capacity of >= 1.000 l (excl. seamless containers and containers specifically constructed or equipped for one or more types of transport)	25%
73	73141400	Woven cloth, incl. endless bands, of stainless steel wire (excl. woven products of metal fibres of a kind used for cladding, lining or similar purposes and endless bands for machinery)	25%
73	73141900	Woven cloth, incl. endless bands, of iron or steel wire (excl. stainless and woven products of metal fibres of a kind used for cladding, lining or similar purposes)	25%
73	73144900	Grill, netting and fencing, of iron or steel wire, not welded at the intersection (excl. plated or coated with zinc or coated with plastics)	25%
73	73151110	Roller chain of iron or steel, of a kind used for cycles and motorcycles	25%
73	73151190	Roller chain of iron or steel (excl. roller chain of a kind used for cycles and motorcycles)	25%
73	73151200	Articulated link chain of iron or steel (excl. roller chain)	25%
73	73151900	Parts of articulated link chain, of iron or steel	25%
73	73158900	Chain of iron or steel (excl. articulated link chain, skid chain, stud-link chain, welded link chain and parts thereof; watch chains, necklace chains and the like, cutting and saw chain, skid chain, scraper chain for conveyors, toothed chain for textile machinery and the like, safety devices with chains for securing doors, and measuring chains)	25%
73	73159000	Parts of skid chain, stud-link chain and other chains of heading 7315 (excl. articulated link chain)	25%
73	73181410	Self-tapping screws, of iron or steel other than stainless (excl. wook screws)	25%
73	73181491	Spaced-thread screws of iron or steel other than stainless	25%
73	73181499	Self-tapping screws of iron or steel other than stainless (excl. spaced-thread screws and wood screws)	25%
73	73181640	Blind rivet nuts of iron or steel other than stainless	25%

73	73181660	Self-locking nuts of iron or steel other than stainless	25%
73	73181692	Nuts of iron or steel other than stainless, with an inside diameter <= 12 mm (excl. blind rivet nuts and self-locking nuts)	25%
73	73181699	Nuts of iron or steel other than stainless, with an inside diameter > 12 mm (excl. blind rivet nuts and self-locking nuts)	25%
73	73211110	Appliances for baking, frying, grilling and cooking with oven, incl. separate ovens, for domestic use, of iron or steel, for gas fuel or for both gas and other fuels (excl. large cooking appliances)	25%
73	73211190	Appliances for baking, frying, grilling and cooking and plate warmers, for domestic use, of iron or steel, for gas fuel or for both gas and other fuels (excl. cooking appliances with oven, separate ovens and large cooking appliances)	25%
73	73229000	Air heaters and hot-air distributors, incl. distributors which can also distribute fresh or conditioned air, non-electrically heated, incorporating a motor-driven fan or blower, and parts thereof, of iron or steel	25%
73	73239300	Table, kitchen or other household articles, and parts thereof, of stainless steel (excl. cans, boxes and similar containers of heading 7310; waste baskets; shovels, corkscrews and other articles of the nature of a work implement; articles of cutlery, spoons, ladles, forks etc. of heading 8211 to 8215; ornamental articles; sanitary ware)	25%
73	73239900	Table, kitchen or other household articles, and parts thereof, of iron other than cast iron or steel other than stainless (excl. enamelled articles; cans, boxes and similar containers of heading 7310; waste baskets; shovels and other articles of the nature of a work implement; cutlery, spoons, ladles etc. of heading 8211 to 8215; ornamental articles; sanitary ware)	25%
73	73241000	Sinks and washbasins, of stainless steel	25%
73	73251000	Articles of non-malleable cast iron, n.e.s.	25%
73	73259910	Articles of malleable cast iron, n.e.s. (excl. grinding balls and similar articles for mills)	25%
73	73259990	Articles of iron or steel, cast, n.e.s. (excl. of malleable or non-malleable cast iron, grinding balls and similar articles for mills)	25%
73	73269030	Ladders and steps, of iron or steel	25%
73	73269040	Pallets and similar platforms for handling goods, of iron or steel	25%
73	73269050	Reels for cables, piping and the like, of iron or steel	25%
73	73269060	Ventilators, non-mechanical, guttering, hooks and like articles used in the building industry, n.e.s., of iron or steel	25%
73	73269092	Articles of iron or steel, open-die forged, n.e.s.	25%
73	73269096	Sintered articles of iron or steel, n.e.s.	25%
76	76061110	Plates, sheets and strip, of non-alloy aluminium, of a thickness of > 0,2 mm, square or rectangular, painted, varnished or coated with plastics	25%
76	76061191	Plates, sheets and strip, of non-alloy aluminium, of a thickness of > 0,2 mm but < 3 mm, square or rectangular (excl. such products painted, varnished or coated with plastics, and expanded plates, sheets and strip)	25%
76	76061220	Plates, sheets and strip, of aluminium alloys, of a thickness of > 0,2 mm, square or rectangular, painted, varnished or coated with plastics	25%
76	76061292	Plates, sheets and strip, of aluminium alloys, of a thickness of > 0,2 mm but < 3 mm, square or rectangular (excl. painted, varnished or coated with plastics, expanded plates, sheets and strip)	25%
76	76061293	Plates, sheets and strip, of aluminium alloys, of a thickness of >= 3 mm but < 6 mm, square or rectangular (excl. such products painted, varnished or coated with plastics)	25%
87	87114000	Motorcycles, incl. mopeds, with reciprocating internal combustion piston engine of a cylinder capacity > 500 cm³ but <= 800 cm³	25%
87	87115000	Motorcycles, incl. mopeds, with reciprocating internal combustion piston engine of a cylinder capacity > 800 cm³	25%

89	89039110	Sea-going sailboats and yachts, with or without auxiliary motor, for pleasure or sports	25%
89	89039190	Sailboats and yachts, with or without auxiliary motor, for pleasure or sports (excl. seagoing vessels)	25%
89	89039210	Sea-going motor boats and motor yachts, for pleasure or sports (other than outboard motor boats)	25%
89	89039291	Motor boats for pleasure or sports, of a length <= 7,5 m (other than outboard motor boats)	25%
89	89039299	Motor boats for pleasure or sports, of a length > 7,5 m (other than outboard motor boats and excl. seagoing motor boats)	25%
89	89039910	Vessels for pleasure or sports, rowing boats and canoes, of a weight <= 100 kg each (excl. motor boats powered other than by outboard motors, sailboats with or without auxiliary motor and inflatable boats)	25%
89	89039991	Vessels for pleasure or sports, rowing boats and canoes, of a weight > 100 kg, of a length <= 7,5 m (excl. motor boats powered other than by outboard motors, sailboats with or without auxiliary motor and inflatable boats)	25%
89	89039999	Vessels for pleasure or sports , rowing boats and canoes, of a weight > 100 kg, of a length > 7,5 m (excl. motor boats and motor yachts powered other than by outboard motors, sailboats and yachts with or without auxiliary motor and inflatable boats)	25%

Source: European Commission (2016)

Table 2. **Monthly Results for DWL, Tariff Revenue and Total Cost to Importers**

Month	Deadweight Loss	Tariff Revenue	Total Cost Importers
May-18	0	0	0
Jun-18	14.1	66.9	81.0
Jul-18	8.8	42.0	50.9
Aug-18	5.7	27.3	33.0
Sep-18	5.4	25.8	31.1
Oct-18	6.3	30.6	36.9
Nov-18	6.0	28.5	34.5
Dec-18	4.0	19.2	23.2
Jan-19	4.9	23.9	28.8
Feb-19	5.3	25.5	30.8
Mar-19	7.8	37.5	45.4
Apr-19	6.6	31.8	38.4
May-19	8.1	39.4	47.5
Total FY1	***83.1***	***398.4***	***481.5***
Jun-19	7.5	36.1	43.5
Jul-19	5.4	26.4	31.9
Aug-19	4.6	22.6	27.2
Sep-19	5.1	24.6	29.7
Oct-19	6.1	29.4	35.5
Nov-19	4.8	23.1	27.9
Dec-19	4.1	20.1	24.2
Jan-20	4.7	22.8	27.5
Feb-20	4.6	22.3	26.9
Mar-20	5.4	26.4	31.8
Apr-20	4.6	22.4	27.0
May-20	3.6	17.3	20.9
Total FY2	***60.5***	***293.6***	***354.1***
Total	**143.6**	**692.0**	**835.6**

Note: Monthly figures for DWL, tariff revenue and total cost to importers calculated over the 48-month period following the tariff increase. Numbers correspond to current prices in millions of euros. Detailed explanations on the calculations can be found in the text.