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How exporters neutralised an increase in tariffs

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Abstract

I use the unanticipated and large additional tariffs the US imposed on European Union products due to the Airbus-Boeing conflict to analyse how exporters reacted to a change in trade policy. Using firm-level data for Spain and applying a difference-in-differences methodology, I show that the export revenue in the US of the firms affected by the tariff hike did not significantly decrease relative to the one of other Spanish exporters to the US. I show that Spanish exporters were able to neutralise the increase in tariffs by substituting Spanish products with products originated in countries unaffected by tariffs and shifting to varieties not affected by tariffs. My results show that tariff avoidance is another margin exporters can use to counteract the effects of a tariff hike.

KEYWORDS

Airbus-Boeing conflict, exporting firms, Spain, tariff avoidance, tariffs, US

1 | INTRODUCTION

With the arrival of Donald Trump to the US presidency, tariffs became a major policy tool of the US administration. As recorded by the Peterson Institute's Trump's Trade War Timeline, the Trump administration opened six major trade wars, which affected all its main trade partners.[1] The US also withdrew from the Trans-Pacific Partnership and forced a renegotiation of the North

[1] https://www.piie.com/blogs/trade-investment-policy-watch/trump-trade-war-china-date-guide.

American Free Trade Agreement seeking to restrict its free-trade provisions. The regression from trade integration was not a trend exclusive to the US (Colantone et al., 2021). For example, in January 2020, the United Kingdom disengaged from the European Union (EU), culminating in the largest reversal in deep economic integration in recent history (Dhingra & Sampson, 2022).

The shift toward more aggressive and unilateral trade policies has raised interest in understanding how exporters adjust to a more hostile environment. However, there is little evidence on how economies and firms respond in practice to tariffs (Cavallo et al., 2021). This paper analyses how Spanish exporters adjusted to the tariffs imposed by the Trump administration due to the Airbus-Boeing conflict. In October 2019, the US introduced an additional 25% tariff on 64 Spanish products, which represented almost 5% of the total exports of Spanish goods to the US in 2018.[2] Furthermore, the importance of the US market for Spanish exporters affected by the tariff was high: 32%. A key feature of this trade conflict is that the US imposed tariffs on many products that had no relationship with the aircraft industry. For example, in the case of Spain, the products most affected by the additional tariff were olive oil, wine, cheese and olives. Hence, exporters of those products could not anticipate the imposition of a tariff. This creates a suitable environment to identify how exporters adjust to a change in trade policy.

Using firm-level monthly export data to the US and a difference-in-differences specification, I find that Spanish exporters affected by the increase in tariffs experienced an insignificant decrease in export revenue in the US relative to other Spanish exporters to the US. Spanish exporters affected by the additional tariff did not have either a larger probability of exiting the US market than the rest of the exporters to the US.

How were Spanish exporters to the US able to counteract the increase in tariffs? They used two major strategies to *avoid* tariffs. The first was to substitute a product originated in Spain with a product originated in a country not targeted by tariffs. For example, Spanish olive oil exporters to the US increased their imports of olive oil from Tunisia and Portugal, countries not affected by the US tariff, bottled it in Spain and shipped it to the US with a label declaring that the origin of the product was Tunisia or Portugal. Spanish Customs recorded these shipments as Spanish exports to the US. However, as was the goal of Spanish exporters, US Customs considered that the bottling of olive oil in Spain had not introduced a substantial change in the product and thus recorded the shipments from Spain as imports from Tunisia or Portugal, with no tariffs imposed. Due to this record discrepancy, the value of olive oil imports from Spain recorded by US customs accounted for less than 50% of the mirror export value recorded by Spanish customs. I provide evidence showing that this gap was not the result of tariff evasion, but the result of a tariff avoidance strategy followed by Spanish exporters.

The second strategy, used by wine and cheese producers, was to shift exports from tariff-targeted varieties to similar nontargeted varieties. For example, wines with an alcohol strength by volume of 14% or less were subject to an additional tariff, whereas wines with a higher alcohol strength were not. The alcoholic strength of red wines, the most important variety exported by Spain to the US, is in the range of 13–15. Therefore, it was possible for red wine exporters with an alcoholic strength equal to or lower than 14% to shift their exports to varieties with a higher alcoholic strength to avoid the tariff. Regarding cheese, some varieties of cheese made from sheep's milk, the most important cheese variety exported by Spain to the US, were targeted by a tariff, whereas other similar ones were not. This allowed Spanish exporters to shift from the targeted to the nontargeted variety and avoid the negative impact of the tariff. I show that there was an actual change in exported varieties and not a product reclassification to evade tariffs. I document

[2] The US was the top-6 destination of Spanish merchandise exports, accounting for 4.4% of its total exports in 2018.

that the targeted varieties that were "far" in product characteristics compared to those not targeted (e.g. white wine and cheese made from cow's milk) experienced a much greater decrease in exports than varieties that were "close".

The strategies implemented by Spanish firms during the Airbus-Boeing conflict reveal that exporters have another margin to adjust to changes in trade policy: trade avoidance. Like the trade evasion margin highlighted by Demir and Javorcik (2020), trade avoidance enables exporters, at least those specialised in primary and the manufacturing of primary products, to respond quickly to changes in trade policy. This paper shows that this margin can be powerful enough to neutralise the effect of an increase in tariffs.

This paper contributes to four strands of literature. First, this work relates to the margins exporters can use to adjust to changes in trade policy. Models of international trade with export fixed costs and firm heterogeneity in productivity show that some exporters will reduce their sales (the intensive margin) and others will exit the export markets (the extensive margin) in response to a tariff increase (Melitz, 2003). Firms exporting multiple products (the product margin) will concentrate their sales on their most productive, or core, product in response to an increase in trade costs (Bernard et al., 2011; Eckel & Neary, 2010). Models with strategic pricing (the mark-up margin) predict that firms will reduce their mark-ups in response to a higher tariff (Atkeson & Burstein, 2008). Ludema and Yu (2016) showed that an increase in tariffs leads exporters to reduce the quality of products (the quality margin). Finally, Demir and Javorcik (2020) showed that exporters in Turkey increased tariff evasion after taxes were introduced on some types of foreign transactions (the tariff evasion margin). I show that tariff avoidance is another margin exporters can use to mute the negative effects of a tariff increase.

Second, the paper contributes to the empirical literature that analyses how exporters react to changes in trade policy. Fitzgerald and Haller (2018) showed that exporters are more sensitive to changes in tariffs than to changes in the real exchange rate. Albornoz et al. (2021) concluded that fewer Argentinian firms exported to the United States after an unanticipated tariff was imposed on their products. They also showed that surviving exporters began to sell new products in the US to counteract the reduction in revenue from tariff-targeted products. Jiao et al. (2022) found that Chinese firms' exports to the United States decreased significantly after the United States imposed tariffs on their products. This drop was only partially compensated for with higher sales to the EU. This paper contributes to this literature showing that exporters can mute the negative effects of tariffs by exporting products originated in other countries and shifting to varieties not targeted by tariffs.

Third, this paper is related to the tariff *evasion* literature. In a seminal article, Bhagwati (1964) compared the value of exports reported by the exporter country and the value of mirror imports reported by the importer country to evaluate the magnitude of tariff evasion in Turkey. This methodology was recovered and refined by Fisman and Wei (2004), who showed that misreporting of Chinese imports from Hong Kong was positively correlated with tariff rates. Misreporting happened mainly because importers misclassified high-tariff products as similar low-tariff products. Javorcik and Narciso (2008) found that tariff evasion is more prevalent in differentiated than homogeneous products because it is more difficult to identify a price misreporting in the former than in the latter. This study contributes to this literature showing that the positive correlation between the trade gap between exports and mirror imports and tariffs may also be explained by a tariff avoidance strategy rather than a tariff evasion strategy.

Fourth, this paper contributes to the tariff avoidance literature. One of the best-known examples of tariff avoidance is the one related to the so-called chicken tax. In the early 1960s, Germany imposed a tax on frozen chicken imported from the United States. In retaliation, the US imposed a 25% global tariff on light trucks, with the aim of making the import of German Volkswagen pickups, which were very popular in the US at that time, less attractive. The tariff remained in force even when disputes between Germany and the US over chicken disappeared. Paradoxically, the chicken tax ended up hurting US car manufacturers, which used very awkward procedures to avoid the tariff when importing vans produced in their manufacturing facilities abroad to the United States.[3] There is also literature showing that firms shift production across export platforms to avoid the effect of tariffs (Flaaen et al., 2020). This paper contributes to this literature showing that exporters can implement tariff avoidance strategies very rapidly in response to a change in trade policy.

The paper is organised as follows. Section 2 uses econometric analyses to estimate the impact of tariffs on exports at the product and firm level. Section 3 describes the tariff avoidance strategies followed by Spanish exporters, and the final section concludes.

2 | THE IMPACT OF TARIFFS ON SPANISH EXPORTS TO THE US

This section analyses the impact of tariffs on Spanish exports to the US. First, I explore the impact of tariffs at the product level using import data from the US Census. Next, I analyse the impact of tariffs on Spanish exporter revenue and survival in the US market using data from Spanish customs. As will be seen, the impact of tariffs was different when analysed at the product or exporter level.

2.1 | Product-level analyses

I use data on US monthly imports from Spain from the US Census to compare the evolution of products that were targeted by a tariff with that of those that were not.[4] I calculate a 12-month rolling sum of imports to avoid the noise introduced by monthly data. For example, the value corresponding to January 2019 is the sum of the import value in that month and the previous 11 months. The value of imports in September 2019, 1 month before the introduction of tariffs, is set at 100.

Figure 1 shows that tariffs led to a large decrease in imports. During the period in which the tariffs were in force, October 2019–March 2021, the imports of products targeted by the tariffs (solid blue line) decreased by 62%. Imports of products not targeted by tariffs (red dashed line) only declined by 3%. Imports of products targeted by tariffs began to increase once tariffs were lifted in March 2021.[5] However, the import level 1 year after tariffs had been lifted, March 2022, was still 32% lower than the one in the month before tariffs were imposed.

Figure 2 presents the evolution of imports in the four main Spanish products, in terms of value, targeted by tariffs: olive oil, cheese, wine and olives.[6] The largest decrease occurred in olive

[3] See, for example, Wall Street Journal "To Outfox the Chicken Tax, Ford Strips Its Own Vans" published on September 23, 2009. Available at https://www.wsj.com/articles/SB125357990638429655#pr.

[4] To obtain a cleaner comparison, I excluded the products that had been included in the list of products that potentially could be targeted by a tariff but, finally, no tariff was imposed.

[5] Tariffs were suspended on the 4th and 11th of March for UK and EU products, respectively.

[6] For each product category, I only compute the imports of the varieties that were hit by a tariff.

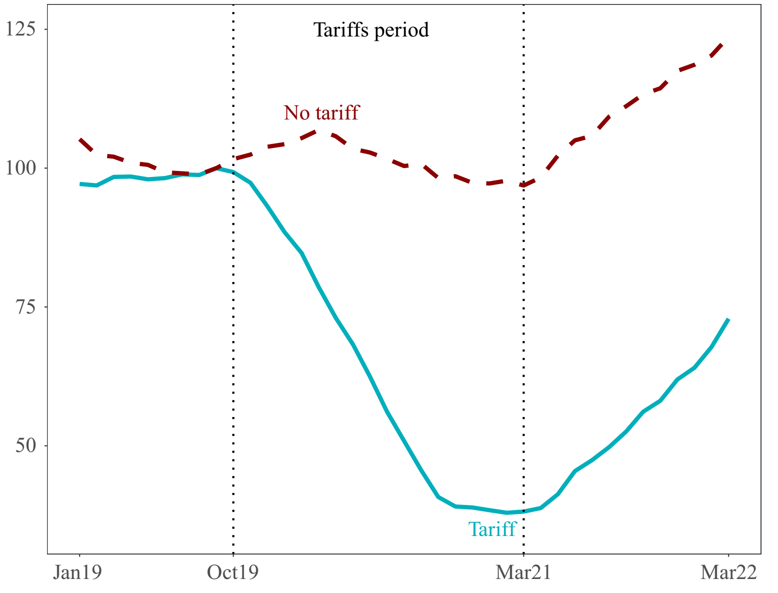

FIGURE 1 US imports from Spain: tariff vs. non-tariff products, 2019–2022 (rolling 12-month sum; September 2019 = 100). *Source*: Author's own elaboration based on the US Census database. [Colour figure can be viewed at wileyonlinelibrary.com]

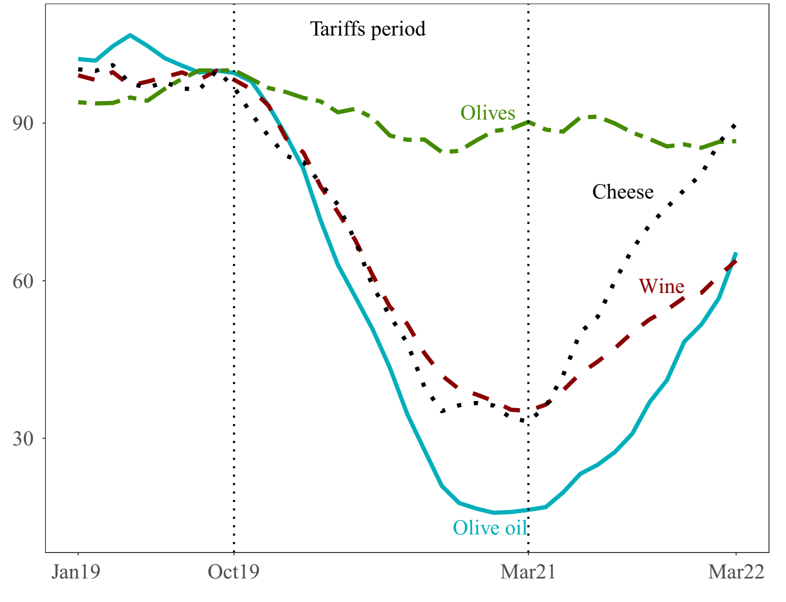

FIGURE 2 Impact of tariffs on the four main products targeted by tariffs, 2019–2022 (rolling 12-month sum; September 2019 = 100). *Source*: Author's own elaboration based on the US Census database. [Colour figure can be viewed at wileyonlinelibrary.com]

oil, where imports dropped by 84% during the tariff period. The decreases were also large for wine and cheese: 65% and 67%, respectively. The lowest decrease happened in olives: 10%.

To confirm the visual appreciation of Figure 1, I estimate the following difference-in-differences specification:

$$y_{ktm} = \exp\left[\beta\left(Tariff_k * Post_{tm}\right) + \gamma_{km} + \gamma_t + \epsilon_{ktm}\right] \quad (1)$$

where y_{ktm} is the import value of US imports of product k in year t and month m from Spain. $Tariff_k$ turns one if the US imposed a tariff on product k imported from Spain. $Post_{tm}$ turns one if the year-month combination is after October 2019.[7] The specification includes product × month (γ_{km}) and year (γ_t) fixed effects.[8] ϵ_{ktm} is the disturbance term. To exploit the granularity of the data, products are defined in the 10-digit HTS classification. The β coefficient captures whether the difference in the dependent variable between nontariff-targeted and tariff-targeted products (first difference) changed after tariffs were imposed (second difference). I cluster the standard errors at the product level.

I estimate Equation (1) using a Poisson pseudo-maximum likelihood estimator (Santos-Silva & Tenreyro, 2010). This model keeps the zero-import values in the estimation sample and addresses ordinary least squares (OLS) estimates' heteroscedasticity bias. Column 1 shows that the interaction coefficient is negative and statistically significant, indicating that imports of products targeted by tariffs decreased relative to nontargeted products after the tariffs were introduced. Specifically, US imports from Spain of tariff-targeted products decreased by 57% relative to nontargeted ones ([1 − exp (−.855)]).

Columns 4 and 5 decompose the impact of tariffs on the value of imports into its quantity and price components. Since this decomposition can only be performed with an OLS model, I re-estimate Equation (1) with it.[9] To compare point estimates, in column 2, I re-estimate the PPML model using the same sample used in the OLS estimations. The OLS point estimate (column 3) is similar to that reported in column 1, confirming that tariffs had a large negative effect on the value of imports. Interestingly, almost all the reduction in import value is explained by a reduction in quantity (column 4). The change in prices is not statistically different from zero (column 5). This latter result suggests that there was a complete pass-through of tariffs to import prices. This result is surprising given the large size of the US market. However, it is in line with previous studies that found complete pass-through of tariffs to import prices during the US-China trade war (Amiti et al., 2019; Fajgelbaum et al., 2020).

I also estimated Equation (1) weighting observations by (i) their share in total US imports from Spain and (ii) the share of US imports from Spain in total US imports by product. In the first estimation, the interaction coefficient is very similar to that reported in Table 1. However, in the second estimation, there is a substantial drop in the value of the interaction coefficient. Products in which imports from Spain represent a large share of US imports are more difficult to substitute than those in which the share is low. Hence, the impact of a tariff will likely be lower among the former than among the latter. Since the regression gives more weight to observations in which the share of US imports from Spain in total US imports is large, it is reasonable to obtain a lower point estimate than in the unweighted regression.[10]

[7] Since tariffs were imposed in the middle of October 2019, I exclude this month's observations from the sample.

[8] Results are robust to using product × year and month instead of product × month and year fixed effects.

[9] As the OLS is a linear estimator, and errors have an expected value of zero, the sum of the quantity and price estimates is equal to the value estimate.

[10] To save on space, these estimations are not reported. They can be requested from the author.

TABLE 1 Impact of tariffs on US imports from Spain. Product-level analysis.

	PPML		OLS		
	(1)	(2)	(3)	(4)	(5)
	Value	Value	Value	Quantity	Price
Tariff × Post	−0.855[a]	−0.853[a]	−0.643[a]	−0.588[a]	−0.055
	(0.234)	(0.243)	(0.127)	(0.132)	(0.035)
Observations	358,678	129,039	129,039	129,039	129,039
Pseudo-R^2	.861	.904			
Adj.-R^2			.756	.814	.840
Zero-value imports	Yes	No	No	No	No

Note: Regressions estimated with monthly export data from January 2017 to February 2021. The dependent variables are import value in columns 1 and 2, and log import value, log import quantity and log import price in columns 3–5, respectively. All regressions include product × month and year fixed effects. Tariff × Post turns 1 if a product was subject to a tariff and the month-year combination is within the tariff-imposition period. Standard errors clustered at the product level are in parentheses. a represents statistical significance at the 1% level.

The period in which tariffs were in force coincided with the Covid-19 pandemic. Products targeted by a tariff could coincide with those that were negatively affected in demand due to social distancing measures. If that were the case, the interaction coefficient would capture the negative shock of the pandemic on the demand for tariff-targeted products rather than the negative effect of tariffs. To rule out this potential bias, I estimate a triple-difference specification, which compares the evolution of US imports from Spain with those from other countries that were not affected by tariffs. The triple-difference specification is defined as follows:

$$y_{kjtm} = \exp\left[\beta\left(Tariff_{kj} * Post_{tm}\right) + \gamma_{kj} + \gamma_{tj} + \gamma_{mj} + \gamma_{kt} + \gamma_{km} + \epsilon_{ktm}\right] \tag{2}$$

where y_{kjtm} is the value of the US imports of product k from country j in year t and month m. Note that the new equation includes five different fixed-effects combinations: product × origin, year × origin, month × origin, product × year and product × month. Now, the β coefficient captures whether the difference between US imports of tariff-targeted products from Spain and other countries (first difference) changed relative to the difference between US imports of nontargeted products from Spain and other countries (second difference) after tariffs were imposed (third difference). To keep the sample computationally feasible, I selected the top 30 origins of US imports in 2018, the year before tariffs were imposed and estimated the model with OLS.[11] As shown in Table A1, the triple difference interaction term remains negative and significant and has a point value similar to that reported in column 3 of Table 1. This result confirms that imports of tariff-targeted products did not decrease relative to the non-targeted ones because of Covid-19.

[11] I exclude other EU members from the list of origin-of-imports countries because they could also be targeted by tariffs. China was also excluded from the sample because many of its products had been targeted by tariffs during the same period.

2.2 | Exporter-level analyses

In this subsection, I analyse how tariffs affected Spanish exporters' revenue and probability of survival in the US. I estimate the following specification:

$$x_{ftm} = \exp\left[\beta\left(ShareTariff_f * Post_{tm}\right) + \alpha_1 Medium_{ft} + \alpha_2 Large_{ft} + \gamma_f + \gamma_{tm} + \epsilon_{ftm}\right] \quad (3)$$

where x_{ftm} is the export revenue of firm f in year t and month m in the US. $ShareTariff_f$ is the share of tariff-targeted products in the total exports of firm f to the US before tariffs were introduced. It captures the extent to which an exporter was affected by tariffs imposed due to the Airbus-Boeing conflict. The specification also introduces two dummy variables that control for the export size of the firm in year t. Export size is defined as the total exports of firm f in year t. $Medium_{ft}$ turns 1 if the firm's export size is above the median and below or equal to the 75% percentile in year t. $Large_{ft}$ turns 1 if the export size of the firm is above the percentile 75. γ_f is a firm fixed effect, γ_{tm} is a year × month fixed effect and ϵ_{ft} is the disturbance term. The key variable is the difference-in-differences interaction $ShareTariff_f * Post_t$, which captures whether the dependent variable changed for Spanish firms exporting tariff-targeted products to the US relative to the one of the other Spanish exporters to the US after tariffs were introduced.

Data on Spanish exporters were collected from the Customs and Excise Department of the Spanish Tax Agency and included the universe of Spanish exporters of goods. The data set contains a firm identifier, the export destination, the product classification, the value of exports and exported quantities. The product classification used by Spanish customs, the Combined Nomenclature, is equivalent to the US HTS classification at the 6-digit level only. I define a 6-digit product to be targeted by a tariff if any of its HTS 8-digit varieties was targeted by a tariff.[12]

The key identification assumption of the difference-in-differences strategy is that other exporters provide an appropriate counterfactual of the trend that exporters hit by tariffs would have followed had the US not introduced the tariffs. To ensure parallel pretrends, I use the Mahalanobis distance algorithm to match each tariff-targeted exporter with a nontargeted exporter using export values to the US in 2016, 2017 and 2018. Figure 3 presents the evolution of exports to the US of the median firm targeted by tariffs (solid blue line) and the median matched firm (dashed red line). By construction, the trend followed by the two types of firms is very similar in the 3 years before the introduction of tariffs. After tariffs were introduced, the trends are also similar: exports decrease for both tariff-targeted and nontargeted exporters.

Table 2 presents descriptive statistics of Spanish exporters of products that were targeted by tariffs and the matched exporters. They are calculated using data from 2016 to 2018 before tariffs were introduced. The number of exporters affected by tariffs was 1216. Wine was the most important product for 78% of the exporters hit by a tariff in the US; olive oil was the most important product for 8% of the exporters, cheese for 3% and olives for 3%. These exporters were matched with 964 firms that were not hit by tariffs. Due to the criteria used for the matching, the median value of exports to the US for both groups is similar. This is also true for the number of products that both groups sell on the

[12] When calculating the firm-level exports, I excluded all products that were threatened by a tariff, but a tariff was not imposed. Products related to the aircraft industry were also excluded. It is reasonable that these manufacturers anticipated an increase in tariffs on their products in the US after the WTO ruling in May 2018 and therefore had enough time to prepare for this change in trade policy.

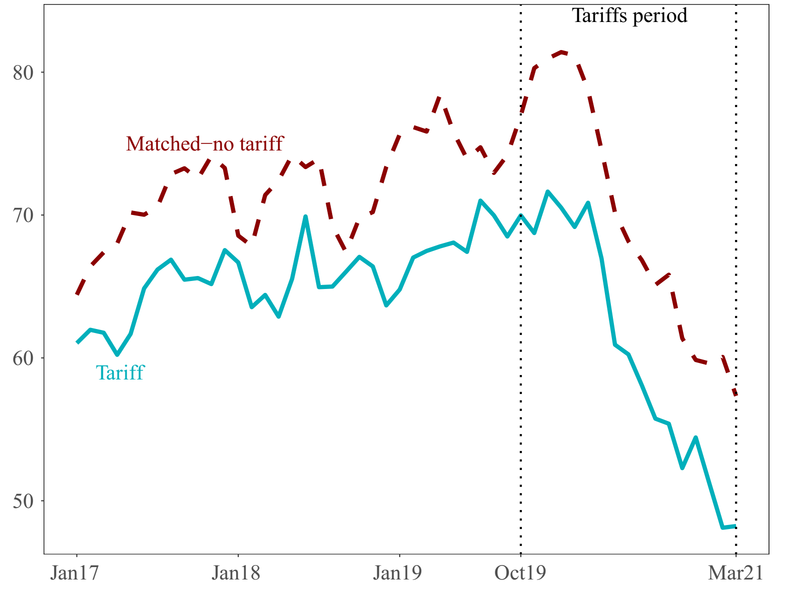

FIGURE 3 Pre-trends. Median exports to the US by a tariff-targeted firm vs a matched firm, 2017–2021 (thousand euros; rolling 12-month sum). *Source*: author's own elaboration based on Customs data. [Colour figure can be viewed at wileyonlinelibrary.com]

TABLE 2 Tariff-targeted exporters vs. matched exporters to the US before tariffs.

	Tariff-targeted exporters	Matched exporters
Number of exporters to the US	1216	964
Export revenue (thousand euros)	233	1458
Export revenue in the US (thousand euros)	54	57
Number of export destinations	6	13
Number of exported products	3	6
Number of exported products to the US	2	2
Exports to the US as a share of total exports (%)	33	8

Note: Average yearly values for the period 2016–2018. A tariff-targeted exporter is a firm that exports at least one product that was targeted by tariffs. Matched exporters are firms that exported no products hit by tariffs.

US market. However, the overall export revenue of the tariff-targeted exporters is lower than that of the matched exporters. The matched firms also export to more destinations and more products than the tariff-targeted firms. Interestingly, the importance of the US market in total exports for firms that were hit by tariffs was greater than for matches.

Table 3 presents the estimations of Equation (3) when export revenue is the dependent variable. I estimate a Poisson pseudo-maximum likelihood model. Column 1 shows that the interaction coefficient, although negative, is statistically insignificant. In line with the visual impression of Figure 3, this result indicates that the export revenue of firms that exported products targeted by tariffs did not decrease significantly compared to one of the control firms after tariffs were introduced.

TABLE 3 Impact of tariffs on Spanish exporters to the US.

	PPML			OLS
	(1)	(2)	(3)	(4)
	Value	Value	Value	Exit
Share tariff × Tariff period	−0.124	−0.105	−0.119	0.015
	(0.111)	(0.100)	(0.115)	(0.016)
Tariff period 3 lags		0.040		
		(0.097)		
Tariff period 2 lags		−0.025		
		(0.065)		
Share tariff × Potential period			0.045	
			(0.075)	
Observations	114,106	97,168	114,106	8587
Pseudo-R^2	.858	.862	.858	
Adj.-R^2				.105

Note: The dependent variable is monthly exports to the US in columns 1–3. In column 4 the dependent variable turns if the firm ceases to export to the US. All regressions include firm and year × month fixed effects and year-specific dummies to control for firm size. Standard errors clustered at the firm level are in parentheses.

As explained above, most of the exporters that were hit by the increase in tariffs were wine exporters. Therefore, the insignificant effect of tariffs on export revenue reported in column 1 may be reflecting the particular situation in that industry. To determine whether tariffs had a similar effect in other industries, I classify exporters according to their most important product and estimate Equation (3) for each group. Table A2, reports the results for the top-4 Spanish product categories targeted by a tariff: olive oil, wine, olives and cheese. In all products, the export revenue in the US of the exporters targeted by tariffs did not decrease significantly relative to their matched exporters after tariffs were imposed.

To further test the validity of the parallel pretrends' assumption, I divide the period before the imposition of tariffs into three subperiods. The first subperiod, Tariff period 1 lag, covers the October 2018–September 2019 period; Tariff period 2 lags covers the October 2017–September 2018 period and the Tariff period 3 lags covers the October 2016–September 2017 period. Column 2 presents the results of estimating Equation (3) with Tariff period 3 lags and Tariff period 2 lags as additional variables. Tariff period 1 lag is the reference category. The Tariff period 3 lags and Tariff period 2 lags coefficients are statistically insignificant, confirming that exporters that were hit by tariffs had a similar trend to the one of exporters that were not hit by tariffs before they were applied.

In column 3, I analyse whether export revenue changed between the date the potential list of targeted products was announced (April 2019) and the final list of targeted products was published (October 2019). The Share tariff × Potential period interaction is statistically insignificant, indicating that the export revenue of potentially-targeted exporters did not change relative to the one of other exporters to the US during the period in which the potential products that could be targeted by a tariff were known.

Next, I analyse whether the imposition of tariffs increased the risk of ceasing to export to the US for firms that were hit by tariffs. I estimate the following equation:

$$Exit_{fz} = \beta\left(ShareTariff_f * Post_z\right) + \alpha_1 Medium_{fz} + \alpha_2 Large_{fz} + \gamma_f + \gamma_z + \epsilon_{fz} \quad (4)$$

where $Exit_{fz}$ turns 1 if the firm exited the US market during period z. To estimate Equation (4), I divide the period of analysis into four subperiods. Since tariffs were in force for 16 full months (November 2019–February 2021), I define three 16-month subperiods for the pretariff period: (1) October 2015–January 2017; (2) February 2017–May 2018 and (3) June 2018–September 2019. For each subperiod, I compute whether the firm exported to the US and estimate a linear probability model. Column 4 of Table 3 shows that the risk of stopping exporting to the US did not increase significantly for exporters who were hit by tariffs relative to other exporters after the tariffs were introduced.

I also analysed whether exporters hit by tariffs in the US changed their export performance relative to other Spanish exporters to the US in third foreign markets. I did not find any significant changes between the two groups of exporters.[13]

In sum, the firm-level analysis indicates that Spanish exporters targeted by tariffs had similar economic outcomes in the US as not-targeted exporters. The next section analyses how Spanish exporters targeted by tariffs were able to neutralise the negative impact of the tariff hike.

3 | SPANISH EXPORTERS' TARIFF-AVOIDANCE STRATEGIES

Spanish exporters followed two major strategies to counteract the introduction of tariffs: (1) the substitution of Spanish products by products originated in countries that had not been affected by a tariff and (2) the substitution of tariff-targeted varieties by nontargeted ones. This section describes these tariff avoidance strategies.

3.1 | Substitution of Spanish products by products originated in non-targeted countries

The first tariff avoidance strategy followed by Spanish exporters to the United States was to substitute a Spanish product targeted by a tariff with the same product originated in a nontargeted country. This strategy was used by olive oil exporters.

Figure 4 shows the imports of olive oil by Spanish olive oil exporters to the US. These firms accounted for 86% of all Spanish olive oil imports in 2018, the year before the tariffs were introduced. Tunisia was the most important origin of imports for these firms in 2018, accounting for 41% of total imports, followed by Portugal with 27%. These two countries were not targeted by a tariff on olive oil. There was a decrease in the value of imports from all countries until the United States imposed tariffs. During the tariff period, Spanish exporters of olive oil to the United States increased imports from Portugal and, especially, from Tunisia. There is also a very sharp decrease in the value of imports from Tunisia once the tariffs were lifted.

As reported in the media and confirmed by the author in personal communications with industry representatives, a large share of the olive oil in bulk imported from Tunisia and Portugal

[13] To conserve space, estimates are available upon request.

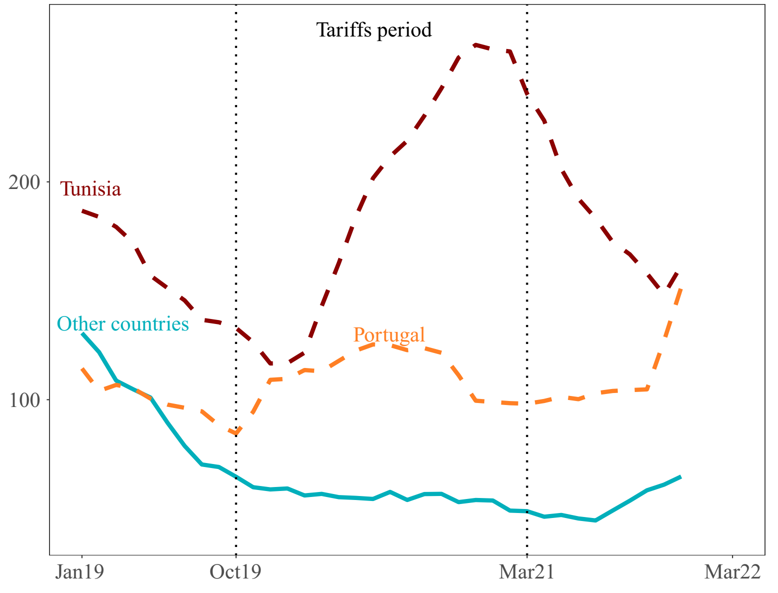

FIGURE 4 Imports of olive oil by Spanish exporters of olive oil to the US, 2019–2022 (Million euros. Rolling 12-month sum). *Source*: Author's own elaboration based on US Customs data. [Colour figure can be viewed at wileyonlinelibrary.com]

during the tariff period was bottled in Spain and exported to the US in substitution of the tariff-targeted olive oil originated in Spain.[14] The label of these olive oil containers exported by Spanish firms to the US stated that the origin of the product was Tunisia or Portugal. This was the key to the Spanish exporters' tariff-avoidance strategy. US customs considered that the bottling that had occurred in Spain did not constitute a major product transformation. Hence, US Customs recorded the shipments from Spain as imports of olive oil from Tunisia or Portugal. Since these countries had not been targeted by a tariff, Spanish exporters could avoid additional import duties.

Figure 5 shows the evolution of US olive oil imports between 2019 and the first quarter of 2022 from its top-4 suppliers in 2018: Italy, Spain, Tunisia and Turkey, which represented 89% of total olive oil imports in that year. It also plots imports from Portugal, the top-9 supplier, which accounted for 1% of total imports in 2018. There is an increase in olive imports from Portugal and, in particular, from Tunisia after tariffs were imposed. Imports from these countries decreased once tariffs were lifted. There is no significant change in the value of imports from Italy and Turkey, countries that were not targeted by tariffs and occupied the top and the top-4 position, respectively, as suppliers of olive oil to the US in 2018. These trends are in line with the narrative that Spanish exporters substituted Spanish olive oil with olive oil originating in Tunisia and Portugal in their US exports during the period in which tariffs were in force.

The tariff avoidance strategy of Spanish olive oil exporters also led to a large discrepancy between the value of exports reported by Spanish customs and the mirror value of imports

[14] In the media, see, among others, https://www.elconfidencial.com/economia/2020-10-10/espana-aceite-trump-compra-otros-paises_2782899/ and https://www.elconfidencial.com/espana/andalucia/2021-02-17/aceite-envasado-espana-vendio-eeuu-tunez-portugal_2954147/. I interviewed Rafael Pico, Director of Asoliva, Spanish Association of Industry and Exporters of Olive Oil.

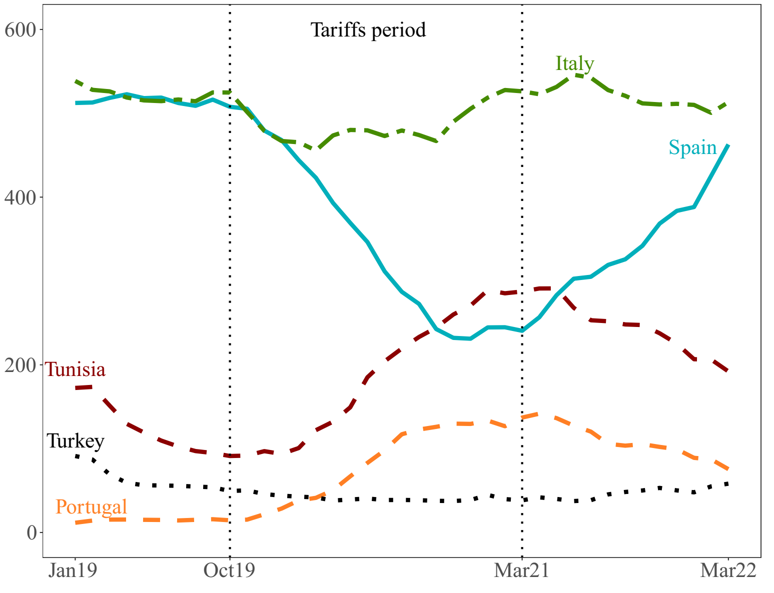

FIGURE 5 US imports of olive oil by countries, 2019–2022 (Million USD. Rolling 12-month sum). *Source*: Author's own elaboration based on US Customs data. [Colour figure can be viewed at wileyonlinelibrary.com]

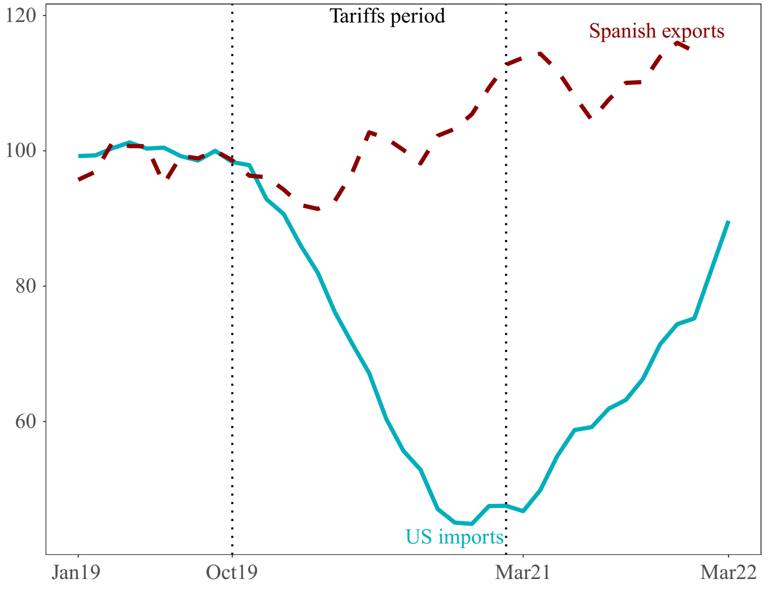

FIGURE 6 Olive oil. US imports from Spain vs. Spanish exports to the US, 2019–2022 (rolling 12-month sum; September 2019 = 100). *Source*: Author's own elaboration based on Customs and US Census data. [Colour figure can be viewed at wileyonlinelibrary.com]

reported by US customs. The dashed red line in Figure 6 captures the rolling 12-month sum value of exports of olive oil from Spain to the US reported by Spanish customs. The solid blue line is the mirror imports reported by US Customs. I set the value of these flows at 100 in

September 2019, the month before tariffs were introduced.[15] The Spanish and US lines are close and move parallel in the months before the introduction of tariffs. However, since tariffs were introduced, the two lines move in opposite directions: US imports decrease, whereas Spanish exports increase. The gap between the lines is remarkable. At the end of the tariff period, US customs had recorded a 53% decrease in the value of olive oil imports from Spain relative to the pretariff period, while Spanish customs had recorded a 14% increase in the value of olive oil exports to the US.

This difference is explained by the fact that Spanish Customs recorded as exports to the US all containers shipped from Spain to the US, although a large part of them had not been filled with olive oil produced in Spain. This recording criterion explains why Spanish exports of olive oil to the US did not decline, and even increased, despite the fact that an additional 25% tariff had been imposed. It also provides the first explanation of why a large decline is observed in US imports of Spanish tariff-targeted products (Figure 1) and, at the same time, we find no significant effect on the export revenue of Spanish exporters of tariff-targeted products to the US relative to other Spanish exporters (Table 3). Note that the gap between Spanish exports and the mirror US imports began to narrow once tariffs were lifted in March 2021. However, a large gap remained even 1 year after tariffs had been removed. This suggests that some Spanish exporters continued to export olive oil that originated in other countries after the elimination of tariffs.

As mentioned in the introductory section of the paper, many studies have relied on the gap between the value of exports and the mirror value of imports to identify tariff evasion. The present case highlights that the gap may also be the outcome of exporters' tariff avoidance strategies and the differences in the criteria to record trade flows between the exporting and importing countries' customs offices.

As additional evidence, I ran a simple OLS regression:

$$x_i = \alpha + \beta \Delta m_i + \epsilon_i \tag{5}$$

where x_i is the value of the olive oil exports to the US by firm i during the tariff period, α is a constant, Δm_i is the change in the imports of olive oil from Tunisia and Portugal between the tariff and pretariff period and ϵ_i is the disturbance term.

The β coefficient is expected to be positive: only Spanish olive oil exporters that increased imports from Tunisia and Portugal could substitute the Spanish olive oil with the olive oil of nontargeted countries and keep their export revenue in the US. Table A3 reports a positive and statistically significant β coefficient: a 1000 euro increase in olive oil imports from Tunisia and Portugal was correlated with a 627 euro increase in olive exports to the US market. This result is in line with the argument that Spanish olive oil exporters substituted the Spanish olive oil with olive oil from nontargeted countries to avoid the negative impact of tariffs on their exports to the US.

The substitution of olive oil produced in Spain with olive oil from non-tariff countries was a feasible strategy for Spanish exporters whose competitive strategy in the US was based on prices. The main goal of these exporters was to maintain their relationship with large US retailers. These retailers would not have accepted a rise in prices, forcing Spanish exporters to find alternatives to

[15] To make the figures comparable, the Spanish tariff-targeted olive oil exports and the mirror US imports are calculated at the HS 6-digit level.

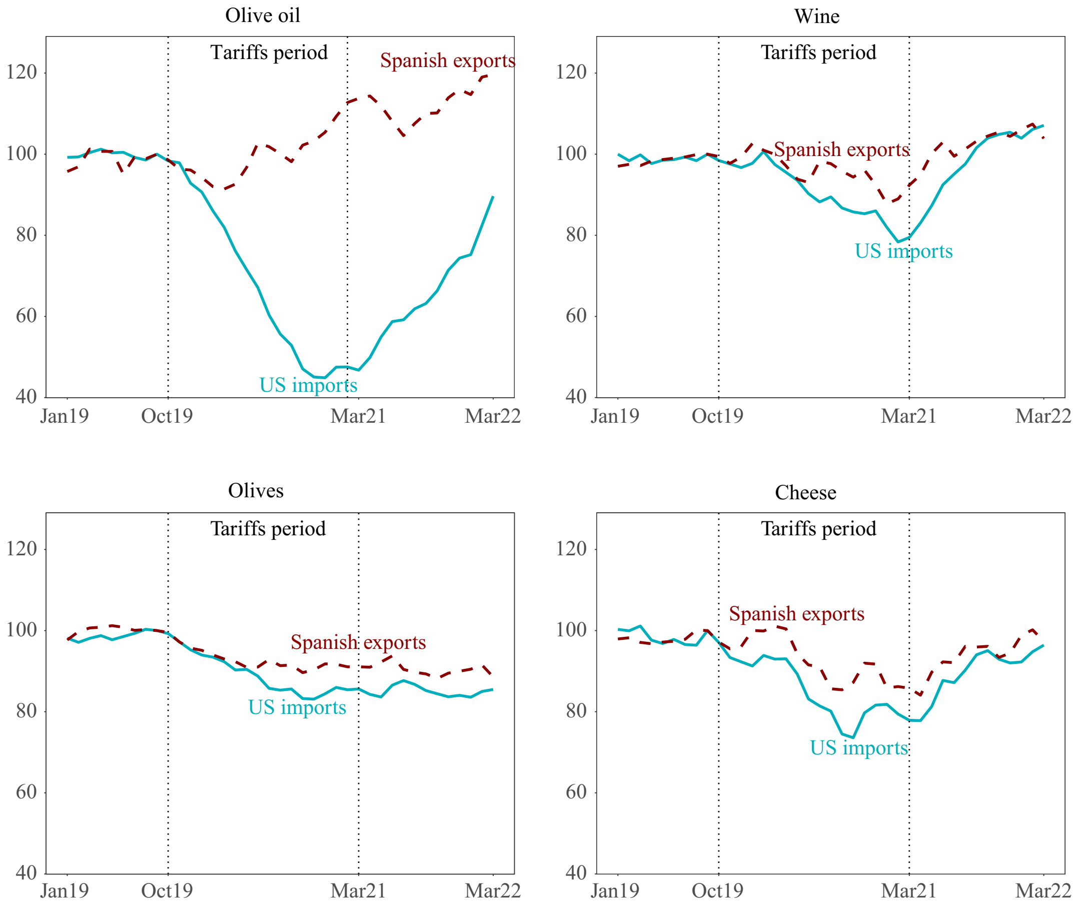

FIGURE 7 Analysis by product: US imports from Spain vs. Spanish exports to the, 2019–2021 (rolling 12-month sum; September 2019 = 100). *Source*: Author's own elaboration based on US Census and Agencia Tributaria trade data. [Colour figure can be viewed at wileyonlinelibrary.com]

offer a price-competitive product.[16] However, product substitution was not an option for exporters that had built their competitive strategy on the relationship between high-quality olive oil and its Spanish origin.

Spanish firms could also use two additional strategies to avoid tariffs in the US. First, olive oil was not subject to tariffs if it was exported in bulk. This benefited Spanish exporters that were already bottling olive oil in the US. Bottling in the US might become an option for the rest of the exporters. However, US imports of olive oil in bulk from Spain decreased during the tariff period, indicating that Spanish exporters did not follow this strategy. The main reason was that the cost

[16] For example, the export manager of a major Spanish olive oil firm asserted that large US distributors would not have allowed even a 2% increase in prices (https://issuu.com/olimerca/docs/vermultimedia/s/10169409). In another related context, Iacovone et al. (2015) showed that Walmart demanded a lower price than traditional retailers from its suppliers in exchange for a larger market in Mexico. In contrast, the results by Cavallo et al. (2021) suggested that in the US-China trade war retailers absorbed a large share of the increase in costs due to tariffs. They explained this fact based on the differentiated nature of the products that the US imported from China.

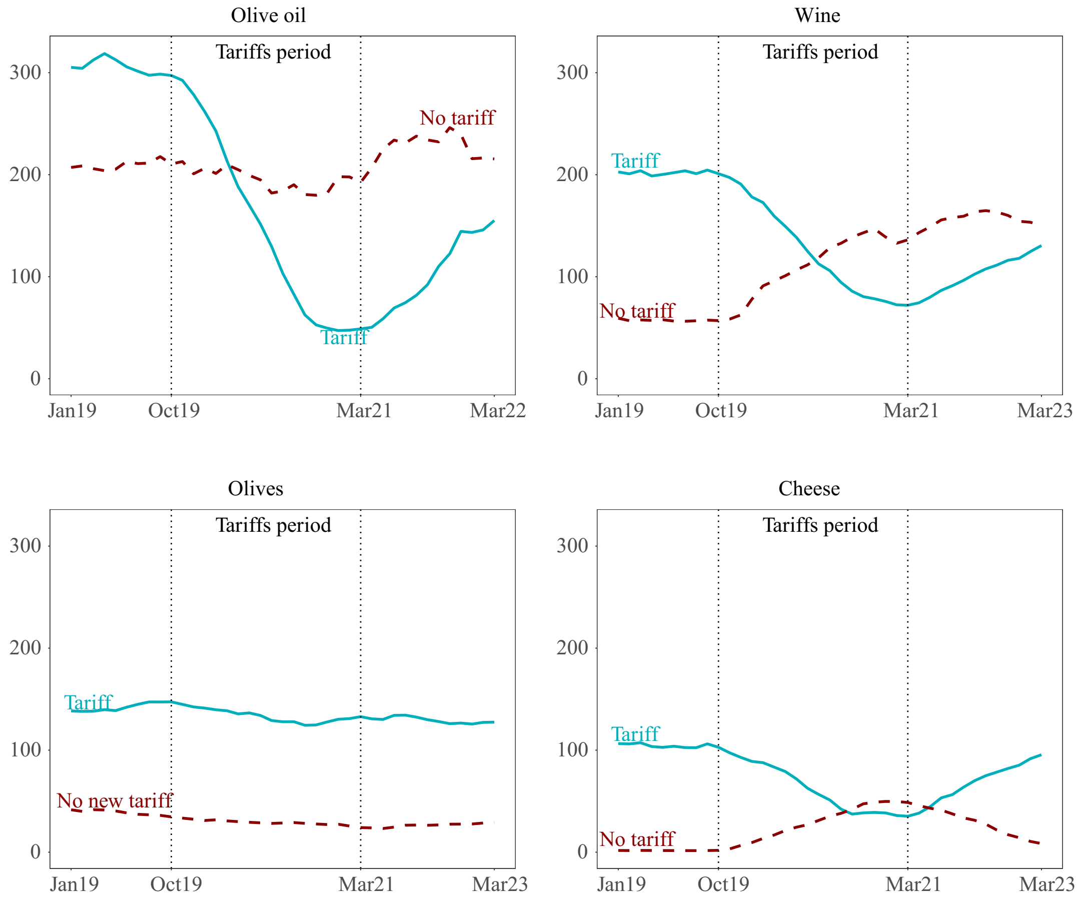

FIGURE 8 Substitution of tariff-targeted varieties with non-targeted ones in US imports from Spain, 2019–2021 (rolling 12-month sum; million USD). *Source*: Author's own elaboration based on US Census trade data. [Colour figure can be viewed at wileyonlinelibrary.com]

of bottling olive oil in the US was too high for many exporters.[17] Second, Spanish exporters that already had production facilities in countries that had not been targeted by tariffs (e.g. Portugal and Tunisia) increased their exports to the US directly from those countries.[18]

Figure 7 shows that the gap between the value of Spanish exports to the US and the mirror value of US imports from Spain also widened during the tariff period for wine, olives and cheese. However, the increase in these products was negligible compared to that in the olive oil industry. An explanation for these differences lies in the product regulations. For example, most of the wine imported by the US from Spain is of varieties protected with designation of origin. Hence, these exporters cannot substitute the origin of their product. Another explanation, as analysed in the next subsection, is that, in the case of wine and cheese, Spanish exporters had an alternative strategy to avoid tariffs.

[17] https://issuu.com/olimerca/docs/vermultimedia/s/10169409.

[18] https://www.elconfidencial.com/empresas/2019-10-04/aceite-oliva-arancel-aceituna-exportacion_2268007/.

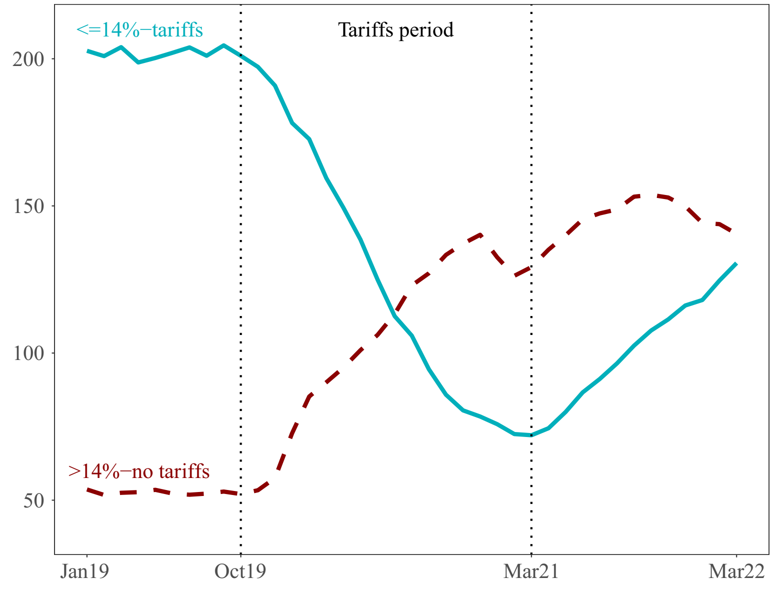

FIGURE 9 Wine. US imports by alcoholic strength, 2019–2022 (rolling 12-month sum; million USD). *Source*: Author's own elaboration based on US Census trade data. [Colour figure can be viewed at wileyonlinelibrary.com]

3.2 | Substitution of tariff-targeted varieties with nontargeted ones

The second strategy followed by Spanish exporters to avoid the negative effects of tariffs was to substitute the tariff-targeted varieties with similar nontargeted ones. Figure 8 compares the evolution of US imports from Spain of tariff-targeted varieties and nontargeted varieties in the top-4 products targeted by tariffs. For each HTS 8-digit variety targeted by a tariff, I identify other varieties belonging to the same HTS 6-digit product that were not targeted by a tariff. There is a decrease in US imports of the tariff-targeted varieties when tariffs enter into force in the four products analysed. For wine and cheese, there is a parallel increase in imports of nontargeted varieties. In the case of wine, the increase in imports of nontargeted varieties covered 57% of the decrease in imports of targeted varieties (75 out of 132 million USD); in the case of cheese, 80% of the decrease was covered by nontargeted varieties (48 out of 60 million USD).

Contrary to wine and cheese, there is no substitution in imports between targeted and nontargeted varieties in olive oil and olives. In the former, as explained above, firms could have avoided the tariff exporting olive oil in bulk. However, firms did not use this strategy because it was costly and they had the alternative of exporting olive oil originated in nontargeted countries. In the latter, the additional tariff targeted the green-olive variety. The other main variety, black olive, had already been targeted by countervailing and antidumping measures since August 2018.[19] Therefore, shifting from targeted to non-targeted varieties was not an option for olive exporters. It is interesting to observe that the relative decrease in imports

[19] The combined tariff equivalent of these measures was similar to the 25% additional tariff applied on the green variety. See https://www.govinfo.gov/content/pkg/FR-2018-08-01/pdf/2018-16449.pdf and https://www.govinfo.gov/content/pkg/FR-2018-08-01/pdf/2018-16450.pdf.

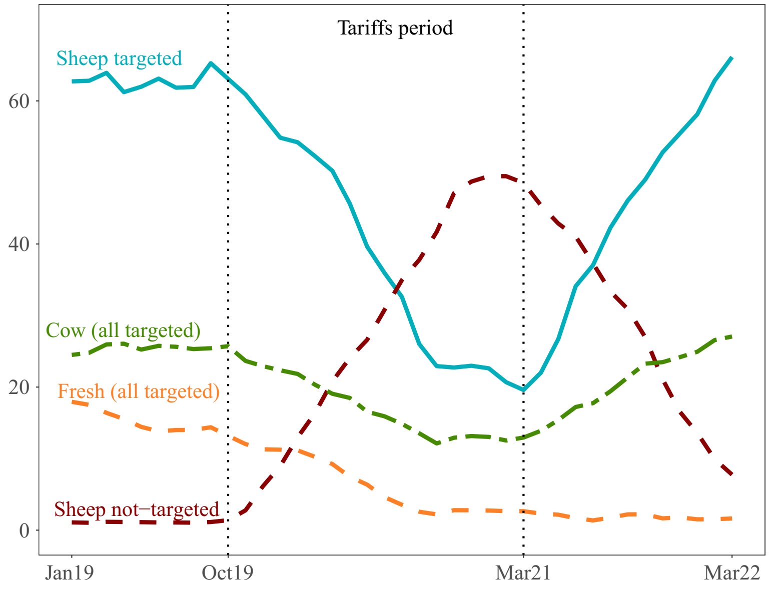

FIGURE 10 Cheese. US imports from Spain by top categories, 2019–2022 (rolling 12-month sum; million USD). *Source*: Author's own elaboration based on US Census trade data. [Colour figure can be viewed at wileyonlinelibrary.com]

after tariffs were introduced was smaller in olives than in the rest of the products. I address this fact at the end of this section.

The substitution of exported varieties in wine and cheese was feasible because some targeted and nontargeted varieties were similar. Regarding wine, the variety targeted by the tariff was wine in containers that hold 2 L or less with an alcoholic strength by volume equal or not greater than 14%. However, the variety with an alcohol strength greater than 14% in the same type of containers was not targeted by the tariffs. Figure 9 shows that there was a substitution in imports between these varieties once the tariffs were introduced.

Spanish red wine, which accounted for 75% of total Spanish exports of wine in containers holding 2 L or less before tariffs were introduced, has an alcohol strength in the 13%–15% range.[20] Hence, it was feasible for Spanish red wine exporters to substitute red-wine varieties with an alcohol strength equal or below 14% with those of an alcohol strength above 14%. This may explain why exports of red wine in containers holding 2 L or less only decreased by 7.6% during the tariff period. However, Spanish white wine, which represented 18% of total Spanish exports of wine in containers of 2 L or less before tariffs were introduced, has an average alcohol strength between 10% and 11%. In this case, the change to varieties with an alcohol strength above 14% was not feasible. For this type of wine, exports declined by 23.4% relative to the pretariff period.

The US also imposed an additional tariff on wines originating in France and Germany. However, contrary to Spain, the tariff was imposed on wines with an alcoholic strength equal to 14% or less and wines with an alcoholic strength >14%. No substitution between wine varieties occurred in US imports from these countries once tariffs were imposed.

[20] https://catatu.es/blog/graduacion-vino/.

TABLE 4 Impact of tariffs on US imports of olives.

	PPML		OLS		
	(1)	(2)	(3)	(4)	(5)
	Value	Value	Value	Quantity	Price
Tariff×Post	−0.273	−0.255	−0.553[a]	−0.551[a]	−0.002
	(0.196)	(0.196)	(0.132)	(0.105)	(0.062)
Observations	4240	2265	2265	2265	2265
Pseudo-R^2	.920	.955			
Adj.-R^2			.825	.801	.618

Note: Regressions estimated with monthly export data from January 2017 to February 2021. The dependent variables in columns 1–4 are import revenue, log import revenue, log import quantity and log import price, respectively. All regressions include product×destination, year and month fixed effects. Tariff×Post turns 1 if a product was subject to a tariff in a specific import origin and the month-year combination is within the tariff-imposition period. Standard errors clustered at the product level are in parentheses. a represents statistical significance at the 1% level.

It would have been ideal to confirm the change between wine varieties using exporter-level data. However, this was not possible since the alcohol strength threshold used by the EU trade classification is set at 15% rather than 14%, concealing the change between varieties that occurs at the latter threshold. Finally, it is interesting to observe that US imports of wines with an alcoholic strength equal to or below 14% began to increase after tariffs were lifted. Imports of varieties with an alcohol strength greater than 14% began to decline only several months after the tariffs were lifted.

Figure 10 plots the evolution of US imports of cheese from Spain before, during and after the tariff period. Three categories account for most of imports: cheese made from sheep milk, fresh cheese and other cheeses containing cow milk. Tariffs were imposed on the three varieties. However, the cheese made from the sheep milk category had a close variety that was not targeted by a tariff.[21] In the rest of the categories, all alternative varieties were targeted by a tariff. The figure shows a large decrease in imports of the cheese made from sheep's milk targeted by tariffs and a big increase in the cheese made from sheep's milk not targeted by tariffs. In fact, the nontargeted variety more than compensated for the decrease in imports in the targeted varieties. These trends suggest that Spanish firms could switch rapidly from the targeted varieties to the nontargeted ones in their exports to the US. In contrast, in the categories without an alternative nontargeted variety, the decrease in imports is less intense than in the targeted sheep category.

Note that cheese made from sheep's milk varieties reversed their trends once tariffs were lifted. This further suggests that Spanish firms had shifted the targeted with the nontargeted varieties in their exports to avoid the negative effect of tariffs.

As was the case for wine, it would have been ideal to explore the shift across varieties using data at the exporter level. However, the product classification used by the US at the 8-digit level, the one at which tariffs were imposed, is different from the one used by the EU at the 8-digit level disaggregation. This difference in classification precluded me from identifying

[21] Specifically, HTS codes 04069056 and 04069057 were targeted by an additional 25% tariff, whereas code 04069059 was not.

the varieties targeted by tariffs and the nontargeted ones in the EU classification at the 8-digit level.

Figures 2 and 8 showed that the negative impact of tariffs on US imports of Spanish olives was much smaller than in other tariff-targeted products. To understand this differential impact, I estimate the following regression:

$$m_{jktm} = \exp\left[\beta\left(Tariff_{jk} * Post_{tm}\right) + \gamma_{jkm} + \gamma_t + \epsilon_{ktm}\right] \quad (6)$$

where m_{jktm} are US imports of olive variety k from country j in year t and month m. The difference-in-differences interaction term, $Tariff_{jk} * Post_{tm}$, turns 1 if the US imposed a tariff on country j and the period analysed is when the tariffs were in force. The sample covers the period January 1997–February 2021 and includes all countries from which the United States imported olives.[22] The sample only includes the olive varieties that were targeted by tariffs.

Column 1 of Table 4 shows that olive imports from countries targeted by tariffs decreased in the period in which the tariff was in force. However, the coefficient is statistically insignificant. This result was unexpected since one would expect a significant decrease in imports from countries targeted by an additional 25% tariff. To understand this result, it is important to consider the share of Spain in total olive imports from the United States targeted by tariffs. In 2018, this share was 62%. The next countries in the ranking were Greece and Italy, with 26% and 7% of total US imports, respectively. Spain's large share suggests that Spanish olives were competitive in the US, difficult to substitute and commanded a low import demand elasticity. This low demand elasticity could explain why a 25% increase in tariffs did not lead to a significant decrease in imports.

In columns 3–5, I decompose the change in the value of US imports into the quantity and price margins. Since this decomposition can only be performed with an OLS estimator, in column 2 I repeat the PPML estimation in column 1 with the sample used for the OLS decomposition. The point estimate barely changes relative to the estimate reported in column 1. However, when using an OLS model to estimate Equation (6), the interaction coefficient becomes negative and significant (column 3). The table also shows that the reduction in revenue was explained by a reduction in quantities. Prices, which do not include tariff duties, did not change, indicating a complete pass-through of tariffs to prices. This result is in line with the low import demand elasticity of Spanish olives in the US (Fajgelbaum & Khandelwal, 2022).

4 | CONCLUSION

In contrast to previous decades characterised by a process of trade liberalisation at the global and regional level, there has been a shift toward more unilateral and aggressive trade policies since the middle of the 2010s. This paper has analysed how exporters behave in this hostile trade environment.

I use the retaliatory tariffs that the US imposed on some EU products between October 2019 and March 2021 due to the Airbus-Boeing trade dispute as a case study. I show that US imports of Spanish products targeted by tariffs decreased by 62% relative to other US imports from Spain. However, the export revenue of Spanish exporters of tariff-targeted products did not decrease significantly relative to that of other Spanish exporters to the US during the period in which

[22] In addition to Spain, olives imported from France, Germany, and the UK were targeted by tariffs. However, the share of these countries in US total imports of olives targeted by tariffs in the United States in 2018 was only 0.5%.

tariffs were in force. I show that Spanish exporters used two trade avoidance strategies to muffle the negative effects of tariffs. First, instead of exporting Spanish products targeted by tariffs, they exported the same products but originated in countries not targeted by tariffs. Second, they changed from varieties targeted by tariffs to varieties that had not been targeted by tariffs within the same product category.

The trade avoidance strategy followed by Spanish exporters to the US enabled them to neutralise the negative effects of tariffs. This shows that exporters, at least those specialised in primary products and manufacturers of primary products, have an additional margin to counteract a tariff hike.

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DATA AVAILABILITY STATEMENT

I cannot share the firm-level data used in the article since it is not publicly available. However, I would be happy to share my code for the data analysis so that anyone with access to the data can replicate the results.

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APPENDIX

TABLE A1 Triple-difference.

	(1) Value	(2) Quantity	(3) Price
Tariff × Post	−0.578[a]	−0.558[a]	−0.020
	(0.147)	(0.151)	(0.046)
Observations	3,065,942	3,065,942	3,065,942
Adj.-R^2	.669	.760	.823

Note: Regressions estimated with monthly export data from January 2017 to February 2021. The dependent variables in columns 1–3 are log import revenue, log import quantity and log import price, respectively. All regressions include product × destination, year × destination, month × destination, product × year and product × month fixed effects. Tariff × Post turns 1 if a product was subject to a tariff and the month-year combination is within the tariff-imposition period. Standard errors clustered at the product level are in parentheses. a represents statistical significance at the 1% level. Impact of tariffs on US imports from Spain. Product-level analysis.

TABLE A2 Top-4 product categories. Impact of tariffs on US exports.

	(1) Olive oil	(2) Wine	(3) Olives	(4) Cheese
Share tariff × Tariff period	−0.096	−0.118	0.112	−0.049
	(0.195)	(0.096)	(0.255)	(0.403)
Observations	11,048	86,353	3721	4313
Pseudo-R^2	.860	.771	.868	.853

Note: The dependent variable is monthly exports to the US. All regressions include firm, year × month fixed effects and year-specific dummies to control for firm size. Standard errors clustered at the firm level are in parentheses.

TABLE A3 Correlation between the increase in imports of olive oil from Tunisia and Portugal and exports to the US.

	(1)
Δ Imports from Portugal and Tunisia	0.627[b]
	(0.251)
Constant	2360.698[a]
	(829.509)
Observations	198
R^2	.031

Note: The dependent variable is the value of olive oil exports to the US during the tariff period. Standard errors are in parentheses. a and b denote statistical significance at the 1% and 5% levels, respectively.