

# TRADE AGREEMENTS AND ENFORCEMENT: EVIDENCE FROM WTO DISPUTE SETTLEMENT\*

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## Abstract

This paper examines implications of the terms-of-trade theory for the enforcement of international agreements. Like original trade agreement negotiations, we model formal trade *dispute* negotiations as potentially addressing the externality problem that governments implement import protection above the globally efficient level so as to shift some of the policy's costs onto trading partners. We first extend the Bagwell and Staiger (1999, 2011) model from trade agreement accession negotiations to the setting of enforcement negotiations, and the resulting theory guides our empirical assessment. We use instrumental variables to estimate the model on information from trade volume outcomes deriving under WTO disputes that took place over 1995-2009. Our evidence is consistent with theoretical predictions that larger import volume outcomes are associated with products that have smaller increases to foreign exporter-received prices as a result of the dispute, larger pre-dispute import volumes, larger import demand elasticities, and smaller foreign export supply elasticities. Dispute settlement outcome differences are also explained by asymmetries in country-level bilateral retaliation capacity and the severity of the free rider problem associated with foreign exporter concentration. Finally, while the evidence is strongest for disputes that are not settled - and thus which result in formal WTO legal rulings and calls for compliance - the results do not extend beyond disputes involving high-income WTO member countries and certain types of policy changes that find themselves subject to litigation.

Keywords: trade agreements, terms of trade, WTO, dispute settlement

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(12),  $M^{BR} \rightarrow M^{PO}$ . On the other hand, the smaller is  $\omega^{*BR}$ , the greater is the responsiveness of foreign export supply to any given change from the best response to the politically optimal policy, and thus the larger the resulting post-dispute level of imports, *ceteris paribus*.

Before moving to a discussion of the data and our estimation approach, we clarify two important aspects of our theoretical framework that is explicitly designed to focus attention on the potential terms-of-trade implications of government policy changes. First is our assumption that the respondent government sets off the events that leads to the dispute through an exogenously triggered implementation of its best response policy. That is, we do not consider formal motives behind why the government made such a policy change and whether it is due to shocks to political preferences (e.g.,  $\gamma$ ), trade volumes, technology, domestic demand conditions, etc. Second, we also assume that this dispute-triggering event involves the respondent deviating all the way to its best response policy; i.e., we do not consider the theoretical possibility that the country deviates from the initial politically optimal policy to some alternative policy that falls short of the best response.<sup>19</sup> While our approach is designed to empirically investigate whether the determinants of trade dispute outcomes are consistent with the core relationships deriving from the terms-of-trade theory and in general we find evidence of these relationships, nevertheless, we also report results in which this framework explicitly breaks down. We provide below potential explanations behind the limitations to the model’s performance in explaining trade liberalization outcomes (and, by extension, inference on policy changes) and whether they may be motivated by the viability of these particular assumptions.<sup>20</sup>

## 4 Data and Estimation

We rely on theoretically motivated equation (12) to ultimately estimate models of the form

$$\ln(M_{grc}^{PO}) - \ln(M_{grc}^{BR}) = \xi_1[\ln(p_{grc}^{w,PO}) - \ln(p_{grc}^{w,BR})] + \xi_2\left[\frac{\sigma_{gr}^{BR}}{\omega_{*BR}^{gr}} \ln(M_{grc}^{BR})\right] + \nu_{grc}, \quad (13)$$

where  $g$  indexes the disputes (products),  $r$  indexes respondent (importing) countries,  $c$  indexes complainant (exporting) countries, and  $\nu_{grc}$  is the error term. The theory suggests our estimates to be  $\xi_1 < 0$ , and  $\xi_2 > 0$ .

Next we turn to a discussion of the econometric issues associated with estimating equation (13)

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<sup>19</sup>While this is clearly a simplifying assumption, in the absence of evidence suggesting otherwise, we motivate it as a reasonable first step. Put differently, one important question for a formal model to address would be why, if the respondent country knew it would ultimately face a formal trade dispute for any policy change above the status quo (politically optimal) level, it would chose to implement a policy increase short of the best response level.

<sup>20</sup>To our knowledge, Maggi and Staiger (2015b) is one of the few trade agreement models that has disputes arising in equilibrium as well as variation in “outcomes” of the dispute, i.e., whether disputes settle early or proceed through fully through the legal process and obtain rulings. Nevertheless, the basic underlying trade agreement framework is not designed to capture salient aspects of the terms-of-trade theory of trade agreements that the empirical evidence (cited above) has found to be relevant across a number of different settings for the formation of non-cooperative and cooperative tariffs (and non-tariff barriers) under the WTO. Other theoretical contributions in which disputes can arise in equilibrium, but in which terms-of-trade motives are also not considered, include Beshkar (2010, 2013), Maggi and Staiger (2011), Staiger and Sykes (2013a) and Park (2011).

and our particular approach to instrumental variables estimation that addresses these concerns. Then we introduce the data and the construction of the variables to be used in the estimation.

#### 4.1 Instrumental variables estimation

Next consider our approach to estimating equation (13) and two econometric issues that arise. In particular, we use instrumental variables (IV) to address potential concerns over endogeneity.

First, a strict interpretation of the model may omit factors that impact both the quantity of imports directly (through  $\nu_{grc}$  in equation 13) and indirectly through its impact on changes to exporter prices,  $[\ln(p_{grc}^{w,PO}) - \ln(p_{grc}^{w,BR})]$ . Examples would include non-captured import demand or foreign export supply shocks; if left unaddressed, this would lead to inconsistent estimates of  $\xi_1$ .

We construct instruments for the post-dispute change in exporter prices  $[\ln(p_{grc}^{w,PO}) - \ln(p_{grc}^{w,BR})]$  that is uncorrelated with  $\nu_{grc}$ . Our instrument for  $[\ln(p_{grc}^{w,PO}) - \ln(p_{grc}^{w,BR})]$  is based on earlier changes in exporter prices for the disputed product - e.g., those that took place because of the original imposition of the allegedly WTO-violating policy. Specifically, if  $BR$  is the year after the respondent first imposes its best response policy (i.e., the first full year that the policy is in effect), our approach is to instrument for  $[\ln(p_{grc}^{w,PO}) - \ln(p_{grc}^{w,BR})]$  with  $[\ln(p_{grc}^{w,BR-2}) - \ln(p_{grc}^{w,BR})]$ .<sup>21</sup> We also follow Khandelwal (2010) and include the percent change in crude oil prices between the politically optimal and best response years interacted with the log of distance between the respondent and complainant as an additional instrument. In addition to being a potential supply shifter, this change in crude oil prices will control for changes in transportation costs over the period of dispute which are necessarily embedded in our calculations of export prices, as described below.

A second potential concern with estimating equation (13) is that the volume of imports in the best response year ( $M_{grc}^{BR}$ ) is certainly endogenous in our model. Intuitively both the volume of imports in the best response year and the growth of imports between the politically optimal year and the best response year will be a function of shocks occurring during the best response year. To motivate our empirical strategy, consider a decomposition of the error term into two components:

$$\nu_{grc}^{BR} = \epsilon_{grc} + u_{grc}^{BR}.$$

Here  $\epsilon_{grc}$  measures all the time-invariant, unobserved factors that influence the volume of imports between two countries, including distance, whether the two countries share a border, and variables that measure the historical relationship between the two countries.<sup>22</sup> The second component,  $u_{grc}^{BR}$ , measures any additional shocks that influence the volume of imports in the best response year. Because both  $M_{grc}^{PO}$  and  $M_{grc}^{BR}$  are a function of the same unobserved factor in  $\epsilon_{grc}$ , the dependent variable  $\ln(M_{grc}^{PO}) - \ln(M_{grc}^{BR})$  differences out this time invariant error, while leaving

<sup>21</sup>We fully explain the mapping of the timing of policy changes, years  $t = BR$  and  $t = PO$ , and the trade dispute information in the next section.

<sup>22</sup>Given the limited period of time between the best response and politically optimal year, one could also imagine that near time-invariant variables would also be captured in this component, such as factors measuring the comparative advantage of two countries, relative size, and whether the two countries are members of the same regional trade agreement.

the shock occurring during the best response year in the error term. The failure to address the endogeneity of  $M_{grc}^{BR}$  would result in biased coefficient estimates.

Our instrument is thus the average volume of trade between 1988 and the year prior to the best response year. This average volume of trade will be highly correlated with  $M_{grc}^{BR}$  as it is a function of the time-invariant determinants of trade captured in  $\epsilon_{grc}$ . Unlike  $M_{grc}^{BR}$ , however, the instrument will be uncorrelated with the shock occurring specifically in the best response year,  $u_{grc}^{BR}$ , that remains in our error structure.

Finally, to test for the quality of our instruments, we use standard tests for under-identification, weak instruments, and over-identification.

## 4.2 Construction of WTO dispute sample

We begin with a population of 347 formal bilateral (complainant-respondent) WTO disputes that were initiated and legally concluded between 1995 and 2009.<sup>23</sup> We expand WTO dispute database of Horn and Mavroidis (2008) by adding years of additional disputes, and more details on policies under dispute and traded products now made available in Bown and Reynolds (forthcoming). We begin with 1995 as that was the first year that the WTO and its Dispute Settlement Understanding was in effect, and we conclude in 2009 as we require two years of post-dispute trade data with which to observe potential changes in trade volumes resulting from the dispute settlement negotiations.

Figure 1 presents a timeline of the policy changes associated with the dispute settlement process and the means by which we map the timing of the theory to the dispute settlement data.

The first year of interest is the “best response” year, or the first full year that the respondent country has in place the policy that is ultimately the subject of the WTO dispute. In Figure 1,  $t = BR$  is given by period 3, and it occurs one year after the alleged WTO-violating policy was first imposed and is thus the first full year that the policy is in effect. While respondent countries are rarely alleged to have simply raised their applied tariffs, but instead are alleged to have imposed a WTO-violating policy through a nontariff barrier (which implies difficulty in measuring the *size* of the ad valorem equivalent of the policy change), identifying the timing of the imposition of the best response policy (period 2) is relatively straightforward. In most instances, the year of imposition of the best response policy is available from either official WTO documentation associated with the dispute or from official government notifications available from other sources. However, it is important to note that 18 percent of the disputes in the sample are initiated *without* such a policy change being relevant. To clarify, it is *not* that the date of the policy change is unobservable, it is simply that the WTO dispute arises under the allegation that the respondent has *failed* to change its policy so as to bring itself into compliance with basic WTO obligations either at the end of the

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<sup>23</sup>Overall, members filed 402 WTO disputes between 1995 and 2009. However, 55 were associated with alleged trade violations that were still in force as of 2009. Furthermore, we clean the population of redundant disputes (i.e., a complainant filing multiple disputes against the same respondent country over the same issue) and break into bilateral pairings any instances in which multiple complainants jointly file a dispute against a common respondent over the same issue. Because our model examines a setting in which enforcement negotiations take place bilaterally, we define our unit of observation as a complainant-respondent pair.

estimates on the retaliation capacity and exporter concentration variables in the “unsuccessful” subsample suggest that the model may be particularly useful in identifying important determinants behind the relatively less successful negotiated outcomes (at least as measured by this metric), where little import growth occurred.

## 6 Conclusion

This paper examines the implications of the terms-of-trade theory for the enforcement of international agreements. Our approach extends the Bagwell and Staiger (1999, 2011) theoretical and empirical approach from the setting of original trade agreement negotiations to the setting of formal trade *dispute* negotiations.

We estimate the model on a new data set of the trade volume outcomes deriving from formal WTO disputes initiated and concluded between 1995 and 2009, and we provide evidence that determinants of the trade flows that result from dispute settlement negotiations are consistent with theoretical predictions. In particular, larger post-dispute trade volume outcomes are associated with disputed products that have larger pre-dispute trade volumes, smaller increases to exporter-received prices, larger import demand and smaller foreign export supply elasticities. The results are economically significant and they are robust to inclusion of controls for asymmetries in bilateral retaliation capacities at the country level.

Nevertheless, our evidence from applying the terms-of-trade model to understanding dispute settlement outcomes does leave a number of unanswered questions. First is why this particular application fails to explain WTO disputes triggered by policies applied on a “partial” basis, whereby the respondent has excluded some third country trading partners from application of the disputed policy that it has applied against the complainant. A second question concerns the failure to find robust evidence of the model for the negotiated dispute settlement outcomes of developing countries. While this in itself may be consistent with other evidence from the literature that the impact of the WTO itself on trade volumes has differential effects for developing countries relative to high-income countries (Subramanian and Wei, 2007), it does not resolve the question of what specific purposes developing countries have in mind when they sign onto trade agreements like the WTO. While a theoretical motivation is that developing countries may be using the WTO as a commitment device vis-a-vis their private sectors rather than to neutralize terms-of-trade externalities (Maggi and Rodriguez-Clare, 1998; Limão and Tovar, 2011), it remains unclear how the external enforcement of this commitment device motive is implemented in practice if not through dispute settlement. A better understanding of these questions is an important area for future research.

Table 4: Model Estimates of Post-Dispute Growth in Trade Volumes

	Dependent Variable the Import Volume Growth in Products Under Dispute: $\ln(M_{grc}^{PO}) - \ln(M_{grc}^{BR})$							
	OLS (1)	IV: Instrument for Prices (2)	IV: Instrument for Volume (3)	IV: Full IV Estimates (4)	IV: Alternative Definition of BR Year (5)	IV: Baseline (6)	IV: Add Complainant/ Respondent FE (7)	IV: Add Sector FE (8)
$\ln(p_{grc}^{w,PO}) - \ln(p_{grc}^{w,BR})$	-1.080*** (0.157)	-0.966*** (0.283)	-1.080*** (0.115)	-0.962*** (0.283)	-1.188*** (0.214)	-0.997*** (0.266)	-0.975*** (0.227)	-1.014*** (0.231)
$\frac{\sigma_{gr}^{BR}}{\omega_{gr}^{BR}} \ln(M_{grc}^{BR})$	0.002* (0.001)	0.002** (0.001)	0.002** (0.001)	0.002** (0.001)	0.001* (0.001)	0.001* (0.001)	0.002*** (0.001)	0.000 (0.001)
ln(Complainant's imports from respondent / Value at Stake in dispute for retaliation capacity)						0.084** (0.039)	0.076* (0.040)	0.087* (0.046)
Global disputes						-0.376* (0.206)	-0.269 (0.214)	0.055 (0.250)
Global disputes x Exporter concentration						0.649** (0.328)	0.373 (0.338)	0.071 (0.364)
Respondent's real GDP growth between BR and PO						1.912*** (0.667)	0.561 (1.364)	0.654 (1.392)
Complainants's real GDP growth between BR and PO						-1.076 (0.903)	-0.710 (1.510)	-1.404 (1.576)
Dispute's PO year is during trade collapse of 2008-9						-0.241 (0.251)	-0.245 (0.233)	-0.163 (0.244)
Dispute's BR year is during trade collapse of 2008-9						-0.537 (0.562)	-0.877 (0.534)	-0.977 (0.624)
ln(Respondent's real GDP)						0.053 (0.061)	-0.708 (5.390)	0.664 (6.081)
ln(Complainant's real GDP)						-0.066 (0.048)	9.552*** (3.219)	9.476** (3.708)
ln(Respondent's real GDP per capita)						0.089 (0.108)	0.307 (6.346)	-2.194 (6.763)
ln(Complainant's real GDP per capita)						-0.065 (0.080)	-12.002*** (3.479)	-11.519*** (3.962)
Constant	0.230*** (0.079)	0.223*** (0.082)	0.226*** (0.080)	0.219*** (0.082)	0.187** (0.081)	-0.939 (0.951)	52.833* (30.857)	63.010** (31.374)
Observations	167	167	167	167	165	167	167	167
Root MSE	0.999	0.993	0.990	0.993	0.994	0.906	0.652	0.609
Cragg-Donald		16.18	6518	10.76	18.16	10.12	6.326	5.313
Sargan Test				0.934	0.423	0.279	0.506	0.755

Note: Robust standard errors in parentheses, \*\*\*, \*\*, \* denote statistically different from zero at the 1, 5, and 10 percent levels, respectively. Note that  $g$  indexes the disputes (products),  $r$  indexes respondent (importing) countries,  $c$  indexes complainant (exporting) countries,  $BR$  denotes the best response year (defined as one year after the violation sparking the dispute in all specifications except (5) in which it is defined as the year of the initiation of the dispute), and  $PO$  denotes the politically optimal year (two years after the resolution of the dispute). Cragg-Donald is the F-statistic associated with the Cragg-Donald test for weak instruments and Sargan Test is the p-value associated with the Sargan test for overidentifying restrictions.