Online Appendix to "Self-Enforcing Trade Policy and Exchange Rate Adjustment" Not intended for publication

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In this Appendix, we take a look at the data to see whether our theoretical predictions of the paper can find some empirical support. We investigate the effects of the exchange rate regime on the incentive to initiate trade disputes, which often result in applying retaliatory tariffs.

Intuitively, the exchange rate regime should matter because exchange rate manipulation or currency wars, that are more likely under flexible exchange rate regimes, can lead to retaliation through tariffs. Flexible exchange rate regimes should therefore lead to stronger incentives to manipulate tariffs. Following Barattieri, Cacciatore, and Ghironi (2018), our empirical analysis of this potential effect relies on Bown (2016)'s Global Anti-Dumping database that collects anti-dumping or trade disputes initiatives at the Dispute Settlement Body of the WTO, that are usually followed by the imposition of tariffs.

For each country covered by the dataset, we count the number of trade disputes initiated each year and relate this variable to a set of explanatory variables. Those include the level of GDP, the GDP growth rate, net exports to GDP, a measure of trade openness, a measure

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of exchange rate flexibility, and a trade-weighted measure of real exchange rate.[1] We have no prior about the effect of size (measured by the log of GDP) and openness (measured by the trade openness ratio) on the occurrence of trade disputes. We expect GDP growth, net exports and competitiveness (measured by the level of the trade-weighted real exchange rate) to reduce the probability of trade disputes while exchange rate flexibility should raise the probability of trade disputes, since the former makes currency manipulations easier both by the country and by partners, and thus enhances the probability that trade restrictions are used as a tool in a potential currency war. Table 1 below summarizes the characteristics of the different variables contained in our dataset.

Table 1: Summary statistics of the dataset

	Mean	Min.	Max.	Stdv.	P_{20}	P_{40}	P_{60}	P_{80}
Trade disputes initiated annually	10.9	0.0	94.0	15.0	1.0	3.0	8.0	17.1
log(GDP)	13.3	2.7	16.7	2.3	12.5	13.2	13.8	14.5
GDP growth, in %	4.3	−19.4	28.6	5.6	0.5	2.8	4.9	8.4
Net exports to GDP, in %	0.4	−24.5	31.9	6.4	−3.6	−1.2	1.4	4.0
Trade openness, in %	44.0	6.7	123.4	26.5	20.1	30.3	44.6	67.0
Exchange rate flexibility	9.9	2.0	15.0	3.2	8.0	10.0	12.0	13.0
Trade weighted real exchange rate	1.1	0.4	2.7	0.3	0.9	1.0	1.1	1.2

Note: Based on 612 observations.

The dependent variable – the number of trade disputes initiated – is a count variable that is non-negative and takes integer values. As such, it requires that a Poisson or a negative binomial regression is used. Under the Poisson model, the dependent variable is distributed as a Poisson describing the probability that a number of events realizes within a given time interval. One limitation of the Poisson model however is that it does not account for potential over-dispersion given that the Poisson distribution imposes a variance of the dependent variable that is equal to the mean, a condition that is likely not to be met in our sample. The negative binomial model is a generalization of the Poisson model that loosens

[1]The GAD database covers different periods for each country and the longest period covered ranges from 1977 to 2015. It is completed by various indicators taken from the PennWorld database, the Ilzetzki, Reinhart, and Rogoff (2017) classification of exchange rate regimes and a trade-weighted measure of the real exchange rate taken from the EQCHANGE CEPII Database. Appendix C details the characteristics of our dataset.

this restrictive assumption by specifying a Poisson-gamma mixture distribution, according to which overdispersion can be estimated. We include a constant, abstract from any country fixed-effect, pool our panel data and report the results of the Poisson and negative binomial regression in Table 2 below.

Table 2: The impact of key macro variables on trade disputes.

	Dependent: Trade disputes	
	Poisson	Neg. Bin.
Cst.	-1.3713^{**}	-0.4761
	(-2.2299)	(-1.2349)
log(GDP)	0.3172^{***}	0.2643^{***}
	(8.8202)	(13.5361)
GDP growth	-0.0145	-0.0256^{***}
	(-1.4586)	(-2.9315)
Net exports	-0.0200^{**}	-0.0053
	(-2.0729)	(-0.7383)
Openness	-0.0076^{***}	-0.0099^{***}
	(-3.4974)	(-5.6510)
Exchange rate flexibility	0.0216	0.0418^{***}
	(1.2763)	(2.7417)
Trade-weighted RER	-0.4597^{**}	-0.6763^{***}
	(-2.2171)	(-3.9684)
Observations	612	612
Dispersion parameter	1.0000	1.3569
Loglikelihood	-4532.61	-1974.60

Note: *p<0.1; **p<0.05; ***p<0.01.

Table 2 shows that positive GDP growth and net exports lower the probability of trade disputes. Depending on the specification, net exports or GDP growth are statistically non-significant. In both cases the signs make sense: countries with a growing economy and positive trade balance are less likely to initiate trade disputes. The log of GDP affects positively the probability of trade disputes under both specifications: larger countries initiate more trade disputes all else equal, potentially making strategic use of their home market size. Openness significantly lowers the probability of trade disputes, which can also be rationalized by the fact that more open economies have more to lose to deter international trade flows. Exchange rate flexibility is statistically non-significant in the Poisson model but has the same

positive sign than in the negative binomial model, where it is statistically significant: all else equal, countries with a more flexible exchange rate are more likely to initiate trade disputes. Finally, competitiveness affects trade disputes in the way it is expected to: countries with a relatively depreciated trade-weighted real exchange rate are less likely to initiate trade disputes. Overall, we conclude that most macroeconomic variables inspected in this empirical work affect trade disputes in a significant and sensible way, and that our main variable of interest, exchange rate flexibility, raises the probability of trade disputes.

What is the evidence regarding the impact of different types of macro shocks on the degree of protection? The discussion in the introduction of the paper emphasizes that the empirical question of the (counter)-cyclicality of trade restrictions is quite mixed, and depends on the measure of protection, and the time frame of the data. The results of our paper indicate that the pattern of tariff setting may be pro-cyclical, counter-cyclical, or a-cyclical, depending on the degree of price stickiness, the types of macro shocks, and the elasticity of inter-temporal substitution. Given the wide divergence of views on the appropriate identification of productivity shocks and especially monetary shocks, we defer a full empirical analysis of this aspect of the model to a future paper. However, in Auray, Devereux, and Eyquem (2019) we provide some initial evidence suggesting that the cyclical pattern of trade disputes in response to particular forms of money and productivity shocks is consistent with the results above for the case $\sigma < 1$.

References

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A Data description

We test the effects of various variables on trade disputes. The explained variable is the total number of trade disputes observed for country i at time t. The dataset is annual and covers the following countries: Argentina, Australia, Brazil, Canada, Chile, China, Columbia, Costa Rica, the European Union, India, Indonesia, Israel, Japan, South Korea, Mexico, Malaysia, New Zealand, Pakistan, Peru, Philippines, Russia, Thailand, Turkey, Taiwan, the USA, Venezuela and South Africa. The longest time range is 1977-2015 and most countries have more limited time ranges. The potential explanatory variables are:

- The log of GDP (PennWorld Tables 9.0)
- The annual rate of GDP growth (PennWorld Tables 9.0)
- The depreciation rate of nominal exchange rate (vs the US dollar). Positive = depreciation, negative = appreciation. (PennWorld Tables 9.0)
- Net exports to GDP (PennWorld Tables 9.0)
- The openness ratio: exports plus imports divided by GDP (PennWorld Tables 9.0)
- The exchange rate regime according to the Ilzetzki, Reinhart, and Rogoff (2017) classification (http://www.carmenreinhart.com/data/browse-by-topic/topics/11/)
- The trade-weighted measure of the real exchange rate take from the EQCHANGE CEPII Database (http://www.cepii.fr/CEPII/fr/bdd_modele/presentation.asp?id=34). Weights are time-varying (averaged over the last 5 years). This variable is an index (100 in 2010) and expressed with opposite signs as usual in the litt. We thus take $log(100/x)$ where x is the variable expressed in the database to get a measure of depreciation in the usual sense (positive = depreciation, negative = appreciation).