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ABSTRACT

Protectionism during the crisis: Tit-for-tat or chicken games?*

During the recent financial crisis many countries resorted to protectionist measures to try to boost demand for domestically-produced goods. In this paper we explore the extent to which the adoption of protectionist measures led to retaliation by other countries undermining the increase in demand. We found no evidence of retaliation. On the contrary, there is strong evidence of chicken-games being played. Indeed, the probability of a protectionist measure being imposed on a trading partner's export bundle is significantly smaller when the partner imposes a protectionist measure on home exports.

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Keywords: chicken-games, financial crisis and trade retaliation

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1 Introduction

During economic crises governments sometimes adopt protectionist measures to redirect demand towards domestically produced goods. Economists often warn that the adoption of beggar-thy-neighbor policies may lead to a retaliatory response, which may end up reducing demand for domestic goods, and deepen the crisis. When the United States passed the Smooth-Hawley Trade act in 1929, increasing by 60 percent tariffs on more than 3000 products, at least 60 countries enacted retaliatory tariffs. This doubled the world average level of protection, and according to Irwin (1988) partly explains the 70 percent reduction in world trade by 1933.

Several authors have warned of a protectionist response developing during the current economic crisis. If in terms of traditional trade policy instruments (tariffs and antidumping duties) the response has been relatively timid (Kee, Neagu and Nicita, 2012), Baldwin and Evenett (2009) argued that this time protectionism took murkier forms (e.g., "Buy America" provisions, subsidies, non-tariff barriers) which are not easily observed. The dataset put together by the Global Trade Alert (GTA) offers an opportunity to explore the determinants of these murkier forms of protectionist response. This is what Evenett et al. (2011) do with the help of existing models of trade policy formation and found that these models systematically under-predict the protectionist response to the crisis.

Our focus is on the extent of retaliation to protectionist measures adopted by trading partners. Arguably, a share of the overall protectionist response may be associated with retaliation, and anecdotal evidence suggests that this was the case during the recent global crisis. For example, China's response to the 35 percent tariff on imports of Chinese tyres imposed by the US, was to impose countervailing duties of 31 percent on imports of chicken from the United States, later increased to 105 percent. Another example is the response by some Canadian towns to the "Buy America" provisions in the US fiscal package. In May 2009 some Canadian towns adopted legislation that barred US companies from municipal contracts.[1]

[1] *Trade Wars Brewing in Economic Malaise* by A. Faoila and L. Montgomery in the Washington Post, May 15th 2009.

To move beyond anecdotic evidence we use the GTA database to examine whether countries that have been affected by a protectionist measure adopted by a trading partner, systematically retaliate by adopting measures that hurt exports of that trading partner. The empirical exercise is undertaken controlling for bilateral determinants of the response, such as distance, common language, trade flows, as well as importer and exporter fixed effects. We also explore whether WTO membership restrained the extent of retaliation, as sometimes argued (WTO, 2011).

2 The Empirical Model and Data

Let Y_{ij} denote the existence of a protectionist measure in country i that negatively affects exports of country j. The probability that a protectionist measures is applied ($y > 0$), or not ($y = 0$) is given by:

$$P(Y_{ij} = y) = \begin{cases} \pi_{ij} & \text{if } y = 0 \\ 1 - \pi_{ij} & \text{if } y > 0 \end{cases} \tag{1}$$

where π_{ij} is the probability that country i decides not to put in place a protectionist measure that hurts country j's exporters. It depends on a set of covariates $\mathbf{x_{ij}}$ which are linearly related through a Roget link.

$$\text{logit}(\pi_{ij}) = \ln\left(\frac{1 - \pi_{ij}}{\pi_{ij}}\right) = \mathbf{x_{ij}}\boldsymbol{\alpha} \tag{2}$$

where $\boldsymbol{\alpha}$ is a vector of parameters to be estimated. $\mathbf{x_{ij}}$ is a matrix of explanatory variables including a dummy variable indicating whether or not country j has imposed a protectionist measure on country i's exports. This is our coefficient of interest capturing retaliation. Other covariates include bilateral distance between trading partners, whether they share a common language or border, the import and export flows between partners, WTO membership, etc. We also include home (i) and partner-country (j) fixed effects to control for any determinant of the overall home and partner-country protectionist response during the crisis.

Two technical points need to be addressed. First, errors may be correlated by country-pair as each country appears as home and as partner, but also by home country as

trade policy responses may be correlated across different trading partners. Thus, standard errors are corrected non-parametrically with two-way clustering techniques as suggested by Colin Cameron et al. (2006) that we extend using the δ-method to compute the standard errors of the marginal effects in the case of logit estimates. For the seek of robustness, we provide three different two-way clustering corrections of standard errors: by country-pair and home country, by country-pair and partner country, and by home and partner country. Second, the use of fixed effects in non-linear models may bias the estimated coefficients. We have two answers. First, we report estimates using a linear probability model with fixed effects that show very similar results to the ones obtained with the logit model. Second, the dimensions of our dataset are not those of the traditional fixed effect specification with a large n (cross section) and a small t (time dimension) where the incidental parameter bias tends to be large. In our dataset we have the same number of observations in the "cross sectional" dimension (i.e., home countries) as in the "time" dimension (i.e., partner countries). And when these two dimensions are of similar size, then the incidental parameter bias is very small as shown by Heckman (1981) through Monte Carlo simulations.

2.1 Data

Our main variable of interest captures the presence or absence of a protectionist measure imposed by each country on its partners. The source of this data is the GTA database available at www.globaltradealert.org, and discussed in Evenett et al. (2011). The GTA dataset also provides information regarding liberalizing measures vis-à-vis different trading partners that we use as control variables. We only consider countries that appear at least one time in the GTA dataset, either as imposing a measure or as a target. This may raise issues of sample selection, which we correct with home and partner country fixed effects. This leaves us with 116 countries in the sample representing more than 96 percent of world trade. Our sample covers all measures put in place between November 2008 and December 2010.

Two other important data source are the World Bank's World Development Indicators (WDI) from where we obtained information on GDP for the pre-crisis period (the average

between 2004 and 2006), and the CEPII geographical database from where we took the gravity type variables. Import and export shares of trading partners come from United Nation's Comtrade database and they are for the pre-crisis period (the average for 2004-2006). WTO membership is from the WTO website. Table (1) provides some descriptive statistics.

3 Results

The results of the estimation of model (2) with and without importer and exporter fixed-effects are reported in Table 1. The first two columns report linear probability estimates as robustness for logit estimates. All four models describe the data relatively well and control variables have signs that are robust across specifications. Countries tend to impose protectionist measures on countries that are similar in terms of size, with whom they share a border, from where they import more, and which did not introduce liberalizing measures vis-à-vis home exports.[2]

More importantly, across the four models there is no evidence of retaliation, but rather the opposite. If a protectionist measure is imposed by a trading partner on home exports, this reduces the probability of observing a measure imposed by home on the partner's export bundle by 40 to 70 percent. This result is hard to explain in a non-cooperative trade policy setting, which would predict tic-for-tac strategies (i.e., a positive coefficient on the variable of interest). It cannot be explained either in a cooperative setup, where we should observe no systematic correlation between measures imposed by and on a trading partner (see Bagwell and Staiger, 1999).

A potential explanation for our empirical result is Rapoport's (1966) "Chicken-game". This type of game differs from the classic prisoner's dilemma setup in that the worst possible outcome for a player does not arise when the other player deviates from the cooperative strategy, but rather when both deviate. Figure (1) illustrates this payoff matrix. The

[2]Note that when using the log of the share of imports instead of the log of imports as a control variable we obtain identical results in the fixed effect regressions and qualitatively similar results in the specifications without fixed effects. We also obtain similar results when introducing the share of imports instead of the log of the share of imports.

are two players moving simultaneously with two pure strategies:[3] "status quo" and "trade barrier". The payoff matrix is assumed to be symmetrical. The key assumption is that the outcome of a trade war (both adopting a "trade barrier" strategy) is worse for each of the players than the outcome of maintaining the status quo or having the partner only impose a trade barrier.

One potential explanation for this payoff matrix would involve a combination of both existing rationales for trade agreements: terms-of-trade and the value of commitment vis-à-vis domestic lobbies as in Maggi and Rodríguez-Clare (2007). In such a world a move from playing the "status-quo" strategy to playing the "trade barrier" strategy brings a terms-of-trade gain that can be dominated by the loss associated with not having a credible commitment mechanism any longer. This loss can be significantly larger when the trading partner is also playing the "trade barrier" strategy. It is clear that there are two pure-strategy Nash equilibria which involve one country imposing a trade barrier and the other chickening-out. Note that these two pure-strategy Nash equilibria are inefficient and there is a role for trade agreements to support cooperation.[4]

An alternative explanation for our results is that countries impose protectionist measures on countries that are less likely to retaliate: "you don't mess with the lion, you go after the sheep." To address this we checked whether the "chicken-game" result was robust to the introduction of an interaction term between GDP differences between home and partner and the protectionist measure imposed by the partner. The marginal effect on the protectionist response reported in Table (3) for a specification identical to the one reported in column 4 of Table 2, but with an interaction term, is almost identical to the one reported in Table 2.[5] Thus, the "go after the sheep" effect does not seem to be driving our "chicken-game" result.

[3]We abstract from mixed strategies because any mixed equilibrium will not be evolutionary stable.

[4]However our empirical results show a statistically weak impact of WTO membership on the likelihood of observing a protectionist measure being imposed after controlling for importer and exporter fixed effects.

[5]Note that the marginal effect in Table (3) is calculated at the mean and taking into account the fact that the protectionist measure impose by the partner also appears in the interaction term. For space reasons we only report the marginal effect of interest, but the marginal effects of control variables are qualitatively identical to the ones reported in Table 2, and available upon request from the authors.

4 Conclusion

We found no evidence of trade retaliation during the recent economic crisis, but rather the opposite. The probability of observing a protectionist measure imposed on a trading partner significantly declines when the trading partner imposes a protectionist measure on home exports. Chicken-games rather than prisoner's dilemma seem to have been played among trade policy makers during the crisis, providing indirect support for theories of trade agreements that combine both terms-of-trade and commitment motives.

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Figure 1: Trade Policy Chicken-game

	Status-quo	Trade Barrier
Status-quo	0 ; 0	-2 ; 1
Trade Barrier	1 ; -2	-3 ; -3

Table 1: Data Summary

Explanatory Variables	Description	mean	std. deviation	min	max
Partner's protection on home exports	Dummy variable. 1 if partner implemented at least one protectionist measure harming home.	0.45	0.50	0	1
Absolute difference (in logs) between home and partner's GDP	The log of the absolute difference between home and partner GDP.	26.29	1.87	19.11	30.02
Liberalizing measure at home on partner	Dummy variable. 1 if home applied at least one liberalizing measure that benefits partner.	0.18	0.39	0	1
Bilateral distance (in logs)	Log of bilateral distance between home and partner.	8.46	0.98	4.45	9.87
Common language	Dummy variable. 1 for common official primary language in home and partner.	0.17	0.37	0	1
Common border	Dummmy variable. 1 if home and partner share a common border.	0.11	0.31	0	1
Home's imports (in logs)	Log of home imports from partner.	11.80	3.20	-2.78	19.47
Home and Partner are WTO members	Dummy variable. if home and partner are WTO members.	0.82	0.38	0	1

Table 2: Retaliation or chicken games during the crisis?

	Linear Probability	FE-linear Probability	Marginal effects Logit	Marginal eff. FE-logit
Partner's protection	-0.60	-0.41	-0.70	-0.71
on home exports	(0.04)***	(0.05)***	(0.06)***	(0.14)***
	(0.04)***	(0.05)***	(0.05)***	(0.16)***
	(0.04)***	(0.04)***	(0.05)***	(0.10)***
Absolute difference (in logs)	-0.02	-0.03	-0.03	-0.09
between home and partner's GDP	(0.01)*	(0.01)**	(0.02)*	(0.04)**
	(0.01)*	(0.01)**	(0.02)*	(0.04)**
	(0.01)**	(0.01)**	(0.01)*	(0.03)***
Liberalizing measure at home	-0.25	-0.32	-0.36	-0.57
on partner	(0.07)***	(0.06)***	(0.07)***	(0.28)**
	(0.07)***	(0.06)***	(0.06)***	(0.37)
	(0.07)***	(0.06)***	(0.07)***	(0.20)***
Liberalizing measure by partner	-0.38	-0.26	-0.48	-0.44
on home	(0.06)***	(0.06)***	(0.06)***	(0.25)*
	(0.05)***	(0.05)***	(0.04)***	(0.32)
	(0.06)***	(0.06)***	(0.05)***	(0.19)**
Bilateral distance (in logs)	0.09	0.02	0.15	0.07
	(0.02)***	(0.03)	(0.03)***	(0.08)
	(0.03)***	(0.03)	(0.04)***	(0.07)
	(0.03)***	(0.02)	(0.04)***	(0.07)
Common language	-0.09	-0.07	-0.13	-0.12
	(0.04)**	(0.05)	(0.06)**	(0.14)
	(0.05)**	(0.04)*	(0.07)**	(0.11)
	(0.04)**	(0.04)*	(0.05)**	(0.12)
Common border	0.26	0.19	0.42	0.42
	(0.08)***	(0.07)***	(0.10)***	(0.35)
	(0.08)***	(0.07)***	(0.11)***	(0.47)
	(0.07)***	(0.06)***	(0.09)***	(0.24)*
Partner's imports (in logs)	0.01	0.001	0.02	-0.01
	(0.01)**	(0.01)	(0.01)**	(0.03)
	(0.01)*	(0.01)	(0.01)	(0.04)
	(0.01)	(0.01)	(0.02)	(0.04)
Home's imports (in logs)	0.03	0.02	0.04	0.07
	(0.01)***	(0.01)***	(0.01)***	(0.03)**
	(0.01)***	(0.01)***	(0.02)***	(0.03)**
	(0.01)**	(0.01)***	(0.02)**	(0.03)**
Home and Partner are WTO members	-0.08	-0.11	-0.13	-0.34
	(0.04)**	(0.07)	(0.06)**	(0.29)
	(0.05)*	(0.07)	(0.08)	(0.32)
	(0.04)*	(0.03)***	(0.07)*	(0.17)**
N	948	948	948	675
R^2	0.42	0.63	0.38	0.51

Marginal effects at the mean. Standard errors in parentheses respectively clustered by: country pair and home, country pair and partner, and home and partner. For dummy variables changes are from zero to one; * stands for $p < 0.1$, ** stands for $p < 0.05$, *** stands $p < 0.01$. In the logit regressions the R^2 are pseudo-R^2. Note that the number of observations drops in the last column because the home and partner fixed effects perfectly predict the outcome (the imposition of a protectionist measure by home or on the partner).

Table 3: Overall marginal effect of Partner's protection

	Marginal eff. FE-logit
Overall effect of	-0.72
Partner's protection	(0.11)***
	(0.10)***
	(0.09)***

Marginal effects at the mean. Standard errors in parentheses respectively clustered by: country pair and home,country pair and partner, home and partner. They are computed using the δ-method from the standard errors of the coefficients obtained using Cameron et al (2006) method. * stands for $p < 0.1$, ** stands for $p < 0.05$, *** stands $p < 0.01$.