Trade Liberalization and Regime Type: Evidence from a New Tariff-line Dataset*

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Abstract

This paper provides an empirical analysis of the theoretical prediction that variations in domestic political institutions produces heterogeneous trade policy across products and partners. We collect 5.7 billion observations of applied tariff rates that 136 countries apply to their trading partners. We then develop a Bayesian multilevel estimator that distinguishes the effects of regime type across industries and trading partners. We find that democracies tend to have lower trade barriers than non-democracies but are more likely to protect their agricultural sectors. We also find that pairs of democracies achieve greater tariff reductions in bilateral Free Trade Agreements than dyads with a democracy and a non-democracy because of shallower concessions granted by non-democratic importers to their democratic partners; democratic importers meanwhile still grant concessions to their non-democratic partners. Our findings add nuance to the claim that democratic political institutions facilitate unilateral and bilateral trade liberalization.

Keywords: democracy, trade liberalization, international trade, preferential trade agreements, bilateral product-level tariffs, big data, heterogeneous effects, agricultural protection

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1 Introduction

Theories of international political economy predict that differences in countries' domestic political and economic environments will result in heterogeneous trade policy across products and partners. Governments face disparate protective demands from various political groups (e.g. Hillman, 1984; Rogowski, 1987; Magee, Brock, and Young, 1989; Hiscox, 2002; Kim, 2017) while countries with different political institutions evaluate political rents and social welfare differently for each sector (Grossman and Helpman, 1994). Moreover, trade policies are also expected to differ across trading partners. The number of Preferential Trade Agreements (PTAs) has grown significantly over the last few decades, creating a complex web of preferential policies across products and partners that affects much of international trade (Bhagwati, 2008). Again, characteristics of domestic political institutions are important determinants of partner-specific trade liberalization (Mansfield, Milner, and Rosendorff, 2000, 2002).

Empirical investigation of these theoretical predictions has lagged, however, because researchers have typically been limited to using high-level, aggregate measures of trade policies when evaluating the relationship between regime type and trade policies. Specifically, many studies employ Most Favored Nation (MFN) applied tariff rates or non-tariff barrier indicators and then take the average across products (e.g. Mansfield and Busch, 1995; Gawande and Hansen, 1999; Milner and Kubota, 2005; Kono, 2006). The resulting *single* number for a given importer-year observation is then used to examine whether democracies have more liberal trade policies than non-democracies. Yet, theories that predict differences in trade liberalization between democracies and non-democracies often yield rich predictions about the effects of regime type on tariff rates for different economic sectors. For example, Anderson et al. (1986) argue that developed countries will be likely to protect their agricultural markets as farmers can overcome their collective action problems better than voters. Furthermore, Park and Jensen (2007) theorize that differences in electoral systems will be associated with different degrees of agricultural protection even within democracies. These theoretical predictions are unfortunately elided by coarse measures of trade policies.

Studies that examine the interactive effects of regime types are also limited. As Mansfield, Milner, and Rosendorff (2000) note, measures of bilateral trade barriers across all combinations of country-pairs are notoriously difficult to collect at the product level, and thereby constrain researchers to use bilateral trade volume as a proxy measure for partner-specific trade policy.

We collect over 5.7 billion observations of product-level applied tariff rates that countries apply to their trading partners, incorporating the universe of preferential rates and Generalized System

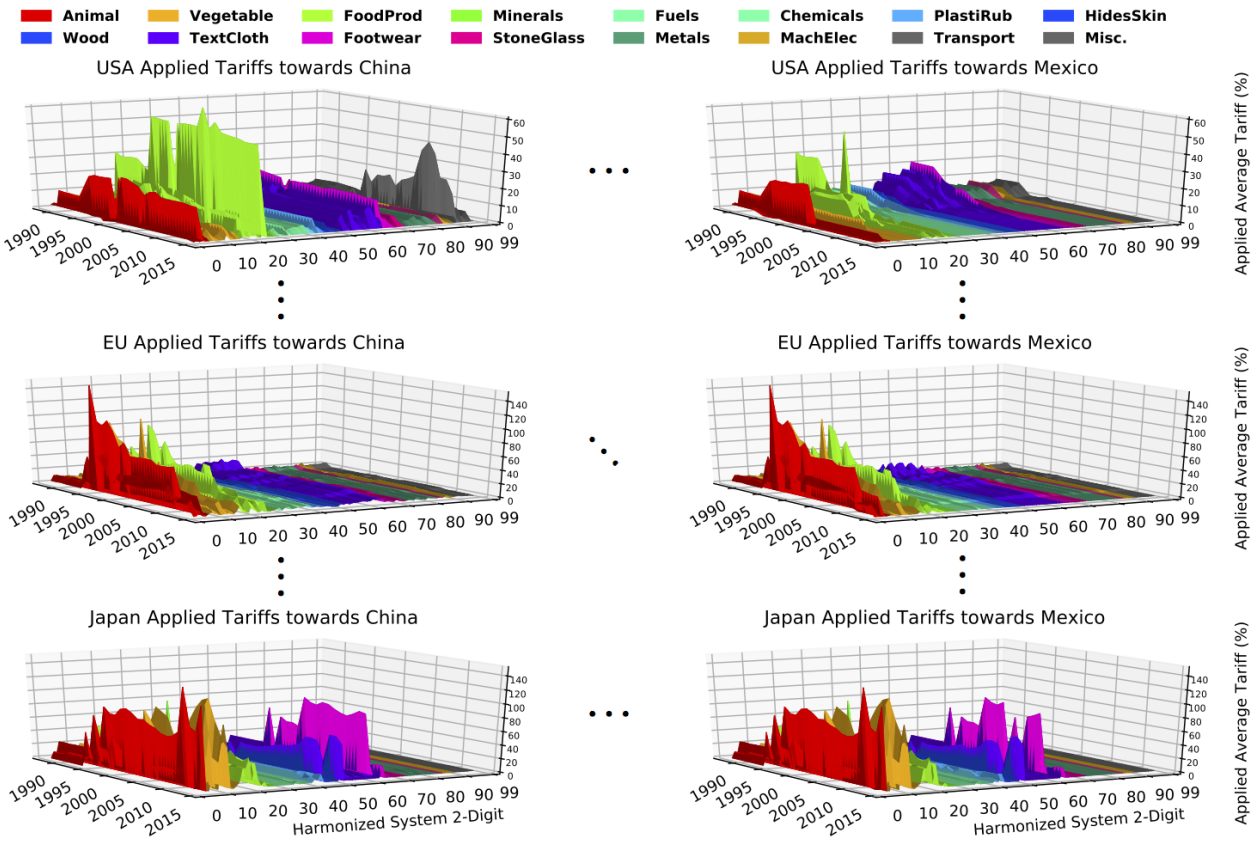

Figure 1: **Variations in Ad Valorem Applied Tariff Rates across Trading Partners and Industries:** This figure demonstrates how our tariff-line data captures both partner-specific and industry-varying trade policies. Importers are plotted down each column and exporters are plotted across each row. For a given country and partner, our data distinguishes precise tariff rates on more than 100 specific products in various industries (colored within plot) over 20 years. Increases in applied tariff rates may be attributed to the conversion of specific tariff rates into ad valorem equivalents or actual temporary increases due to "binding overhang" (Pelc, 2013).

of Preferences (GSP) at the *tariff-line* level (the level at which tariff policy is actually set). We develop a replicable automated pipeline to (1) retrieve massive amounts of tariff data from multiple web data sources, (2) identify the partner-specific tariff rates for each product, and (3) resolve any discrepancies arise. Figure 1 demonstrates the significant variations in applied tariff rates across trading partners and products that we observe in our data. For example, the first row shows that across industries and over time, the MFN tariff rates applied by the U.S. on imports from China (both members of the WTO) are very different from the preferential rates applied on imports from Mexico (both members of NAFTA). The columns show that exporters (in this example, China and Mexico) face markedly different tariffs on their products with different trading partners. We then combine our product-level tariff data for each directed dyad with numerous country-, dyad-, and

directed dyad-level data, including measures of political institutions, GATT/WTO membership, and product-level bilateral trade volume. To the best of our knowledge, this is the first database that combines bilateral trade policies and trade volume at the product level across 136 countries over 20 years.

The main contribution of the paper is to empirically examine the relationship between the domestic political institutions of trading partners and their trade policies towards each other. To incorporate the rich structure and volume of our data, we develop a Bayesian multilevel estimator that calculates the effects of political institutions on tariff rates for different industries and trading partners. We begin our analysis by comparing the MFN trade policies of democracies and non-democratic countries. Consistent with Milner and Kubota (2005), we find that democracies are associated with lower trade tariffs than non-democracies, on average. However, we find a high level of heterogeneity across industries. Specifically, we find that democracies are more likely to protect their agricultural sector than are non-democracies. However, democracies are likely to impose significantly lower tariffs on most manufacturing and raw material industries than are non-democracies. Our findings are evidence that variations in regime type is one reason that trade liberalization proceeds unevenly across industries. In particular, they provide first empirical evidence for the agriculture industry's unique status in trade politics, which has been identified by many studies but has not been explained by domestic political institutions (Anderson et al., 1986; De Gorter and Tsur, 1991; Olper, 1998; Swinnen et al., 2000; Davis, 2003; Thies and Porche, 2007).[1]

Next, we conduct dyadic analysis to examine whether pairs of democracies are more likely to engage in deeper trade liberalization than are mixed pairs of democratic and non-democratic trading partners. We consider a total of 90 bilateral Free Trade Agreements (FTAs) that have been signed between 1991 and 2012. For products in each of 96 Harmonized System (HS) 2-digit industries, we compute differences in average applied tariff rates before and after each agreement. We then compare the difference-in-differences between the two institutional combinations. In contrast to existing studies, we find little evidence that pairs of democratic nations tend to undergo deeper trade liberalization than mixed pairs (Mansfield, Milner, and Rosendorff, 2000). However, the *direction* of trade liberalization matters. We show that a non-democratic importer engages in shallower trade liberalization when negotiating with a democratic exporter than a democratic importer does when negotiating with another democracy. However, democratic importers give even deeper reductions in tariffs to non-democratic negotiating partners than they do to other democracies. These results

[1]See Beghin and Kherallah (1994) and Park and Jensen (2007) for notable exceptions.

are robust across various industries. Overall, our findings add nuance to the claim that democratic political institutions facilitate unilateral and bilateral trade liberalization.

The bilateral product-level tariffs database, the source code, and the estimated industry-varying effects of political institutions as well as their posterior distributions will be made publicly available at `https://poltrade.github.io/`.

2 New Database: Bilateral Product-level Applied Tariffs

In this section, we describe the challenges involved in collecting large amounts of detailed bilateral tariff rates that countries apply to different products and trading partners. We discuss the variation in applied tariff rates, our data compilation process, the discrepancies in available data sources, and the ways we organize the data for our empirical analyses.

2.1 Heterogeneity in Trade Policies

Heterogeneity across Sectors and Products. Scholars have theorized a number of ways in which regime type may affect trade policies across economic sectors as well as across specific products. One prominent explanation suggests that trade policies will reflect median voter's preferences in democracies, with the result that democracies will liberalize industries that utilize their abundant factor of production (Milner and Kubota, 2005).[2] Democratic governments may also differ in their incentives to respond to organized interest groups. Specifically, Betz and Pond (2018) find that democracies place higher tariffs on goods with higher consumption shares, such as agricultural products, due to the higher incentive for collective action by interest groups than by voters.

In fact, several studies have found that there exist significant differences between democratic and autocratic government agricultural policies. "Rural bias" exists in democracies because rural districts tend to be overrepresented in national legislatures. (Anderson, Rausser, and Swinnen, 2013). For example, the United States Senate has two senators from each state despite significant differences in population and size across them. Similarly, Olper and Raimondi (2010) argue that transitions to democracy will result in agricultural protection because franchise expansion will render the concentrated interests of farmers more important in elections while consumers will generally have dispersed interests towards trade policies (also see Pierskalla, 2012, for comprehensive reviews on the relationship between elections and rural bias). On the other hand, autocratic leaders rely for support

[2]To be sure, states may also deal with distributional consequences of trade with other industrial policies. For example, democratic corporatism and social arrangements among workers, trade unions, and governments may be adopted in order to maintain high levels of equality with globalization (e.g. Katzenstein, 1985; Soskice and Hall, 2001).

on a small "winning coalition" based primarily in urban areas (usually the military, sometimes a royal family) (de Mesquita et al., 1999; Wallace, 2013). Furthermore, maintaining low food prices is important to mitigate threats to regime survival as high food prices can lead to riots in cities (Bellemare, 2015; Thomson, 2017). For instance, Lagi, Bertrand, and Bar-Yam (2011) highlight food price as a primary driving force behind the Arab Spring in North Africa and the Middle East. These studies consistently predict that autocracies are more likely to liberalize agricultural industries than democracies.

Heterogeneity across Trading Partners. Countries with different regime types will not only have different unilateral incentives to liberalize certain industries and products, but they will also face distinct bilateral commitment problems in negotiating with different trading partners (e.g. Mansfield, Milner, and Rosendorff, 2000, 2002), as illustrated by Figure 1. WTO members face different tariffs when they export goods to other member states because they are permitted to enter regional trade agreements under Article XXIV of GATT, Enabling Clause, and to lower tariffs for the least developed countries with the GSP. That is, the rule of "non-discrimination" does not prevail in practice. For example, in 2013 the U.S. tariffs on cars (Harmonized Tariff Schedule [HTS] subheading `87039000`) exported by FTA partner South Korea was 1.5% whereas it was 2.5% (the MFN rate) for cars originating from other WTO members. Moreover, even the GSP rate for specific products can vary across GSP beneficiaries for strategic reasons. As Carnegie (2015, pg, 60) finds, Pakistan was *partially* suspended from the U.S. GSP program in 1996 due to its violations of workers' rights. Indeed, we find that the applied rates on gloves (HTS subheading `39262030`) given to Pakistan was 3% (the MFN rate) in 1997 instead of the GSP rate of 0% even though Pakistan remained a GSP beneficiary and still received benefits for many other products. To examine the political sources of such heterogeneity, researchers must use partner-specific tariff-line data rather than aggregate tariff measures.

2.2 Challenges in Collecting and Constructing the Bilateral Tariff Data

We develop an automated pipeline to create a dataset of bilateral trade policy for each tariff-line product and partner. To create our dataset, we begin with two data sources: (1) the WTO Integrated Database (IDB) and (2) UNCTAD Trade Analysis Information System (TRAINS). Both contain applied tariff rates on a variety of products for all WTO countries from 1996 to 2016. However, there are three challenges that limit the use of these databases by researchers in practice.

First, to download all product-level tariffs, each database requires users to submit numerous queries to the system for each importer-year pair, which in our case amounts to more than 2,188

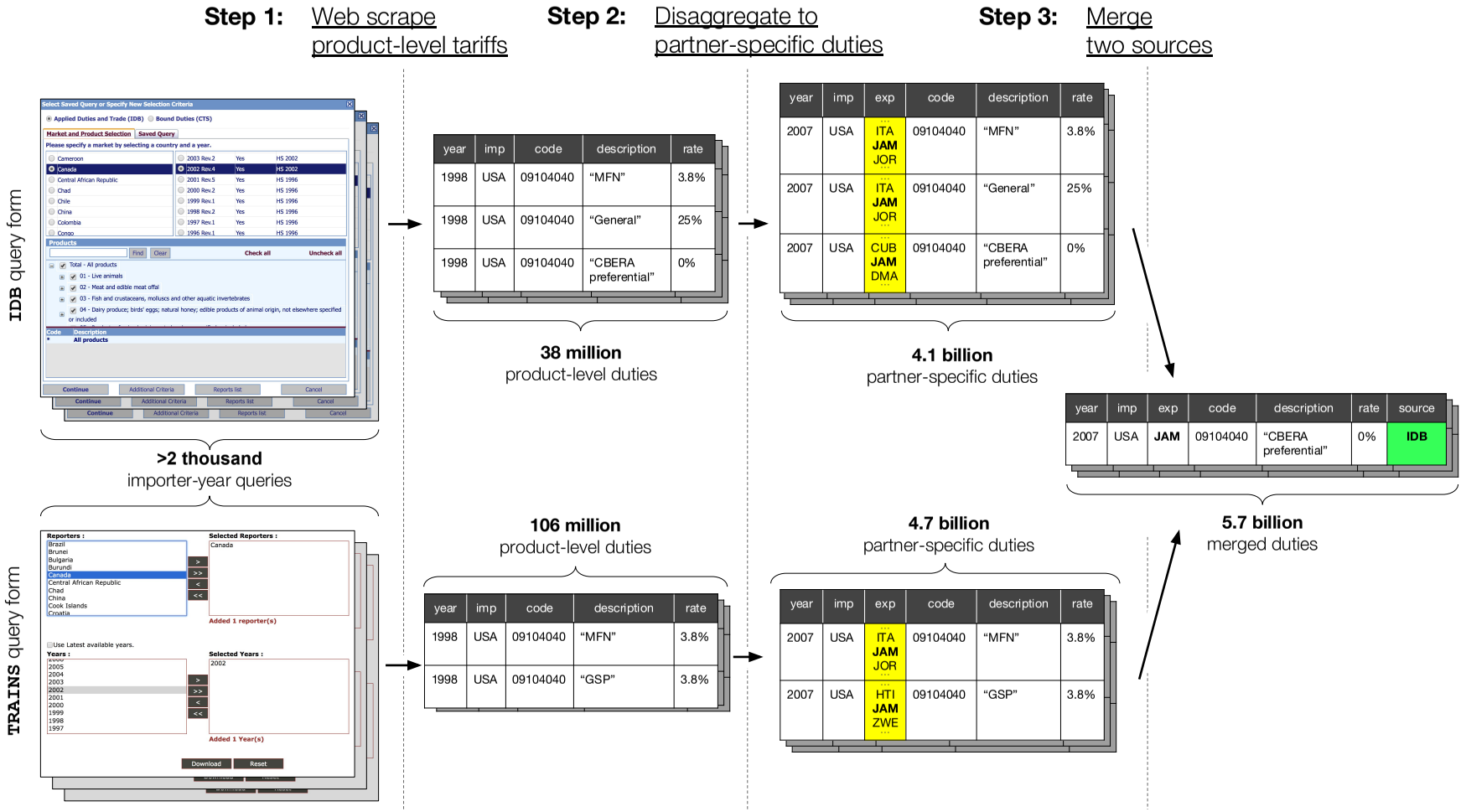

Figure 2: **Tariff-line Dataset Creation:** This figure illustrates the process of creating our industry-level partner-specific tariff dataset. As an example, we show how we produce the 1998 U.S. duty on Jamaican imports of `Ginger, saffron, turmeric (curcuma), thyme, bay leaves, curry and other spices.` (HTS subheading `09104040`). First, we scrape tariffs across all available importers and years using the public web forms for IDB and TRAINS. Then, we use the tariff beneficiary description (shown as `description`) to find all tariffs whose beneficiary group includes Jamaica. As shown, each database is missing a duty that the other contains. IDB contains an MFN duty, a general duty, a preferential duty, but not the GSP duty; TRAINS contains a MFN duty and a GSP duty, but not the preferential duty. Finally, to select the duty amongst these candidates most likely applied in practice, we use a custom merging algorithm described in Appendix A.2. In this case, Jamaica enjoys a zero tariff due to a preferential Caribbean Basin Economic Recovery Act (CBERA) duty, which supersedes both the MFN and GSP rates.

Issue	Year-Importer-Exporter-HS (Product description)	WTO IDB report	UNCTAD TRAINS report (≈ AVE)	Solution	N obs. (%)
Missing Report	2013-China-India-09041200 (Crushed or ground Piper pepper)	10%	none	Use non-missing.	2.35 billion (41.8%)
	1991-Japan-Korea-140490499 (Cod fish)	none	10%		
Conflicting Reports	1997-Australia-Singapore-22082010 (Grape wine)	3%	3% + $31.12/L (≈ 127%)	Use ad valorem equivalent (AVE) computed by UNCTAD.	0.24 billion (4.25%)
	2005-Canada-Australia-22084010 (Rum)	24.56¢/litre of alcohol	24.56¢/litre of alcohol (≈ 1.43%)		
	2004-Argentina-Paraguay-87083110 (Motor vehicle brakes)	0%	14%	Use lower (preferential) rate.	
	1996-U.S.-Mexico-87033100 (Cars of ≤ 1,500 cc cylinder capacity)	2.5%	0%		

Table 1: **Solutions to Tariff Data Issues:** This table illustrates examples of specific issues that arise when attempting to find the correct applied rate for a tariff-line using the IDB and TRAINS databases. In each example, our algorithm selects the report believed to be the more precise applied rate. For instance, for Australia's 1997 tariff on `Grape wine` from Singapore, IDB only reports a 3% ad valorem rate while TRAINS accounts for an additional $31.12 per litre of wine in its ad valorem equivalent (AVE) rate. We provide full details of the merging algorithm in Appendix A.2.

queries (**Step 1** in Figure 2). To overcome this difficulty, we develop software that automates the data retrieval process, gathering nearly 100 GB (Gigabytes) of product-level tariff data.

The second challenge is to identify the correct partner-specific rates. Specifically, both databases specify only the "type" or category of tariff rate that a given importer applies to its partners. For example, IDB reports that in 1998 the United States applied a 3.8% tariff rate on `Ginger, saffron, turmeric (curcuma), thyme, bay leaves, curry and other spices` (HTS subheading `69120090`) for all partners belonging to the United States Generalized System of Preferences, but does not further disaggregate the specific countries (e.g. Albania, Angola, and so on). We use a mix of hand-coding from WTO and World Bank reference materials and string matching algorithms applied to country names and regional trade agreement titles in order to map each unique "type" appearing in the original data to its corresponding set of disaggregated country ISO codes.[3] Even when the tariff "type" clearly applies to one country, an additional step is needed to link the textual description to the relevant country code. **Step 2** in Figure 2 illustrates this process using an example tariff-line. Appendix A.1 describes our data collection and processing in full detail.

Finally, there exists a number of inconsistencies between the two data sources. Table 1 summarizes various issues that we identify. First, we find significant differences in data coverage. This is problematic given that researchers tend to rely primarily on one of the widely used data sources for

[3]A reference list of preference beneficiaries for many tariff measures can be found at `http://wits.worldbank.org/WITS/WITS/Support%20Materials/TrfMeasures.aspx?Page=TfMeasures`.

empirical research. Data for 52 importer-years appear only in IDB (but not TRAINS), while data for about 420 importer-years appear only in TRAINS (but not IDB). As a result, we find that at least 2.35 billion observations are missing from one of the databases, and thus make sure to utilize the available data whenever possible. Second, IDB returns duties as they are originally reported (e.g. `24.56¢/litre of alcohol`), while TRAINS uses a method to estimate an ad valorem equivalent (AVE) for any reported non-ad valorem rate (e.g. `24.56¢/litre of alcohol` $\approx$ `1.43%`). TRAINS also uses this method to convert mixed or compound duties (e.g. `3% + $31.12/L` $\approx$ `127%`).[4] In both cases, our algorithm chooses TRAINS, since it is the more precise and informative source to use. Third, preferential rates may be available from only one source. As shown in the last row of Table 1, TRAINS shows the correct 1996 NAFTA duty-free rate for United States-Mexico trade in `Cars of` $\leq$ `1,500 cc cylinder capacity` while IDB does not. Likewise, IDB shows Argentina's duty-free rate for `Motor vehicle brakes` imports from MERCOSUR trade bloc partner Paraguay while TRAINS does not. Our algorithm picks the correct partner-specific preferential rate for both tariff-lines. After resolving these issues of missing data and discrepancy between the two sources, we create a dataset of over 5.7 billion observations of bilateral trade policy at the product level. Appendix A.2 details each step in our resolution algorithm.

Figure 3 summarizes the availability of our data for each importer and year. Although the large number of missing import-year observations from both primary sources (white cells) prevents our dataset from being fully comprehensive, the figure shows that our dataset covers tariff policies for all major participants of global trade (top 50 trading countries in volume) since 1995.[5] Moreover, we make several improvements by combining data from the two available sources (red and blue cells) and resolving various discrepancies where the sources may conflict (black cells). In total, Figure 3 shows that we cover 2,188 importer-year tariff profiles. Using this data, we now turn to the analysis of trade policy across countries with different political institutions.

[4]For a given non-ad valorem tariff tariff, UNCTAD calculates an ad valorem equivalent (AVE) by estimating the unit value of a product using volume statistics. The type of statistics – either tariff-line level statistics from TRAINS, HS 6-digit statistics from UN Comtrade, or HS 6-digit statistics aggregated across OECD countries – depends on data availability for each product. The unit value is then used to approximate a (%) tariff rate. In cases where only an IDB report is available for a compound rate, we impute an AVE using only the ad valorem component of the duty rate.

[5]To be sure, there exist other non-tariff barriers (NTB) of trade that might reflect disparate interests of countries with different regime types (Kono, 2006). Unfortunately, it is notoriously difficult to get disaggregated NTB measures across countries with different regime types. In this article, we focus on tariff rates, which are known to be positively correlated with other forms of trade barriers.

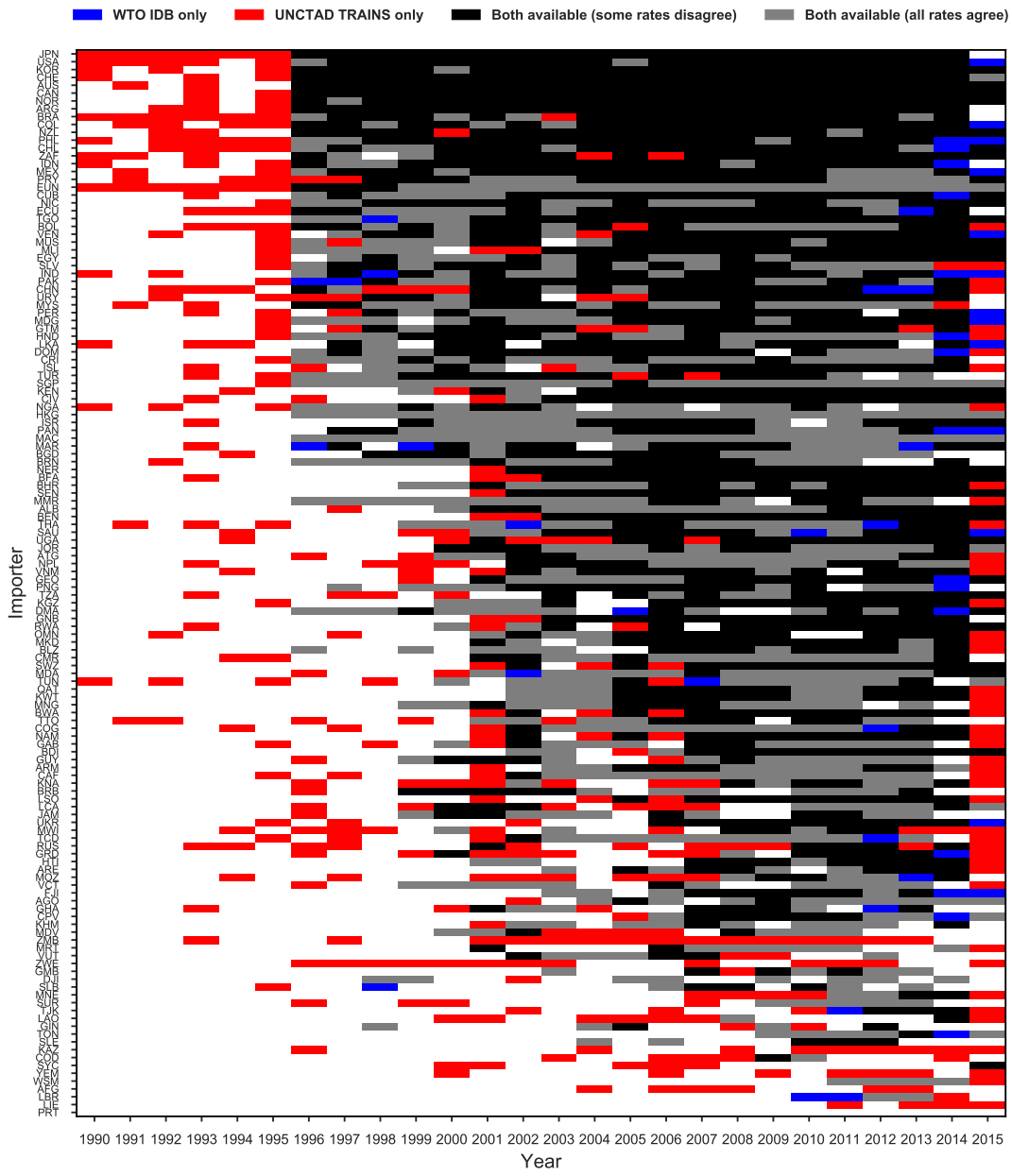

Figure 3: **Data Availability across Importers and Years:** Altogether, we compile 2,188 importer-year tariff profiles from the WTO Integrated Database (IDB) and the UNCTAD Trade Analysis Information System (TRAINS). As illustrated in this figure, only 51% of these observations are available from both sources where the reported duty rates agree. Appendix A.1 explains data collection and processing in detail.

3 Regime Type and Trade Policy

In this section, we examine differences in import tariff policy between democracies and non-democracies.

We begin by analyzing unilateral trade policies (monadic analysis) across countries using MFN ap-

plied tariff rates. We then utilize our bilateral tariff data to investigate whether pairs of democracies engage in deeper trade liberalization than other pairs do (dyadic analysis).

3.1 Monadic Analysis

Do democratic political institutions facilitate unilateral trade liberalization? Applying the Stolper-Samuelson theorem, Milner and Kubota (2005) argue that democratization empowers the owners of factors with which their country is abundantly endowed, and therefore one should expect that trade liberalization will ensue, reflecting the median voter's preferences. Using MFN tariff rates averaged across products, they find that democratization in labor-abundant developing countries is associated with lower trade barriers. Other scholars have argued the reverse, however, suggesting that the need to win elections makes democratic politicians sensitive to the demands of interest groups who offer support in exchange for trade protection (Frieden and Rogowski, 1996). Autocracies, meanwhile, need appeal to only a very small segment of society to secure their power, and therefore might be less susceptible to various societal pressures (Acemoglu and Robinson, 2005; Henisz and Mansfield, 2006)

To shed light on this debate, we examine whether trade policy varies between democracies and non-democracies across industries. Our industry-level analysis is motivated by the endogenous tariff literature in which competing economic interests across sectors determine industry-level trade policy (e.g. Mayer, 1984). In fact, the Stolper-Samuelson theorem postulates that the distributional implications of trade liberalization will be asymmetric in capital-abundant and labor-abundant industries, resulting in trade policy heterogeneity across industries. Moreover, as Grossman and Helpman (1994) show, political activities of industries such as lobbying interact with economic heterogeneity in import-penetration and demand elasticity. Consequently, the canonical model of trade policy also predicts differences in trade policy across industries (see, Proposition 2 in Grossman and Helpman, 1994).

3.1.1 Methodology

To estimate the effects of regime type on trade policy, we introduce the following hierarchical Tobit model of the observed MFN tariff rate τ_{ith} for importer i and industry h in year t:

$$\begin{aligned} \tau^*_{ith} &= \beta X_{it} + \gamma_h^\top \mathbf{V}_{it} + \delta^\top \mathbf{Z}_{it} + \lambda W_{ith} + \eta_i + \theta_t + \epsilon_{ith} \\ \tau_{ith} &= \begin{cases} \tau^*_{ith} & \text{if } \tau^*_{ith} \geq 0 \\ 0 & \text{otherwise} \end{cases} \end{aligned} \tag{1}$$

where τ^*_{ith} is a latent tariff, which we observe if it is greater than zero, and is censored at zero otherwise. We use a logged value of τ_{ith} to address the high skewness of tariffs. To facilitate the comparison of our empirical findings against existing studies, we use a binary measure of democracy where X_{it} is unity if importer i's Polity IV score is 6 or above in year t and zero otherwise (e.g. Mansfield, Milner, and Rosendorff, 2000; Milner and Kubota, 2005; Persson and Tabellini, 2005). $\mathbf{V}_{it}$ is a set of covariates—democracy (X_{it}), log GDP per capita, and an intercept—for which we estimate industry-specific coefficients. $\mathbf{Z}_{it}$ represents a vector of covariates that have been identified in the literature as confounding factors of regime type and trade policy: log GDP per capita (PPP basis), log population, an indicator for GATT/WTO membership, log import volume, and an intercept. All covariates are lagged by 1 year.[6] We also include the continuous Balassa index, W_{ith}, in order to control for countries' revealed comparative advantages, which vary across industries and time.[7] That is, we account for the possibility that developing and developed countries may use different technologies to produce similar goods. Finally, η_i and θ_t are importer- and year-varying intercepts respectively, and ϵ_{ith} is idiosyncratic error assumed to be drawn from a Normal distribution:

$$\eta_i \overset{\text{i.i.d.}}{\sim} \mathcal{N}(\mathbf{0}, \Sigma_\eta), \qquad \theta_t \overset{\text{i.i.d.}}{\sim} \mathcal{N}(\mathbf{0}, \Sigma_\theta), \qquad \epsilon_{ith} \overset{\text{i.i.d.}}{\sim} \mathcal{N}(0, \sigma^2_\epsilon). \tag{2}$$

To be sure, countries may have different domestic institutions that aggregate trade preferences across various sectors, meaning that trade policies of certain sectors tend to be highly correlated. For example, the U.S. Congress established the Agricultural Policy Advisory Committee (APAC) and other advisory committees within the Department of Agriculture to provide advice on the administration and implementation of U.S. trade policy. To account for heterogeneous political processes across industries, we model the industry-varying effects hierarchically. Specifically, we allow the effects to vary across Harmonized System 2-digit industry h (e.g. vegetables vs. fish) but incorporate the complex correlations within a broader sector k (e.g. food sector) that operates differently from other sectors (e.g. textile sector):

$$\gamma_h \sim \mathcal{N}(\phi_{k[h]}, \Sigma_\gamma) \tag{3}$$

$$\phi_k \sim \mathcal{N}(\mathbf{0}, \Sigma_\phi) \tag{4}$$

[6] GDP and population figures come from the World Bank Open Data website: `https://data.worldbank.org/`. Trade volume data are sourced from the United Nations Comtrade Database. In the exposition that follows, we use "non-democracy" as a shorthand to describe importer-years with Polity IV scores of less than 6.

[7] The Balassa index of a given industry in a given country is the ratio of the industry's share of the country's total exports to the industry's share of global exports.

where Harmonized System 2-digit industry h belonging to sector k is drawn from a multivariate-Normal distribution with a mean vector $\phi_{k[h]}$ and covariance matrix Σ_γ, and ϕ_k is drawn from a multivariate-Normal distribution with mean 0 and covariance matrix Σ_ϕ. This means that the industry-specific coefficients vary based on the sector k to which the industry belongs, which increases the plausibility of the exchangeability assumption for the industry-specific effects.

In this analysis, we examine MFN tariffs for 127 countries over 26 years (1990 to 2015) for 96 HS 2-digit (HS2) industries.[8] To the best of our knowledge, this is the first industry-level study that examines the relationships between regime type and MFN trade policy covering both developing and developed nations. We aggregate MFN tariffs at the industry level by taking the simple average of MFN tariffs for all products in a given industry. We observe 218,903 MFN rates in total, including 18,199 duty-free rates (0%). To address missingness in our covariate data, we create multiple imputed datasets using a standard multiple imputation algorithm (Honaker, King, and Blackwell, 2011). For each imputed dataset, we run four separate Markov chains. Our posterior sample combines the chains from five imputed datasets.[9]

We estimate the parameters of our model using the Hamiltonian Monte Carlo (HMC) method implemented in the Stan program (Carpenter et al., 2016). HMC is an appropriate tool to deal with the complexity of our model, as the high dimensionality of the parameter space might result in inefficient mixing and severe autocorrelation if we used a Markov Chain Monte Carlo (MCMC) method (Betancourt, 2017). HMC explores the parameter space efficiently, making it possible to estimate parameter values with accuracy within a reasonable length of time. We verify convergence using the Gelman-Rubin statistic. In our results, we focus specifically on the posterior means and credible intervals of our quantity of interest, but we make the entire posterior samples publicly available.

3.1.2 Empirical Results

Our quantity of interest is the industry-specific effect of democracy on trade policy. The model given in equation (1) decomposes this quantity into two parts: (1) the main effect β and (2) the industry-specific partial effect of democracy $\gamma_h^{\texttt{DEM}}$.[10]

Figure 4 reports the posterior distribution of our quantity of interest, $\beta + \gamma_h^{\texttt{DEM}}$. The mean of

[8] We analyze 127 of the 164 WTO members because we exclude member states for which we have five or fewer years of covariate data.

[9] We run the five sets of analyses in parallel.

[10] Note that γ_h is a vector of industry varying effects, and we denote the element corresponding to the democracy variable X_{it} by $\gamma_h^{\texttt{DEM}}$.

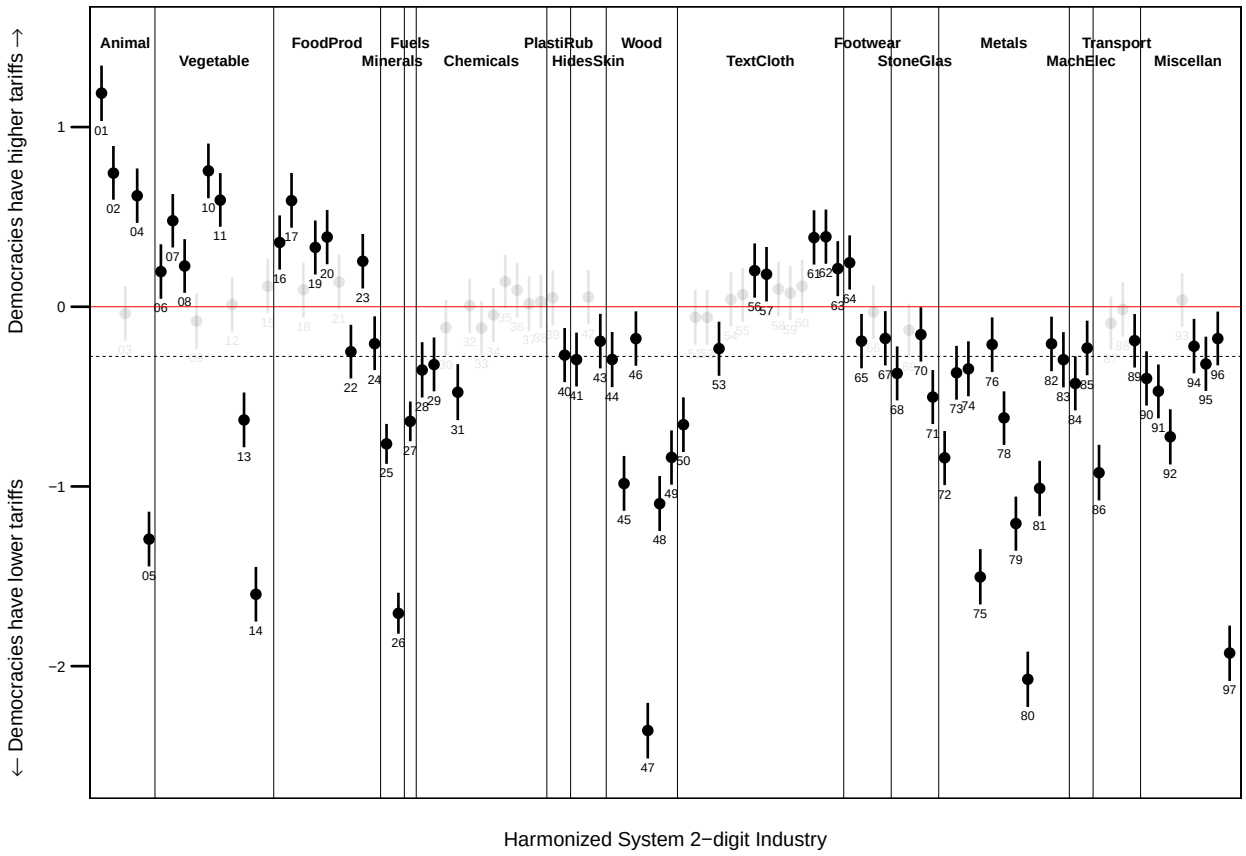

Figure 4: **Effect of Democracy on Log Tariffs:** This plot presents posterior means and 95% credible intervals for the estimated effects of democracy on tariff rates for each HS2 industry. Across all industries, MFN tariffs are about 31%($\approx \exp(0.27) - 1$) lower on average for democracies than non-democracies (the solid red horizontal line). However, there exists significant heterogeneity in the effect of democracy across industries. Democracies tend to have relatively higher tariffs in agricultural sectors. Industries with black lines are those in which the difference in MFN tariffs between democracies and non-democracies are statistically different from zero. The two-digit Harmonized System industry codes are given at the bottom of each line.

the posterior distribution of the main effect of democracy, β (marked by the red horizontal line), shows that democracies impose about 31%($\approx \exp(0.27) - 1$) lower MFN tariffs across industries on average compared to non-democracies. This finding is consistent with Milner and Kubota (2005) and Chaudoin, Milner, and Pang (2015), who find that democratization of developing nations is associated with trade liberalization. In addition, we find that democracies are more likely to have liberal trade policy than non-democracies even when we include a large number of developed countries and use a more fine-grained industry-level dataset than the existing studies do.

It is important to note, however, that the results reveal significant heterogeneity in the effects of democracy across industries. Visual inspection of Figure 4 shows several industries in which the democracy effect is significantly different from the posterior mean of the main effect, β (the red line).

Animal, vegetable, and food products have democracy effects that are higher than the main effect; for the majority of industries in these sectors, the effects turn out to be statistically significant (marked by black vertical lines). In particular, democracies are more protective of agricultural and textile sectors than non-democracies are. Conversely, minerals, wood, and metals products have democracy effects significantly lower than the main effect. Our findings are consistent with Betz and Pond (2018), who find that democratic governments impose *higher* tariffs on goods with higher consumption shares such as agriculture and textile industries. For comparability with Milner and Kubota (2005) we also conduct the analysis with only less-developed countries, and we find similar results for the average effect of democracy across all products. That is, agricultural protection is a general phenomenon across both developing and developed democracies with different factor intensity; see Figure 8 in Appendix C.

The significant deviation of agricultural trade policy from the overall effect of democracy on tariff rates merits further discussion. As discussed in Section 2.1, democratic political institutions may be more susceptible to protectionist demands from the agricultural sector compared to other industries. Economically, agricultural producers are vulnerable to price changes due to inelastic supply of agricultural products in general. Therefore, they are more likely to overcome collective action problems and concentrate their demands for protection, especially when the industry is declining due to foreign competition (Hillman, 1984). On the other hand, as Anderson et al. (1986) argue, consumers bear the dispersed costs of protection, making it politically viable to provide agricultural protection. Another reason the agricultural sector is particularly effective at demanding protection is due to the overrepresentation of rural districts in many democracies, creating a "rural bias" in the national legislature. Many of the voters in these overrepresented districts work in agriculture or have ties to the agricultural sector, for instance through extended family (Mulgan, 1997; Davis, 2003). Our finding that agricultural imports are subject to higher tariff rates, after controlling for various factors such as the size of the economy and comparative advantages, suggests that political representation of the agricultural sector should be an important theoretical component in the study of political institutions and trade policy (Park and Jensen, 2007).

3.2 Dyadic Analysis

Does the interaction of regime type between trading partners affect the depth of trade liberalization? Mansfield, Milner, and Rosendorff (2000) argue that constraints on the chief executive imposed by the legislature, through ratification of trade policy, allow democracies to credibly commit to liberal trade policy. This is because forward-looking democratic executives expect that protective trade

policy will be adopted to reflect the legislature's preferred policy (i.e., protection) if the executive fails to agree. Knowing this, democracies can credibly commit to mutual trade liberalization when they negotiate with each other. Based on this logic, Mansfield, Milner, and Rosendorff (2000) predict that democratic pairs will have more open trade relations than mixed pairs of democracies and non-democracies.

We make three contributions to the study of the interaction of regime types on trade policy. First, we directly analyze trade *policies* between country-pairs rather than using a proxy measure that indirectly captures the outcome of interest. Mansfield, Milner, and Rosendorff (2000), for instance, use bilateral trade volumes as a proxy for trade policy. Although it is generally true that there exists an inverse relationship between trade volume and trade barriers, many studies suggest that there exist numerous confounding factors through which political institutions may either directly or indirectly affect trade volume other than through countries' trade policies. For example, stable contractual institutions allow countries to trade more even when trade policies that govern the trade relations are held fixed (Nunn, 2007; Levchenko, 2007). By using applied tariffs, our analysis will give more accurate estimates of the relationship between regime type and the choice of trade policy.

Second, we distinguish the *direction* of trade policy between importing and exporting countries. A direct test of the hypothesis that pairs of democracies are more likely to engage in liberalization requires researchers to examine the interactive effect in two directions: (1) whether a democratic importer is more likely to liberalize when its export partner is a democracy rather than a non- democracy, and (2) whether a democratic exporter can achieve freer market access when its negotiating import partner is a democracy instead of a non-democracy. That is, if the credible commitment mechanism postulated by Mansfield, Milner, and Rosendorff (2000) drives mutual trade liberalization, we should expect to see evidence for both mechanisms.

Finally, we investigate heterogeneity across industries. The findings from the monadic analysis above show that countries might face different political pressures from various interest groups affecting their unilateral incentives to liberalize. Consequently, we expect that bilateral trade negotiations will also be affected by trading partners' industry-specific political constraints. The bilateral tariff data that we introduced in Section 2 enables us to examine the complexity of bilateral trade policy outcomes across industries.

3.2.1 Methodology

We employ a difference-in-differences (DiD) identification strategy. Specifically, we examine the industry-specific interactive effects of regime type on the degree of trade liberalization as a result of

bilateral Free Trade Agreements (FTAs). We compare the magnitudes of tariff reductions before and after FTAs between dyads with different regime types. The proposed linear hierarchical model for the change in trade policy before and after FTA between importer i and exporter j is given by

$$\begin{aligned}\Delta\tau_{ijth} &= \alpha + (\beta^{\texttt{DEM/NONDEM}} + \gamma_h^{\texttt{DEM/NONDEM}})X_{ijt}^{\texttt{DEM/NONDEM}} + (\beta^{\texttt{NONDEM/DEM}} + \gamma_h^{\texttt{NONDEM/DEM}})X_{ijt}^{\texttt{NONDEM/DEM}} \\ &+ (\beta^{\texttt{NONDEM/NONDEM}} + \gamma_h^{\texttt{NONDEM/NONDEM}})X_{ijt}^{\texttt{NONDEM/NONDEM}} \\ &+ \delta_0^\top \mathbf{Z}_{it} + \delta_1^\top \mathbf{Z}_{jt} + \delta_2^\top \mathbf{Z}_{ijt} + \lambda W_{ith} + \xi_h + \epsilon_{ijth}, \end{aligned} \tag{5}$$

where h again indexes industry. For an FTA between i and j that goes into effect in year t^*, we compare the degree of tariff reduction between $t^* - L$ and $t^* + F$ where L and F denote the length of lags and leads, respectively. To minimize extrapolation into the future, we focus on the comparison of tariff rates immediately before and after each trade agreement by setting $L = 1$ and $F = 1$.[11] To simplify the notation, we denote the year prior to the FTA taking effect by t, i.e., $t = t^* - L$. Then $\Delta\tau_{ijth}$ represents a change in tariffs (logged) for industry h between year $t^* - L$ and $t^* + F$. As noted, our analysis distinguishes the direction of trade liberalization: $X_{ijt}^{\texttt{DEM/NONDEM}}$ is an indicator equal to 1 if the Polity score for importer i is 6 or above, and the score for exporting partner j is below 6; $X_{ijt}^{\texttt{NONDEM/DEM}}$ and $X_{ijt}^{\texttt{NONDEM/NONDEM}}$ are defined similarly. $\mathbf{Z}_{it}$ and $\mathbf{Z}_{jt}$ represent covariates for the importer and partner, and include log population and log GDP in year t. $\mathbf{Z}_{ijt}$ represents dyad-level covariates including logged total trade volume between the two countries, log of the partner-specific mean tariff imposed by the importer across all industries, whether at least one of the pair is a major power, whether both parties were GATT/WTO members, as well as logged distance (in kilometers) between the two countries. Furthermore, to account for the fact that democracies might have lower underlying tariff rates to begin with, we control for pre-existing tariff levels by including the pre-FTA MFN rates W_{ith} for each industry h. Finally, ξ_h is an industry-specific intercept. As in the monadic analysis, we model the prior distribution of industry-varying coefficients $\gamma_h = [\xi_h,\ \gamma_h^{\texttt{DEM/NONDEM}},\ \gamma_h^{\texttt{NONDEM/DEM}},\ \gamma_h^{\texttt{NONDEM/NONDEM}}]$ to be Normally distributed:

$$\begin{aligned}\gamma_h &\sim \mathcal{N}(\phi_{k[h]}, \Sigma_\gamma) \\ \phi_k &\sim \mathcal{N}(\mathbf{0}, \Sigma_\phi). \end{aligned} \tag{6}$$

The quantities of interest are the differences in the degree of trade liberalization between democratic pairs (i.e., dyads in which both parties are democracies) and mixed dyads (i.e., one party is a

[11] To account for the possibility that there exist phase-in periods in trade agreements, we also check the robustness of our findings by setting $L = F = 3$. We find that the direction of bilateral trade liberalization is significant in this analysis as well.

democracy and the other is not):

$$\mathbb{E}[\Delta\tau_{ijth} \mid X_{ijt}^{\texttt{DEM/NONDEM}}] - \mathbb{E}[\Delta\tau_{ijth} \mid X_{ijt}^{\texttt{DEM/DEM}}] = \beta^{\texttt{DEM/NONDEM}} + \gamma_h^{\texttt{DEM/NONDEM}} \quad (7)$$

$$\mathbb{E}[\Delta\tau_{ijth} \mid X_{ijt}^{\texttt{NONDEM/DEM}}] - \mathbb{E}[\Delta\tau_{ijth} \mid X_{ijt}^{\texttt{DEM/DEM}}] = \beta^{\texttt{NONDEM/DEM}} + \gamma_h^{\texttt{NONDEM/DEM}}, \quad (8)$$

where equation (7) compares a dyad with two democracies to a mixed dyad where the *importer* is a democracy and the partner is not, and equation (8) compares a dyad with two democracies to a mixed dyad where the *exporter* is a democracy and the importing partner is not.

3.2.2 Empirical Results

We obtain data on preferential trade agreements from the WTO's Regional Trade Agreements Information System (RTA-IS) database.[12] We focus on bilateral FTAs in which there are only two parties to the agreement and in which both parties are sovereign states (as opposed to one or both parties being in existing regional trade agreements). We therefore include agreements such as the USA-Australia FTA but exclude NAFTA, the EU-Canada FTA, and the EFTA-SACU FTA, for example. Our dataset consists of 90 unique bilateral FTAs. Of these 90 bilateral FTAs, 44 are signed between democratic dyads, 38 are mixed dyads, and 8 are dyads in which both parties are non-democracies. There are 36 unique parties to these 90 FTAs, of which 26 are democracies and 10 are non-democracies. The full list of bilateral FTAs included in our analysis is given in Appendix B.[13]

Our emphasis on bilateral FTAs arises from our interest in understanding how democratic institutions relate to the outcomes of trade negotiations. Certainly, countries that enter into trade negotiations are not a random sample from the population of all possible dyads, and therefore we emphasize that our estimand is *not* the difference in tariff reduction between democratic pairs and mixed pairs *tout court*. Rather, we are interested in differences in tariff reductions between dyad types among those dyads that successfully negotiate bilateral FTAs. This interest in the "intensive margin" of negotiated outcomes is the same premise that motivates the model developed by Mansfield, Milner, and Rosendorff (2000), who also compare the tariff rates that result from democratic dyad trade agreements to those of mixed dyad trade agreements.

We begin our dyadic analysis without distinguishing the direction of trade liberalization in order to make a direct comparison between our analysis and prior research. That is, this "undirected" dyadic analysis compares pairs of democracies ($X_{ijt}^{\texttt{PAIR}} = \mathbb{1}\{X_{it} = 1 \text{ and } X_{jt} = 1\}$) to a mixed pair of

[12] This database is available from `http://rtais.wto.org/`.

[13] As Table 2 shows, 19 of the bilateral FTAs are fairly recent, taking effect on or after 2010. Importers sometimes revise the data they previously reported to the WTO and UNCTAD, including revisions to tariff schedules. We periodically check the underlying databases for changes, and will update our analysis as the data are refreshed.

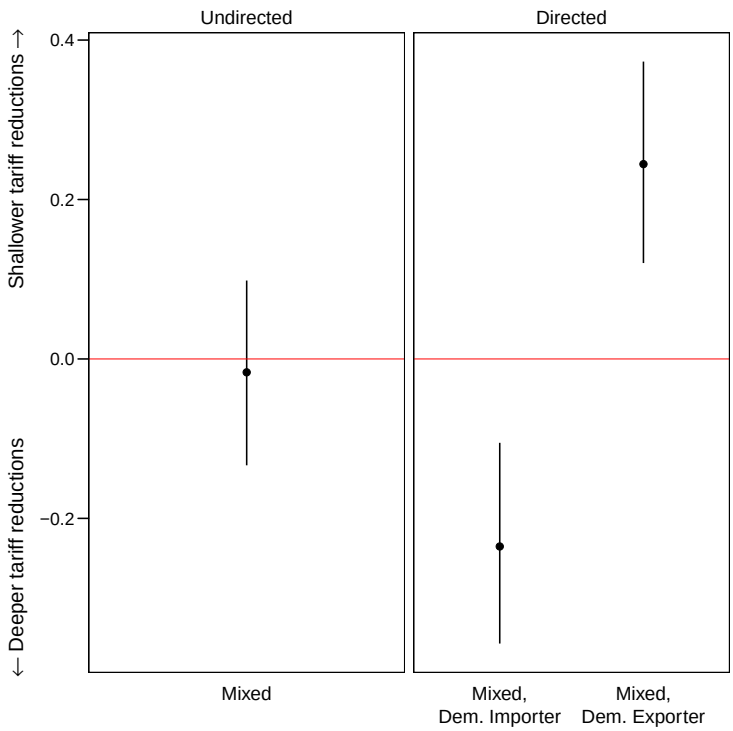

Figure 5: **Tariff Reductions by Dyad Type:** The left panel shows the difference in tariff reductions between mixed dyads (where one party to the FTA is a democracy and the other is a non-democracy) and democratic dyads. On average, we do not find a statistical difference between these two types of dyads. The right panel disaggregates mixed dyads into two types: one in which the importer is the democracy and one in which the exporter is the democracy. The left-hand line in the right panel shows that a democratic importer gives deeper concessions to a non-democratic partner than it would to a democratic partner. In contrast, a non-democratic importer secures shallower reductions from a democratic partner than a democratic import partner would.

a democracy and a non-democracy ($X_{ijt}^{\texttt{MIXED}} = \mathbb{1}\{X_{it} = 1 \text{ or } X_{jt} = 1, \text{ and } X_{it} \cdot X_{jt} \neq 1\}$) using the non-democratic pairs as our reference category. This set-up follows Mansfield, Milner, and Rosendorff (2000), although we consider applied tariffs rather than bilateral trade volume as a direct measure of trade policy outcome. The left panel in Figure 5 presents the estimated tariff reduction by mixed pairs compared to that between democratic pairs (the red horizontal line). On average, we do not find any difference between mixed dyads compared to democratic dyads. This differs from Mansfield, Milner, and Rosendorff (2000), who find that democracies are more likely to engage in trade liberalization among themselves than to trade with non-democracies.[14]

Next, we decompose the direction of trade liberalization among FTA partners. The right panel in

[14]Our model also allows us to compare pairs of non-democracies to pairs of democracies. We find that the former engages in deeper liberalization than the latter (-0.34 log points), although this estimate is likely to be noisy given the small number of FTAs involving non-democracy pairs in our data.

Figure 5 reports the posterior mean and 95% credible intervals of the quantities described by equations (7) and (8), respectively. First, we examine whether democratic importers are able to engage in deeper trade liberalization when their counterpart is a democracy rather than a non-democracy. This corresponds to the estimate on the left-hand side ("Mixed, Dem. Importer") in the panel. We find that democratic importers tend to engage in deeper tariff reductions when their partner is a non-democracy rather than a democracy. Second, we consider whether democratic exporters can achieve better market access when their negotiating partner (the importer) is a democracy instead of a non-democracy. As shown in the right-hand side ("Mixed, Dem. Exporter") in the panel, we find that the degree of tariff reductions is significantly lower among democracies than when the importing country is non-democratic. These results suggest that the finding in Mansfield, Milner, and Rosendorff (2000) that democratic dyads achieve greater tariff reductions than mixed dyads is due to the fact that non-democratic importers give shallower concessions to democratic exporters than democratic importers give to democratic exporters.

To explore the complex bilateral incentives among FTA partners, we examine the interaction of industry-specific effects and regime type on the depth of trade liberalization. Figure 6 shows whether mixed pairs with democratic importers engage in deeper or shallower liberalization compared to democratic pairs for 97 HS 2-digit industries. We find that mixed pairs engage in *deeper* tariff reductions for agricultural products than democratic pairs do. However, there are minimal differences in tariff rates across all other industries. This suggests that democracies not only face protective demands from the agricultural sector as shown in our earlier monadic analysis, but also find it difficult to mutually commit to open their agriculture markets bilaterally. This begs a question: why are democratic importers able to give concessional tariff rates on agricultural products to non-democratic exporters? We note that the "urban bias" hypothesis suggests that a democratic importer might be better able to liberalize its agricultural market when negotiating with an autocracy because the latter can engage in reciprocal liberalization. Although we leave for future research the task of investigating this alternative possibility, our analysis shows that distinguishing the direction of trade liberalization is important to understand the conditions under which reciprocal trade liberalization is politically sustainable.

Finally, we investigate whether mixed pairs with a democratic exporter engage in deeper or shallower tariff reductions than democratic pairs. Figure 7 shows that democracies (again marked by the red horizontal line) mutually commit to deeper trade liberalization than mixed pairs across all industries except for those in the agricultural sector. These findings shed important light on the

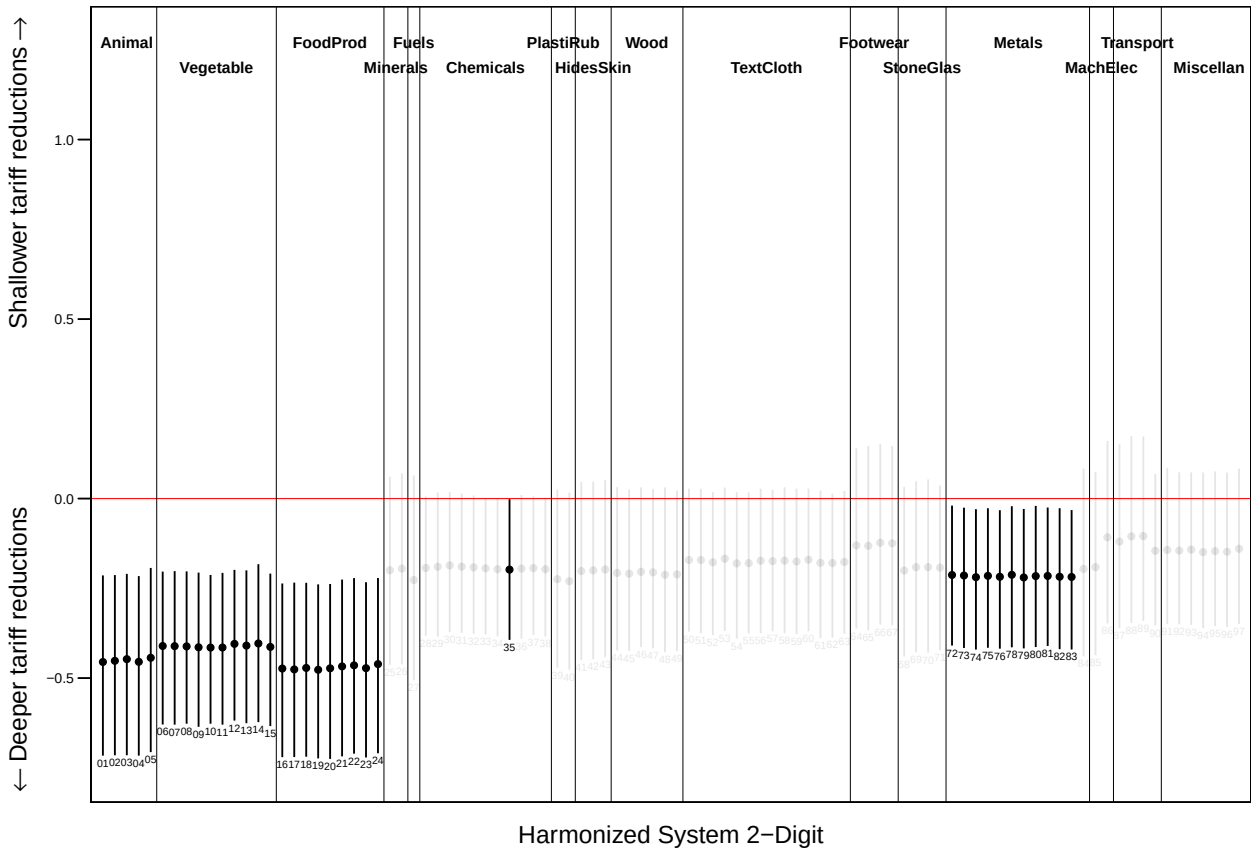

Figure 6: **Mixed Dyad with Democratic Importers Compared to Democratic Dyads:** In most sectors, we do not observe differences in tariff reductions between a democratic dyad and a mixed dyad with a democratic importer and a non-democratic exporter. A democratic importer, however, does give deeper tariff reductions in agricultural products to their non-democratic partners than they do to their partners.

earlier findings given in Figure 5 in which we had only partial evidence for the credible commitment mechanism among democracies. Specifically, we find that democracies might face at least as severe a commitment problem as mixed pairs when it comes to their policies toward agricultural industries. In short, both monadic and dyadic analyses given in this section consistently identify the existence of heterogeneous political dynamics related to agricultural protection.

4 Concluding Remarks

In this paper, we present a novel dataset with nearly 6 billion observations of product-level applied tariff rates that countries apply to their trading partners, incorporating the universe of preferential rates and the Generalized System of Preferences. To do so, we combine and augment existing datasets available from the WTO and UNCTAD, and we resolve conflicting information between these two datasets. Our dataset lays an important empirical foundation for investigating trade politics at a

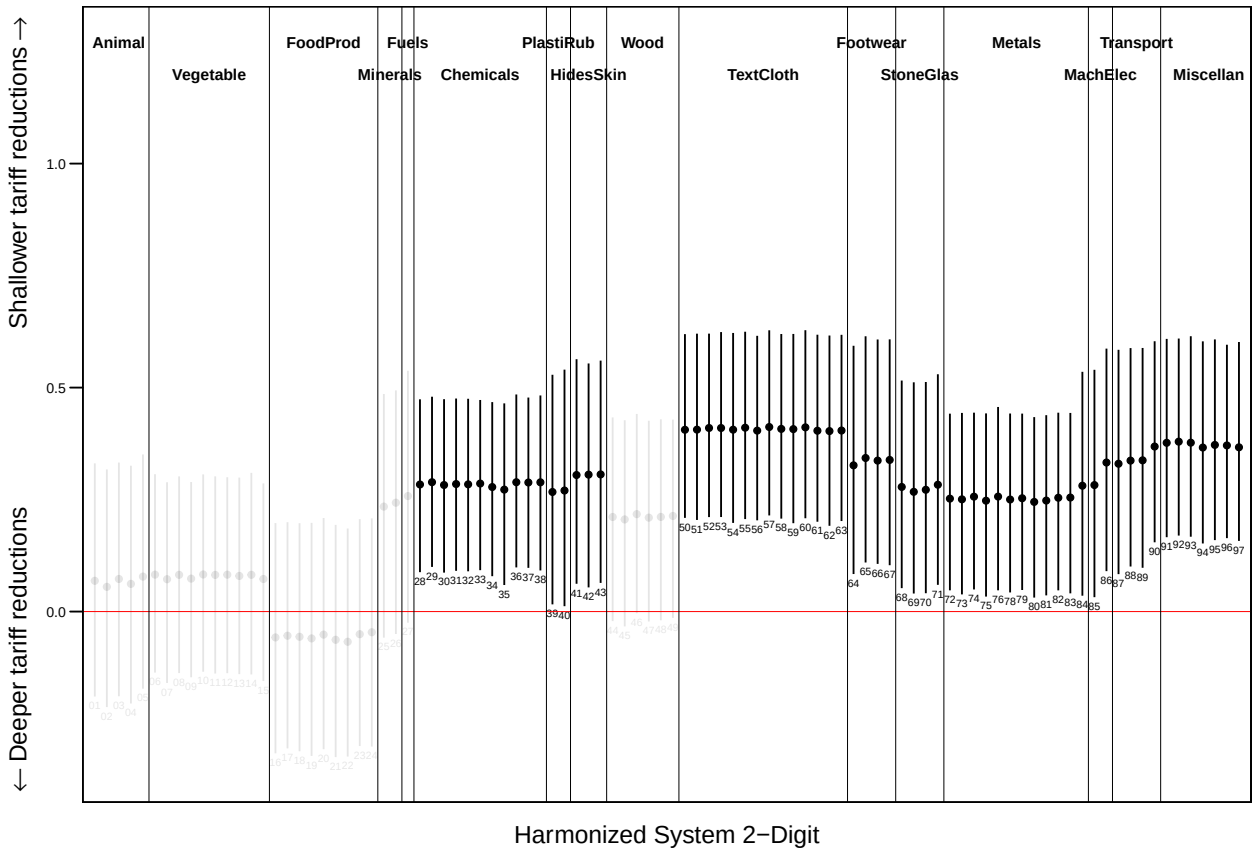

Figure 7: **Mixed Dyad with Democratic Exporters Compared to Democratic Dyads:** A non-democratic importer tends to give shallower tariff reductions compared to a democratic importer, when the FTA partner is a democracy. (Equivalently, a democratic importer gives deeper tariff reductions to another democracy, compared to a non-democratic importer.) The differences are robust across various sectors. However, we find no significant differences in the agricultural sector.

much more granular level than has previously been carried done.

We use this new data to examine an enduring question in international political economy: whether there are systematic differences in trade policy between countries with different regime types. Consistent with prior work, we find that democracies have lower tariff rates than non-democracies, on average. However, focusing on the average elides significant heterogeneity. We document that democracies are more protective than non-democracies for many industries, and in particular industries in the agricultural sector.

Our data also allows researchers in the field of international and comparative political economy to track fine-grained temporal changes in product-level trade policy for directed dyads. In particular, we examine whether interactions between regime types at the dyad level results in differences in the degree of bilateral trade liberalization. Our analysis of 90 bilateral FTAs, based on a difference-in-differences design, partially confirms prior findings that democratic pairs achieve greater tariff

reductions than a mixed pair with a democracy and a non-democracy. However, we show that the difference between democratic pairs and mixed pairs is due in large part to shallower concessions granted by non-democratic importers to democratic partners, but not vice-versa. Put another way, democratic importers grant trade concessions to democratic exporters and non-democratic exporters, but democratic exporters win more trade concessions from democratic importers than from non-democratic importers. It is important to note that the results presented in this article should not be interpreted as causal effects of democratization on unilateral and bilateral trade liberalization across industries. We leave for future research this challenging task of investigating how exactly *changes* in political institutions translate into trade policy outcomes.

Our dataset can be combined with industry-level covariates, such as import and export concentration, as well as country-specific industry structures, to further explore linkages between political institutions and industry-level trade policies. It can also be used to study the increasing complexity of product-level trade policy that affects the deepening of global supply chain and production networks. In addition, as other scholars have pointed out, there exists significant variation in institutional structures within democracies and non-democracies (Rickard, 2015; Kono, 2015). Differences in the scale and scope of support coalitions that a government needs to assemble are likely to result in different configurations of demands for trade protection. Research into the relationships between political institutions and trade policies continues to be relevant as policymakers around the world re-evaluate the merits of trade liberalization and re-negotiate existing trade agreements in response to pressures from their constituents. The question is not so much whether there will be more or less liberalization, but rather which products and industries will be most exposed to a review of trade policies. This article presents findings that usefully contribute to this research agenda.

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A Tariff-line Dataset

A.1 Bilateral Tariff Data Collection and Processing

A tariff-line is a numeric code that each importer uses to identify a unique product. For a given product, tariff-lines can differ from country to country; however, the first six digits of the tariff-line are internationally standardized under the Harmonized System.

There are two existing sources of tariff-line data: the WTO's Integrated Database (IDB), publicly accessible at the WTO's public Tariff Analysis Online (TAO) facility, and UNCTAD's Trade Analysis Information System (TRAINS), publicly accessible at the World Bank's World Integrated Trade Solution (WITS) website.[15] Together they form a comprehensive collection of ad valorem and non-ad valorem tariff rates across all WTO countries and Harmonized System products from 1988 to the present.

To compile this universe of tariffs, we first web-scrape tariff-lines for all available importers and years. An observation in this dataset is a tariff rate imposed in a given year by an importer on a product imported from a country (e.g. Republic of Korea) or a group of countries (e.g. NAFTA, Mercosur, WTO members). Where the tariff affects a group of countries, we identify the members of the group and expand the observation so that each new observation is a dyad with an importer and exporter. Finally, for each resulting (year, importer, exporter, tariff-line) we compare duties from IDB and TRAINS to select the most likely applied duty using the algorithm detailed in Appendix A.2.

Figure 2 graphically illustrates the data collection, processing, and merging steps in our tariff dataset creation using an example United States tariff-line. The next sections detail each of these steps for IDB and TRAINS respectively. To further clarify each step, we use a recurring example tariff-line: The United State's (USA) 2013 tariff on HS product `62011330` (Overcoats, raincoats, car-coats, capes, cloaks and similar articles) from South Africa (ZAF). Notably, this particular tariff-line is a beneficiary of the African Growth and Opportunity Act (AGOA) enacted by the U.S. in 2000.

A.1.1 WTO IDB Duty Collection and Processing

We perform the following steps to collect and process IDB duties:

> **Step 1. (Web scrape product-level duties)** For each year and importer, we scrape all IDB product-level applied tariffs available through WTO's public Tariff Analysis Online (TAO) facility. Each duty is identified by its year, importer, and Harmonized System product code and contains information on its specific beneficiary group as well as the rate applied. E.g.

Year	Imp.	Code	Full description	Type	Reported rate
2013	USA	`62011330`	"MFN applied duty rate"	02	49.7 cents/kg + 19.7%
2013	USA	`62011330`	"General duty rate"	80	52.9 cents/kg + 58.5%

[15] TAO's URL is `https://tao.wto.org/`, and WITS's URL is `https://wits.worldbank.org/`

We acquire two different reported duties from IDB for American imports of overcoat-like apparels from WTO countries (including South Africa) in 2013.

Step 2. (Parse compound and mixed tariff rates) In IDB, all tariff-lines with compound or mixed rates (rates that have both an ad valorem and non ad valorem component) have a `NULL` in the field for the numerical duty rate. Rather than discarding these complex tariffs, we parse the ad valorem component from the reported rate text and use it as a approximation of the full duty rate. E.g.

Year	Imp.	Code	Full description	Type	Reported rate (≈ imputed AVE)
2013	USA	`62011330`	"MFN applied duty rate"	02	49.7 cents/kg + 19.7% (≈ **19.7**%)
2013	USA	`62011330`	"General duty rate"	80	52.9 cents/kg + 58.5% (≈ **58.5**%)

We now have an approximate 'ad valorem equivalent' rate imputed for these and all other IDB mixed/compound duty rates.

Step 3. (Disaggregate duty beneficiaries to countries) Each duty has a type field and description field that uniquely indicates its specific beneficiary which may be a country (e.g. `Preferential rate for Canada`), members of an agreement (e.g. `North-American Free Trade Agreement`), or a group of countries (e.g. `G16`). We use a mix of hand-coding from official materials and string matching with country names and regional trade agreement titles in order to map each duty type appearing in IDB data to its respective set of countries. [16] E.g.

Year	Imp.	Exp.	Code	Full description	Type	Reported rate (≈ imputed AVE)
2013	USA	**ZAF**	`62011330`	"MFN applied duty rate"	02	49.7 cents/kg + 19.7% (≈ 19.7%)
2013	USA	**ZAF**	`62011330`	"General duty rate"	80	52.9 cents/kg + 58.5% (≈ 58.5%)

We find that both IDB duty types stipulate South Africa as a beneficiary.

A.1.2 UNCTAD TRAINS Duty Collection and Processing

Likewise, we perform the following corresponding steps for TRAINS tariffs:

Step 1. (Web scrape product-level duties) For each year, we scrape all TRAINS product-level tariffs available through the WITS web site. E.g.

Year	Imp.	Code	Full description	Type	Reported rate (≈ UNCTAD AVE)
2013	USA	`62011330`	"Most Favoured Nation duty rate treatment"	002	49.7 cents/kg + 19.7% (≈ 21.22%)
2013	USA	`62011330`	"AGOA preference on certain textiles and apparel for eligible countries"	051	0.0%

[16] We use official preference beneficiaries for many tariff measures from `http://wits.worldbank.org/WITS/WITS/Support%20Materials/TrfMeasures.aspx?Page=TfMeasures`. We map beneficiaries of regional trade agreements from the Regional Trade Agreements Information System (RTA-IS) publicly accessible at `http://rtais.wto.org/`.

We find two different duties applicable to 2013 American imports of HS product `62011330` from South Africa. Unlike IDB however, TRAINS reports a preferential rate (AGOA). Also unlike IDB, TRAINS provides its own ad valorem equivalent (`21.22%`) for the compound MFN tariff (`49.7 cents/kg + 19.7%`).

Step 2. (Disaggregate duty beneficiaries to countries) Using a combination of a region-to-countries mapping and a type-to-countries mapping, both provided by the World Bank, we expand each beneficiary-level duty to its disaggregated partner-specific duties. E.g.

Year	Imp.	Exp.	Code	Full description	Type	Reported rate (≈ UNCTAD AVE)
2013	USA	**ZAF**	`62011330`	"Most Favoured Nation duty rate treatment"	002	49.7 cents/kg + 19.7% (≈ 21.22%)
2013	USA	**ZAF**	`62011330`	"AGOA preference on certain textiles and apparel for eligible countries"	051	0.0%

Again, we find that both the duties found in TRAINS stipulate South Africa as a beneficiary.

Performing these procedures, we acquire 4.1 billion IDB and 4.7 billion TRAINS product-level partner-specific duties. However, as noted in our example, for each (year, importer, exporter, product) we may have multiple conflicting duties, of which only one is actually applied. In the next section, we describe the merging algorithm used to solve this problem.

A.2 Tariff Merging Algorithm

A given (year, importer, exporter, industry) query may return multiple possible duties from the WTO IDB database and the UNCTAD TRAINS database. In some cases, both sources agree on an ad valorem rate, but TRAINS provides a more informative specific duty rate. In other cases, TRAINS correctly accounts for a compound or mixed rate while IDB does not. Moreover, for some years, one source correctly retrieves a newly enforced preferential rate while the other mistakenly reports previous years' Most Favored Nation (MFN) duty rate. Finally, for all non-ad valorem tariffs, TRAINS provides an ad valorem equivalent (AVE) rate using a custom statistical method that allows comparisons to be made between products with ad valorem and non-ad valorem rates. For such tariffs, IDB only provides the original non-ad valorem rate which is typically less informative for trade researchers.

The goal of the merging algorithm is to account for all of these cases in order to select the single most accurate and informative duty that an importer applies to a industry and partner in a given year. We illustrate how this is done using the previous example of United States' 2013 tariff on HS product `62011330` from South Africa. In this case, it is clear that United States, in practice, applies the preferential AGOA duty rate over the Most Favored Nation duty rate. Our algorithm correctly picks this rate in three steps:

Step 1. (Pick IDB candidate) If there are any preferential IDB duties for the given tariff-line, pick the preferential duty with the lowest rate. Otherwise, pick the non-preferential

duty with the lowest rate. When picking from either set, sort duties using the ad valorem rate (or the imputed AVE in the case of mixed/compound tariffs); if no duties in the set have an ad valorem component, sort using the parsed specific rate. E.g.

Year	Imp.	Exp.	Code	Full description	Type	Reported rate (≈ imputed AVE)
2013	USA	ZAF	62011330	"MFN applied duty rates"	02	49.7 cents/kg + 19.7% (≈ 19.7%)
2013	USA	ZAF	62011330	"General duty rate"	80	52.9 cents/kg + 58.5% (≈ 58.5%)

In this case, since there are no preferential duties reported by IDB, we pick the lower of the non-preferential duties using the imputed AVE values.

Step 2. (Pick TRAINS candidate) If there are any preferential TRAINS duties for the given tariff-line, pick the preferential duty with the lowest rate. Otherwise, pick the non-preferential duty with the lowest rate. When picking from either set, sort duties using the ad valorem rate (either the reported ad valorem rate or the AVE imputed by UNCTAD). E.g.

Year	Imp.	Exp.	Code	Full description	Type	Reported rate (≈ UNCTAD AVE)
2013	USA	ZAF	62011330	"Most Favoured Nation duty rate treatment"	002	49.7 cents/kg + 19.7% (≈ 21.22%)
2013	USA	ZAF	62011330	"AGOA preference on certain textiles and apparel for eligible countries"	051	0.0%

Since there is only a single preferential duty, we select it as the best TRAINS candidate.

Step 3. (Select between candidates) Given the best IDB and TRAINS candidate duties, if one is preferential and the other is not, select the duty that is preferential. If both are either non-preferential or preferential and the TRAINS candidate has an imputed AVE, select the TRAINS candidate. Otherwise, select the candidate with the lowest ad valorem rate. If either a TRAINS or IDB candidate could not be found, select the candidate that is available. E.g.

Year	Imp.	Exp.	Code	Original description	Final applied rate	Source
2013	USA	ZAF	62011330	"MFN applied duty rates"	49.7 cents/kg + 19.7% (≈ 19.7%)	IDB
2013	USA	ZAF	62011330	"AGOA preference on certain textiles and apparel for eligible countries"	0.0%	TRAINS

Since TRAINS provides a preferential rate and IDB does not, we select the TRAINS candidate as the applied duty for this tariff-line.

The result is a unique tariff for each (year, importer, exporter, product) query. In sum, this procedure merges 4.1 billion IDB duties with 4.7 billion TRAINS duties to produce 5.7 billion 'resolved'

bilateral tariffs.[17]

[17]We implement this procedure as a distributed SQL operation on the Hadoop big data ecosystem. Overall, this operation takes more than 72 hours to complete on a 10 node computing cluster (256 GB RAM per node, 24 CPU per node) and the resulting un-indexed dataset is more than 900 GB in size.

B List of Bilateral FTAs

Table 2: List of Bilateral Free Trade Agreements

Panel A: Non-Democratic Pairs		
Armenia	Ukraine	1994
Azerbaijan	Ukraine	1994
Ukraine	Uzbekistan	1994
Jordan	Singapore	2003
Morocco	Turkey	2004
Egypt	Turkey	2005
China	Singapore	2007
Jordan	Turkey	2009
Panel B: Mixed Pairs		
Georgia	Ukraine	1994
Israel	Turkey	1995
Georgia	Turkmenistan	1998
Macedonia	Turkey	1998
Jordan	United States	1999
New Zealand	Singapore	1999
Japan	Singapore	2000
Australia	Singapore	2001
Singapore	United States	2002
Australia	Thailand	2003
Moldova	Ukraine	2003
New Zealand	Thailand	2003
Tunisia	Turkey	2003
Bahrain	United States	2004
Chile	China	2004
Japan	Malaysia	2004
South Korea	Singapore	2004
Morocco	United States	2004
Panama	Singapore	2004
China	Pakistan	2005
Japan	Thailand	2005
Albania	Turkey	2006
China	New Zealand	2006
Georgia	Turkey	2006
Malaysia	Pakistan	2006
Peru	Singapore	2007
Oman	United States	2007
China	Peru	2008
Montenegro	Turkey	2008
China	Costa Rica	2009
Canada	Jordan	2010

Table 2: Continued on next page

Table 2 – *Continued from previous page*

Chile	Malaysia	2010
Australia	Malaysia	2011
Costa Rica	Singapore	2011
South Korea	Turkey	2011
Montenegro	Ukraine	2011
Mauritius	Turkey	2011
Switzerland	China	2012

Panel C: Democratic Pairs

Colombia	Mexico	1993
Canada	Chile	1995
Canada	Israel	1995
Chile	Mexico	1997
Israel	Mexico	1998
Canada	Costa Rica	2000
Chile	Costa Rica	2000
Chile	El Salvador	2000
Panama	El Salvador	2001
Chile	South Korea	2002
Mexico	Uruguay	2002
Chile	United States	2002
Australia	United States	2003
Japan	Mexico	2003
Sri Lanka	Pakistan	2003
Chile	Japan	2005
Mauritius	Pakistan	2005
Costa Rica	Panama	2006
Indonesia	Japan	2006
Japan	Philippines	2006
Chile	Panama	2006
Australia	Chile	2007
Canada	Peru	2007
Switzerland	Japan	2007
Chile	Colombia	2007
Guatemala	Panama	2007
Honduras	Panama	2007
Nicaragua	Panama	2007
Chile	Peru	2007
Peru	United States	2007
Chile	Guatemala	2008
Canada	Colombia	2009
South Korea	Peru	2009
Colombia	United States	2010
Japan	Peru	2010
South Korea	United States	2010
Mexico	Peru	2010

Table 2: Continued on next page

Table 2 – *Continued from previous page*

Chile	Nicaragua	2010
Panama	Peru	2010
Panama	United States	2010
Canada	Panama	2011
Costa Rica	Peru	2011
Canada	Honduras	2012
Australia	South Korea	2012

C Additional Figures

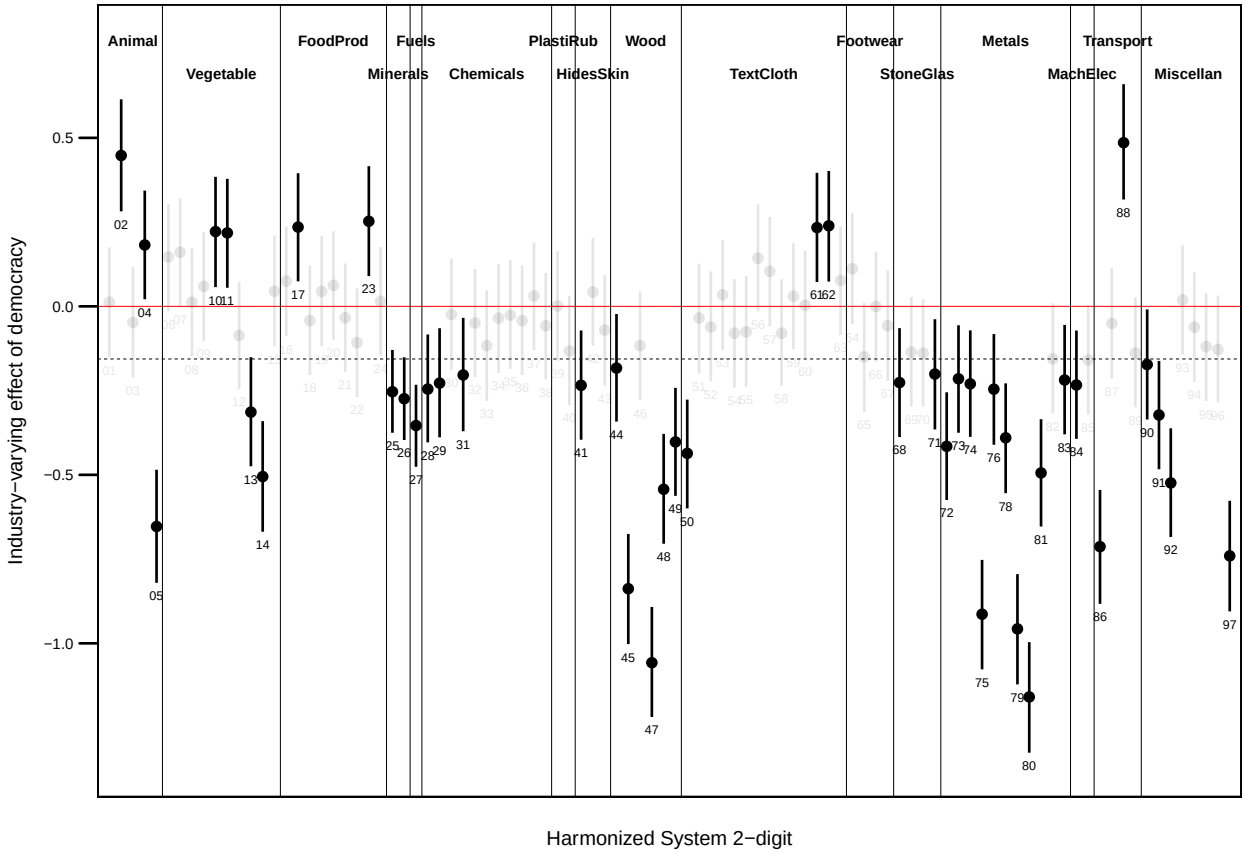

Figure 8: **Effect of Democracy on Log Tariffs, Less-Developed Countries:** This plot presents posterior means and 95% credible intervals for the estimated effects of democracy on trade policy for each HS2 industry. The two-digit Harmonized System chapter codes are given at the bottom of each line.