

# The (Non-)Neutrality of Value-Added Taxation

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# The (Non-)Neutrality of Value-Added Taxation

## Abstract

Border adjustment taxes like the value-added tax (VAT) are commonly regarded to promote efficiency and equity due to their *de jure* trade neutrality. We analyse the effects of the VAT on trade in final goods in the European Union (EU) from 1988 to 2019. We find that the VAT is *de facto* non-neutral. A one percentage point VAT increase implies a 5.45% reduction of foreign imports relative to internal trade. These effects are not driven by institutional quality, EU accession, or preferential Common Market access.

JEL-Codes: F100, F140, H240.

Keywords: value-added taxation, trade neutrality, discrimination, border adjustment.

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# 1 Introduction

Border adjustment taxes (BATs) like the destination-based cash flow tax (DBCFT), the carbon border adjustment mechanism or the value-added tax (VAT) aim to raise revenue while leveling the international playing field by avoiding tax discrimination, promoting fair competition, and preventing unintended economic distortions (see e.g. Auerbach and Devereux, 2018). The key mechanism to achieve these goals is a border adjustment under which inflows of goods, services, and transactions are subject to the domestic tax provisions, while outflows are generally exempt. Destination-based taxes with a border adjustment mechanism are thus *de jure* neutral – domestic and imported economic activity are treated equally – and supposed to promote efficiency and equity (see Brockmeyer et al., 2024).

The most commonly applied form of BATs is the VAT with almost 90% of the world’s countries currently applying some form of value-added taxation, accounting for 75% of world GDP, 92% of the world population, and 81% of global imports.<sup>1</sup> One key characteristic commonly attributed to the VAT is trade neutrality – domestic trade and imported goods and services are subject to the same tax provisions, leaving relative prices unchanged. In fact, trade neutrality is legally guaranteed by Article III of the General Agreement on Tariffs and Trade.<sup>2</sup> Early theoretical contributions have developed conditions under which any border adjustment is trade neutral (see Grossman, 1980; Feldstein and Krugman, 1990). Thus, it is generally accepted by scholars, policymakers, and the World Trade Organization (WTO) that the VAT is neutral due to its destination principle and border adjustment. However, several authors have identified conditions under which this may not be the case, including substitution between distortionary taxes or tariffs and the VAT (see Feldstein and Krugman, 1990; Keen and Lahiri, 1998; Haufler et al., 2005). The question of non-neutrality is particularly important in light of the historical trend towards higher VAT rates and falling tariff levels around the globe (see Büttner and

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<sup>1</sup>In fact, the United States of America remain the only major country in the world that has not introduced a VAT. Calculations are based on the UN Comtrade database, World Bank GDP and population data and self-collected VAT regime information for the year 2020.

<sup>2</sup>The WTO has been involved in disputes over the VAT’s trade neutrality, focusing on specific provisions rather than the VAT in general (see Cuadros, 2016). It has adopted a more aggressive stance on direct taxation, such as the US Extraterritorial Income Exclusion Act and foreign sales corporation scheme (see Daly, 2005).

Madzharova, 2018).<sup>3</sup> This is because the arguments for the efficiency and equity of Border Adjustment Taxes (BATs) largely depend on their neutrality. Still, empirical evidence on the neutrality of the VAT is scarce.

This paper empirically investigates the claim of trade neutrality under the VAT and demonstrates that the VAT is *de facto* non-neutral. Our estimation approach builds on recent innovations in modelling the effects of non-discriminatory, country-specific trade policies. We focus on the differential impact of the VAT on inter- and intra-national trade of (eventual) European Union (EU) members from 1988 to 2019. We find that a one percentage point VAT increase results on average in a 5.45% decrease in aggregate imports relative to domestic trade of final goods. While the VAT may be *de jure* trade neutral, its impact on relative trade renders it *de facto* non-neutral. Additionally, we demonstrate that these effects are not driven by institutional quality, EU accession, or Single Market benefits. Focusing on EU countries yields several advantages. Imports into the EU face the same tariff- and non-tariff barriers. Similarly, the application of the VAT is largely harmonised between members states. Finally, concerns about data quality for inter- and intra-national trade is low (see Emran and Stiglitz, 2005; Morrow et al., 2022).

This paper is not the first to evaluate the relationship between the VAT and trade, but the first to directly test for trade neutrality by considering internal and international trade simultaneously. Thus, it contributes to several strands of the international trade and public finance literature. First, we add to the empirical trade literature, analysing the impact of the VAT on aggregate trade. Desai and Hines (2003) conduct a cross-sectional country-level analysis, finding a negative relation between VAT revenue and exports as well as imports. Keen and Syed (2006), also looking at the country-level but using panel data, find no VAT effect. In an industry-level panel analysis Nicholson (2010) finds negative effects on both exports and imports. Sharma (2020) finds that industries with a high intermediate goods share of output decrease exports substantially. This effect is driven by developing countries and most likely attributable to imperfect refunding for exporters. Most recently, Benzarti and Tazhitdinova (2021) analyse the effect of the VAT on aggregate international trade using an two-way-fixed-effects approach, regressing imports and exports on the reporting country's tax rate and country-level controls. Similar to our analysis, they focus on EU countries, but they do not include intra-national trade

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<sup>3</sup>Thuncke (2023) provides illustrative evidence for the development of the VAT over time.

in their estimation. They find a VAT elasticity of aggregate trade close to zero, with no significant anticipatory or delayed effects.

Second, we contribute to the public economics literature analysing the effects of consumption tax reforms on prices and demand. Doyle Jr. and Samphantharak (2008) illustrate that sales tax suspensions and reinstatements in US states show little demand responses. Chetty et al. (2009) document that excise tax changes have considerable effects on the price and demand for groceries and alcoholic beverages. Similarly, Kosonen (2015) exploits a VAT reform for hairdressing services in Finland and finds no demand responses. Benzarti and Carloni (2019) exploit a temporary VAT reduction in France on restaurant visits and find little to no demand effects. Both Bachmann et al. (2021) and Fuest et al. (2024) find a sizable pass-through of a temporary VAT cut in Germany. Büttner and Madzharova (2021) demonstrate that consumption tax changes are fully reflected in prices even though with non-instantaneous timing. Thus, the public finance literature illustrates that VAT rate changes affect consumer prices and unit sales significantly.

In contrast to prior literature, our paper explicitly studies trade neutrality by directly comparing the impact of VAT on imports relative to domestic trade. We demonstrate clear-cut effects of the VAT on trade and thus document *de-facto* non-neutrality. We employ a gravity-like model with a Poisson Pseudo Maximum Likelihood (PPML) estimator following Santos Silva and Tenreyro (2006). Compared to papers that use a logarithmic transformation of trade flows, like Benzarti and Tazhitdinova (2021), PPML allows us to properly account for zero trade flows, heteroskedasticity, and non-linearities. In contrast to a two-way-fixed-effects approach, the gravity-like estimation employs a border dummy and a rich fixed effects structure that enables us to estimate the differential effect of VAT changes on imports relative to domestic trade within a country, rather than their impact on trade in comparison to not (yet) treated control countries. Additionally, by focusing on the relative response of imports vis-à-vis internal trade we go beyond the analysis of recent papers, like Benzarti and Tazhitdinova (2021), and directly test for trade neutrality defined as the relative, rather than the absolute elasticity of international trade.

The remainder of this paper is organised as follows. Section 2 provides an overview of the data and descriptive statistics. Section 3 and section 4 presents our identification approach and our empirical results. We provide several robustness checks to validate our results in section 5. Section 6 concludes.

## 2 Data

The empirical analysis of the research questions requires data on VAT regimes, trade flows and control variables. The VAT data set used in the analysis contains a panel of the 28 (eventual) EU member countries from 1967 to 2020 and stems from the European Commission.<sup>4</sup> It contains information on standard VAT rates and the reduced rates applied to foodstuffs. We follow Benzarti and Tazhitdinova (2021) in employing a narrative approach to exclude fiscally motivated tax changes. Summary statistics are displayed in Table 1. Not including initial introductions, we record 122 exogenous VAT changes, 95 of which are positive and 27 of which are negative. The average rate change was an increase by 1.16 percentage points, with a median value of 1 percentage point. We observe fewer reduced rate changes compared to the standard rate with an average rate change of 1 percentage point and a standard deviation of 2.7.

The analysis focuses on (eventual) EU-member countries for two reasons. First, EU countries exhibit higher institutional quality resulting in better VAT enforcement which therefore should not substantially affect the results of the analysis. Morrow et al. (2022) provide evidence that increases in VAT rates in countries with lower institutional quality lead to increased evasion by shifting domestic economic activity to the informal sector while imports are still registered at the border (see also Emran and Stiglitz, 2005). Second, lack of enforcement raises questions about data quality. By focusing on (eventual) EU members we analyse the impact of VAT on trade in the absence of enforcement and data quality issues.

The trade data used for the analysis is the *International Trade and Production Database* (ITPD) from the US International Trade Commission (see Borchert et al., 2021, 2022). The ITPD database contains detailed and global trade information for the manufacturing sector from 1988 to 2019. For our analysis we distinguish between manufactured foodstuffs and manufactured non-food goods. The former is subject to the reduced VAT rate, while the standard VAT rate is applied to the latter. The analysis focuses on trade in final goods as the VAT is fully rebated on intermediate inputs. Similarly, exports are exempt from VAT and thus excluded from the analysis. The data are only available at the International

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<sup>4</sup>The United Kingdom did not formally leave the EU and its customs union until after our period of analysis.

Standard Industrial Classification (ISIC) level, which are converted to the Broad Economic Category (BEC) level to filter for inter- and intranational trade in food and consumption goods.<sup>5</sup> We conduct standard rest of world (RoW) aggregation as in Yotov et al. (2016). The panels were balanced by adding zero trade flows for any missing dyadic observation. Trade flows are reported net of VAT, just as they are reported net of tariffs.

The core advantage of the ITPD data over most other databases is that it contains information on domestic trade which is constructed by subtracting total exports from production. Previous empirical studies have focused on the impact of the VAT on international trade, disregarding domestic trade data. However, answering the question of trade neutrality – i.e. estimating the VAT elasticity of imports relative to the elasticity of internal trade – necessarily requires reliable data on internal trade.

Data on institutional quality is taken from the Worldwide Governance Indicators of the World Bank. As in Kaufmann and Kraay (2023) we use the pre-standardized perceived Control of Corruption score as a proxy for institutional quality.

Table 1: Summary Statistics

Variable	N	Mean	Std. Dev.	Min	Pctl. 25	Pctl. 75	Max
Trade Flow (m.)	100,620	261	2,592	0	0.052	37	93,695
Standard Rate Change	122	1.1	2.5	-12	0.5	2	8
Food Rate Change	64	0.99	2.7	-9	0.5	2.3	8
Institutional Quality	27	1.1	0.76	-0.21	0.39	1.7	2.3

### 3 Identification Strategy

To investigate the trade neutrality of the VAT we follow the gravity-style approach from Beverelli et al. (2018) and Heid et al. (2021) to analyse non-discriminatory trade policies.<sup>6</sup> The key component for identification is a border indicator, distinguishing between

<sup>5</sup>The conversion from ISIC to BEC is implemented using the *concordance* package in R (see Liao et al., 2020).

<sup>6</sup>For the seminal contribution setting up the structural gravity model, see Anderson and van Wincoop (2003). See also Anderson (1979) and Eaton and Kortum (2002).



international and domestic trade flows, interacted with the VAT rate of the importing country.<sup>7</sup> This returns the differential effect of the VAT rate changes on imports relative to domestic trade. A coefficient close to zero would indicate de-facto neutrality.

We include a comprehensive set of fixed effects. First, importer/exporter-year-sector fixed effects control for any unobserved annual shocks at the country and industry level including business cycles, elections, policy changes like tax reforms. Symmetric pair-sector fixed effects control for time-invariant determinants of bilateral trade, i.e., geographical distance, common language etc.. Third, border-year fixed effects control for globalisation effects like the reduced costs of international trade relative to domestic trade due to changed economic interdependence and integration. We thus estimate the following model with PPML:

$$X_{ijst} = \exp(\beta \text{BORDER}_{ij} \times \text{VAT}_{jts} + \eta_{its} + \nu_{jts} + \xi_{ijs} + \zeta_{ijt}) \times u_{ijt}, \quad (1)$$

where the coefficient  $\beta$  measures the *differential* impact of the VAT of importer  $j$  in year  $t$  in sector  $s$  on trade flows from exporter  $i$  compared to internal trade.<sup>8</sup>  $\eta_{its}$  is the exporter-time-sector,  $\nu_{jts}$  the importer-time-sector and  $\xi_{ijs}$  the (symmetric) pair-sector fixed effect.<sup>9</sup>  $\zeta_{ijt}$  represents the border-year fixed effect. We focus on imports and internal trade, since exports are exempt from the VAT.<sup>10</sup> From equation (1) we identify  $\beta$  from the direct impact of VAT changes on imports relative to domestic trade within a country, rather than obtaining a treatment effect from a between country comparison. We estimate all models using the *fixest* package for R (see Bergé, 2018).

Based on the comprehensive fixed effects structure, the only threat to our identification approach is potential reverse causality. However, as the VAT is widely considered to be trade neutral, it is highly unlikely that rates are influenced by trade related considerations.

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<sup>7</sup>The border indicator equals one for each national border, irrespective of whether countries are both members of the same regional trade agreement.

<sup>8</sup>In particular, differentiation of equation (1) yields  $\beta_2 = \frac{\partial X_{ijts}/X_{ijts}}{\partial \text{VAT}_{jts}}$  if  $\text{BORDER}_{ij} = 1$ . Thus,  $\beta$  is the VAT elasticity of imports relative to the VAT elasticity of internal trade.

<sup>9</sup>Our results are robust to using asymmetric pair fixed effects and available upon request.

<sup>10</sup>Some research has indicated imperfect rebating of the VAT for Chinese exports; see Chandra and Long (2013), since this effect is confined to China, we do not expect any variation of aggregate exports with the VAT for a representative country in our samples.

Although cyclical fluctuations are captured in our fixed effects, we do exclude rate changes explicitly motivated by fiscal consolidation, as in Benzarti and Tazhitdinova (2021).

## 4 Empirical results

We estimate equation (1) both for a pooled sample including the food and non-food sectors, as well as for each sector category separately. Results are shown in Table 2. We observe sizable negative coefficients for the interaction between cross-border flows and VAT rates, that are statistically significant at the 1 percent level in columns (1) and (3). In particular, results for the pooled sample imply that on average a one percentage point increase in the applied VAT rate of the importing country leads to a decrease in imports from a foreign country relative to internal trade by 5.45 %. Column (3) indicates that this effect is even larger when restricting the sample to the non-food sector. Turning to column (2), we find a smaller and statistically insignificant effect for foodstuffs. We can reject the Null hypothesis of trade neutrality of the VAT, especially for non-food trade.

These estimates suggest that the VAT discriminates against international trade even though it is applied uniformly to all final goods sales. Thus, the VAT is non-neutral. However, non-neutrality may not necessarily be caused by the VAT itself, but by other factors that have a differential impact on imports and domestic trade. Varying enforcement from differences in institutional quality, EU enlargement, or Single Market characteristics could potentially explain our findings. In the following section we address these concerns and demonstrate that our results remain robust.

## 5 Robustness

To ensure the validity of our baseline results in Table 2, we conduct several robustness tests. First, our results blend the effects of VAT changes and EU accession. To address this concern, we reestimate equation (1) dropping all non-founding EU members from the sample. The results are presented in Table 3. We obtain qualitatively robust and quantitatively larger coefficients compared to the baseline specification, suggesting that our baseline coefficients are conservative.

Second, the non-neutrality of the VAT could be driven by gaps in institutional quality.

Table 2: Trade Neutrality of the VAT

Model:	Final Good (1)	Food (2)	Non-Food (3)
<i>Variables</i>			
VAT $\times$ Border	-0.0545*** (0.0177)	-0.0065 (0.0217)	-0.0647*** (0.0198)
<i>Fixed-effects</i>			
Importer-Year-Sector	Yes	Yes	Yes
Exporter-Year-Sector	Yes	Yes	Yes
Symmetric Pair-Sector	Yes	Yes	Yes
Border-Year	Yes	Yes	Yes
<i>Fit statistics</i>			
Observations	94,614	46,849	47,765
Pseudo R <sup>2</sup>	0.9898	0.9920	0.9876
BIC	1,875,465.6	728,022.7	1,139,924.2

**Note:** Shown are results estimating equation (1) using PPML. Standard errors are clustered at the importer-sector level and shown in parentheses. The dependent variable is trade flows at the importer-exporter-sector-year level. The independent variable is the interaction between an indicator for trade flows crossing an international border and the applicable VAT rate in percent. VAT rate changes motivated by fiscal policy considerations are excluded. Significance levels: \* $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

We investigate the role of institutional quality which might result in differential treatment of imports and domestic trade due to heightened enforcement capacity at the border and lower capacity to monitor domestic economic activity (see Morrow et al., 2022). We would expect countries with weak perceived institutional quality to exhibit a positive coefficient, given that internal – but not cross-border – trade may move to the informal sector following VAT rate increases. We augment equation (1) by interacting the  $Border \times VAT$  term with an indicator for below median institutional quality within the EU. Table 4 presents the results. We find sizable, negative, and statistically significant effects of the VAT on imports relative to domestic trade for the baseline category of high institutional

Table 3: Trade Neutrality of the VAT - Founding EU Members

Model:	Final Good (1)	Food (2)	Non-Food (3)
<i>Variables</i>			
VAT $\times$ Border	-0.0810*** (0.0231)	0.0732 (0.0994)	-0.0861*** (0.0237)
<i>Fixed-effects</i>			
Importer-Year-Sector	Yes	Yes	Yes
Exporter-Year-Sector	Yes	Yes	Yes
Symmetric Pair-Sector	Yes	Yes	Yes
Border-Year	Yes	Yes	Yes
<i>Fit statistics</i>			
Observations	54,722	27,238	27,484
Pseudo R <sup>2</sup>	0.9901	0.9921	0.9881
BIC	1,515,634.2	600,286.9	909,349.8

**Note:** Shown are results estimating an augmented equation (1) using PPML. Standard errors are clustered at the importer-sector level and shown in parentheses. The dependent variable is trade flows at the importer-exporter-sector-year level. The independent variable is the interaction between an indicator for trade flows crossing an international border and the applicable VAT rate in percent. VAT rate changes motivated by fiscal policy considerations are excluded. Only founding members of the EU are included in the sample. Significance levels: \* $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

quality. For countries with below-median institutional quality, however, the overall effect of the VAT on imports is indeed positive. Thus, similar to Morrow et al. (2022) we find that poor institutional quality leads to enforcement gaps in internal trade. VAT increases prompt firms to move domestic transactions to the shadow economy but not imports, which are documented at the border. Thus, the negative baseline coefficient in Table 2, if anything, underestimates the impact of the VAT, as the institutional quality channel operates in the opposite direction.

Finally, the EU membership status of exporters and its potential effects on the non-

Table 4: Institutional Quality

Model:	Final Good (1)	Food (2)	Non-Food (3)
<i>Variables</i>			
VAT × Border	-0.0800*** (0.0203)	-0.0231 (0.0486)	-0.0839*** (0.0214)
VAT × Border × Low Inst. Qual.	0.1050*** (0.0385)	0.0256 (0.0606)	0.1324** (0.0590)
Food Trade	Yes	Yes	No
Non-Food Trade	Yes	No	Yes
<i>Fixed-effects</i>			
Importer-Year-Sector	Yes	Yes	Yes
Exporter-Year-Sector	Yes	Yes	Yes
Symmetric Pair-Sector	Yes	Yes	Yes
Border-Year	Yes	Yes	Yes
<i>Fit statistics</i>			
Observations	92,690	45,939	46,751
Pseudo R <sup>2</sup>	0.9899	0.9920	0.9878
BIC	1,841,187.5	721,387.2	1,112,647.0

**Note:** Shown are results estimating an augmented equation (1) using PPML. Standard errors are clustered at the importer-sector level and shown in parentheses. The dependent variable is trade flows at the importer-exporter-sector-year level. The independent variables are an interaction between an indicator for trade flows crossing an international border and the applicable VAT rate in percent and a triple interaction between these two variables and an indicator for below median institutional quality. VAT rate changes motivated by fiscal policy considerations are excluded.

Significance levels: \* $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

neutrality of of the VAT could explain our results. Non-EU imports are subject to customs duties, more stringent documentation requirements, and differing VAT treatment compared to intra-EU international trade. Most notably, a reverse charge mechanism for intra-EU trade shifts the legal incidence from the seller to the buyer (see Bohne et al.,

2024).<sup>11</sup> All these aspects make trading with EU members relatively more attractive and thus potentially drive the non-neutrality of the VAT. To investigate the role of non-EU imports, we augment equation (1) to include an interaction with an indicator that is equal to one if the exporter is an EU member and zero otherwise. The results are depicted in Table 5. We find that the VAT is non-neutral for imports from EU countries as well as from non-EU countries. Though the effect is dampened for imports from EU countries, the overall effect is still sizeably negative.

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<sup>11</sup>A producer sourcing inputs domestically pays VAT on inputs and deducts that amount from their VAT bill on their sales. A producer sourcing inputs from other EU countries does not pay VAT on the input and pays the full VAT amount on their sales to the government.

Table 5: EU Exporter

Model:	Final Good (1)	Food (2)	Non-Food (3)
<i>Variables</i>			
VAT $\times$ Border	-0.0913*** (0.0286)	-0.0061 (0.0317)	-0.1210*** (0.0327)
VAT $\times$ Border $\times$ EU Exporter	0.0304* (0.0184)	-0.0072 (0.0163)	0.0509** (0.0238)
Food Trade	Yes	Yes	No
Non-Food Trade	Yes	No	Yes
<i>Fixed-effects</i>			
Importer-Year-Sector	Yes	Yes	Yes
Exporter-Year-Sector	Yes	Yes	Yes
Symmetric Pair-Sector	Yes	Yes	Yes
Border-Year	Yes	Yes	Yes
<i>Fit statistics</i>			
Observations	33,750	16,870	16,880
Pseudo R <sup>2</sup>	0.9901	0.9925	0.9874
BIC	1,244,873.2	503,699.2	736,678.6

**Note:** Shown are results estimating an augmented equation (1) using PPML. Standard errors are clustered at the importer-sector level and shown in parentheses. The dependent variable is trade flows at the importer-exporter-sector-year level. The independent variables are an interaction between an indicator for trade flows crossing an international border and the applicable VAT rate in percent and a triple interactions between these two variables and an indicator for intra-EU trade flows. VAT rate changes motivated by fiscal policy considerations are excluded. Significance levels: \* $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

## 6 Concluding remarks

Border adjustment taxes (BATs) are often argued to level the international playing field and efficiently raise revenue by avoiding tax discrimination, promoting fair competition, and preventing unintended economic distortions. The key feature of BATs to ensure these

outcomes is neutrality implying that the inflows of goods, services, and transactions are subject to the same legal provisions as domestic economic activity. This paper empirically tests this feature for the most commonly applied BAT, the value-added tax (VAT). We demonstrate that the VAT is *de facto* non-neutral in the context of international trade. Using EU VAT regime information from 1988 to 2019, we analyse non-neutrality by explicitly distinguishing between inter- and intranational trade using recent advancements in the estimation of non-discriminatory trade policies. We find that a one percentage point VAT increase results on average in a 5.45% reduction in imports relative to domestic trade. This results cannot be explained by differences in institutional quality, EU accession, or preferential Common Market access.

Our results are in contrast to the only comparable empirical study by Benzarti and Tazhitdinova (2021) which finds no effect of the VAT on aggregate trade. However, there are some important differences between our study and Benzarti and Tazhitdinova (2021). Benzarti and Tazhitdinova (2021) only consider international but not intranational trade, thus, the authors are unable to directly test trade neutrality of the VAT. There are also considerable differences in the empirical approach. As Santos Silva and Tenreyro (2006) illustrate, log linearising trade flows can introduce substantial estimation biases due to heteroskedasticity and the exclusion of zero values. These issues are resolved by using Pseudo Poisson Maximum Likelihood estimation as is done in our analysis. The linear two-way-fixed-effects design of Benzarti and Tazhitdinova (2021) compares the effect of VAT changes on imports to trade of countries that have not (yet) experienced a VAT increase controlling for origin and destination country fixed effects as well as common annual shocks for both countries. In contrast to this, our results are derived from the differential impact of VAT changes on imports relative to domestic trade within a given country controlling for both destination and origin-time fixed effects as well as destination and origin-pair fixed effects.

Given our results, policy-makers should be aware that VAT changes have substantial effects on trade patterns – most likely through differential responses in relative prices – and subsequently welfare implications. Consequently, increasing the VAT to provide additional public goods or as a substitute for other tax instruments should be carefully reconsidered. More generally, our results imply that the neutrality of BATs is not guaranteed. If the VAT proves to be non-neutral in a high-quality institutional environment with a well-defined tax base, the desired efficiency and equity gains of recent proposals like the destination-based



cash flow tax or the carbon border adjustment mechanism cannot be taken for granted. Thus, BATs may implicitly or explicitly serve as a discriminatory policy instrument. Exploring the details of non-neutrality in the context of BATs requires a model that can explain the differential pricing behaviour of firms and/or different market entry behaviour of domestic and foreign firms.<sup>12</sup> Future research could explore the underlying mechanisms that result in the non-neutrality of the VAT. Additionally, the question remains whether non-neutrality of the VAT is particularly relevant in common markets like the EU and if it also extends to regional trade agreements. We leave such an analysis to future research.

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<sup>12</sup>An emerging literature investigates differential markup behaviour in imperfectly competitive markets in a trade context. See, for example, Atkeson and Burstein (2008), Edmond et al. (2015), Arkolakis et al. (2019), Behrens et al. (2020), Breinlich et al. (2020), and Heid and Stähler (2024).

## References

- Anderson, J. E. (1979). A Theoretical Foundation for the Gravity Equation. *American Economic Review*, 69(1): 106–116.
- Anderson, J. E., and van Wincoop, E. (2003). Gravity with Gravitas: A Solution to the Border Puzzle. *American Economic Review*, 93(1): 170-192.
- Arkolakis, C., Costinot, A., Donaldson, D., and Rodríguez-Clare, A. (2019). The Elusive Pro-competitive Effects of Trade. *Review of Economic Studies*, 86(1): 46–80.
- Atkeson, A., and Burstein, A. (2008). Pricing-to-Market, Trade Costs, and International Relative Prices. *American Economic Review*, 98(5): 1998-2031.
- Auerbach, A., and Devereux, M. (2018). Cash-Flow Taxes in an International Setting. *American Economic Journal: Economic Policy*, 10(3): 69–94.
- Bachmann, R., Born, B., Goldfayn-Frank, O., Kocharkov, G., Luetticke, R., and Weber, M. (2021). A Temporary VAT Cut as Unconventional Fiscal Policy. NBER Working Paper 29442.
- Behrens, K, Mion, G., Murata, Y., and Südekum, J. (2020). Quantifying the Gap Between Equilibrium and Optimum under Monopolistic Competition. *Quarterly Journal of Economics*, 135(4): 2299–2360.
- Benzarti, Y., and Carloni, D. (2019). Who Really Benefits from Consumption Tax Cuts? Evidence from a Large VAT Reform in France. *American Economic Journal: Economic Policy*, 11(1): 38–63.
- Benzarti, Y., and Tazhitdinova, A. (2021). Do Value-Added Taxes Affect International Trade Flows? Evidence from 30 Years of Tax Reforms. *American Economic Journal: Economic Policy*, 13(4): 469-489.
- Bergé, L. (2018). Efficient estimation of maximum likelihood models with multiple fixed-effects: the R package FENmlm CREA Discussion Papers No. 13
- Beverelli, C., Keck, A., Larch, M., and Yotov, Y. V. (2018). Institutions, Trade and Development: A Quantitative Analysis. CESifo Working Paper 6920.
- Bohne, A., Hines Jr., J. R., Koumpias, A. M., and Tassi, A. (2024). The Effects of the Reverse Charge Mechanism on the VAT Gap. Mimeo.
- Borchert, I., Larch, M., Shikher, S., and Yotov, Y. V. (2021). The International Trade and Production Database for Estimation (ITPD-E). *International Economics*, 166: 140–166.

- Borchert, I., Larch, M., Shikher, S., and Yotov, Y. V. (2022). The International Trade and Production Database for Estimation - Release 2 (ITPD-E-R02). USITC Working Paper 2022-07-A.
- Breinlich, H., Fadinger, H., Nocke, V., and Schutz, N. (2020). Gravity with Granularity. CEPR Working Paper DP15374.
- Brockmeyer, A., Mascagni, G., Nair, V., Waseem, M., and Almunia, M. (2024). Does the Value-Added Tax Add Value? Lessons Using Administrative Data from a Diverse Set of Countries. *Journal of Economic Perspectives*, 38(1): 107–132.
- Büttner T., and Madzharova B. (2018). WTO Membership and the Shift to Consumption Taxes. *World Development*, 108: 197–218.
- Büttner T., and Madzharova B. (2021). Unit Sales and Price Effects of Pre-announced Consumption Tax Reforms: Micro-level Evidence from European VAT. *American Economic Journal: Economic Policy*, 13(3): 103–134.
- Chandra, P., and Long, C. (2013). VAT Rebates and Export Performance in China: Firm-Level Evidence. *Journal of Public Economics*, 102: 13–22.
- Chetty, R., Looney, A., and Kroft, K. (2009). Salience and Taxation: Theory and Evidence. *American Economic Review*, 99(4): 1145–1177.
- Cuadros, M. (2016). The Non-Discrimination Principle and VAT: Rules of Thumb for Trade and Tax Policy-Makers. *Global Trade and Customs Journal*, 11(2): 62–70.
- Daly, M. (2005). The WTO and Direct Taxation. WTO Discussion Paper No. 9.
- Desai, M., and Hines, J. (2005). Value-Added Taxes and International Trade: The Evidence. Working Paper.
- Doyle Jr., J. J., and Samphantharak, K. (2008). \$ 2.00 Gas! Studying the Effects of a Gas Tax Moratorium. *Journal of Public Economics*, 92(3-4): 869–884.
- Eaton, J., and Kortum, S. (2002). Technology, Geography and Trade. *Econometrica*, 70(5): 1741–1779.
- Edmond, C., Midrigan, V. and Xu, D. (2015). Competition, Markups, and the Gains from International Trade. *American Economic Review*, 105(10): 3183–3221.
- Emran, M. S., and Stiglitz, J. E. (2005). On Selective Indirect Tax Reform in Developing Countries. *Journal of Public Economics*, 89(4): 599–623.

- Feldstein, M., and Krugman, P. (1990). International Trade Effects of Value-Added Taxation. in: *Taxation in the Global Economy* (edited by Razin, A. and Slemrod, J.), 263–282, NBER.
- Fuest, C., Neumeier, F., and Stöhlker, D. (2024). The Pass-Through of Temporary VAT Rate Cuts: Evidence from German Supermarket Retail. *International Tax and Public Finance*, forthcoming.
- Grossman, G. (1980). Border Tax Adjustments: Do they Distort Trade? *Journal of International Economics*, 10(1): 117–128.
- Haufler, A., Schjelderup, G., and Stähler, F. (2005). Barriers to Trade and Imperfect Competition: The Choice of Commodity Tax Base. *International Tax and Public Finance*, 12(3): 281–300.
- Heid, B., Larch, M., and Yotov, Y. V. (2021). Estimating the Effects of Non-discriminatory Trade Policies within Structural Gravity Models. *Canadian Journal of Economics*, 54: 376–409.
- Heid, B., and Stähler, F. (2024). Structural Gravity and the Gains from Trade under Imperfect Competition: Quantifying the effects of the European Single Market. *Economic Modelling*, 131: 106604.
- Kaufmann, D., and Kraay, A. (2023). Worldwide Governance Indicators.
- Keen, M., and Lahiri, S. (1998). The Comparison between Destination and Origin Principles under Imperfect Competition. *Journal of International Economics*, 45(2): 323–350.
- Keen, M., and Syed, M. (2006). Domestic Taxes and International Trade: some Evidence. IMF Working Paper 06/47.
- Kosonen, T. (2015). More and Cheaper Haircuts after VAT Cut? On the Efficiency and Incidence of Service Sector Consumption Taxes. *Journal of Public Economics*, 131: 87–100.
- Liao, S., Kim, I.S., Miyano, S., and Zhang, H. (2020). Concordance: Product Concordance. CRAN: R package version 2.0.0.
- Morrow, P., Smart, M., and Swistak, A. (2022). VAT Compliance, Trade, and Institutions. *Journal of Public Economics*, 208: 1–16.
- Nicholson, M. (2010). Value-Added Taxes and US Trade Competitiveness. FREIT Working.
- Santos Silva, J., and Tenreyro, S. (2006). The Log of Gravity. *Review of Economics and Statistics*, 88(4): 641–658.

- Sharma, R. R. (2020). Does the VAT Tax Exports? *Economic Inquiry*, 58(1): 225–240.
- Thuncke, G. U. (2023). Are Consumers Paying the Bill? How International Tax Competition Affects Consumption Taxation. MPI for Tax Law and Public Finance Working Paper Series 2023-26.
- Yotov, Y. V., Piermartini, R., Monteiro, J., and Larch, M. (2016). An Advanced Guide to Trade Policy Analysis: The Structural Gravity Model. UNCTAD and WTO.