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The elasticity of imports to MFN tariffs

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Abstract

When the UK left the EU, it introduced a new import tariff schedule, one of the largest MFN tariff reforms in decades of a developed economy. This paper exploits this policy change to estimate the elasticity of imports to MFN tariffs, addressing the endogeneity of trade policy through two strategies: a country-based approach using trade agreement partners whose MFN exposure is plausibly exogenous, and a product-based approach leveraging mechanical tariff changes from schedule simplification. Using a difference-in-differences design with EU imports as a control group, I find that ignoring endogeneity yields an elasticity of 2.5, while IV estimates range from 4.5 to 8.7. Dynamic responses are even larger: three years after the reform, elasticities reach 10-12. These results suggest that widely used tariff-based elasticities are substantially underestimated, with implications for quantitative trade models and welfare analysis.

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Non-Technical Summary

When the UK left the European Union in January 2021, it introduced the UK Global Tariff (UKGT) – the first full overhaul of its independent tariff schedule in nearly fifty years. The reform was unusually large for a developed economy: it reduced Most Favoured Nation (MFN) tariffs on two thirds of products, simplified the tariff structure, and expanded the share of zero tariff lines from 27% to 47%. This major policy shift offers a rare opportunity to understand how imports respond to MFN tariff changes, a question central to the calibration of quantitative trade models and the evaluation of trade policy.

Estimating the elasticity of imports to tariffs is challenging because tariff rates are not set randomly. They often reflect political economy pressures, sectoral competitiveness, and concerns about protecting domestic producers. This endogeneity can bias standard regression estimates toward zero. The UKGT, however, provides two sources of plausibly exogenous variation that help overcome these concerns.

The first strategy is country based. It exploits the behaviour of countries that had Preferential Trade Agreements (PTAs) with the EU before Brexit. These partners often continue to face MFN tariffs because many firms do not fully use their preferential access. Since the UK's MFN schedule in 2021 was not designed around imports from PTA partners, MFN tariff changes affecting these countries can be treated as exogenous. Moreover, the degree to which each PTA partner is exposed to MFN tariffs varies widely due to differences in preference utilisation. This variation provides rich identifying power.

The second strategy is product based. Many tariff changes under the UKGT resulted mechanically from tariff simplification rules – eliminating "nuisance" tariffs below 2.5% and rounding down rates into standardised bands. These mechanical changes depend only on the initial tariff level and not on product specific economic shocks, making them another source of quasi random variation.

Using a difference in differences design that compares UK import changes to those of EU member states (which did not change their MFN schedule), the paper shows that naïve estimates significantly understate the tariff elasticity. Ignoring endogeneity produces an elasticity of about -2.5. In contrast, instrumental variable estimates exploiting either strategy are much larger: -5.4 to -8.7 in static specifications.

Importantly, the paper documents strong dynamic adjustment. Three years after the reform, import responses intensify, and the implied tariff elasticity reaches 10-12. Robustness tests focusing on smaller PTA flows and non Generalised Scheme of Preferences partners suggest that even these large estimates may represent a conservative lower bound.

These results challenge the widely used benchmark elasticity of around five. They imply that most existing studies – particularly those relying on PTA based tariff variation without accounting for partial preference utilisation or policy endogeneity – substantially underestimate how responsive trade flows are to tariff changes. Taken together, the evidence indicates that the true trade elasticity is considerably larger, and that quantitative trade models calibrated using traditional estimates may understate the impact of tariff reforms on trade and welfare.

The UKGT thus provides compelling new evidence that tariff based elasticities should be revised upward, reinforcing the need for empirical approaches that properly account for multiple tariff regimes, utilisation behaviour, and the dynamics of adjustment.

The elasticity of imports to MFN tariffs

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27th January 2026

Abstract

When the UK left the EU, it introduced a new import tariff schedule, one of the largest MFN tariff reforms in decades of a developed economy. This paper exploits this policy change to estimate the elasticity of imports to MFN tariffs, addressing the endogeneity of trade policy through two strategies: a country-based approach using trade agreement partners whose MFN exposure is plausibly exogenous, and a product-based approach leveraging mechanical tariff changes from schedule simplification. Using a difference-in-differences design with EU imports as a control group, I find that ignoring endogeneity yields an elasticity of 2.5, while IV estimates range from 4.5 to 8.7. Dynamic responses are even larger: three years after the reform, elasticities reach 10-12. These results suggest that widely used tariff-based elasticities are substantially underestimated, with implications for quantitative trade models and welfare analysis.

1 Introduction

When the UK left the European Union in January 2021, it regained full autonomy over its import tariff policy. The introduction of the UK Global Tariff (UKGT) constituted one of the largest unilateral changes to the MFN tariff schedule of an advanced economy in decades, reducing tariffs on 66% of products and increasing the share of zero-duty tariff lines from 27% to 47%.

This reform provides a unique opportunity to estimate the elasticity of imports to MFN tariffs. Beyond its scale, the UK Global Tariff offers an unusually clean empirical setting, as it delivers two credible strategies to address the endogeneity of trade policy and admits a natural control group.

This paper makes three contributions. First, it provides new estimates of the elasticity of imports to MFN tariff changes using a large reform and exploiting institutional features of the UKGT to isolate plausibly exogenous tariff variation. Second, it shows that information on imports by tariff regime generates

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valuable variation for econometric identification and is central to correctly estimating trade elasticities from tariff-based regressions. Third, it documents substantial dynamic adjustment of imports to tariff changes, with elasticities increasing by up to 50% within three years of the reform.

The results indicate that addressing tariff endogeneity substantially increases the estimated elasticity of imports. While the OLS estimator yields an elasticity of around 2.5, IV estimates exploiting institutional design of the new UK MFN tariff schedule range between 5.4 and 8.7. Accounting for dynamic adjustment, the elasticity rises to 10-12 within three years of the reform.

A key challenge in estimating tariff elasticities is the endogeneity of tariff rates. Governments do not set tariffs randomly; instead, they reflect the outcome of political economy forces balancing the interests of producers, consumers, and other stakeholders. Tariffs may also respond endogenously to import competition or to productivity shocks in trading partners.

Beyond being a wide-ranging reform, the UK Global Tariff offers two complementary approaches to address this endogeneity. These two approaches are based on looking at the responses of either countries or products for which the tariff change can be considered plausibly exogenous.

The first approach is country-based and exploits the response of Preferential Trade Agreement (PTA) partners to changes in MFN tariffs. Because PTA partners have access to preferential rates, MFN tariffs are not primarily set in response to import pressures from these countries. If MFN tariffs respond to anticipated import surges, they are more likely driven by imports from MFN countries rather than PTA partners. At the same time, PTA partners are affected by MFN tariff changes to the extent that tariff preferences are not fully utilized. Data on imports by tariff regime show that MFN tariffs are frequently applied even when preferences are available, implying that imports from PTA countries can respond to MFN tariff changes.

Focusing on PTA partners therefore provides a source of plausibly exogenous MFN tariff variation. Moreover, variation across countries and products in exposure to MFN tariffs – measured by the share of imports subject to the MFN regime – generates substantially richer variation in applied tariffs than the product-level MFN schedule alone.

The second approach exploits mechanical tariff changes generated by the UKGT's tariff simplification rules, including the elimination of low tariffs and tariff banding. Conditional on initial EU tariff levels, these changes are orthogonal to product-level shocks and can be treated as quasi-random.

Estimating tariff elasticities using the UK Global Tariff also allows for a natural control group: imports of the remaining EU member states. These countries are geographically close to the UK, share a similar economic structure, and faced the same MFN tariffs prior to the UK's exit from the EU. This enables a comparison of changes in UK imports for a given country-product pair with contemporaneous changes in EU imports of the same product from the same country.

Consistent with the identification strategy, the results show that correcting for endogeneity substantially increases the estimated tariff elasticity. Static OLS regressions produce an elasticity of approximately 2.5, while estimates exploiting either the country-based or product-based identification strategies yield static elasticities between 5.4 and 8.7. These findings align with the idea of Trefler (1993) that trade policy endogeneity biases estimated coefficients toward zero. Moreover, static estimates mask significant dynamic adjustment: by 2024, three years after the reform, the implied tariff elasticity reaches values between 10 and 12. Additional robustness exercises focusing on smaller PTA partners suggest that these estimates may represent a lower bound.

Although these elasticities are larger than those reported in much of the existing literature, I argue that most available estimates might be downward biased. The issues, which is explained in details in the companion paper (Tamberi forthcoming), relates to the use of variation in tariffs across countries induced by Preferential Trade Agreements without accounting for the partial utilization of such agreements. This approach, which is commonly used to estimate tariff elasticity, yields an estimate of the elasticity scaled down by the average preference utilization rate of the sample. Once preference utilization is explicitly accounted for, tariff elasticities in the range of 10-12 emerge, closely aligning with the results of the present paper.

A further contribution of this paper is to highlight the importance of accounting for tariff regime utilization when working with tariff data. Empirical studies often implicitly assume that eligibility for preferential tariffs implies their use. However, data on imports by tariff regime indicate otherwise, and utilization rates can vary substantially across countries and products.

When properly incorporated, imperfect tariff preference utilization provides valuable identifying variation. First, it implies that even countries eligible for preferential tariffs respond to changes in MFN tariffs. Second, it generates cross-country variation in exposure to product-level MFN tariffs, measured by the share of imports entering under the MFN regime.

Taken together, this paper and its companion study argue that widely used estimates of the tariff elasticity should be revised upward, as most are biased toward zero. This reassessment has important implications for quantitative trade models, in which the trade elasticity plays a central role in determining trade flows and welfare.

The remainder of this paper is organized as follows. Section 2 discusses the literature and Section 3 describes the data. Section 4 explains the methodology used to estimate the MFN tariff elasticity and Section 5 presents the results. Section 6 concludes.

2 Related literature

One of the most popular approaches to estimate the trade elasticity is to use variation in import tariffs across products and exporting countries. In their meta-analysis, Head and Mayer (2014) report that 44% of the estimates of the trade elasticity rely exclusively on tariffs, and an additional 26% use a combination of tariffs and freight costs.[1]

Under the World Trade Organization rules, countries set a common tariff across all exporters called the Most Favoured Nation (MFN) tariff. They can then grant lower tariffs to specific countries if they sign Preferential Trade Agreements (PTAs). The variation in import tariffs generated by PTAs allows the estimation of the trade elasticity by looking at imports of a given importer across various exporting countries. This is a common approach in the literature, used for instance by Caliendo and Parro (2015) and Fontagné, Guimbard and Orefice (2022). These papers, which exploit cross-sectional variation to estimate the tariff elasticity, produce estimates of the trade elasticity around 4-5.

Using PTA tariffs as identifying variation to estimate the trade elasticity allows the researcher to control for importer- and exporter-specific confounders via fixed effects. However, as discussed in the companion paper (Tamberi forthcoming), because the tariff preferences granted by PTAs are only partially utilized, the standard regressions of imports on tariffs yield an elasticity of imports to tariff eligibility, which equals the structural trade elasticity multiplied by the average preference utilization rate of the sample. Addressing the partial uptake of tariff preferences, I find a trade elasticity between 10-12.

Other authors used difference-in-differences methods to estimate the trade elasticity, finding smaller values than the central value of 5 reported in Head and Mayer (2014). Amiti, Redding and Weinstein (2019) and Fajgelbaum et al. (2020) look at the 2018 US trade war and estimate a trade elasticity around 2. Because the data used by these papers only covers a short period after the implementation of the 2018 US special tariffs, their estimates represent short-run elasticities, which could explain the low values.

Boehm, Levchenko and Pandalai-Nayar (2023), also using difference-in-differences, exploits changes in the MFN tariff rates of a country using PTA partners as the control group. Using a dataset with global coverage, they find a long-run elasticity around 2. Here the use of PTA countries as control for MFN tariff changes can be problematic when PTA countries do not use tariff preferences, as the control group is actually affected by treatment. This can be seen as an issue of non-compliance with treatment assignment, where some units in the control group (the PTA countries) actually take the treatment (the MFN tariff). Partial compliance will lead to a trade elasticity estimate biased towards zero.

[1] Statistics computed using the online replication package of Head and Mayer (2014).

3 Data

This section describes the data used in the empirical analysis.

Data on UK imports are obtained from HM Revenue & Customs (HMRC), the UK customs authority. The data are available at monthly frequency and are aggregated to the annual level for the period 2017-2024 by exporting country and Combined Nomenclature (CN) 8-digit product. The sample includes UK imports from all non-EU countries; imports from EU member states are excluded.

Data on EU imports are sourced from Eurostat and are available at annual frequency for the same period (2017-2024), also by exporting country and CN 8-digit product. The 27 EU member states are aggregated into a single importing entity. As with the UK data, imports originating from the EU or the UK are excluded.

I additionally exclude imports from the Overseas Countries and Territories (OCTs) associated with the EU27. These countries benefited from tariff-free access to the UK market during the UK's EU membership but were moved to the MFN regime following Brexit. To maintain a clean identification strategy, observations involving OCTs are dropped. These countries account for a negligible share of UK imports and their exclusion has little quantitative impact on the results.

Information on tariff preference utilization is also obtained from Eurostat. Preference utilization rates are computed for the pre-reform period 2017-2019 and averaged by exporting country and product.

Data on the UK Global Tariff, including information on the nature of tariff changes (e.g. tariff simplification measures), are taken from the UK Government's official publications. The dataset reports tariff rates for all declarable tariff lines in 2020, defined at either the 8- or 10-digit level. I aggregate the tariff data to the CN 8-digit level using a simple average. The analysis focuses exclusively on *ad valorem* tariffs.

To account for trade remedies, I use TARIC data to identify country-product pairs subject to additional duties, including antidumping and countervailing measures, during the sample period. All such observations are excluded from the analysis.

Finally, to ensure consistency of product definitions over time, I apply a product concordance following the methodology of Boehm, Levchenko and Pandalai-Nayar (2023). Products are concorded over time only when a one-to-one match exists across nomenclature revisions. Products that split or merge over time are treated as distinct product codes and are not concorded.

3.1 The UK Global Tariff

The UK Government launched a consultation process for a new MFN tariff schedule in February 2020, allowing interested parties to express their views on the new tariff schedule and provide feedback. The new tariffs were announced on 19 May 2020 and replaced the EU Common External Tariff from 1 January 2021.

The proposed changes involved removing tariffs on products representing key inputs for UK producers or where the UK had no production; it also liberalized "green goods" as a form of environmental policy. The UK Global Tariff also retained tariffs on about 5,000 tariff lines. The reasons mentioned for keeping tariffs was maintaining the same level of protection in some sectors (agriculture, ceramics, chemicals, bio-ethanol and motor vehicles) as well as avoiding the erosion of tariff preference granted to developing countries, a theme also highlighted in the responses to the public consultation (DIT 2020b; DIT 2020c). All these changes (or absence thereof) are somehow linked to import competition, hence they very likely to be endogenous in a regression and hence cannot be used directly.

For identification purposes, the two key features of the UK Global Tariff come from the simplification of the tariff schedule: the removal of small tariffs and tariff banding. The removal of nuisance tariffs below 2.5% was justified on a cost/benefit trade-off. The UK Government wrote that "the protection value of these tariffs may be outweighed by the administrative burden of collecting these revenues" (DIT 2020a).

Tariff banding works by keeping tariffs within specific boundaries, rounding down the existing rates to the lower limit of the band. The UK adopted three standardized bands. Tariffs up to 20% were rounded down to the nearest multiple of 2. Tariffs between 20 and 45% were rounded down to the nearest multiple of 5, and tariffs above 50% to the nearest multiple of 10.

Importantly for the econometric exercise, the removal of nuisance tariffs and tariff banding affected many products. Out of the 7,915 8-digit products for which we can compute a tariff change, 4,385 products see a tariff change, of which 3,168 are due to the removal of nuisance tariffs below 2.5% or tariff banding.[2]

Table 1 reports the summary statistics of the tariffs aggregated at the 8-digit product level. The new schedule reduced the simple average tariff from 4.7% to 3.6%. The table also reports the summary statistics of the tariff changes, both for the overall sample and for the tariff simplification sample.

In line with the econometric model, the tariff change is computed as:

$$\Delta \ln(1 + \text{tariff}_v) = \ln \left(\frac{1 + \text{UK MFN}_v/100}{1 + \text{EU MFN}_v/100} \right) \tag{1}$$

The new tariff schedule introduced only tariff reductions and no tariff increase, affecting 78% of the 4,385 products with an EU MFN tariff above zero.

The simplification sample includes all the products that saw tariff reductions due to the removal of tariffs $\leq 2.5\%$ or tariff banding, as well as products for which the EU MFN tariff was already zero. This sample counts 5,480 products, of which 3,168 see a tariff reduction.

[2] Tariff changes cannot be computed if the EU or UK MFN rates are not *ad valorem*.

Table 1: Summary statistics of tariffs

Sample	N. products	mean	std	min	25%	50%	75%	max
Tariff levels								
EU MFN	7889	4.710	5.249	0.000	0.000	3.500	6.500	74.900
UK MFN	8063	3.626	5.334	0.000	0.000	0.000	6.000	70.000
Change in log(1+tariff)								
All tariffs	7889	-0.011	0.017	-0.176	-0.016	-0.005	0.000	0.000
CET>0	5589	-0.015	0.018	-0.176	-0.018	-0.009	-0.003	0.000
$\Delta \ln(1 + tariff) \neq 0$	4372	-0.020	0.018	-0.176	-0.027	-0.014	-0.007	-0.001
Simplification	5455	-0.006	0.007	-0.049	-0.011	-0.005	0.000	0.000
CET>0	3155	-0.010	0.006	-0.049	-0.015	-0.009	-0.005	-0.001
$\Delta \ln(1 + tariff) \neq 0$	3155	-0.010	0.006	-0.049	-0.015	-0.009	-0.005	-0.001

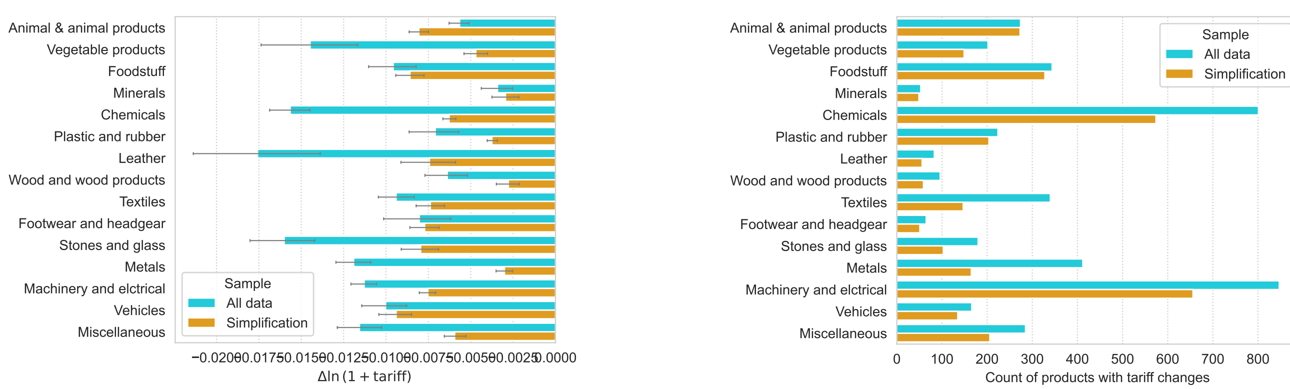
Source: author's calculation based on UK Global Tariff data at the 8-digit level of product aggregation, *ad valorem* tariffs only.

Figure 1 shows the average tariff changes (Figure 1a) and the number of products with a tariff change (Figure 1b) by broad sectors. It shows both the coverage of the full sample and the tariff simplification sample. The simplification sample focusses on a subset of all tariff changes and overall the average changes are smaller (an exception is Animal and animal products: this is because the simplification sample excludes some products with no change in the tariff).

Figure 1: Tariff changes by sector

(a) Average tariff change

(b) Count of tariff changes



3.2 Preference Utilization Rates

Countries and products differ greatly in the use of preferential tariffs. For UK imports from PTA partners, the average share of imports coming under a preferential tariff regime in the sample (computed for products with an EU MFN tariff above zero) is 20%. This means that most of the imports coming from PTA partner countries are subject to the MFN tariff.[3] Figure 2a shows the average share of the UK by product groups. The products with the highest shares are those where the EU MFN tariff is high – agriculture, food and textiles. There is also substantial heterogeneity across partners within the same product.

Because the shares are computed before the UK MFN tariff change – and even before the new tariffs were announced – we can consider them exogenous with respect to the tariff change. They can be used to measure the exposure of each PTA country-product to changes in the MFN tariff. The exposure is measured as the share of imports coming under the MFN regime over 2017-19 (one minus the preferential import share). The effective tariff change for PTA country i and product v can be measured as:

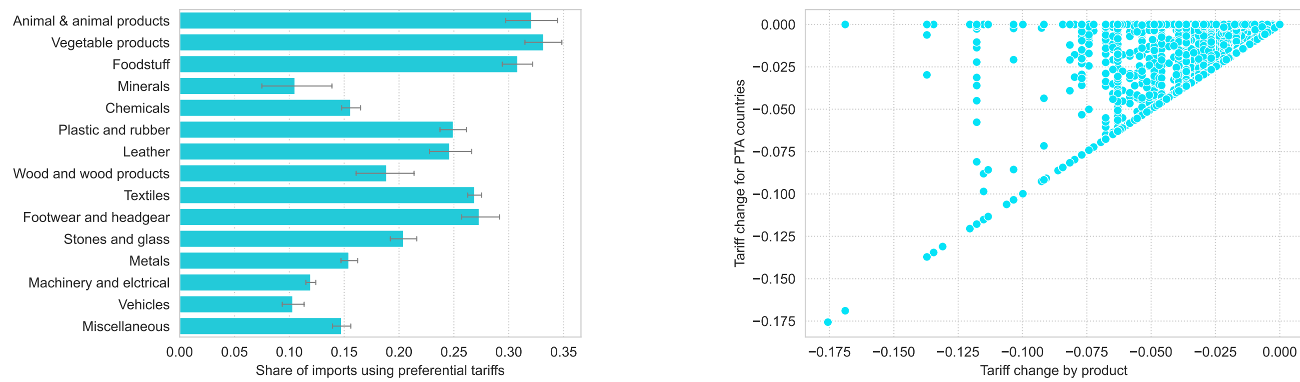
$$\Delta \ln(1 + \text{tariff})_{vij}^{PTA} = s_{vij}^{MFN} \times \Delta \ln \left(\frac{1 + \text{UK MFN}_v}{1 + \text{EU MFN}_v} \right) \tag{2}$$

where s_{vij}^{MFN} is the average share of MFN imports over 2017-19 by exporter i, importer j=UK,EU and product v. Because there is large variation in MFN import shares across countries and products, adding such information greatly increases the variation available to estimate the tariff elasticity. For instance, a 10% change in the tariff for a given product results in an effective change of 5% for a country with an MFN import share of 50% and in a zero effective change for a country with 0% of MFN imports. Figure 2b plots the PTA countries tariff change for the UK (tariff change times MFN import share of the UK) against the change in the MFN tariff. The points on the 45 degree line are those with 100% MFN import share. For all the other points outside the diagonal, the MFN import share scales down the product-specific tariff change introducing valuable variation across the country dimension.

[3] Note that these are unweighted average across products. Import-weighted shares are much higher, as larger flows tend to make better use of tariff preferences.

Figure 2: Preferential imports shares and PTA tariff changes

(a) Average preferential import share　　　　(b) PTA countries tariff changes



4 Estimating the MFN tariff elasticity

One might think a change in the MFN tariff rate affects imports of countries trading under the MFN regime, while PTA partner countries remain unaffected and could be used as a control group.[4] This would be the case if all imports from PTA partners would come under the preferential regime. However, data on preference utilization rates tell us the contrary. As shown in Section 3.2, a large share of UK imports from PTA partners come under the MFN regime, and it will respond to changes in the MFN tariff. In the estimation, I consider PTA partners as treated from the MFN tariff change, but scaling the tariff change by their MFN import share before the tariff change.

The tariff change (1) is multiplied by the 2017-19 average MFN import share by partner and product s_{vij}^{MFN} as in (2). For MFN countries this share equals one. In the Appendix, I show how this interaction can be justified with a theoretical model where firms self-select into the MFN or preferential tariff regime. Beyond properly recognizing the exposure of PTA partner countries to an MFN tariff change, the use of s_{vij}^{MFN} also increases the variation in the applied tariff change.

The regression model is then following:

$$\ln M_{vijt} = \alpha_{vij} + \alpha_{it,V} + \alpha_{jt,V} + \beta \left[Post_t \times UK_j \times s_{vij}^{MFN} \times \Delta \ln(1 + \text{tariff}_v)\right] + \epsilon_{vijt} \tag{3}$$

[4]To the best of my knowledge, the only other paper looking at MFN tariff changes for estimating the tariff elasticity is Boehm, Levchenko and Pandalai-Nayar (2023). The authors consider PTA partner countries as not affected by MFN tariff changes, and use them as a control group.

where M_{vijt} are imports of a CN 8-digit product v of country j (UK or the EU27) from exporting country i in year t. The αs are fixed effects at the exporter-importer-product, exporter-year-sector (V) and importer-year-sector. The sector V is defined as the HS 4-digit product.

The main independent variable is the change in the UK MFN tariff interacted with the 2017-19 average MFN import share s_{vij}^{MFN}, the dummy UK_j which equals one when the UK is the importer and zero for the EU, and a post-treatment dummy $Post_t$ for the period 2021-24.

To deal with the endogeneity of tariff changes, I use two approaches which focus on two sub-samples where variation in tariffs can be considered exogenous. The first approach is a country-based sample selection, focussing on the response of PTA countries. The second is a product-based approach, focussing on the variation in tariffs introduced by tariff simplification.

Country-based approach: A key concern in estimating the tariff elasticity is that changes in MFN tariff rates may be correlated with unobserved exporter-competitiveness shocks, leading to endogeneity in the tariff variable. To address this, we can exploit the fact that changes in the UK MFN tariff schedule implemented in 2021 can be considered largely exogenous from the perspective of countries with preferential trade agreements with the EU prior to Brexit. PTA partners' export patterns are unlikely to influence the design of the UK's MFN tariff schedule, which in turn could be shaped by concerns about competition from MFN exporters. As a result, the MFN tariff changes experienced by PTA exporters provide plausibly exogenous variation.

Let PTA_i be a dummy variable that equals one if a country had a PTA with the EU before 2021. The endogenous regressor is defined as:

$$X_{vijt} = Post_t \times UK_j \times s_{vij}^{MFN} \times \Delta \ln(1 + \text{tariff}_v) \tag{4}$$

while $Corr(X_{vijt}, \epsilon_{vijt}) \neq 0$ in the full sample, we will have $Corr(X_{vijt}, \epsilon_{vijt} | PTA_i = 1) = 0$ for the sub-sample of PTA partners.

I construct an instrument that isolates the exogenous component of the tariff change. The country-based IV is defined as:

$$Z_{vijt}^{PTA} = X_{vijt} \times PTA_i \tag{5}$$

The IV equals the tariff exposure X_{vijt} for PTA countries and zero otherwise, thereby isolating the part of X that arises from tariff changes affecting exporters whose trade with the UK is unlikely to drive MFN tariff-setting. If MFN tariff changes are orthogonal to import demand shocks from PTA exporters, then $Corr(Z_{vijt}^{PTA}, \epsilon_{vijt}) = 0$ implying that Z_{vijt}^{PTA} is a valid instrument.

Given the relatively low average utilization rate of tariff preferences, we might be concerned that MFN tariff changes will actually respond to import competition from PTA partners as well. If this was the case, the issue would most likely pertain to large imports from PTA members. To address this possible concern, I restrict the PTA-based IV to exclude large PTA country-product pairs. In particular, I compute the UK import share by country for each 8-digit product over the pre-shock period 2017-19 and exclude PTA country-product pairs with import shares above a threshold. In alternative specifications, I consider large flows those with import share above 20, 10 and 5%. Letting $small_{vij}$ be a dummy that equal one if a country-product pair has import share below the chosen threshold, this alternative instrument is constructed as:

$$Z_{vijt}^{smallPTA} = X_{vijt} \times PTA_i \times small_{vi} \tag{6}$$

Finally, a further concern arises from the UK government's mention that MFN tariff changes considered the issue of eroding tariff preferences granted to developing countries under GSP schemes. For products where GSP margins were sizeable, MFN tariffs may therefore have been set partly in response to GSP exporters' interests, violating the exogeneity condition for the country-based IV.

To address this issue, I construct an alternative instrument restricting the variation to non-GSP PTA partners (e.g., countries like Korea, Japan, Norway, Switzerland). These countries benefit from reciprocal PTAs, not unilateral preference schemes, and were unlikely to shape the MFN tariff design through preference-erosion considerations. This sample accounts for 77 of the 153 PTA partners of the UK.

This alternative instrument is constructed as:

$$Z_{vijt}^{FTA} = X_{vijt} \times PTA_i^{\text{no-GSP}} \tag{7}$$

where $PTA_i^{\text{no-GSP}}$ is a dummy that equals one if partner i has and non-GSP PTA and zero for MFN countries or countries with preferential access for developing countries.

Product-based approach: An alternative way of dealing with the endogeneity of tariff changes is to focus only on a subset of products for which the tariff changes are plausibly exogenous. As discussed above, tariff simplification involving the removal of nuisance tariffs of 2.5% or below and tariff banding generates mechanical changes in the MFN tariff that can be exploited to estimate the tariff elasticity. The product-based approach is similar to the country-based one, but restricting the sample along the product dimension of the data.

Let $Simple_v$ be a dummy variable that equals one if the tariff reduction is driven by tariff simplification or if the EU MFN tariff was already zero. The product-based sample-selection approach implies estimating

(3) restricting the sample to the products with $Simple_v = 1$.

As before, we can construct the product-based instrumental variable as:

$$Z_{vijt}^{Simple} = X_{vijt} \times Simple_v \tag{8}$$

As the tariff change is exogenous for the subset of products with $Simple_v = 1$, then Z_{vijt}^{Simple} is a valid instrument.

Before presenting the estimation results, we should spend some words on the interpretation of the two country- and product-based instruments. As the instruments identify different groups of *compliers* – country-product pairs which are 'moved' into the treatment group by the instrument – they might well estimate two different sub-population elasticities if the tariff elasticity is not common for all units. While the two approaches can be seen as complement, as the country-based approach focusses on all products but exported by PTA partners only, while the product-based approach restricts the products but looks at all countries, I argue that the country-based approach should be preferred.

The selection of products into the 'tariff simplification' group was an active choice of the UK government in relation to the policy, hence can be subject to some endogeneity. In a sense, the tariff-simplification rules provide some exogenous variation conditional on being the simplification product basket, which might be an non-trivial restriction. By contrast, PTA membership was pre-determined with respect to the 2021 UK MFN tariff reform, and driven by EU-level trade policy objectives. This minimizes concerns of PTA membership endogeneity with respect to the 2021 tariff change. For this reason, the country-based IV approach is the preferred one.

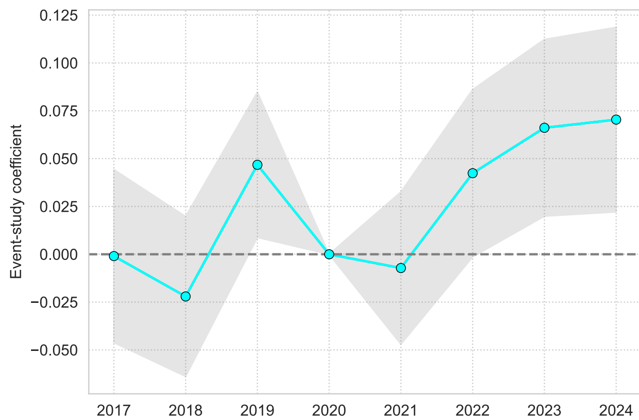
5 Results

Before turning to the estimation of the tariff elasticity, I estimate an event study regression. I use a a binary treatment indicator that equals one if the country-product pair faced a tariff reduction and zero otherwise.[5] The event study regression controls for the same set of fixed effects of model (3), and the reference year is 2020, the last pre-reform year.

The results, which are plotted in Figure 3, do not highlight the presence of pre-treatment trends. After the tariff reduction, imports in the treatment group started to increase compared to the control group. By 2024, imports subject to the tariff reduction increased by about 7%.

[5]The treatment dummy will be zero for PTA countries that do not exported under the MFN regime.

Figure 3: Event study regression results



The figure reports the results from the event study regression of the log of imports where treatment the dummy equals one if a country-product pair faced a tariff change and zero otherwise. The reference period is 2020, and the regression includes fixed effects at the exporter-importer-product, exporter-HS4-year and importer-HS4-year level. The dashed lines represent the 95% confidence interval, which is based on standard errors clustered at the importer-product level.

I now turn to the estimation of the tariff elasticity. Table 2 reports the baseline results. The first column reports the OLS results on all data. Column 2 reports the PTA-based IV results, and column 3 the results using the tariff simplification IV. Standard errors are clustered at the importer-product level, as this is the level at which the MFN tariff change occurs.

The OLS estimator gives a tariff elasticity coefficient of -2.5, which is substantially smaller than the IV estimates. the PTA instrument yields an elasticity of -8.7, and the tariff simplification one gives an elasticity of -5.4, on average. Overall, these results show that ignoring the endogeneity of trade policy biases regression coefficients towards zero in line with Trefler (1993).

Table 2: Baseline results

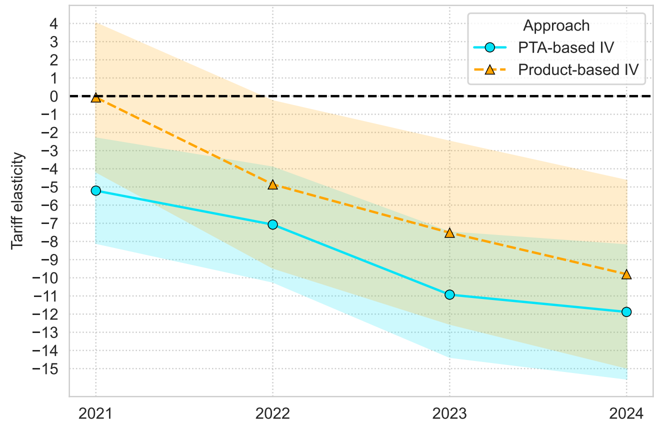
	OLS (1)	PTA countries IV (2)	Tariff simpl. IV (3)
Tariff change	-2.534***	-8.683***	-5.452***
	(0.616)	(1.218)	(1.724)
F-stat first stage		1564	1396
Observations	2,266,528	2,266,528	2,266,528

Standard errors clustered at the importer-product level in parenthesis. * p<0.1, ** p<0.05, *** p<0.01. The tariff change is computed as log[(1+UK MFN)/(1+EU MFN)], interacted with a dummy for the UK as importer and post-treatment dummy for 2021-24. All regressions include fixed effects at the exporter-importer-product, exporter-HS4-year and importer-HS4-year levels.

The two IV approaches appear to identify different coefficients. However, the static results of Table 2 masks the dynamic adjustment of imports to tariff changes, which bring the country- and product-based IV results very close. I re-estimate the IV models interacting the tariff changes with dummies for each year between 2021-24. The results, reported in Figure 4, show a strong dynamic adjustment with the tariff elasticity increasing in absolute value over time. Both types of IVs yield similar results, with the elasticity reaching values of 10-12 three years after the initial tariff change.

The main difference between the PTA- and product-based IV appear to be the elasticity in 2021, which is zero for the product-based approach and about -5 for the PTA-based method. Although the product-based IV yields somewhat smaller coefficients for all years, the 0 coefficient in 2021 largely explains why the average post-reform elasticity of Table 2 is absolutely smaller for the product- than PTA-based method.

Figure 4: Dynamics of the tariff elasticity, IV regressions



5.1 Robustness

In this his section I report some robustness tests for the country-based IV approach.

Small PTA flows: Table 3 reports the results restricting the PTA-based excluding country-product pairs with large import share in the UK market. Column 1 reproduces the baseline results with all PTA flows for references. Columns 2-3 restricts the IV sample to PTA country-product pairs for which the UK import share in 2017-19 (computed for each product separately) is below 20, 10 and 5%, respectively. The results show that the baseline elasticity of -8.7 might be a lower bound, as restricting the sample to small PTA import flows yield increasingly large elasticities. The most restrictive specification with the 5% import share threshold, yields an average elasticity of -20.

Table 3: Results excluding large PTA exporters

	All PTAs	PTAs, import share < :		
		20%	10%	5%
	(1)	(2)	(3)	(4)
Tariff change	-8.683***	-12.933***	-16.137***	-20.133***
	(1.218)	(1.316)	(1.436)	(1.615)
F-stat first stage	1564	1401	1314	1168
Observations	2,266,528	2,266,528	2,266,528	2,266,528

Standard errors clustered at the importer-product level in parenthesis. * $p<0.1$, ** $p<0.05$, *** $p<0.01$. The tariff change is computed as log[(1+UK MFN)/(1+EU MFN)], interacted with a dummy for the UK as importer and post-treatment dummy for 2021-24. All regressions include fixed effects at the exporter-importer-product, exporter-HS4-year and importer-HS4-year levels.

Excluding developing countries: Table 4 reports the results excluding PTA countries with unilateral preferential schemes for developing countries. Column 1 reports the results estimated on all non-GSP PTA flows, and shows an elasticity of -11.3, somewhat larger than the PTA-based baseline of -8.3. Columns 2-4 further restrict the sample to small non-GSP PTA countries. The pattern of results is similar to the one of all PTA countries reported in Table 3. In the most restrictive specification – excluding all GSP countries and PTA exporters with import shares above 5% – the elasticity reaches 22.2. This specification reflects a very specific complier group for whom MFN tariff changes are almost perfectly exogenous. These results are consistent with the view that the baseline PTA-based IV estimate is a conservative lower bound, and that endogeneity in tariff setting for major or GSP suppliers attenuates unrestricted IV estimates toward zero.

Table 4: Results excluding GSP exporters

	All FTAs	FTAs, import share < :		
		20%	10%	5%
	(1)	(2)	(3)	(4)
Tariff change	-11.275***	-15.492***	-18.641***	-22.238***
	(1.569)	(1.679)	(1.784)	(1.926)
F-stat first stage	1217	1149	1118	1051
Observations	2,266,528	2,266,528	2,266,528	2,266,528

Standard errors clustered at the importer-product level in parenthesis. * p<0.1, ** p<0.05, *** p<0.01. The tariff change is computed as log[(1+UK MFN)/(1+EU MFN)], interacted with a dummy for the UK as importer and post-treatment dummy for 2021-24. All regressions include fixed effects at the exporter-importer-product, exporter-HS4-year and importer-HS4-year levels.

Results by product group: In Table 5 I report elasticities estimated for 11 product groups. The estimations are done with PTA-based IV approach, running separate regressions for each product group. Homogeneous products, such as minerals or stone and glass, tend to have larger elasticities. The least elastic product group is wood and wood products, but the elasticity for this sector is estimated imprecisely.

Table 5: Results by product groups

Sector	HS2	Coefficient	Std. Error	Observations
Animal & vegetables	01-14	-5.56**	(2.37)	128299
Foodstuff	15-24	-17.81***	(5.92)	99986
Minerals	25-27	-48.24**	(23.79)	32332
Chemicals and plastic	28-40	-6.82***	(2.56)	288847
Leather	41-43	-16.54*	(9.36)	44318
Wood and wood products	44-49	-2.03	(10.87)	95267
Textiles and clothing	50-67	-10.48**	(4.85)	466816
Stones and glass	68-71	-12.67**	(5.69)	88315
Metals	72-83	-6.27	(3.94)	237139
Machinery and vehicles	84-89	-6.79**	(2.65)	560618
Miscellaneous	90-97	-15.91***	(3.36)	224591

Standard errors clustered by importer-product in parenthesis. * $p<0.1$, ** $p<0.05$, *** $p<0.01$. Each regression includes fixed effects at the exporter-importer-product, exporter-HS4-year and importer-HS4-year level. The results come from the PTA-based IV regression approach.

6 Conclusion

This paper exploits the UK Global Tariff reform – a rare large-scale change in MFN tariffs – to provide new evidence on the elasticity of imports to tariffs. Using two complementary strategies to address the endogeneity of tariffs – country-based variation among PTA partners and product-level mechanical changes generated by tariff simplification – I show that ignoring endogeneity leads to substantial downward bias. While naive OLS estimates imply an elasticity of around 2.5, the IV estimates range from 5.4 to 8.7. Importantly, import responses exhibit strong dynamics: three years after the reform, the elasticity reaches values between 10 and 12. Robustness exercises suggest that these estimates may be a lower bound.

These findings challenge the prevailing benchmark elasticity of 5 and indicate that most existing estimates – typically based on preferential tariff variation without accounting for partial preference uptake or policy endogeneity – understate the true responsiveness of trade flows. The results are consistent with those in the companion paper (Tamberi, forthcoming), which shows that once partial utilization of preferential trade agreements is addressed, FTA tariff liberalization generates elasticities in the same range of 10-12.

Taken together, the two papers call for a reassessment of tariff-based trade elasticity estimates in settings with multiple import regimes and incomplete preference utilization. Revising the trade elasticity upward has important implications for quantitative trade models, where this parameter governs the magnitude of trade responses, the welfare consequences of trade policy, and the calibration of counterfactual exercises.

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Appendix

A Theory background

This section shows how the empirical specification can be derived as a log-linear approximation from a model with trade regime heterogeneity as in Demidova and Krishna (2008).

We start from the standard Melitz (2003) with a Pareto distribution of firm productivity. When countries i and j have a PTA, firms in an exporting country i can export to j under the MFN regime paying a fixed cost f_{ij} and facing the MFN tariff $\tau_j^{MFN} = 1 + MFN_j$. Alternatively, the can pay an additional fixed cost f_{ij}^{PRF} to access to lower preferential tariffs $\tau_{ij}^{PRF} < \tau_j^{MFN}$. This settings implies that, if fixed costs of accessing tariff preferences are high or the margin between the preferential an MFN tariff is low, only the most productive firms will self-select into the preferential tariff regime, while the least productive exporters trade under MFN. If instead the fixed costs are low or the tariff margin is high, all exporters use the tariff preferences.

The model yields the following expression for total exports (sum of MFN and preferential exports) from i to j:

$$X_{ij} = A_j B_i \left(\tau_j^{MFN}\right)^{-\frac{\sigma\theta}{\sigma-1}} \left[1 + \left(\left(\frac{\tau_j^{MFN}}{\tau_{ij}^{PRF}}\right)^{\sigma} - 1\right)^{\frac{\theta}{\sigma-1}} \times \left(\frac{f_{ij}}{f_{ij}^{PRF}}\right)^{\frac{\theta-\sigma+1}{\sigma-1}}\right] \tag{9}$$

where A_j and B_i summarise aggregate demand and supply conditions, σ is the CES elasticity of substitution and θ is the shape parameter of the Pareto distribution of firm productivity. Note that if the tariff margin is null ($\tau_{ij}^{PRF} = \tau_j^{MFN}$), or the preferential regime fixed costs are high ($f_{ij}^{PRF} \to \infty$) we end up with the standard trade model of MFN trade.

In this model, the share of imports coming under the preferential regime, or the preference utilization rate (PUR), can be expressed as:

$$PUR_{ij} = \frac{X_{ij}^{PRF}}{X_{ij}} = \frac{\left(\frac{\tau_j^{MFN}}{\tau_{ij}^{PRF}}\right)^{\sigma} \left[\left(\frac{\tau_j^{MFN}}{\tau_{ij}^{PRF}}\right)^{\sigma} - 1\right]^{\frac{\theta}{\sigma-1}} \times \left(\frac{f_{ij}}{f_{ij}^{PRF}}\right)^{\frac{\theta-\sigma+1}{\sigma-1}}}{1 + \left[\left(\frac{\tau_j^{MFN}}{\tau_{ij}^{PRF}}\right)^{\sigma} - 1\right]^{\frac{\theta}{\sigma-1}} \times \left(\frac{f_{ij}}{f_{ij}^{PRF}}\right)^{\frac{\theta-\sigma+1}{\sigma-1}}} \tag{10}$$

The derivative of (9) with respect to the log of τ_j^{MFN} is:

$$\frac{\partial \ln X_{ij}}{\partial \ln \tau_j^{MFN}} = -\frac{\sigma\theta}{\sigma-1} + \frac{\sigma\theta}{\sigma-1} \frac{\left(\frac{\tau_j^{MFN}}{\tau_{ij}^{PRF}}\right)^{\sigma} \left[\left(\frac{\tau_j^{MFN}}{\tau_{ij}^{PRF}}\right)^{\sigma} - 1\right]^{\frac{\theta}{\sigma-1}} \times \left(\frac{f_{ij}}{f_{ij}^{PRF}}\right)^{\frac{\theta-\sigma+1}{\sigma-1}}}{1 + \left[\left(\frac{\tau_j^{MFN}}{\tau_{ij}^{PRF}}\right)^{\sigma} - 1\right]^{\frac{\theta}{\sigma-1}} \times \left(\frac{f_{ij}}{f_{ij}^{PRF}}\right)^{\frac{\theta-\sigma+1}{\sigma-1}}} = -\frac{\sigma\theta}{\sigma-1} \left(1 - PUR_{ij}\right)$$

Adding a time subscript, we can derive the empirical equation by taking the log-linear approximation of (9) around the equilibrium before the tariff change:

$$\ln X_{ijt} = a_{ij} + a_{jt} + a_{it} - \frac{\sigma\theta}{\sigma-1} \left(1 - PUR_{ij,0}\right) \ln\left(\frac{\tau_{j,t}^{MFN}}{\tau_{j,0}^{MFN}}\right) + \epsilon_{ij} \tag{11}$$

where ϵ_{ij} is the error term and the $a_{..}$ are fixed effects. The variable of interest can be computed as the interaction of the MFN import share before the tariff change $(1 - PUR_{ij,0})$ multiplied by the change in the tariff $\ln\left(\tau_{j,t}^{MFN}/\tau_{j,0}^{MFN}\right)$.