Department for
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BIST New Quantitative Trade Model

BIST Modelling Working Papers

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Introduction

This paper introduces and describes a New Quantitative Trade Model (NQTM), used for trade policy analysis within the Department for Business, Innovation, Science and Trade (BIST). It provides an overview of how this model operates, the theory and data used to construct it, and its key limitations. The motivation for adding this model to BIST's modelling suite is to better take advantage of recent innovations in the literature and extend BIST's existing suite of simulation models.

NQTMs are a class of models which emerged from structural gravity and exact hat algebra. They are fully micro-founded and able to run counter-factual scenario analysis, while also allow for a close connection between theory and parameter estimation. The BIST NQTM structure is the same as outlined in Caliendo and Parro (2015). In particular, the model allows for a micro-founded general equilibrium framework which can closely map trade and production data, while also being parsimonious compared to large-scale Computable General Equilibrium (CGE) models such as GTAP.

The model splits into two versions depending on the level of sector and region aggregation being used in the analysis. The first uses the Inter-Country Input-Output table created by the OECD and is referred to as the ICIO version. The second uses a simulation dataset created by the United States International Trade Commission (USITC) and is referred to as the ITPD version. Both use an identical theoretical structure, but only the ICIO version uses data on sector input-output linkages and so captures the use of output from one sector as an input into another.

Comparison between the GTAP CGE model and BIST's NQTM reveals interesting differences in capability, data, and results. Although both models broadly follow the same general structure, GTAP is significantly more complex. They conclude similar direct trade impacts but can diverge when considering welfare and third-country impacts. GTAP's additional channels tends to produce greater overall welfare effects compared to the NQTM's simpler framework.

This paper is structured in six parts. Section 1 will outline the model theory, including the basic structure and equilibrium conditions. Section 2 will describe the trade and tariff data used to produce the model, including multiple levels of aggregation. Section 3 will discuss parameter estimation, and the assumptions underpinning the trade elasticity. Section 4 will show how shocks are calculated and implemented in service sectors. Section 5 briefly discusses the general limitations of the NQTM. Finally, Section 6 will compare BIST’s NQTM to GTAP.

Section 1: Model Theory

1.1 From the Services Gravity Model to the New Quantitative Trade Model

BIST previously used a single-sector services gravity model (2021). This is upgraded and replaced by the Caliendo and Parro (2015) New Quantitative Trade Model. The new framework brings two major improvements.

1. The NQTM is a **multi-sector** general equilibrium model. Sectors are interdependent such that a shock in one has consequences for all. Total trade deficits are exogenous, unlike the services gravity model where sector level trade deficits are fixed. This more realistic structure enables richer substitutions reflecting specialisation to arise. For example, imagine an FTA which lowers the cost of trade in Rice. The NQTM will show that more rice imports to the UK where it is comparatively less competitive will be funded through exporting more in financial services where it has greater comparative advantage.

2. The NQTM incorporates **sectoral linkages** through trade in intermediate inputs. Using OECD Inter-Country Input-Output data, the model captures how a policy change in one sector cascades through supply chains to affect costs and output in downstream or upstream industries.

Together, these two improvements make the NQTM more realistic and insightful than the previous single-sector model. Crucially, the model’s design allows it to incorporate these complexities while remaining tractable. By solving the equilibrium in terms of proportional changes, the NQTM keeps data requirements manageable even as it adds multi-sector detail and inter-industry components.

1.2 Theoretical Foundations

The Caliendo and Parro (2015) model extends the Ricardian framework of Eaton and Kortum (2002) to a setting of multiple sectors, trade in intermediate goods, and input-output linkages. It is one of the most influential trade models in economics and a workhorse framework for policy analysis.

- **Gravity**: At its core it is a gravity model of international trade where bilateral trade flows are proportional to economic size and inversely proportional to trade costs.

The gravity model of trade is one of the most empirically robust and widely validated frameworks in economics, and commonly used for trade policy analysis.

- **Ricardian trade & Eaton and Kortum foundations**: The gravity relationship is derived from Eaton and Kortum (2002) micro foundations. Countries differ in productivity, and consumers and firms buy where prices are lowest. Each country's sector-level productivity is a random draw from a Fréchet distribution which creates the conditions for comparative advantage.

- **The trade elasticity reflects the underlying productivity distribution:** The trade elasticity, referred to as θ in the equations below, determines how responsive trade is to changes in cost. It is given by the underlying Fréchet productivity distribution in that sector, reflecting its dispersion parameter or equivalently its shape. The more similar productivity is across countries, the more responsive trade flows are to a trade shock, and so the greater the value of elasticity parameter.

- **Perfect competition**: Firms price their goods and services for sale at cost. Consumers and firms buy final and intermediate goods where prices are lowest after accounting for trade costs.

- **Production inputs:**

  - **Labour**: Labour endowment is fixed in each country, there is no immigration, and labour is perfectly mobile across sectors. Wages are determined at country level, and therefore all sector-level production faces the same wage costs.

  - **Composite intermediate goods**: Since production of any sector-level good can use inputs from every sector in the model, costs in one sector are dependent on the prices of materials from all sectors. This mechanism allows for shocks in one sector to ripple through the supply chain.

- **Trade shocks**: Policy influences trade through two levers: first by changing tariffs, and second by changing non-tariff measures formulated as iceberg trade-costs.

- **Outputs**: The model produces counter-factual outputs for the effects on bilateral trade flows, production, expenditure, sectoral deficits, prices, costs, and welfare.

1.3 Model Solution

The model features N countries (indexed by n and i) and J sectors (indexed by j and k). Firms produce goods in each sector at a unit cost c_i^j, and consumers in each country purchase these goods at a price p_i^j (accounting for any trade costs) in each sector j – with P_n^j denoting the overall price level (price index) for sector j in country n.

The model solves in proportional changes (exact "hat" algebra), meaning every variable is expressed as a ratio of its counterfactual x' to baseline x value, where $\hat{x} = \frac{x'}{x}$. Solving in hats cancels out unobservable baseline constants (like technology levels), making counterfactual analyses simpler and focusing attention on the observable elements that drive the results.

There are six key equilibrium equations that define the model: (i) the change in country and sector unit cost $\hat{c}_i^j$; (ii) the change in sectoral price index $\hat{P}_n^j$; (iii) the change bilateral trade shares $\hat{\pi}_{n,i}^j$; (iv) total expenditure for each country on each sector $X_n^{j'}$; (v) the trade balance condition; and finally (vi) the change in welfare $\widehat{W}_n$.

1.3.1 Cost of production and input-output linkages. –

Production of a sector level good depends on labour and material inputs costing wages w_i and the prices P_i^k. In principle a good from any sector can be used as a material input into the production of any other. The production function is Cobb-Douglas and is expressed for a product variant ω^j below, where $l_n^j(\omega^j)$ reflects the labour inputs, $m_n^{k,j}(\omega^j)$ reflect material inputs, and $z_n^j(\omega^j)$ reflects the inherent level of productivity.

$$q_n^j(\omega^j) = z_n^j(\omega^j) l_n^j(\omega^j)^{\gamma_n^j} \prod_{k=1}^{J} m_n^{k,j}(\omega^j)^{\gamma_n^{k,j}} \qquad (1)$$

The parameter γ_n^j is the share of sector j's production cost attributed to labour while $\gamma_n^{k,j}$ is the share of input costs coming from intermediates of sector k. These share parameters satisfy $\sum_{k=1}^{J} \gamma_n^{k,j} + \gamma_n^j = 1$.

Given this production system the equilibrium condition for proportional change in unit cost is given as equation (2) below:

$$\hat{c}_n^j = \hat{w}_n^{\gamma_n^j} \prod_{k=1}^{J} \left(\hat{P}_n^k\right)^{\gamma_n^{k,j}} \qquad (2)$$

Trade in intermediate goods is crucial for capturing global value chains. When the cost of producing a good increases, not only does it affect final consumers directly, it also raises costs on goods in other industries as well.

1.3.2 Prices and trade cost shocks. –

A country's sector price index is aggregated using CES. The trade elasticity θ_j is exogenous and fixed. The change in price level is show in equation (3) below:

$$\hat{P}_n^j = \left[\sum_{i=1}^{N} \pi_{ni}^j \left(\hat{c}_i^j \hat{\kappa}_{ni}^j\right)^{-\theta_j}\right]^{-1/\theta_j} \qquad (3)$$

Where trade costs κ_{ni}^j are comprised of tariffs τ_{ni}^j and iceberg trade d_{ni}^j such that $\kappa_{ni}^j = \left(1 + \tau_{ni}^j\right). d_{ni}^j$. Trade share π_{ni}^j is the proportion of expenditure on good j from exporter i for importer n.

The equation shows how the price faced by importers for a specific sector-good relies on both underlying production costs $\hat{c}_i^j$ and the costs imposed by trade frictions $\hat{\kappa}_{ni}^j$, weighted by the importance of each exporting country to the importer π_{ni}^j.

1.3.3 Change in bilateral trade shares. –

The change in market share of a given sector between two countries depends on the change in price competitiveness between a specific exporter $\hat{c}_i^j\, \hat{\kappa}_{ni}^j$ and the sector aggregate price $\hat{P}_n^j$.

$$\hat{\pi}_{n,i}^j = \left[\frac{\hat{c}_i^j\, \hat{\kappa}_{ni}^j}{\hat{P}_n^j}\right]^{-\theta^j} \qquad (4)$$

The numerator represents the price country n faces when buying from country i. Through κ_{ni}^j it accounts for both tariffs and iceberg trade costs. The denominator is the average price country n faces when buying goods from the same sector across all other countries, as shown in equation (3). In this way the direct incentive to import from a specific country is relative to costs of importing from the global market overall.

Note that equation (4) shows how the model is built around structural gravity. The relative change in the trade share is the product of an exporter-specific push factor $\hat{c}_i^j$, an importer-specific pull factor $\hat{P}_n^j$, and a bilateral trade cost factor $\hat{\kappa}_{n,i}^j$. Distance and other bilateral trade costs are accounted for through the $\hat{\kappa}_{n,i}^j$ term. GDP is netted out of the equation by expressing the relationships as trade shares, which include domestic consumption and production.

1.3.4 Total expenditure. –

Total counter-factual expenditure $X_i^{j'}$ is equal to the sum of post-shock expenditure from households and firms. This is expressed below in equation (5).

$$X_n^{j'} = \sum_{k=1}^{J} \gamma_n^{j,k} \sum_{i=1}^{N} X_i^{k'} \frac{\pi_{i,n}^{k'}}{1+\tau_{i,n}^{k'}} + \alpha_n^j I_n' \qquad (5)$$

The first term captures intermediate demand. First, it sums the value of sales from country n to all countries in each sector k to get total sectoral output. Second, it calculates as a ratio of total output how much was spent on the intermediate good j for each sector using the parameter $\gamma_n^{j,k}$. Finally, it sums across all sectors to calculate the value of good j being used in production.

The second term captures final demand. The proportion of income spent by households on sector j is α_n^j. National income consists of labour earnings, tariff revenues and the trade deficit which is equivalent to the difference in total imports and total exports.

1.3.5 Trade balance and general equilibrium. –

Markets clear such that each country's total expenditure must equal their total output plus the trade deficit. Anything produced by a country must be either sold domestically or exported. In equilibrium, a country's total imports minus total exports equals its exogenous trade deficit D_n.

$$\sum_{j=1}^{J}\sum_{i=1}^{N} X_n^{j\prime} \frac{\pi_{n,i}^{j\ \prime}}{1+\tau_{n,i}^{j\ \prime}} = \sum_{j=1}^{J}\sum_{i=1}^{N} X_i^{j} \frac{\pi_{i,n}^{j\ \prime}}{1+\tau_{i,n}^{j\ \prime}} + D_n \qquad (6)$$

The left-hand side term reflects the total amount of expenditure for country n across all sectors and from all suppliers. The right-hand side term reflects the total amount of production for country n as the sum of sales to all countries across all sectors, and the trade deficit.

1.3.6 Welfare. –

Welfare is captured as the additional income the average consumer would need to achieve the counterfactual utility at baseline prices.

$$\widehat{W}_n = \frac{\hat{I}_n}{\hat{P}_n} \qquad (7)$$

It is defined as nominal income $\hat{I}_n$ deflated by the change in the final consumption price index $\hat{P}_n$.

Section 2: Data

Three key elements are used to construct the model:

1. **Trade Data**: information on bilateral flows between countries in different sectors.
2. **Production Network Data**: information on the intermediate and final demand across countries and sectors.
3. **Tariff Data**: information on the average tariff applied to goods trade between different countries in different sectors.

The model is built to allow for different levels of sector aggregation. This means multiple data sources are used for each key element, as shown in Table 2.1.

Table 2.1: data sources

Level of Sector Aggregation	Trade Data	Production Network Data	Tariff Data
Broad *(basic version)*	OECD – Inter-Country Input-Output tables (ICIO)	OECD – Inter-Country Input-Output tables (ICIO)	Global Tariff Database (GTD) – Teti (2024)
Disaggregated *("no materials" version)*	USITC – International Trade and Production Database for Simulation (ITPD-S)	Assumed	CEPII – Market Access Map HS6 (MAcMap)

The sections below describe the datasets used by the model for analysis at each level of aggregation. All data used is publicly available, and links are provided in the references below. Due to data availability, it is not possible to use production sector links in the analysis of more disaggregated sectors.

2.1 Datasets used for Aggregated Sectors

OECD's Inter-Country Input-Output tables (ICIO) are the main source of data in the aggregated model. These show both the value of goods and services traded between each country in each sector, and how these are then used in the production and consumption of other goods or services.

It covers 76 regions (including all OECD and G20 countries, plus key emerging and developing economies), and 45 industries/sectors, based on the ISIC Rev. 4 classification. The dataset is used to construct Intermediate Consumption, Final Consumption, Value Added, Bilateral Trade, and Deficits input tables for the ICIO NQTM.

The **Global Tariff Database** is used to calculate the average tariff rate applying to each bilateral flow in the ICIO data. It was collated by Fedora Teti (2024) and represents the most recent methodology for estimating tariffs.

It consists of bilateral statutory tariff rates for 200 importers and their partners, spanning 34 years (1988–2021). It includes both MFN and preferential tariffs and is based on HS6-level tariff rates (HS88/92 Nomenclature), covering over 6.9 billion observations. The model uses the unweighted average bilateral tariff variable for complete coverage of all regions used in the simulation.

Although constructed from HS6-level codes, the data is provided in ISIC Rev. 3 and is converted to ISIC Rev. 4 to match the OECD data.

2.2 Datasets used for Disaggregated Sectors

The main source of data for disaggregated sectors is the **International Trade and Production Database for Simulation (ITPD-S).** This is collated by the United States International Trade Commission (USITC) and cleaned specifically for use in simulation modelling. It reflects bilateral trade only and unlike the OECD data above does not supply information on the global production network.

It provides a complete matrix of trade flows across 170 sectors and 265 regions, including non-UN member states such as the Vatican. Where data is missing from the original data source, it is imputed by using appropriate gravity-based methodology. For example, for the year 2019 there are around 36k imputed trade flows from a total of over 10m (Borchert et al, 2024).

There is no available data on intermediate use, value added, or final consumption that can comprehensively supply production links for sectors at this level of aggregation. For this reason, the model ‘switches off’ sector production linkages when running scenario analysis. This is equivalent to assuming no materials are used in the production of goods and services, or equivalently that labour is the single production input. All values used in the model are made to be consistent with the underlying ITPD-S trade data, and sector level deficits remain endogenous.

Tariffs are taken at HS6 level from **Market Access Map Data (MAcMap)** collated by CEPII and concorded to ITPDS level. These are used to calculate the existing policy tariff for each bilateral trade flow in the model.

Note that the GTD is not publicly available at HS6 level and therefore cannot be used for analysis of disaggregated sectors. This means there are methodological differences in baseline tariff estimates at different levels of aggregation.

2.3 Key Assumptions

The baseline year of the model is set to 2019. This is the most recent year that exists in all available datasets and is selected to make the data consistent both within and between levels of aggregation.

Average tariffs are calculated as the arithmetic mean of their sub-sectors. The choice when aggregating HS6 product level tariffs to sector level is between weighted average and arithmetic mean. Although the weighted tariff is a more literal reflection of money paid for goods transacted, since high tariff goods are both reported and traded less, it suffers from a crucial endogeneity issue. The arithmetic mean is selected both to mitigate this problem, and as a better reflection for how policy shocks are calculated during live trade negotiations.

Tariffs for select regions in the disaggregated version are imputed by grouping them together into ‘rest-of-world’. Since the model source datasets are produced and cleaned at length by global institutions, missing data has already been mostly addressed. However, the MAcMAP tariff data does not perfectly cover regions found in the ITPD-S. Bilateral flows with missing tariff data account for 1.5% of total trade in the ITPD version.

This is dealt with by grouping into rest-of-world and assigning the average sector tariff. The total number of regions in the model is cut from 265 to 153.

Section 3: Parameter Estimates

The key exogenous parameters used by the model are the sectoral trade elasticities know as θ^j and described above. In principle, the true parameters are estimated rather than observed. There are many different approaches used across the literature. Since service sectors don't apply tariffs, identification is generally much harder than in goods sectors.

BIST's NQTM draws parameters from an actively updated evidence base. The parameters presented here are selected from the literature and are current as of June 2026. However, these estimates may be replaced in the future as new research becomes available. Furthermore, BIST modellers may choose to assign different parameters depending on the circumstances of the policy change being simulated, and the availability of additional qualitative evidence. The current best estimates for the θ parameters are given as follows:

1. Goods sectors use estimates from Fontagné, Guimbard, and Orefice (2022).
2. Service sectors draw primarily from a new working paper from the USITC; approximately matching elasticities to the relevant sectors at ITPDE level (Ahmad and Schreiber, 2024).
3. Service sectors not in the USITC research set θ to a central value of 5 after surveying the literature.

3.1 Goods Sectors

Fontagné, Guimbard, and Orefice (2022) use the following structural gravity specification to regress bilateral trade on tariffs, across HS6 products.

$$x_{i,j,k,t} = \exp\left[\chi_{i,k,t} + \chi_{j,k,t} + \beta_k \ln\left(1 + \tau_{i,j,k,t}\right) + \gamma_k \ln d_{i,j} + \xi_k Z_{i,j}\right] \times \epsilon_{i,j,k,t}$$

The regression is estimated separately for each product. The subscript i refers to the exporter, j to the importer, k to the HS6 product, and t to the year. χ_i and χ_j represent the set of exporter-time and importer-time fixed effects. The bilateral ad-valorum tariff rate is τ and d is the distance between countries. Z is a vector of controls which vary by bilateral pair, which always include dummies for common language, a common border, and a historical colonial relationship. Finally, ϵ represent the error term.

The underlying theoretical framework draws from Armington with CES utility and one-tier of demand, which allows for each HS6 parameter to be fit separately. The key parameter recovered is β_k which is transformed into the Armington trade elasticity as $\beta_k + 1$. By pooling years together, the design exploits both cross-sectional and within country-pair variation.

Both tariffs and trade data are collated by CEPII. Information on trade at HS6 level is taken from the BACI database, and information on tariffs is taken from MAcMAP. Regressions include the years 2001, 2004, 2007, 2010, 2013 and 2016. They regress across 159 exporters to 152 destinations.

They report HS6 level product estimates at the 1% level of statistical significance, replace insignificant estimates by zero, and drop the 1.9% of coefficients which are both positive and significant. The resulting mean trade elasticity is 5.3.

To recover sector level estimates they pool HS6 products together, keeping product-level fixed effects, but fitting a common trade elasticity parameter. The following gives the adapted specification for ICIO level sectors.

$$x_{i,j,HS6,t}^{ICIO} = \exp\left[\chi_{i,HS6,t} + \chi_{j,HS6,t} + \beta_k^{ICIO}.\ln\left(1+\tau_{i,j,HS6,t}\right) + \gamma_k^{ICIO}.\ln d_{i,j} + \xi_k^{ICIO}.Z_{i,j}\right] \times \epsilon_{i,j,HS6,t}$$

Since there is a total 5,050 HS6 sectors, each sector regression has enough power to estimate a statistically significant effect in all but two sectors: “R&D and Other Business Activities”, and “Electricity, Gas and Water Supply”. The mean elasticity recovered across all significant sectors is 6.

The NQTM model takes the ICIO level elasticities as given and applies the relevant concordance to HS6 level estimates to attain an average at the more disaggregated ITPD sector level.

3.2 Service Sectors

The selection of the θ parameters for services sectors reflects the inability to repeat the sort of methodology outlined in Fontagné, Guimbard and Orefice (2022) without tariffs. In the context of services, the trade elasticity is a theoretical construct that coverts the idiosyncratic impact on trade of a non-tariff factor to its ad-valorum equivalent.

A default estimate of 5 is assigned to all service sectors in the model. This follows a general reading of the literature as the most plausible average. For example, in Head and Mayer's (2013) 'Gravity equations: Workhorse, Toolkit, and Cookbook' they conclude "*overall, our preferred estimate for [the trade elasticity] is −5.03, the median coefficient obtained using tariff variation, while controlling for multilateral resistance terms*" (p.38).

Establishing this default value, elasticities are then adjusted using new research by Ahmad and Schreiber (2024), who provide Armington elasticity estimates for several disaggregated U.S. services sectors. Their approach relies on the theoretical relationship that exists between the elasticity and profit margins under monopolistic competition.

Under the assumptions that sectors are segmented, homogeneous firms sell idiosyncratic varieties, and firms have a constant marginal cost, the relationship relating revenue to the trade elasticity is given below:

$$\pi_i = \frac{R_i}{\sigma_s} - F_i$$

The sector-level Armington elasticity is notated as σ_s, profits for firm i are notated as π_i, revenue is R_i and fixed costs are F_i. These firm level ratios are aggregated and re-arranged to produce the following actionable identity.

$$\sigma_s = \frac{Revnues_s}{Operating\ Profits_s}$$

They estimate sector Armington elasticities for services using annual industry data from the BEA for the time period 2003-2022. NAICS sectors are then concorded to GTAP sectors, from which they directly estimate the services Armington elasticities.

The Armington elasticity and the NQTM trade elasticity are related through the identity $\theta = (\sigma - 1)$. These elasticities are aggregated and applied intuitively to the NQTM model, in both the ICIO and ITPD version. For example, Table 3.1 shows the decision made for the ITPD model:

Table 3.1: services sector trade elasticities in the ITPD NQTM

Sector	Decision	Assumed Trade Elasticity
Manufacturing services on physical inputs	Default	5.0
Maintenance and repair services n.i.e.	Default	5.0
Transport	Ahmad and Schreiber	4.8
Travel	Ahmad and Schreiber	6.4
Construction	Ahmad and Schreiber	4.4
Insurance and pension services	Ahmad and Schreiber	3.1
Financial services	Ahmad and Schreiber	4.3
Charges for use of intellectual property	Default	5.0
Telecom, computer, information services	Ahmad and Schreiber	1.9
Other business services	Ahmad and Schreiber	3.8
Heritage and recreational services	Ahmad and Schreiber	4.8
Health services	Ahmad and Schreiber	8.7
Education services	Ahmad and Schreiber	7.2
Government goods and services n.i.e.	Default	5.0
Services not allocated	Default	5.0
Trade-related services	Ahmad and Schreiber	17.3
Other personal services	Default	5.0

Section 4: Implementing Service Shocks

Shocks to services trade are modelled via changes in *iceberg trade costs*. These capture trade frictions that are not directly reflected in tariff rates, such as regulatory compliance costs, border inspections, administrative burdens, and losses incurred during transport. The term “iceberg” reflects the assumption that a proportion of the good’s value is effectively lost in transit, analogous to how an iceberg melts as it moves.

The impact of a Free Trade Agreement on iceberg trade costs for services sectors is indirectly measured using the OECD’s Services Trade Restrictiveness Index (STRI). This is a composite measure that quantifies barriers to trade in services across countries and sectors, built from a comprehensive regulatory database. It is converted into an iceberg trade cost shock in two parts:

i) **Interpreting the negotiated terms of an FTA into a change in the STRI.**

ii) **Converting the change in STRI into a change to iceberg trade costs to be applied in the model.**

4.1 Calculating the STRI

Each negotiated FTA is converted into a change in STRI score that reflects the degree of trade liberalisation, with the resulting shocks applied to each affected importer–exporter–sector pairing. The estimate is a matter of understanding the terms and text of the FTA and making a judgement on how these will interact with the different channels described in the STRI methodology.

The key assumption determining this is how to capture FTA provisions which lock in existing market access, rather than extend it. Countries typically use a more liberal applied services regime than their formal multilateral commitment. The gap between what is happening in practice and the minimum obligation is known as “water”. The wider the gap, the greater the freedom the country has to change their applied regime, and the greater the risk posed to exporters. This uncertainty in turn lowers incentives to export. Hence even though FTAs may not liberalise further in practice, they can still have a meaningful effect by locking-in regimes at the bilateral level.

A growing body of evidence consistently finds that binding commitments lead to increased services trade. The USITC notes that “the literature suggests the estimates should be about 50 percent of the impact of the policies they prevent” (USITC, 2019). The most relevant and recent studies are summarised in Table 4.1. These use similar methodologies to combine measures of binding commitments and econometric gravity modelling.

Table 4.1: Summary of Literature on Services Trade and Applied Liberalisation

Authors	Year	Estimated impact of binding commitments (as a % of equivalent applied liberalisation)
Ciuriak and Lysenko	2016	50%
OECD (Lamprecht and Miroudot)	2018	33% to 50%
Ciuriak, Dadkhah, and Lysenko	2019	42%

Note that there are a range of estimates for this. Following Ciuriak’s, Dadkhah’s, and Lysenko, a 42% scaling factor is used to translate the impact of the FTA onto the STRI (2019). This is the same approach used in BIST’s published Scoping Assessments, Impact Assessments, and internal analysis to support negotiations. For a further example, see the ‘Impact assessment of the Free Trade Agreement between the United Kingdom and India’ (2025).

This figure was chosen because:

1. It is sourced from the most recent paper in the literature which uses the latest empirical methods;
2. It is near to the mid-point of estimates from the three papers in the table above; and
3. It is a more conservative approach than using a 50% scaling factor.

The approach we use is different to those used by other agencies. For example, the USITC use the arbitrary scaling assumptions 0% (low), 25% (medium) and 50% (high) in their assessment of the US-Mexico-Canada trade agreement for the impact of binding commitments relative to applied liberalisations (USITC, 2019).

4.2 Calculating the Impact on Iceberg Trade Costs

The conversion of an STRI shock to an iceberg trade costs shock used in the model is described below:

$$\%\Delta d = e^{-\frac{\beta}{\theta}.stri\_shock} - 1$$

The percentage change in d is the shock implemented in when running the scenario. The two structural parameters are: β which represent the semi-elasticity of trade with respect to the STRI; and θ which represents the elasticity of trade with respect to all trade costs.

While the θ parameter is intrinsic to the model as described above, the sector-level β parameters are estimated directly as described in BIST's 2021 Services Trade Model Working Paper.

For each sector the analysis runs a Pseudo-Poisson-Maximum-Likelihood regression with importer ($\chi_{j,t}$) and exporter ($\pi_{i,t}$) fixed effects. This takes the form below where $x_{i,j}$ denotes exports from country i to country j.

$$x_{i,j,t} = \exp\left[\alpha_1.\ln\left(DIST_{i,j}\right) + \alpha_2.CNTG_{i,j} + \alpha_3.CLN_{i,j} + \alpha_4.LANG_{i,j} + +\alpha_5.COMLEG_{i,j} + \alpha_6.intl_{i,j} + \boldsymbol{\beta.STRI_{i,j,t}} * intl_{i,j} + \pi_{i,t} + \chi_{j,t}\right].e_{i,j,t}$$

The gravity variables distance, contiguous borders, past colonial relationship, common official language, and common legal framework are denoted by $DIST$, $CNTG$, CLN, $LANG$, and $COMLEG$ respectively. The variable $intl$ is a dummy denoting international trade, where $STRI_{i,j,t} * intl_{i,j}$ varies bilaterally as a way to identify β.

The results for traded services sectors are given in table 4.2 for ICIO level sectors, and 4.3 for ITPD level sectors.

Table 4.2: ICIO Beta Parameter Estimates

ICIO Sector	Beta Estimate	Standard Error
Air transport	-1.7***	0.5
Computer programming, consultancy and information services activities	-4.0***	0.9
Construction	-8.5***	0.8
Financial and insurance activities	-6.2***	0.9
Land transport and transport via pipelines	-3.8***	0.4
Postal and courier activities	-5.5***	0.7
Professional, scientific and technical activities	-2.3***	0.5
Publishing, audiovisual and broadcasting activities	-3.7***	0.7
Telecommunications	-2.8***	0.6
Total services (incl. construction)	-3.7***	0.4
Warehousing and support activities for transportation	-3.4***	0.5
Water transport	-3.8***	0.8

****Significant at the 0.1% level*

Table 4.3: ITPD Beta Parameter Estimates

ITPD Sector	Beta Estimate	Standard Error
Construction	-8.3***	1.4
Financial services	-3.8***	1.0
Insurance and pension services	-3.9***	1.1
Other business services	-3.0***	0.6

Telecommunications, computer, and information services	-4.0***	0.8
Trade-related services	-12.5***	2.4
Transport	-3.3***	0.7

****Significant at the 0.1% level*

When applying the model to a policy scenario, upper and lower bounds are calculated using the estimated standard error from the regression to reflect the 95% confidence interval. Reported ranges reflect inherent empirical uncertainty about how trade flows react to trade costs.

Section 5: Limitations

This model reflects an abstract view of the global economy representing best practice in economic theory. It is a representation of the world which assumes the relationship between variables as described by the theory above, and necessarily conditions on historical economic data.

The model is static in that it keeps all factors other than those being shocked constant. It cannot describe the pathway by which the economy moves to a new equilibrium or account for how future changes in underlying variables will impact the economy. Scenario analysis reflects impacts from only the specific channels described; it is not a forecast, projection, or prediction of the future.

The model does not account for impacts on savings or investment. It also does not consider the impact of FTAs on migration. The model cannot be used to identify trade enhancing effects from individual services provisions in a trade deal but instead relies on the STRI as an aggregate statistic.

The reported impacts are generated by changing trade costs only. The model does not seek to reflect impacts from other aspects of the FTA, or from broader spillover effects such as changing market-place competition, etc.

Many of these limitations are inherent to both the task of modelling in general and macroeconomic trade modelling in particular. However, some are specific to the choice of model structure. The following section describes in more detail how this model compares to BIST’s other large General Equilibrium trade model known as GTAP.

Section 6: Comparing BIST’s NQTM to GTAP

One of the models BIST often uses to simulate trade policy scenarios is the Global Trade Analysis Project (GTAP) Computable General Equilibrium (CGE) model. This section compares the NQTM to the standard GTAP model. For more information on GTAP, see the GTAP v7 documentation (Corong, Hertel et al., 2017).

6.1 Theoretical Comparison

As discussed in Section 1, the equations defining the NQTM come from Caliendo and Parro (2015). Bekkers (2017) argues this is a special case of a CGE model. He highlights a number of theoretical differences between the NQTM and GTAP. These are summarised in Table 6.1.

Table 6.1: GTAP vs NQTM overview

Feature	GTAP	NQTM
Household preferences	Non-homothetic	Homothetic
Allocation of consumer income	Split between private consumption, government consumption, and savings	A single “consumption” variable
Region import shares	Differentiates between private households, government, and firms	Has a single share for each region
Factors of production	Various types of labour, capital, land, natural resources	One aggregate factor of production
Factor mobility across sectors	Factors can be mobile, “sluggish”, or fixed	Factor is perfectly mobile
Firm production technology	Nested CES with customisable elasticities	Cobb-Douglas
Savings and investment	Included	Excluded

Country trade deficit	Endogenous	Exogenous
Taxes	Tariffs and various others	Tariffs only
Transport margin sector	Included	Excluded

6.1.1 Factors of production. –

GTAP includes various types of labour, capital, land, and natural resources. In contrast, the NQTM has a single factor of production referred to as "labour", and a "wage" variable.

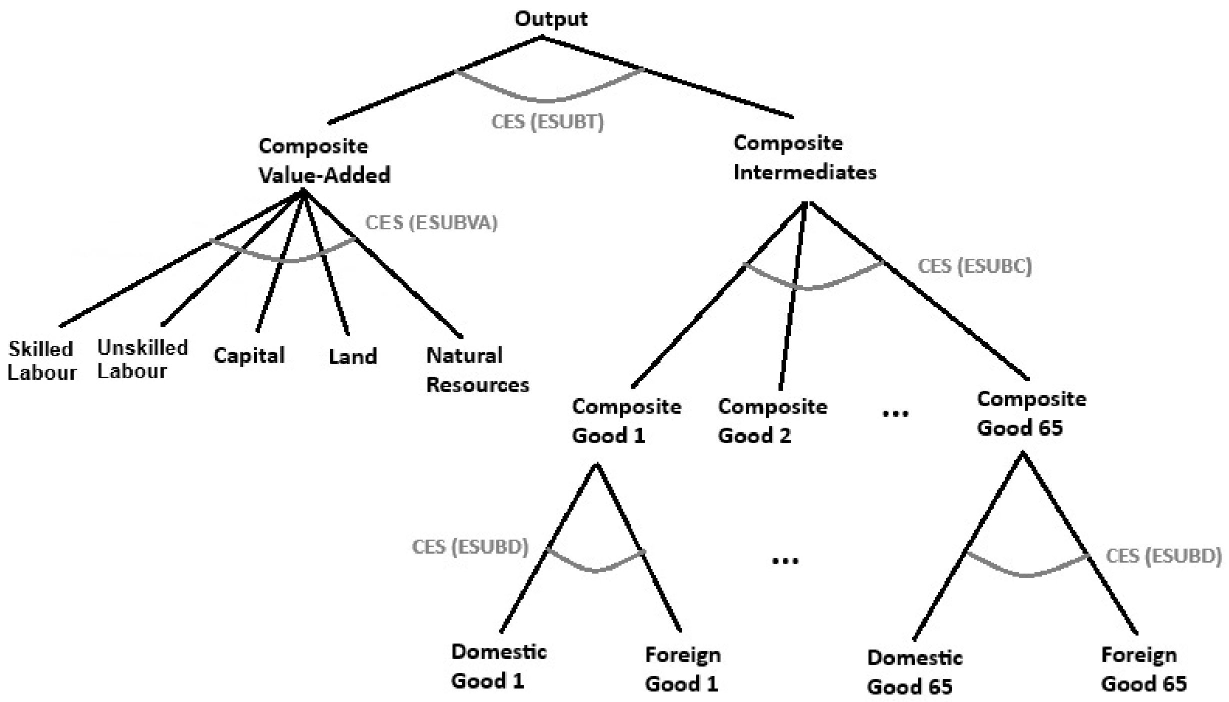
However, the ICIO NQTM baseline data uses the "Value Added" row of the ICIO table. This includes labour, capital, and taxes less subsidies on production. For the ITPD NQTM, BIST assumes that the factor of production is the only input, so factor use is equal to output.

Furthermore, GTAP allows the user to decide which factors are mobile across sectors, which factors are fixed, and which are "sluggish" or partially mobile. In the NQTM, the factor of production is always perfectly mobile across sectors.

6.1.2 Production function. –

The NQTM assumes a Cobb-Douglas production function; see Equation (1) in Section 1. This implies that firms spend a constant share of their revenue on each input including the factor of production. In contrast, GTAP uses a nested CES production function, where firms substitute between different groups of inputs to make composites, then substitute between these composites. The production function in the standard GTAP model is illustrated in Figure 6.1:

Figure 6.1: the GTAP nested CES production function



This allows the user to specify how easily firms can substitute between different factors of production (ESUBVA), or between different intermediate inputs (ESUBC), or between value-added and intermediate inputs (ESUBT). This cannot be done in the NQTM. Setting all these elasticities to 1 gives a Cobb-Douglas production function.

There is a nest for substituting between domestic goods and composite foreign goods, and then a separate nest where foreign goods are sourced from other countries using the Armington elasticity. This differs from the NQTM, where goods from all countries, including domestic, are aggregated into composite goods, which then feed into the Cobb-Douglas production function.

6.1.3 Savings, investment, trade deficits, and international capital flows. –

Consumers in GTAP allocate some of their income to savings. These savings go to a fictional global bank, which then invests them across the world to maximise returns. However, the model distinguishes between exogenous beginning-of-period capital stock used in production, and end-of-period capital stock which is endogenously determined by investment and depreciation and not used in production. Therefore, more saving does not lead to increased production via increased capital stock.

The fictional global bank means that GTAP has endogenous international capital flows, and therefore endogenous country trade deficits. In contrast, in the NQTM all income is consumed in the current period, there is no saving or investment, and country trade deficits are exogenous.

6.1.4 Taxes. –

In the NQTM tariffs are the only explicit source of tax revenue. In GTAP, there are tariffs and export taxes/subsidies. There are also taxes/subsidies on production and on purchases of commodities and factors. This means policies such as production subsidies can be easily modelled in GTAP but not in the NQTM.

It also means that the NQTM data cannot be used to replicate 2019 GDP figures; this point is discussed further in the “Data comparison” subsection.

6.1.5 The transport margin sector in GTAP. –

In GTAP, all trade flows create demand for the global “transport margin” sector. The transport margin sector buys transportation services (sectors Air Transport, Water Transport, and Other Transport) from all countries.

Therefore, an increase in global trade will increase production of the UK’s transportation services sectors, which is equal to domestic demand + exports to other countries + exports to the global transport margin sector.

This mechanism does not exist in the NQTM. Global trade can increase with no increase in total production of transportation services.

6.2 Data Comparison

The differences between the NQTM databases and the GTAP database are summarised in Table 6.2:

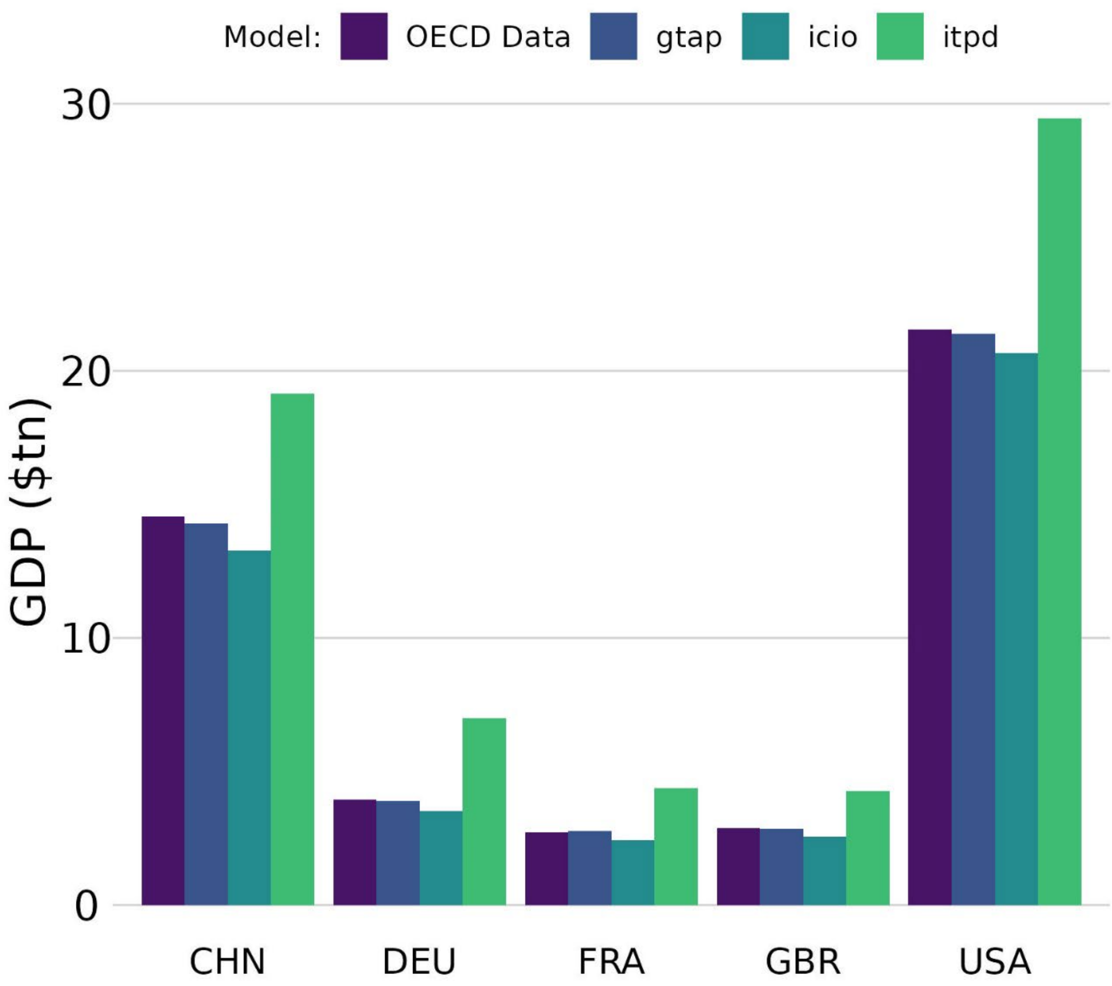
Table 6.2: NQTM and GTAP data comparison

Database	Ref. Year	Input-Output Data?	Sectors	Regions	*Replicates Accurate GDP at Market Price?*
GTAP 12	2023	Yes	65	163	Yes
ICIO NQTM	2019	Yes	45	76	No
ITPD NQTM	2019	No	170	153	No

One key difference between the GTAP database and the NQTM databases is that the GTAP database can be used to closely replicate OECD GDP figures. In contrast, the ICIO NQTM omits net taxes on products, and therefore by construction does not reflect GDP at market prices. Additionally, since the ITPD NQTM lacks input-output linkages it cannot subtract intermediate consumption from gross output and therefore does not reflect GDP.

Figure 6.2 compares the NQTM with both ICIO and ITPD data, to 2019 GTAP data and 2019 OECD data.

Figure 6.2: baseline GDP calculations with GTAP and NQTM databases, compared to OECD data



6.3 Results Comparison

Graphs are presented for illustration only. The scenarios show the difference between models and do not represent live policy options or discussion. Countries in the graphs are anonymised

This section presents results from a scenario in which Country X applies a 50% tariff on UK pharmaceutical exports. This sector was chosen because it has significant trade flows and is included as its own sector in GTAP and both the ICIO NQTM and ITPD NQTM.

In order to align the base year, the GTAP simulations use version 12p2 of the GTAP database as this shares the same reference year as the NQTM.

There are two broad sources of potential differences in results: (i) differences in the data; and (ii) differences in the model equations. To help separate these mechanisms, a third NQTM model using GTAP 12p2 data is also presented, and trade elasticities use the conversion θ = ESUBM - 1.

6.3.1 Trade results. –

Figure 6.3: change in real exports of pharmaceuticals from UK to Country X

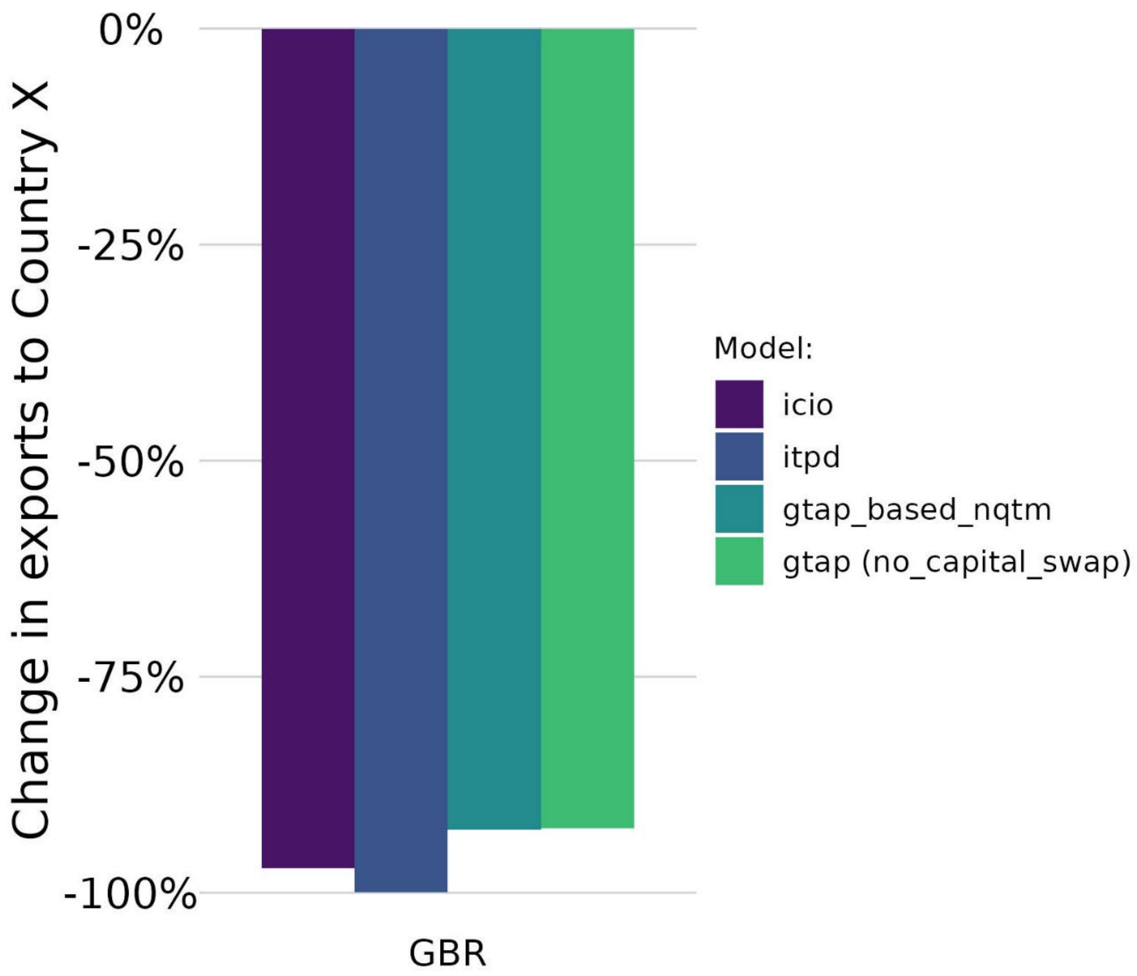
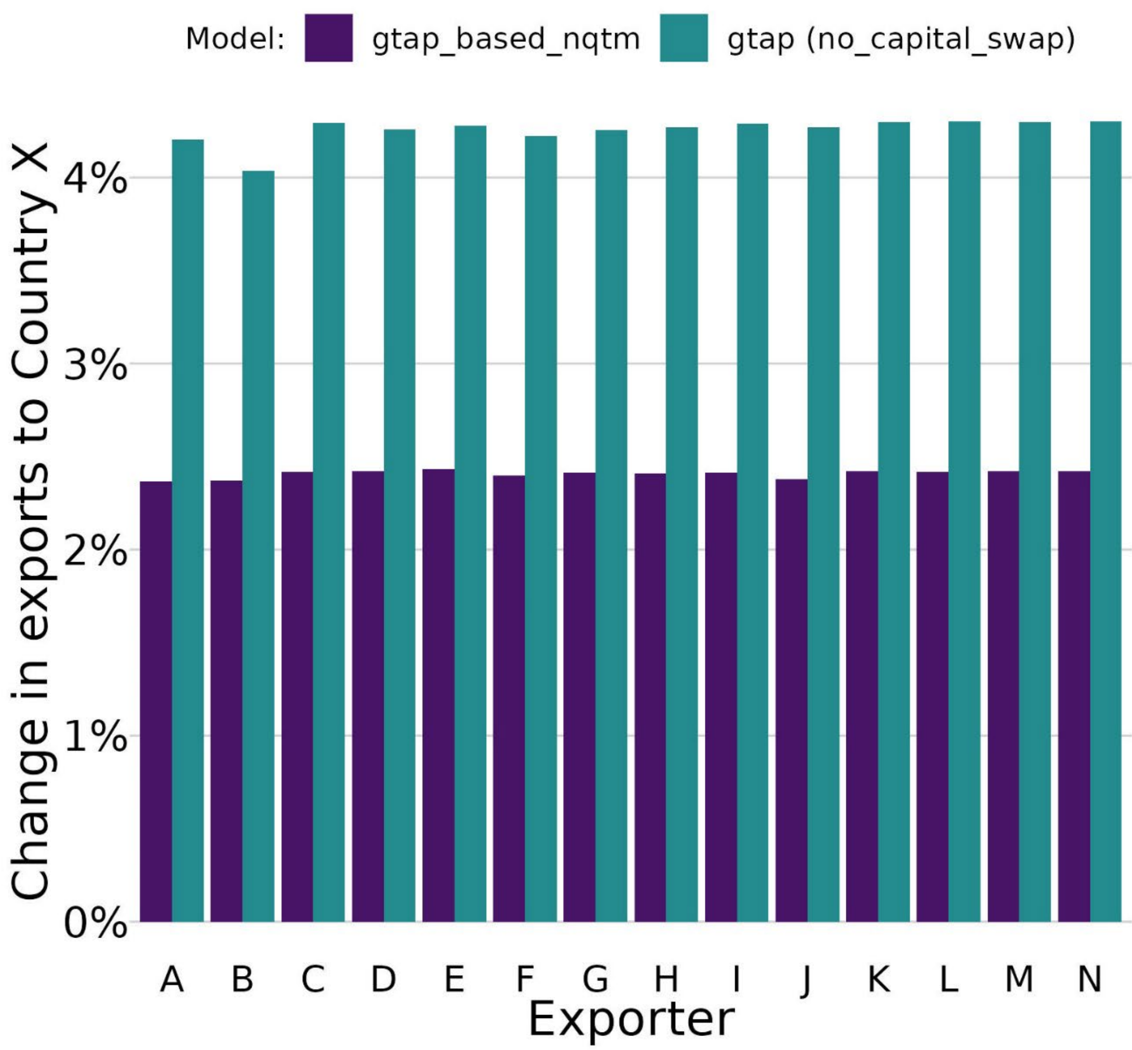


Figure 6.3 shows the impact on UK exports of pharmaceuticals to Country X. The impact is slightly bigger in the ICIO NQTM and ITPD NQTM than in GTAP, but this difference disappears when the NQTM is run using GTAP data. This means that the difference is due to baseline data and elasticities, rather than the model equations.

However, the third-party results are very different. Figure 6.4 shows the change in real-terms exports of pharmaceuticals from countries other than the UK to Country X. There is a much bigger increase in GTAP than in the GTAP-based NQTM, even though the same data and elasticities are used. This suggests that something about the structure of the NQTM leads to a smaller increase in pharmaceuticals exports from third countries to Country X.

Figure 6.4: real change in exports to Country X



The decrease in Country X’s total imports of pharmaceuticals is much bigger in the GTAP-based NQTM than in GTAP. It is not clear why this happens. This result appears to be robust to using a Cobb-Douglas production function in GTAP and making trade deficits exogenous.

6.3.2 Welfare results. –

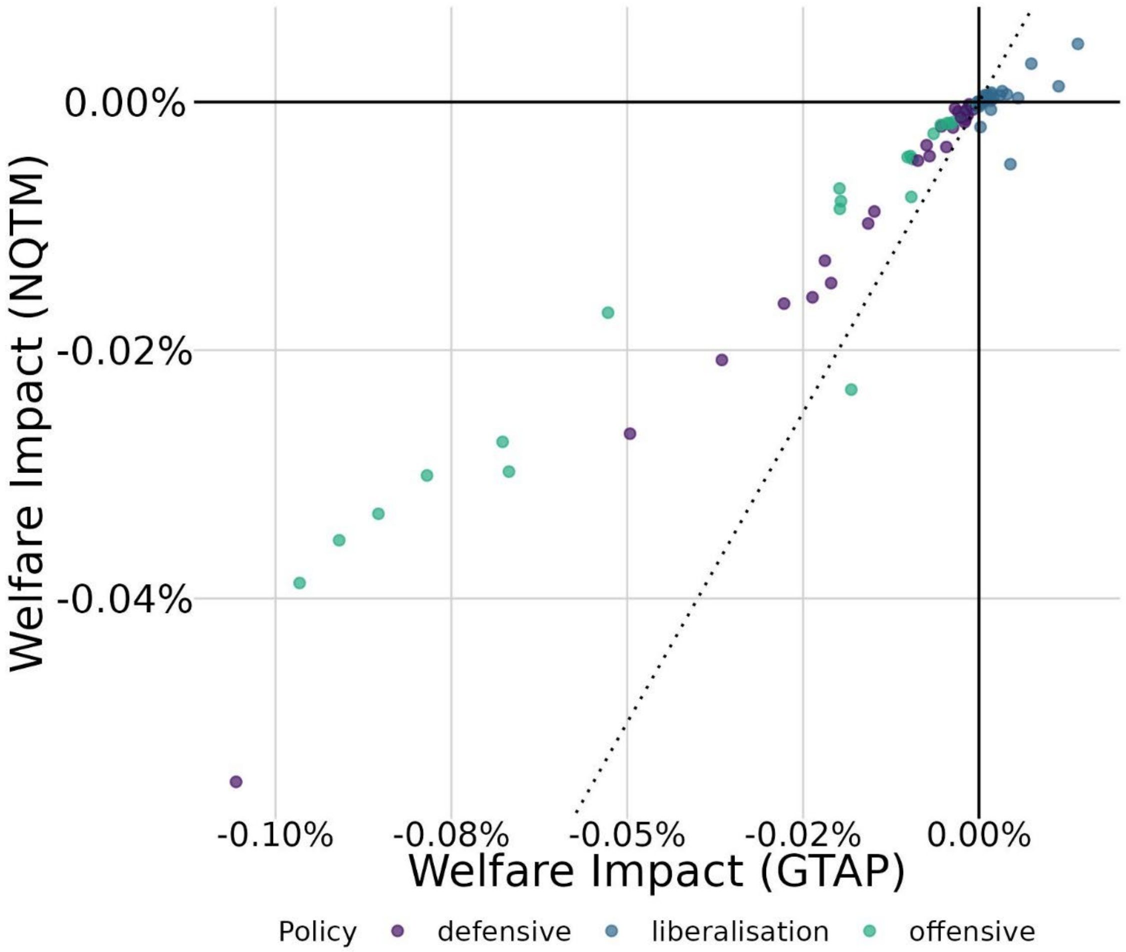
In both GTAP and the NQTM, welfare is measured as equivalent variation; see Equation (6) in Section 1. There is a pre-shock baseline equilibrium and a post-shock counterfactual equilibrium each with their own prices, consumer income, and level of utility. Equivalent variation is the additional income the consumer would need to achieve the counterfactual utility at the baseline prices. It is sometimes referred to as “real income”.

In the NQTM and in GTAP, the welfare impact as a percentage of initial income is also equal to the percentage change in the value of the utility function.

Although the NQTM and GTAP use the same definition of welfare, welfare results tend to be larger in GTAP. Figure 6.5 shows results from a welfare testing exercise. For each GTAP goods sector there is an “offensive” scenario where Country X puts a 50% tariff on UK exports, a “defensive” scenario where the UK puts a 50% tariff on Country X’s exports, and a “liberalisation” scenario where UK tariffs on Country X exports and Country X tariffs on UK exports both go to zero.

These scenarios were modelled in GTAP and a version of the NQTM that uses GTAP data, so differences in welfare impact are entirely driven by differences in model structure.

Figure 6.5: UK welfare impacts from UK-Country X simulations



The impact on UK welfare suggested by the GTAP model is on the x-axis, and the impact suggested by the NQTM is on the y-axis. The dotted line is at 45 degrees and represents parity across models. The offensive and defensive scenarios almost always lead to welfare losses in both models, and this welfare loss is almost always bigger in GTAP.

Although liberalisation scenarios tend to lead to welfare gains there are some exceptions, particularly when using the NQTM. Liberalisation scenarios are almost all below the line, meaning that like above the welfare gain in GTAP is greater than the welfare gain in the NQTM.

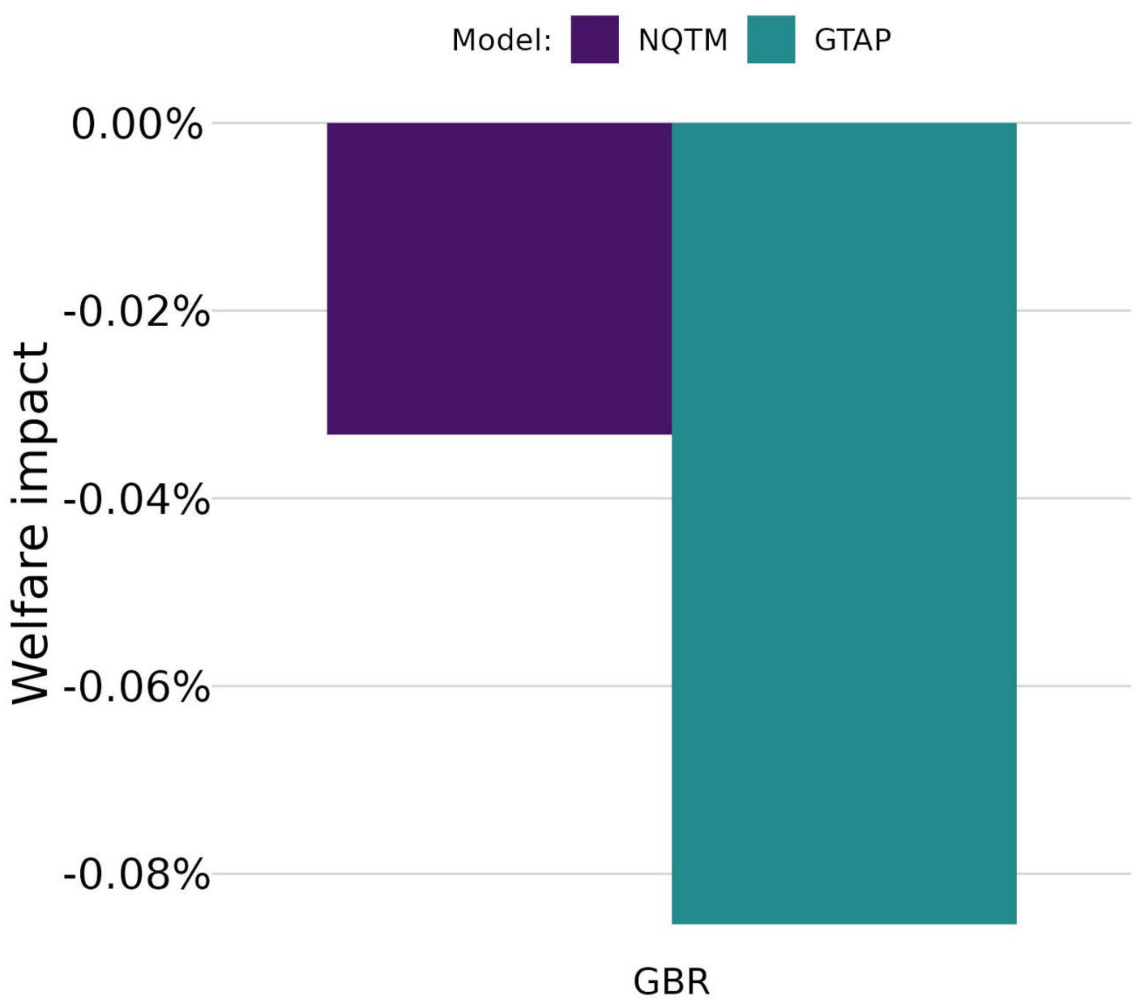
In summary the GTAP model structure systematically produces larger welfare impacts than the NQTM model, even when the same data and trade elasticities are used.

6.3.3 Explaining why GTAP reports greater welfare impacts than the NQTM. –

This section explores why GTAP reports greater welfare impacts than the NQTM using the pharmaceuticals scenario as an illustration.

Figure 6.6 shows the welfare impact in the GTAP model is around twice as big as the welfare impact in the GTAP-based NQTM. Since these models have very similar baseline data, the difference is mostly driven by differences in the model equations.

Figure 6.6: welfare impact of 50% tariff on UK pharmaceutical exports to Country X



There are many features of GTAP that could lead to larger welfare impacts:

1. GTAP models domestic taxes explicitly. This could mean that a reduction in UK pharmaceuticals production leads to a loss of tax revenue on top of the loss of value added captured by the NQTM.
2. Imperfect factor mobility between sectors in GTAP may mean the economy is less able to adjust to a negative shock
3. The nested CES structure of the GTAP production function might make the economy less adaptable. Consider Figure 6.1 and note that by default, ESUBT is zero. This means firms combine the composite value-added with the composite intermediate input in fixed proportions

These causes can be eliminated by setting UK domestic taxes to 0 in the baseline, assuming all factors are perfectly mobile, and setting all production elasticities to 1 collapsing the structure to a Cobb-Douglas production function.

Figure 6.7 shows what happens when this adjusted GTAP model is used to run the pharmaceuticals scenario, and its baseline data is used to run the NQTM. Although the welfare impact in GTAP is smaller than in Figure 6.6, the gap between GTAP and the NQTM is bigger. This suggests these causes are not responsible for the overall difference.

Figure 6.7: welfare impact in adjusted GTAP and NQTM

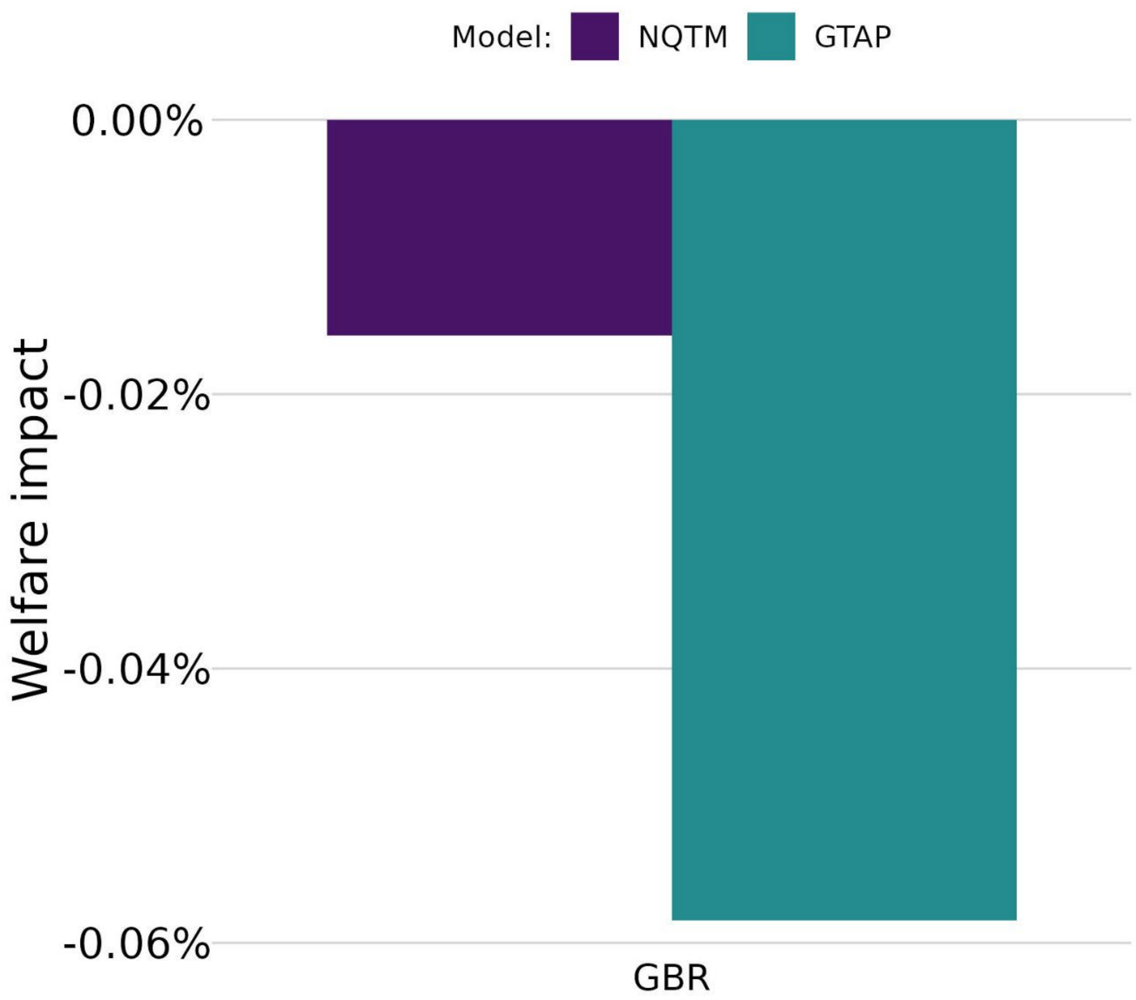


Figure 6.8 includes an additional scenario where the adjusted GTAP model is run with no international capital flows and an exogenous UK trade balance as a share of world GDP following Burfisher and Yuan (2021). This significantly reduces the GTAP welfare loss, bringing it closer to the NQTM welfare loss. This shows that the larger welfare impact in GTAP is caused partly, but not entirely, by the endogenous trade balances and international capital flows that are included in GTAP.

Figure 6.8: welfare impact in adjusted GTAP and NQTM

6.4 Summary

GTAP and the NQTM are both CGE models, but the GTAP model is more complex. The greater complexity does not seem to significantly affect the direct trade impacts. However, welfare impacts and third-country export impacts are larger in GTAP. The larger welfare impacts in GTAP are due, at least in part, to those additional channels through which trade costs can affect welfare which are included in GTAP but not the NQTM.

Links to Datasets Used by The NQTM Model

Dataset Title	Online Link
OECD – Inter-Country Input-Output tables	https://www.oecd.org/en/data/datasets/inter-country-input-output-tables.html
USITC - International Trade and Production Database for Simulation	https://www.usitc.gov/data/gravity/itpds
CEPII – MacMap-HS6	https://www.cepii.fr/cepii/en/bdd_modele/bdd_modele_item.asp?id=12
Global Tariff Database – Feodora Teti (2024)	https://feodorateti.github.io/data.html

References

Ahmad, Saad, and Samantha Schreiber. 2024. "*Estimating Elasticities for Tradable Services in Policy Simulations".* Economics Working Paper Series No. 2024-09-B. U.S. International Trade Commission. **Available Online at:** [https://www.usitc.gov/publications/332/working_papers/ahmad_and_schreiber_9-23-2024.pdf]

Bekkers, E. (2017). "*Comparing CGE and NQT models: a formal overview of the model structures*". World Trade Organization. **Available Online at**: [https://www.unescap.org/sites/default/files/ARTNET-WTO%20Materials%20-%20Comparing%20CGE%20and%20NQT%20a%20formal%20overview%20of%20the%20model%20structures.pdf]

Borchert, I., Larch, M., Shikher, S., and Yotov, Y. (2024), "*Globalization, Trade, and Inequality: Evidence from a New Database*." USITC Working Paper 2024–11–A. **Available Online at**: [https://www.usitc.gov/data/gravity/itpds]

Burfisher, M. & Yuan, W. J. (2021). "COMPARING TRADE BALANCE CLOSURES IN THE GTAP-RECURSIVE DYNAMIC (GTAP-RD) MODEL FRAMEWORK". USITC Working Paper 2021-01-A 2021-01-a_yuan_and_burfisher_gtap_rd_closure_01_2021.pdf

Caliendo, L. & F. Parro. (2015). "*Estimates of the Trade & Welfare Effects of NAFTA*." Review of Economic Studies, 82(1): 144.

CEPII (Centre d'Études Prospectives et d'Informations Internationales) (n.d.) *MAcMap-HS6: International Trade Protection Database*. **Available Online at**: [https://www.cepii.fr/cepii/en/bdd_modele/bdd_modele_item.asp?id=12]

Ciuriak, D., & Lysenko, D., (2016). "*Quantifying Services-Trade Liberalization: The Impact of Binding Commitments*". C.D. Howe Institute Technical Paper for: Better in than Out? Canada and the Trans-Pacific Partnership, 2016, **Available Online at**: [https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2730265]

Ciuriak D., Dadkhah A., & Lysenko D., "*The Effect of Binding Commitments on Services Trade*". World Trade Review. 2020;19(3):365-378. **Available Online at**:

[https://www.cambridge.org/core/journals/world-trade-review/article/abs/effect-of-binding-commitments-on-services-trade/0F35120043766FCB49F0953F857692D3]

Corong, E., Hertel, T., McDougall, R., Tsigas, M. and van der Mensbrugghe, D., 2017. The Standard GTAP Model, Version 7. Journal of Global Economic Analysis 2(1). **Available online at:** [View of The Standard GTAP Model, Version 7]

Department for Business and Trade: Analysis Group. (2021). "*Services Trade Modelling: DIT Analysis Working Paper*". **Available Online at**: [https://www.gov.uk/government/publications/services-trade-modelling-working-paper]

Department for Business and Trade. (2025). "*Impact assessment of the Free Trade Agreement between the United Kingdom and India*". **Available Online at**: [https://assets.publishing.service.gov.uk/media/6880fd0a6a7ea0e1ce1d3597/impact-assessment-of-the-free-trade-agreement-between-the-uk-and-india_a.pdf]

European Commission. (2017). "*Commission Staff Working Document: Impact Assessment Accompanying the document Recommendation for a Council Decision authorising the opening of negotiations for a Free Trade Agreement with Australia*". **Available Online at**: [https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex:52017SC0293]

Fontagné, L., & Decreux, Y. (2011). *"Economic Impact of Potential Outcome of the DDA"* (CEPII Working Paper No. 2011-23). **Available Online at**: [https://www.cepii.fr/PDF_PUB/wp/2011/wp2011-23.pdf]

Fontagné, L., Guimbard, H., & Orefice, G. (2022). "*Tariff-based product-level Trade Elasticity*." Journal of International Economics, 133. **Available Online at**: [http://www.lionel-fontagne.eu/uploads/9/8/3/3/98330770/fgo_jie_preprint.pdf]

Fontagné, L., Guimbard, H. and Orefice, G. (2022). *Product-Level Trade Elasticities* [dataset]. Available Online at: [https://sites.google.com/view/product-level-trade-elasticity].

Freeman, R., Larch, M., Theodorakopoulos, A. and Yotov, Y.V. (2025). "*Unlocking New Methods to Estimate Country-Specific Effects and Trade Elasticities With the Structural*

Gravity Model". Journal of Applied Econometrics, 40. **Available Online at**: [https://onlinelibrary.wiley.com/doi/epdf/10.1002/jae.3133]

Guimbard, H., Jean, S., Mimouni, M. & Pichot, X. (2012) "*MacMap-HS6 2007, an exhaustive and consistent measure of applied protection in 2007*". International Economics, Q2, 2012, p. 99-122". **Available Online at**: [https://www.cepii.fr/cepii/en/bdd_modele/bdd_modele_item.asp?id=12]

Head, K. & Mayer, T. (2013). "*Gravity equations: Workhorse, toolkit, and cookbook*". CEPII Working Paper No. 2013-27. Paris: CEPII. **Available Online at**: [https://www.cepii.fr/pdf_pub/wp/2013/wp2013-27.pdf]

Lamprecht, P., & Miroudot, S. (2018). "*The value of market access and national treatment commitments in services trade agreements*" OECD Trade Policy Papers 213, OECD Publishing. **Available Online at**: [https://ideas.repec.org/p/oec/traaab/213-en.html]

OECD (Organisation for Economic Co-operation and Development) (2023 version) *Inter-Country Input-Output Tables* [Dataset]. **Available Online at**: [https://www.oecd.org/en/data/datasets/inter-country-input-output-tables.html].

OECD (Organisation for Economic Co-operation and Development) (n.d.). *Services Trade Restrictiveness Index* (STRI) [Database]. OECD Data Explorer. **Available Online at:** [https://data-explorer.oecd.org/vis?df[ds]=DisseminateFinalDMZ&df[id]=DSD_STRI@DF_STRI_MAIN&df[ag]=OECD.TAD.TPD&dq=A.AUT......&pd=2019%2C&to[TIME_PERIOD]=false]

Teti, F. (2024). *Global Tariff Database (v_beta1-2024-12)* [Dataset]. **Available Online at:** [https://feodorateti.github.io/data.html]

Teti, F. (2024). "*Missing Tariffs*", CESifo Working Paper No. 11590. **Available Online at:** [https://www.ifo.de/DocDL/cesifo1_wp11590.pdf]

U.S. International Trade Commission. (2024). *International Trade and Production Database for Simulation Version 1.1*. **Available Online at**: [https://www.usitc.gov/data/gravity/itpds]

U.S. International Trade Commission. (2019) "*U.S.-Mexico-Canada Agreement: Likely Impact on the U.S. Economy and on Specific Industry Sectors*". Publication 4889. **Available Online at:** [https://www.usitc.gov/publications/332/pub4889.pdf]

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