WPS8567

Policy Research Working Paper 8567

The Heterogeneous Effects of Trade Policy Uncertainty

How Much Do Trade Commitments Boost Trade?

Alberto Osnago
Roberta Piermartini
Nadia Rocha

WORLD BANK GROUP
Macroeconomics, Trade and Investment Global Practice
August 2018

Abstract

This paper studies the effects of trade policy uncertainty on the extensive and intensive margins of trade for a sample of 65 exporters at the Harmonized System six-digit level. The paper measures trade policy uncertainty as the gap between binding tariff commitments under trade agreements (multilateral and regional agreements) and applied tariffs—what is also known as tariffs' water. The results show that trade policy uncertainty is an important barrier to exports and its effects are heterogeneous. On average and at the current level of tariff commitments, the paper estimates that the elimination of water, without any change of the applied tariff, would increase the probability of exporting by 6 percent and trade volumes by 1.3 percent. The negative impact of trade policy uncertainty on export participation is higher for countries with low-quality institutions and in the presence of global value chains. For a sample of new acceding countries, the analysis finds that removing water would boost the probability of trading by 50 percent and exports by 16 percent. The paper also estimates that the current system of commitments boosts trade by between 10 and 30 percent, compared with a world where at any moment tariffs could be raised to an arbitrarily high level.

This paper is a product of the Macroeconomics, Trade and Investment Global Practice. It is part of a larger effort by the World Bank to provide open access to its research and make a contribution to development policy discussions around the world. Policy Research Working Papers are also posted on the Web at http://www.worldbank.org/research. The authors may be contacted at nrocha@worldbank.org.

The Heterogeneous Effects of Trade Policy Uncertainty: How Much Do Trade Commitments Boost Trade?

Alberto Osnago
WTO

Roberta Piermartini
WTO

Nadia Rocha[1]
World Bank

Keywords: Binding overhang, tariffs, policy space, non-tariff barriers, World Trade Organization

JEL Codes: F10, F13, F14

[1] We thank Valeria Groppo for facilitating access to the database on tariffs. We also thank Jose de Sousa, Chad Bown, Nuno Limão, Aaditya Mattoo, Michele Ruta and the participants to the IMF/WB/WTO Workshop for their useful comments on previous drafts of the paper. Corresponding author: nrocha@worldbank.org.

1. Introduction

Policy makers have long believed that an important contribution of trade agreements is to increase the predictability of trade policy. The WTO and its multilateral agreements of trade in goods aim at ensuring that trade flows as smoothly, predictably and freely as possible. Specifically, WTO members make commitments not to increase tariffs above some bound rates.[2]

Still, trade policy regimes are flexible and tariffs may change without the violation of WTO rules. In fact, a substantial portion of global trade occurs under flexible trade policy regimes. In 2011, on average 27% of world imports were either unbound or bound with a gap between the bound rate (the so-called "tariff water") and the applied rate greater than 5 percentage points. The global average level of tariff water is about 18 percentage points, ranging from about 4 percentage points in high income countries to approximately 24 percentage points in middle and low-income countries (Groppo and Piermartini, 2014).

Understanding the importance of trade policy certainty has become more prevalent in recent years following the reversal of existing trade commitments among major trading partners such as the United States and the United Kingdom. Recent events such as Brexit and unilateral trade policy decisions taken by the United States have caused concern for countries in terms of the uncertainty around future commitments to trade policy and the subsequent potential negative impacts on trade.

Using a recently built database on tariff water to measure the extent of trade policy flexibility of WTO member countries at the HS6-digit product level, this paper studies how a country's exports react to trade policy uncertainty (TPU) in the destination market. The paper also tries to assess the value of trade commitments in terms of additional global trade.

Economic literature has shown that the uncertainty of trade policy, defined as the risk of a tariff reversal, has real economic effects. In a model of trade with heterogeneous firms, Handley (2014) shows that uncertainty over future conditions of trade creates an option value of waiting to enter a new market, thus inducing firms to delay the entry in a foreign market. The risk of a trade policy reversal acts as a fixed cost to enter an export market and therefore has a negative impact on the extensive margin of trade. In this setup, tariff commitments under the WTO should increase the number of products that countries trade. More recently, Handley and Limão (2017) also show that trade policy uncertainty can have an impact on the intensive margin of trade through the effect it has on a firm's technology choice.

[2] Economic theory has recently shown that the reduction of trade policy uncertainty could per se be a motive to enter an agreement. Even if an agreement does not reduce applied tariffs' rates, there are welfare gains from reducing uncertainty (Limão and Maggi, 2013). In support of these views, Groppo and Piermartini (2014) show that WTO commitments -of not increasing tariffs above a certain level- do reduce trade policy uncertainty. Mansfield and Reinhardt (2008) also find that GATT/WTO membership reduces export volatility by up to one-third.

Empirically, focusing on Australia's commitments under WTO, Handley (2014) shows that entry is higher in sectors characterized by lower binding overhangs (the gap between the applied and the ceiling level of the tariff). In particular, Handley estimates that, if Australia could reduce all bindings to current applied tariffs, without changing its applied rates, the number of traded products would increase by 8.8%. Handley and Limão (2012) show a significant increase in Portuguese exports to the EU upon accession even in sectors where applied tariffs did not change. They interpret this as evidence that Portugal's accession to the EU eliminated the (pre-accession) risk that tariffs faced by Portuguese exporters may increase to the level of EU external tariffs. Handley and Limão (2017) estimate that reducing the threat of a trade war China's accession to WTO explains 22% of Chinese export growth to the U.S.

This paper is the first to investigate the impact of trade policy uncertainty on the probability of exporting (extensive margin of trade) and on export values (intensive margin of trade), for a large set of countries, representing more than 95% of world trade. To this purpose, TPU (or tariff water) is defined as the gap between the bound rates and the current applied rates. So far, the literature has focused on the analysis of the effects of TPU on the extensive margin of trade. However, as shown in Handley and Limão (2017), to the extent that firms can upgrade their technologies to decrease their marginal costs, TPU reductions will generate new exports via both new firms entering an export market and via endogenous technology upgrading by incumbent exporters. Assessing the additional intensive margin effect of TPU is key since new entrants are typically small and their contribution to total export growth is rather limited compared to the contribution of existing exporters, especially in developing countries.[3]

The paper also analyzes whether the impact of trade policy uncertainty on the intensive and extensive margins of trade varies across countries with different levels of institutional quality. Trade models incorporating the option value of waiting for firms to enter into an export market because of potential trade policy improvement usually assume that tariffs change at an exogenous rate as a reaction to policy shocks (Handley 2015). This paper explores the possibility that exporters perceive the probability of a tariff change to differ across countries depending on their quality of institutions. If firms perceive countries with better institutions as more predictable, TPU should be a larger obstacle to trade for countries with poor quality of institutions.

The paper also assesses whether the sensitivity of trade to TPU depends on specific industry characteristics.[4] Specifically, we test whether the relationship between TPU and export margins is affected by the presence of global value chains. Since trade policy uncertainty is a source of agglomeration when production is fragmented across countries (Harrigan and Venables, 2006), we

[3] Studies finding that most of the growth of trade is due to the intensive margin rather than the extensive margin include Felbermayr and Kohler (2006), Eaton et al. (2007), and Helpman, Freund (2007), Melitz, and Rubinstein (2008) and Besedes and Prusa (2008), Manova and Zhang, 2009.

[4] Handley and Limão (2017) estimate marginally stronger TPU effects for industries with higher capital/labor intensity. They also find an effect on TPU only for industries with high sunk costs (as predicted by their model).

expect that TPU has a stronger negative effect in the export margins of intermediate goods. We also test whether the sensitivity of trade to TPU depends on the degree of differentiation of a product. While the empirical literature shows that tariffs have a higher negative impact on homogeneous goods (see Kee, Nicita and Olarreaga, 2004), the impact of uncertainty on this kind of goods could go the opposite way. Compared to differentiated goods providers, firms supplying more standardized inputs could more easily offer their products to other markets once a trade policy reversal takes place in a certain destination. Therefore, homogeneous goods should be less affected by TPU.

Throughout the paper, the potential problems of endogeneity deriving both from reverse causality and omitted variables bias are addressed. Reverse causality could arise, for example, if governments are more willing to bound tariff lines where they are less likely to change their MFN tariff. This would potentially bias the estimated results downwards. To address this issue, regressions are estimated for the sub-sample of countries that have acceded the WTO after the Uruguay Round (UR). Compared with pre-existing members, these countries were not involved in the UR negotiations and therefore had less of a say on the level at which to bind their tariffs. To control for omitted variables bias, different sets of fixed effects are included in the estimated regressions.

The results of the paper suggest that multilateral and preferential trade commitments have a positive and statistically significant impact on both the extensive and the intensive margins of trade. On average, at the current level of water, the elimination of water increases the probability of exporting by 6% (an order of magnitude similar to Handley (2014) for Australia). The negative effect of uncertainty on the number of products traded is higher for countries with low quality of institutions, for intermediate goods and for differentiated products. At the intensive margin of trade, water elimination is associated with a 1.3% increase in the value of exports for the full sample. For the sample of new acceding countries, we estimate a much larger impact on trade volumes, equal to 16%. However, this is an order of magnitude comparable to the estimate of Handley and Limão (2017) for China.

2. Data

We measure trade policy uncertainty as the gap between bound rates and effectively applied tariffs - what is also known as water or binding overhang.[5] This measure reflects the assumption that a firm takes a decision of whether to export to a certain destination and/or how much to export based on its perceived risk of a trade policy reversal rather than on the volatility in import tariffs.

In the case of two WTO member countries that have not formed a preferential trade agreement (PTA) between them, bound tariff rates are represented by the MFN ceiling rates at which individual WTO members have committed under the WTO. WTO members have the flexibility to increase applied tariffs

[5] One often suggested alternative is to consider the second moment of the distribution of tariffs. However, such measure would capture also the possibility of tariff reductions which are not relevant for the export choice of firms.

up to their bound levels and can take another member to dispute settlement only when it increases its applied tariff above the bound level. The size of water measures the possibility of a country to freely increase its applied MFN tariffs up to the bound rate without incurring into a dispute at the WTO. The simple presence of water makes trade policy less predictable and therefore more uncertain.

In our analysis we take commitments under PTAs into account by setting the bound rate equal to the preferential tariff for those country pairs that have signed a preferential agreement. Specifically, the level of water is equal to zero for country pairs belonging to the same PTA unless preferential rates are higher than MFN.[6] Algebraically, we define water in product k for a country pair ij as follows:

$$Water_{ijk} = \begin{cases} max(\,Pref\ rate_{ijk} - MFN_{jk}\,, 0) & \forall ij \in PTA \\ \ Bound\ rate_{ijk} - MFN_{jk}, & otherwise \end{cases} \qquad (1)$$

Data on MFN applied rates and WTO bound rates are obtained from Groppo and Piermartini (2014). Their database combines information on MFN applied tariffs from the WTO's Integrated Data Base (IDB) and UNCTAD's Trade Analysis and Information System (TRAINS).[7] The latter database is also used to extract data on effectively applied tariffs for country pairs belonging to a PTA. Data on WTO bound rates are from the WTO Consolidated Tariff Schedules (CTS) database.

Trade data have been retrieved from the UN COMTRADE database. Bilateral exports at the 6-digits level of the Harmonized System 1996 are used for the analysis. Since the number of observations in the full sample is sizable and creates computational challenges, a set of restrictions is established to reduce the sample size of the database. First, the analysis focuses on a cross section analysis for the year 2011. Second, agricultural sectors are excluded from the estimations. These sectors are characterized by a relevant portion of non-ad valorem tariffs and other country-specific distortions such as agricultural subsidies and, consequently, the calculation of the equivalent bound rates could be misleading or biased. Third, importers and exporters that were not WTO members in 2011 are also excluded from the analysis.[8] Fourth, the sample of countries whose share of world trade is less than 0.1% is omitted from the regressions. Finally, zero trade observations in products for which certain countries, mainly small countries, do not export to any destination is disregarded under the assumption that such countries do no produce these products. After applying these restrictions, information on trade, tariffs, bound rates and additional control variables is available for 65 developed and developing countries exporting up to 4,381 different HS6 products to 49 destinations.

Table 1 presents some summary statistics for the main variables of interest.[9] The average value of exports is almost 1.2 million of dollars. The average applied tariff rate is 4.94% while the bound rate is

[6] The number of cases in which preferential rates are above MFN rates is very small.

[7] The authors use TRAINS as the primary source for tariff data and IDB to fill the missing values.

[8] Considering only WTO members and manufacturing products, we have information about 151 countries exporting to 123 countries in 4,399 products. This translates into a sample of more than 81 million observations.

[9] Summary statistics are calculated for the sub-sample of observations that are used in our econometric analysis.

9.12%, almost twice the tariff. The average level of water is slightly more that 4%. Tariffs and bound rates vary considerably across products and countries as does the level of water. There are cases where water is negative. For example, for the EU negative water is recorded on certain footwear from China due to an antidumping duty in that year. In few instances, applied tariffs can be higher than 100%;[10] also bound rates and water can go beyond 350%.[11] Finally, almost half of the country pairs considered in our analysis are involved in a preferential trade agreement.[12]

In the sample of countries considered for the analysis, around 15% of exports is subject to trade policy uncertainty (see Figure 1). Figure 2 shows how the distribution of water changes across countries. Developing and emerging countries present wider flexibility compared to developed ones.

3. Empirical analysis

a. Econometric specification

We assess the effect of trade policy uncertainty on the extensive and intensive margins of trade, by estimating the following equation:

$$y_{ijk} = \alpha + \beta_1 Water_{ijk} + \beta_2 \log(\tau_{ijk} + 1) + \delta_{ij}$$

$$+\delta_{jk_{2d}} + \delta_{ik_{2d}} + \varepsilon_{ijk} \qquad (2)$$

For the regression on the extensive margin, the dependent variable y_{ijk} is a dichotomous variable equal to 1 for positive trade flows in product k between countries i and j. For the regressions on the intensive margin y_{ijk} is the log of total exports of product k from country i to country j, $\mathrm{Ln}(Export_{ijk})$.

$Water_{ijk}$, the main variable of interest, is calculated as in equation (1) and captures the level of trade policy uncertainty faced by country i when exporting product k to country j;[13] τ_{ijk} measures the applied tariffs that country j imposes on country i in product k; δ_{ij}, $\delta_{jk_{2d}}$ and $\delta_{ik_{2d}}$ are country-pair, importer-industry and exporter-industry fixed effects, where industries are defined at the HS Section level (2 digits) and control for any unobservable bilateral and country-industry specific characteristics.[14] In all the regressions, robust standard errors are clustered at the country-pair level.

b. Baseline Results –Extensive and Intensive Margins

[10] Indonesia has a tariff higher than 100% for the HS1996 product code 330210, "Mixed odoriferous substances – food & drink industries".

[11] Panama has a tariff and binding on the HS code 871000 "Tanks and other armoured fighting vehicles, motorised, whether or not fitted with weapons, and parts of such vehicles" of 368% and 353% respectively.

[12] Regarding the PTA variable, we rely on a newly built database by the WTO Secretariat (see WTO, World Trade Report 2011).

[13] In some specifications bound rates are used instead of water to explore the impact of the binding levels on the intensive and extensive margins of trade.

[14] Note that due to the size of the data set, the inclusion of importer- and exporter-product fixed effects at the HS 6-digit level presents computational challenges.

Table 2 reports the results of the linear probability model estimated in equation (2).[15] As expected, higher applied tariffs in country j are negatively related to the probability of exporting from country i to j (see column 1). The coefficient of log tariff is negative and significantly different from zero. Tariffs are on average 4.65%. This implies that decreasing tariffs by one percentage point, equivalent to a 22% reduction of the average tariff, increases the probability of export by 0.12 percentage points ($\beta_2 * 0.22$).

Column 2 shows how trade commitments (multilateral and regional) affect the probability of trade between two countries. The negative and significant coefficient of the (log of the) bound rate suggests that countries are less likely to export to countries with higher bound rates. At the average level, a reduction of bindings of one percentage point (from 8.3 to 7.3%) is associated to a 1.6% increase in the probability of export. These results indicate that not only lower tariff rates, but also more stringent bindings are related to more international trade.

The baseline result is shown in column 3. Trade policy uncertainty, as captured by water, reduces the probability to trade. The magnitude of the coefficient is economically significant. At the average level of water, improvements in commitments through a reduction of water by one point, from 4.1 to 3.1% (almost 24% decrease), are associated to an increase in the probability of exporting of 1.3 percentage points. Alternatively, eliminating trade water will increase exports by almost 6%. The results are in line with Handley's findings for Australia, where water elimination would lead to an 8.8% increase in imported products. The outcomes confirm the theoretical prediction that trade policy uncertainty represents a cost that induces firms to wait and postpone entry to foreign markets. Firms are more likely to export their products not only to countries that have lower tariffs (the coefficient of tariffs is negative and significant), but also to countries with lower water, where the losses deriving from a potential increase in tariffs are limited.

The OLS results for the intensive margin are presented in the last three columns of Table 2. The log-log nature of the specification allows the interpretation of the coefficients on tariffs and bound rates as elasticities. Column 4 shows that a 1% reduction in tariffs is associated to a 3.5% increase in the value of exports. When bound tariff rates are included in the regression (column 5) the tariff coefficient decreases to 3%. Moreover, a reduction in bound rates is negatively associated to the value of exports: reducing the bound rate by 1% increases exports by a 0.7%.

Column 6 shows the baseline results. A reduction of water has a positive effect on the intensive margin of trade. Given the log-level nature of the specification for the estimation of the coefficient of water, our finding suggests that a 10 percentage points decrease in water is associated to a 4.7% increase in

[15] To avoid the incidental parameter problem due to the big set of fixed effects included in the regression, OLS is used to estimate the impact of trade policy uncertainty on the extensive margin of trade. The coefficients of equation (2) have been estimated using the Stata command *reg2hdfe* developed by Guimaraes and Portugal (2010).

the value of exports. Alternatively, the elimination of water would increase exports by 1.3%. The coefficient on tariffs remains negative and significant

4. Robustness checks

Negotiated bound rates, and therefore water, may be affected by trade: the terms-of-trade (TOT) argument for tariff setting suggests that a large importer of a product may wish to set its bound rate high to have the flexibility to realise TOT gains. To address this potential endogeneity bias, we estimate equation (2) on the subsample of importers that acceded the WTO after 1995. In fact, new acceding countries, not being involved in the Uruguay Round negotiations, had to accept the conditions set by the previous members at the moment of accession. Hence, their bound rates and water are exogenous to trade.

Table 3 shows the results on the impact of trade policy uncertainty on the extensive and intensive margins of trade for the subsample of new acceding countries importing from any WTO member available in the data set. The results are similar to the ones presented in the previous tables. Higher levels of tariffs, tariff bound rates and water reduce the probability of exporting to a new acceding member of the WTO. The coefficients are all negative and significant.

As to the magnitudes, the coefficient in column 3 indicates that the elimination of water increases the probability of exporting by 50% and increases exports of new acceding countries by 16%. These effects are larger than those we estimated for the full sample in Table 2. This might be due to the sample of countries included in the regression[16], but it may also suggest that our results for the full sample suffer from downward bias. Note that the order of magnitude of our estimates for the impact on exports of the elimination of water is in line with the estimates of Handley and Limão (2017) for China, where they find that WTO accession increased Chinese export to the U.S by 22%, merely because of the elimination of the uncertainty of commitments.

We also test whether our findings are robust across time. Hence, we estimate the impact of water on the extensive and intensive margin also for the year 2007. The results reported in Table 4 are qualitatively and quantitatively similar to the results for 2011.

5. Trade Policy Uncertainty and Institutions

Countries with better institutions are likely to have more credibility in terms of the policies that they adopt. Therefore, potential exporting firms may perceive the presence of policy flexibility as a lower concern in such countries. This aspect is explored by adding an interaction term between water and the

[16] Our sample of new acceding countries includes only 8 countries.

level of institutions in the regressions. The Worldwide Governance Indicator database is used to measure the quality of institutions across countries.

Results on the interaction term between TPU and three different indicators of institutional quality -rule of law, regulatory quality and control of corruption are reported in Table 5. The coefficients of the interaction terms are all are positive and statistically significant for the extensive margin of trade, meaning that the negative effect of water on export participation is attenuated for countries with better institutions. For the intensive margin of trade, the interaction between the quality of institutions and the water coefficient is not significant.

6. Trade Policy Uncertainty and Product Characteristics

The impact of trade policy uncertainty can be magnified by global value chains (GVCs). Yi (2003) shows that tariffs and non-tariff measures matter more in GVCs, because in GVC goods cross borders multiple times and each time they do so, they incur the cost of the trade barrier they face. Following the same logic, TPU should have a stronger negative effect in the export margins of intermediate goods inputs used for further processing. Papers such as Harrigan and Venables (2006) also show that uncertainty is an important obstacle to trade when production takes place in global supply chains: it is a source of agglomeration when production is fragmented.[17]

To test whether TPU has an amplified impact in the presence of GVCs, an interaction between water and a dummy that identifies the sectors involved in GVCs is included in the regression. The dummy is equal to one for parts and components defined as the Standard International Trade Classification (SITC Rev.3) equivalent of Broad Economic Categories (BEC) parts and components plus unfinished textiles in SITC section division 65.[18] Results are presented in column 1 and 4 of Table 6. The coefficients of water and log tariff are still negative and significant. At the average tariff, a decrease in the applied tariff of one percentage point increases in the probability of trade by 11.2 points. Water elimination for non-intermediate products is associated with an increase in the probability to export of 5.3%. The coefficient of the interaction term is also negative and significant, implying that intermediate goods are more sensitive to trade policy uncertainty. A 100% reduction in water increases the probability of exporting parts and components by around 7%.

Next, it is investigated whether the TPU effect varies across products that are more or less differentiated. There is no prior expectation about the difference between homogeneous and differentiated goods. A trade-off between at least two mechanisms is at play. On the one hand, homogeneous goods are more sensitive to changes in prices. This would suggest that homogenous goods are also more sensitive to uncertainty. Conversely, providers of standardized goods can more easily redirect their supply of

[17] The authors focus on uncertainty in time costs but a similar logic could be applied for uncertainty in trade policy.

[18] Product nomenclatures have then been converted using the conversion tables prepared by the UN Statistics Division.

intermediates towards countries with lower levels of trade policy uncertainty compared to providers of more differentiated and tailor-made goods. Consequently, differentiated goods are more sensitive to uncertainty.

To investigate the sensitivity of homogeneous versus heterogeneous products are more or less sensitive to trade policy uncertainty an interaction term between water and a categorical variable capturing the level of differentiation of goods is included in the regressions. Following Rauch (1999), products are classified into differentiated products (Rauch index=2) reference priced (Rauch index=1), or homogeneous goods (Rauch index=0). Columns 2 and 3 Table 6show the results of regression (2) augmented with the interaction between water and different formulations of the Rauch classification.

In column 2 the coefficient of water is negative and significant suggesting that water has a negative impact on the probability of exporting homogeneous goods. The negative coefficient of the interaction shows that such negative effect of water is stronger the more differentiated the goods. In column 3, water is interacted with a dummy equal to one for differentiated goods only. The coefficient of the interaction term is still negative and significant.

As far as the intensive margin is concerned, Table 6 (columns 4-6) shows the impact of TPU for intermediates and for products with different levels of differentiation on the intensive margin of trade. Also in this case the coefficient of the interaction between water and parts and components tends to be negative and significant. This means that increases in the level of water are associated with bigger decreases in exports of intermediate goods. Similarly, differentiated goods are more sensitive to increases in the level of water.

7. Assessing the value of trade commitments

We assess the value of trade commitments by calculating the effect on global trade of loosening (increasing bound rates) or deepening existing trade commitment (further reducing bound rates). To get a sense of how valuable are existing commitments relative to a counterfactual where they no longer are in force, we estimate how the value of exports would change under two scenarios: (i) all bound rates increase by 100% and (ii) the bound rates are set to the maximum bound rate across all countries in a specific product.

The calculations presented in Table 7 based on our most conservative estimates of the impact of uncertainty on trade flows (those in Table 2) suggest that the predictability of trading conditions ensured by the commitments in trade agreements boosts trade by approximately between 8.6% and 31.8%, compared to a world where at any moment tariffs could be raised to an arbitrarily high level. At the

sectoral level, using the coefficients in Table 6, the costs of undoing trade commitments would be higher for intermediates and differentiated goods compared to final and homogeneous goods.[19]

8. Conclusions

This paper contributes to the emerging economic literature that studies the role of trade policy uncertainty on the extensive and the intensive margins of trade by extending the analysis to a wide sample of countries. Existing papers have looked at specific countries and identified the importance of trade policy uncertainty in explaining Australia's imported goods, Portugal's export increase after its entry to the EU and China's export growth to the US following China's accession to WTO.

We are able to show that TPU has a negative impact both on the probability to export and on export volumes for a wide set of importers and exporters and that these findings are robust to endogeneity.

We estimate that on average, the elimination of all existing water would increase the probability of exporting by 6% and trade volumes by 1.3%. The impact for the sample of countries that acceded WTO after 1995 would be much bigger, equal respectively to 50% increase of the probability to export and 16% more trade flows.

We also show that, in general, for countries with better institutions the impact of TPU on trade participation is dampened: stability and credibility of importers reduces the cost due to the presence of policy space. Taking up commitments under international trade agreements is therefore more beneficial in terms of trade gains for countries with poor institutions. In addition, TPU is an important obstacle to trade when production takes place in global supply chains and has a higher negative impact for more differentiated goods compared to homogeneous ones.

The results of the paper are useful to assess the value of trade commitments such as those agreed under WTO. Trade policy uncertainty — in the form of the threat to apply tariffs that violate existing WTO commitments — reduces trade much like actually applying an ad valorem tariff to global trade. Importers who fear higher future cost of sourcing from foreign suppliers may take precautionary steps to source domestically instead. In a world where at any moment tariffs could be raised to an arbitrarily high level (i.e., double the current bound rate or to the highest existing bound), the volume of trade could be between 10% and 30% lower compared to the volume of trade in a world where traders are assured WTO members will abide by their commitments.

[19] Computations for different levels of institutions are not presented since the respective coefficients are not statistically different from zero.

A. Tables and Figures

Figure 1: Exports by level of water

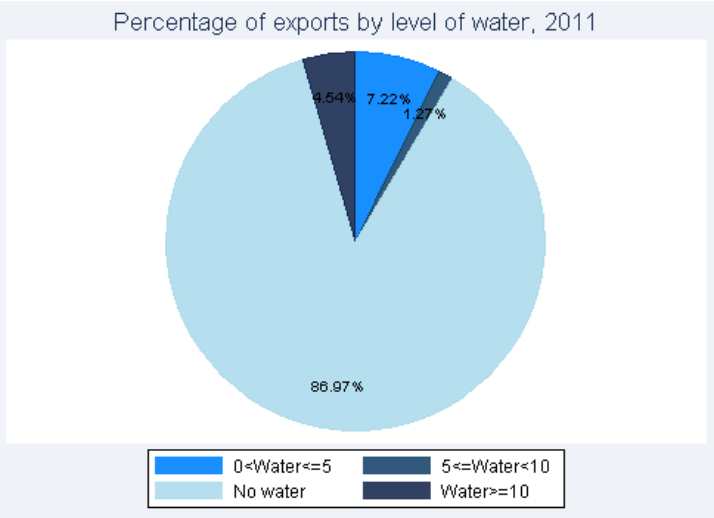

Figure 2: Average water by country, 2011

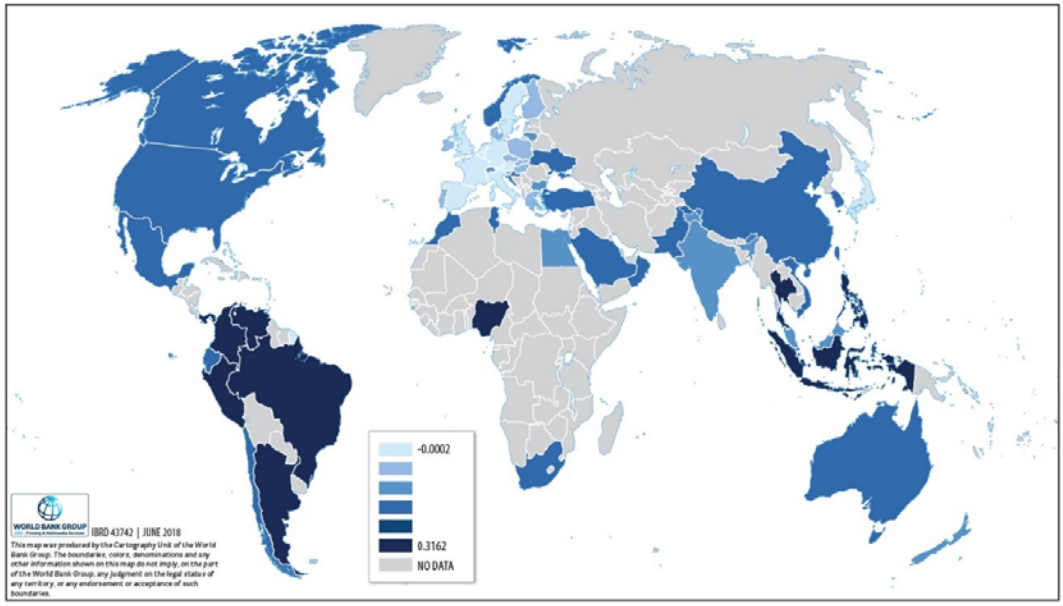

Table 1: Summary statistics for baseline sample

	Mean	Std. Dev.	Min	Max
Exports (1000s $)	1169.01	63253.6	0	69194979
Exports (log)	10.52	3.284	0	24.96
Product traded (binary)	0.302	0.459	0	1
Water	0.041	0.105	-0.3	3.53
Tariff (log)	0.045	0.055	0	0.70
Binding (log)	0.080	0.106	0	1.54
PTA	0.466	0.499	0	1

Table 2: Trade policy uncertainty and trade - Baseline results extensive and intensive margins

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
	Probability to export			Log of export		
Water			-0.0581***			-0.470***
			(0.0130)			(0.112)
Tariff (log)	-0.545***	-0.444***	-0.560***	-3.538***	-2.982***	-3.607***
	(0.0538)	(0.0496)	(0.0543)	(0.206)	(0.227)	(0.209)
Bound rate (log)		-0.131***			-0.670***	
		(0.0191)			(0.159)	
Observations	9,782,092	9,767,065	9,767,065	2,950,465	2,945,477	2,945,477
R-squared	0.376	0.376	0.376	0.340	0.340	0.340
Importer-Industry-2dig FE	Yes	Yes	Yes	Yes	Yes	Yes
Exporter-Industry-2dig FE	Yes	Yes	Yes	Yes	Yes	Yes
Country pair FE	Yes	Yes	Yes	Yes	Yes	Yes

Robust SE in brackets clustered by country-pair.
*** p<0.01, ** p<0.05, * p<0.1

Table 3: Robustness to endogeneity – Sample of new acceding countries

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
	Probability to export			Log of exports		
Water			-0.495***			-4.840***
			(0.0469)			(0.343)
Tariff (log)	-0.879***	-0.371***	-1.084***	-6.188***	-2.372***	-7.964***
	(0.124)	(0.0792)	(0.133)	(0.598)	(0.465)	(0.548)
Bound rate (log)		-0.836***			-5.815***	
		(0.0738)			(0.418)	
Observations	1,023,083	1,023,083	1,023,083	260,054	260,054	260,054
R-squared	0.367	0.371	0.369	0.339	0.341	0.341
Importer-Industry-2dig FE	Yes	Yes	Yes	Yes	Yes	Yes
Exporter-Industry-2dig FE	Yes	Yes	Yes	Yes	Yes	Yes
Country pair FE	Yes	Yes	Yes	Yes	Yes	Yes

Robust SE in brackets clustered by country-pair. The estimates are based on the subsample of importers that acceded the WTO after 1995.
*** p<0.01, ** p<0.05, * p<0.1

Table 4: Probability a product is traded and intensive margin – Results in 2007

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
	Probability to export			Log of export		
Water			-0.0139*			-0.523***
			(0.00781)			(0.0819)
Tariff (log)	-0.315***	-0.268***	-0.317***	-3.344***	-2.570***	-3.356***
	(0.0351)	(0.0357)	(0.0352)	(0.167)	(0.193)	(0.166)
Bound rate (log)		-0.0534***			-0.851***	
		(0.0117)			(0.119)	
Observations	11,764,033	11,738,708	11,738,708	3,430,113	3,423,406	3,423,406
R-squared	0.375	0.375	0.375	0.332	0.332	0.332
Importer-Industry-2dig FE	Yes	Yes	Yes	Yes	Yes	Yes
xporter-Industry-2dig FE	Yes	Yes	Yes	Yes	Yes	Yes
Country pair FE	Yes	Yes	Yes	Yes	Yes	Yes

Robust SE in brackets clustered by country-pair. The estimates are based on the subsample of importers that acceded the WTO after 1995.
*** p<0.01, ** p<0.05, * p<0.1

Table 5: Interaction with institutions: extensive and intensive margins

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
	Probability to export			Log of export		
Water	-0.0425***	-0.0497***	-0.0413***	-0.463***	-0.477***	-0.435***
	(0.0119)	(0.0129)	(0.0121)	(0.115)	(0.113)	(0.114)
Tariff (log)	-0.560***	-0.563***	-0.560***	-3.608***	-3.613***	-3.608***
	(0.0543)	(0.0544)	(0.0543)	(0.208)	(0.208)	(0.209)
Water*Rule of law	0.0318**			0.0251		
	(0.0156)			(0.124)		
Water*Regulatory quality		0.0718***			0.0986	
		(0.0169)			(0.150)	
Water*Control of corruption			0.0366***			0.152
			(0.0142)			(0.110)
Observations	9,767,065	9,767,065	9,767,065	2,945,477	2,945,477	2,945,477
R-squared	0.376	0.376	0.376	0.340	0.340	0.340
Importer-Industry-2dig FE	Yes	Yes	Yes	Yes	Yes	Yes
Exporter-Industry-2dig FE	Yes	Yes	Yes	Yes	Yes	Yes
Country pair FE	Yes	Yes	Yes	Yes	Yes	Yes

Robust SE in brackets clustered by importer-product.
** p<0.01, ** p<0.05, *<0.1

Table 6: Interactions with industry variables: extensive and intensive margins

	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES		Probability to export			Log of export	
Water	-0.0535***	0.0305	-0.00727	-0.356***	-0.111	-0.161
	(0.0131)	(0.0217)	(0.0167)	(0.110)	(0.269)	(0.173)
Water*GVC	-0.0192*			-0.597***		
	(0.0104)			(0.0864)		
Water*Rauch classification		-0.0518***			-0.171	
		(0.00839)			(0.124)	
Water*differentiated			-0.0630***			-0.316**
			(0.0104)			(0.133)
Tariff (log)	-0.552***	-0.666***	-0.645***	-3.608***	-3.640***	-3.685***
	(0.0540)	(0.0558)	(0.0556)	(0.208)	(0.211)	(0.212)
=1 if parts & components	0.101***			0.0583***		
	(0.00127)			(0.0108)		
Rauch classification		0.0614***			-0.186***	
		(0.00101)			(0.0142)	
=1 if differentiated			0.0719***			-0.190***
			(0.00113)			(0.0150)
Observations	9,767,065	9,243,789	9,243,789	2,945,477	2,776,219	2,776,219
R-squared	0.380	0.381	0.380	0.340	0.342	0.342
Importer-Industry-2dig FE	Yes	Yes	Yes	Yes	Yes	Yes
Exporter-Industry-2dig FE	Yes	Yes	Yes	Yes	Yes	Yes
Country pair FE	Yes	Yes	Yes	Yes	Yes	Yes

Robust SE in brackets clustered by importer-product.
*** p<0.01, ** p<0.05, * p<0.1

Table 7: The value of WTO commitments

	Trade gains with respect to a 100% increase in bound rates	Trade gains with respect to bound rates equal to maximum bound across countries
World (Baseline)	8.6%	31.8%
Product groups		
Intermediates	14.9%	63%
Final	7.1%	24.6%
Differentiated	8.9%	34.3%
Non-differentiated	4.1%	9.4%

References

Liliana Foletti, Marco Fugazza, Alessandro Nicita, and Marcelo Olarreaga. Smoke in the (tariff) water. The World Economy, 34(2), 2011.

Valeria Groppo and Roberta Piermartini. Trade Policy Uncertainty and WTO. WTO Staff Working Paper ERSD-2014-23, WTO, 2014.

Paulo Guimarães and Pedro Portugal. A simple feasible procedure to fit models with high dimensional fixed effects. Stata Journal, 10(4):628-649, 2010.

Kyle Handley. Exporting under trade policy uncertainty: Theory and evidence. Journal of International Economics, 94(1):50-66, 2014.

Kyle Handley and Nuno Limão. Trade and Investment under Policy Uncertainty: Theory and Firm Evidence. NBER Working Paper No. 17790, National Bureau of Economic Research, Inc, 2012.

Kyle Handley and Nuno Limão (2017) Policy Uncertainty, Trade and Welfare: Theory and Evidence for China and the U.S, *American Economic Review* 107(9): 2731–2783

James Harrigan and Anthony J. Venables. Timeliness and agglomeration. Journal of Urban Economics, 59(2):300-316, 2006.

Hiau Looi Kee, Alessandro Nicita, and Marcelo Olarreaga. Import Demand Elasticities and Trade Distortions. Policy Research Working Paper Series 3452, The World Bank, 2004.

Hiau Looi Kee, Alessandro Nicita, and Marcelo Olarreaga. Import Demand Elasticities and Trade Distortions. The Review of Economics and Statistics, 90(4):666-682, 2008.

Nuno Limão and Giovanni Maggi. Uncertainty and Trade Agreements. NBER Working Paper No. 18703, National Bureau of Economic Research, Inc, 2013.

James E. Rauch. Networks versus markets in international trade. Journal of International Economics, 48(1):7-35, 1999.

Kei-Mu Yi. Can Vertical Specialization Explain the Growth of World Trade? Journal of Political Economy, 111(1):52-102, 2003.