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What makes countries initiate WTO disputes on food-related measures?

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Abstract

This paper analyses relevant parameters for initiating a World Trade Organization (WTO) dispute on food-related measures and thereby contributes to the question how open de facto the system is for different types of countries. The empirical analysis differs from existing assessments by focussing on agri-food related disputes, thereby allowing for a more in-depth analysis of specific country characteristics not considered in previous studies. The results show that some determinants such as legal capacity and monetary means are not statistically significant for agri-food dispute initiations. This is the case for own protectionist behavior and endured protectionism which lower and enlarge the probability to complain, respectively.

Key words

WTO disputes, agri-food disputes, binomial distribution model of complaints

Introduction

The dispute settlement system of the WTO was set into force by the Understanding on Rules and Procedures Governing the Settlement of Disputes as a part of the WTO Agreement of January 1, 1995. It is the device for the resolution of conflicts arising between members over the interpretation of their commitments under the regime of the organization. Dispute settlement must be self-enforcing, i.e. from the consultation to the potential compliance phase all actions are driven by members.

Referred to as the “central pillar of the multilateral trading system” (WTO, 2007a) the design of the WTO-dispute settlement system is often at the core of the debate on institutional reforms of the WTO and has also been under negotiation on the 4th Ministerial Conference at Doha. A major desire is to make the settlement

system more effective and to allow for the appropriate consideration of developing countries' demands (WTO, 2006) . Reform proposals span a wide field from e.g. tightening time frames as regards panel proceedings and reestablishment of compliance, dealing more effectively with compliance and compensation procedures and assistance for developing countries to ensure their equality of opportunity (PETERSMANN, 2003). However, the understanding and knowlegde of the factors that drive the system are the preconditions to any improvement.

In the area of food-related disputes 132 cases have been initiated in the last 11 years.¹ Regarding the individual country participation the figures on current and previous food-related WTO-disputes reveal that the majority of cases are related to the economically advanced countries.

The following table shows the participation pattern related to development classification of the United Nations.² The group of least developed countries³ share of the WTO membership accounts for about 21% but they did not use the system at all in the field of food related issues. The large group of developing countries initiated 44% of all food-related disputes which is similar to their participation of around 40%.

Table 1: Participation pattern of countries by development classification for the period 1995-2007

		Defendant				
		Developed Countries	Developing Countries	Least Developed	Total	%-Share
Complainant	Developed Countries	50	24	0	74	56.06
	Developing Countries	41	17	0	58	43.94
	Least Developed Countries	0	0	0	0	0
	Total	91	41	0	132	100
	%-Share	68.94	31.06	0	100	

Source: Own compilation based on WTO (2007b) and UNITED NATIONS (2007)

As the developing status at WTO-level is based on self-declaration a pattern which more precisely

¹ These 132 cases refer to seven different Agreements.

² The developing status according to the WTO is based on members' self-declaration and not on verified economic attributes.

³ 32 of currently 150 WTO members are classified as Least Developed Countries.

describes the economic status refers to the World Bank classification of income levels⁴: High and Upper Middle Income countries are involved in 73% of all initiated cases as both defendants and complainants.

Table 2: Participation pattern of countries by income group for the period 1995-2007

		Defendant					
		High Income	Upper Middle Income	Lower Middle Income	Low Income	Total	%-Share
Complainant	High Income	48	16	1	7	72	54.55
	Upper Middle Income	11	12	2	0	25	18.94
	Lower Middle Income	22	7	3	0	32	24.24
	Low Income	3	0	0	0	3	2.27
	Total	84	35	6	7	132	100
	%-Share	63.64	26.52	4.55	5.30	100	

Source: Own compilation based on WTO (2007b) and THE WORLD BANK (2007)

One argument often raised to explain the limited access of the system to developing and low income countries is their lack of human and legal capacity (see e.g. WHALLEY, 1996). Nevertheless, in both groups, developed and developing countries, some members dominate and even some developing countries are rather active (e.g. Brazil, Philippines) indicating that potentially other parameters may play a role.

The subsequent question therefore is whether this pattern can be explained by underlying countries' parameters and whether other than the most prominent attribute "income" may influence a dispute's initiation. Compared to previous empirical studies, this investigation firstly adds an in-depth analysis of only food-related issues and secondly considers newly integrated potential influencing factors that may supplement the understanding of the dispute settlement system drives. The empirical investigation is based on a dispute distribution model developed and employed by HORN, MAVROIDIS AND NORDSTRÖM, 1999.

⁴ Income classification according to The World Bank (2007): Low income: \$875 or less, Lower Middle Income: \$876-3465, Upper Middle Income: \$3466-10,725, High Income: >\$10,726

The paper is organised as follows: After a literature survey on existing empirical studies focussing on the identified relevance of determinants, the model's specification is developed. The following section presents determinants used in this agriculture-specific assessment and their expected influence. Especially the newly considered determinants compared to existing studies are stressed. The assessment of the initiation probabilities and the determinants' relevance will be part of the next section. An evaluation of the results within the general context of evaluating the WTO's accessibility to different types of countries will conclude the paper.

Literature review

A few empirical assessments on the WTO initiation of disputes exist considering various determinants, agreements referred to, roles in a dispute (complainant, defendant, co-complainant and interested party). Table 2 comprises the detected influences of determinants under previous investigations. In Table 3 the investigation period, dispute coverage, their main issue of analysis and the models used are shown.

HORN, MAVROIDIS AND NORDSTRÖM (1999) mark the first empirical investigation by using a binomial dispute distribution model. As most relevant determinant factor a member's export diversification could be identified. GDP did not reveal a significant influence, but a country's legal capacity shows a slight positive influence on its probability to complain. BESSON AND MEHDI (2004) find empirical evidence that legal capacity matters with respect to a country's likelihood to win disputes. This supports the conclusion of BUSCH AND REINHARDT (2003) that early settlements of developing countries, i.e. in the consultation stage or in the Panel stage before a ruling, are missing due to the lack of legal capacity.

Table 3: Survey on investigation period, dispute coverage, main issue and used model of previous empirical studies

Empirical study	Investigation period and dispute coverage	Main issue of analysis	Used model
Horn et al. (1999)	WTO disputes; 1995-1998; 155 complaints; all agreements	Determinants for the initiation of complaints	Binomial Dispute Distribution Model
Holmes et al. (2003)	WTO disputes; 1995-2002; 279 complaints; all agreements	Involvement in complaints (both sides) & Success in disputes	No model - Descriptive statistics
Bown (2004a)	GATT & WTO disputes; 1973-1998; 174 complaints; all agreements	Determinants for compliance after trade disputes	Linear regression
Bown (2004b)	GATT & WTO disputes; 1992-2003; complaints against U.S. trade remedies	Initiation of complaints against U.S. trade remedies	Probit Model
Besson & Mehdi (2004)	WTO disputes; 1995-2002; 40 complaints of developing against developed countries	Success in disputes: Developing against developed countries	Probit Model
Bown (2005)	WTO disputes; 1995-2000; 54 complaints; complaints against import protection on MFN-basis	Engagement as Co-Complainant or Interested third party	Ordered Multinomial Logit Model

Source: Own compilation

The self-enforcing nature of the dispute settlement system has been the starting point for BOWN (2004a, 2004b AND 2005): A focus lies on costs of running a dispute and a country's retaliation power to finally enforce compliance by penalty tariffs on imports of the condemned party. BAGWELL AND STAIGER (2000) and DAM (1970) state that the retaliation threat always has been a central component of the GATT system. The success of this power is linked to the countries' relevance as trade partner and there exists also theoretical support that the retaliation threat is not uniformly distributed over members and that imbalances relating to trade volume and market size shows influence on their force under trade disputes. BOWN (2002) demonstrates that a country's capacity to influence its terms-of-trade determines the credibility of its retaliation threat and from JOHNSON (1953) and KENNAN AND RIEZMAN (1988) it has been revealed that larger countries perform better under tariff war.

BOWN (2005) concentrated on the question whether to join complaints as co-complainant or interested party

and demonstrated a positive impact of the capacity to absorb legal costs on both decisions. Additionally, he identified a positive effect of a member's retaliatory capacity in terms of its relevance as trading partner and a negative impact of countries' dependencies on bilateral development aid. BOWN (2004c) shows that the threat of retaliation is significant for determining whether a government chooses to abide by its international obligations. BOWN (2004b) demonstrates that the successful economic resolution to disputes is influenced by the threat of retaliation by the plaintiff. In respect of developing countries success in disputes BESSON AND MEHDI (2004) discovered empirical support for the influence of their trade retaliation power.

Market access and exporting interests are expected to be relevant for the decision on initiation or participation and there exists empirical substantiation for this. BOWN (2005) provides support for the positive impact of a country's volume of exports at stake in its decision to attend disputes as co-complainant or interested third party and BOWN (2004d) demonstrates its positive influence on the likelihood to complain against United States (U.S.) imposed trade remedies. In the broader sense there is evidence for the relevance of trade volume or share respectively. HOLMES, ROLLO AND YOUNG (2003) reach the conclusion that a member's trade volume determines its likelihood to file complaints on the basis of simple descriptive statistics. This supports the findings of HORN, MAVROIDIS AND NORDSTRÖM (1999) that trade volume and export diversity are closely correlated.

BOWN (2004a) finds only limited confirmation that international obligations affect a country's decision to fulfil its commitments whereas BOWN (2005) finds empirical evidence on the positive influence of a member's international economic relationships – measured by its engagement in preferential trade agreements – on its decision to formally engage in a dispute as co-complainant or interested third party. On the topic of success in disputes, the results of BESSON AND MEHDI (2004) suggest that international economic relationships show influence on a member's likelihood to win and they conclude that the reliance on bilateral assistance has a negative impact. Further, they discuss the impact of military power and find confirmation for the negative

influence that military powerful defendants have on the performance of developing countries in dispute.

The following table summarizes the identified determinants and their influence of existing studies.

Table 4: Survey on findings of previous empirical studies

Determinant	Empirical study	Influence on the likelihood to			
		Initiate disputes	Partake in initiated disputes	Win a dispute	Reach compliance after ruling
Export diversity	Horn et al. (1999)	+			
Exporting interest	Bown (2005)		+		
Export volume	Holmes et al. (2003)	+			
Gross Domestic Product	Bown (2005)		+		
	Horn et al. (1999)	0			
Political economy relationship with respondent	Bown (2004b)				0
	Bown (2005)		+		
	Besson & Mehdi (2004)			-	
Reliance on bilateral assistance	Besson & Mehdi (2004)			-	
	Bown (2005)		-		
Legal capacity	Horn et al. (1999)	+			
	Besson & Mehdi (2004)			+	
Military power	Bown (2004b)				+
	Besson & Mehdi (2004)			+	
Retaliatory capacity	Bown (2004d)	+			
	Bown (2005)		+		
	Besson & Mehdi (2004)			0	

+ positive influence; - negative influence; 0 no influence

Source: Own compilation

Assessing relevance of determinants: The model

This analysis is based on the model first presented by Horn et al. (1999): The initiation decision is described through a binary choice model in which the member's probability to complain against another member is *dependent* on a set of the complainant's traits or the characteristics of its specific environment. The implicated conditional probability function for this binary choice situation is the Bernoulli distribution

$$(1) \quad f(y_{ij} | X_{ik}, \beta_k) = G_i(X'_{ik}\beta_k)^{y_{ij}} (1 - G_i(X'_{ik}\beta_k))^{1-y_{ij}} = \begin{cases} G_i(X'_{ik}\beta_k) & \text{if } y_{ij} = 1, \\ 1 - G_i(X'_{ik}\beta_k) & \text{if } y_{ij} = 0. \end{cases}$$

where y_{ij} is the binary dependent variable which takes 1 for a complaint and 0 for no complaint, β_k denotes the vector of k coefficients with β_0 as absolute term, i and j indicate the complainant and the defendant respectively. The set of k influences is merged in vector X_{ik} . Function $G_i(\cdot)$ calculates the individual probability to complain for a prospective complainant i which can be represented by any cumulative probability distribution function. Here, we use the widely employed conditional logistic distribution,

$$(2) \quad G_i(X'_{ik}\beta_k) = \frac{\exp(X'_{ik}\beta_k)}{1 + \exp(X'_{ik}\beta_k)},$$

which would result in the well-known Logit model when applied to single trials.

The proceeding for the assessment of determinants is the reproduction of the observed sample of dispute initiation over the period from January 1, 1995 to June 30, 2006 based on a dispute distribution function which yields probabilities for positive integers, i.e. the number of a member's initiated disputes. Given that the probability for a litigation decision $G_i(\cdot)$ is constant from one trial to the next and that successive trials are independent, member i 's probability for c_i complaints in n_i trials against all other WTO-members is specified through the Binomial distribution

$$(3) \quad f(c_i | X_{ik}, \beta_k) = \binom{n_i}{c_i} G_i(\cdot)^{c_i} [1 - G_i(\cdot)]^{n_i - c_i},$$

where $c_i = \sum_j y_{ij}$. The expected number of member i 's complaints against all other WTO members is then given by the expected value of the Binomial distribution,

$$(4) \quad E(c_i) = n_i G(\cdot),$$

which is strictly proportional to the number of independent Bernoulli trials n_i .

The applied method is maximum likelihood estimation. The likelihood function for the joint probability of observing the given sample of complaints (c_1, c_2, \dots, c_m) is specified through

$$(5) \quad L(c_1, c_2, \dots, c_m) = \prod_i f(c_i | X_{ik}, \beta_k) = \prod_i \binom{n_i}{c_i} G_i(\cdot)^{c_i} [1 - G_i(\cdot)]^{n_i - c_i}.$$

When setting $\beta_k = 0$ excluding β_0 , thus creating the restricted model, the probability to complain reduces to $G_i(\cdot) = \pi$ for all members i and can be determined analytically. Starting from the logarithmic likelihood function,

$$(6) \quad \log L(c_1, c_2, \dots, c_m) = \sum_i \left[\log \binom{n_i}{c_i} + c_i \log \pi + (n_i - c_i) \log (1 - \pi) \right],$$

and searching for π that meets the first order condition for a maximum of the log-likelihood function, i.e.

$$\max_{\pi} \log L(c_1, c_2, \dots, c_m) \Leftrightarrow \frac{\partial \log L}{\partial \pi} = 0!, \text{ we obtain } \pi = \frac{\sum_i c_i}{\sum_i n_i}.$$

Hence, for the restricted model the maximum likelihood estimator of the probability to start proceedings is simply the total number of observed complaints over the total number of bilateral export flows.

The definition of the number of independent Bernoulli trials requires information about the exact number of infringements that each member faces, as the aforementioned binary choice model refers to the litigation decision when WTO obligations are violated. For the reason that we have no a priori information about the existence of inconsistent trade measures – their existence can merely be assured after a positive Dispute Settlement Body or Appellate Body ruling – the analysis is based on an assumption about their distribution. For

HORN, MAVROIDIS, AND NORDSTRÖM (1999) the number of independent Bernoulli trials is dependent on a country's export diversification, i.e. its number of different exported goods over all products and trading partners under the regime of the WTO. Each counted bilateral export flow is assigned one trial. They worked on the assumption that "disputable trade measures" (DTM) are uniformly distributed over all bilateral export flows. The problem of this approach is that the determinants for the occurrence of disputes cannot be separately identified from the impacts on the existence of DTM, leading to an "export diversity bias", i.e. an increase in disputes with increasing export diversity. This problem already was a central criticism of HOLMES, ROLLO AND YOUNG (2003).

Following the approach of HORN, MAVROIDIS AND NORDSTRÖM (1999) we try to mitigate the problem of missing information about the distribution of infringements by incorporating two new indicators: Endured Protectionism by Trade Partner and Own Imposed Protectionism. In addition to this information on the likelihood of DTM in export flows, the attempt of HORN, MAVROIDIS AND NORDSTRÖM (1999) to select the relevant export flows is utilized with some amelioration, i.e. taking empirical values for average induced litigation costs into account.

Determinants addressed and data used

Against the background of the existing studies, this paper focuses specifically on agricultural and food-related disputes in order to develop an in-depth analysis of determinants relevant in this sector and to additionally introduce new potential determinants. The set of determinants or countries' traits already used in prior studies is reflected by agricultural trade flows characterising the export diversity, a country's wealth and its legal capacity. Due to data availability on the influencing determinants under investigation the members sample is limited to 53, thereby maintaining the distribution of income classes.

Disputes data

Restricting our analysis to agricultural and food related issues, the only precondition for the gathering of initiations is that products of the food sector are affected.⁵ The investigation covers the period from January 1 1995, to June 30, 2006. Each initiation is counted once to avoid double counting, thus omitting re-uptakes of disputes that occur when the consultation period of 12 months is exceeded. For jointly filed initiations each participant is assigned one dispute. When one member simultaneously requests for consultations on the same subject but with different defendants each one is counted by its own. Since the European Communities (EC) is a single customs union with a harmonised trade policy and common tariffs all disputes initiated by its members are assigned to the EC. On the other hand, when disputes are initiated against several EC members there is only one dispute assigned, including all defendants. The number of disputes is for each member related to the whole investigation period,

$$(7) \quad y_i^* = \frac{y_i^o}{t_i} \cdot T,$$

where y_i^* is the time-corrected number of disputes of member i , y_i^o assigns member i 's observed disputes over its WTO-membership time t_i and T stands for the investigation period. This proceeding is self-evident, since the number of filed disputes ought to be linked to a member's membership time in the WTO. By this means the time-bias is outweighed.

Export diversity

We adopt the model first presented by HORN, MAVROIDIS AND NORDSTRÖM (1999). Strictly speaking export diversification is not an explanatory variable but is an intrinsic component of the underlying binomial

⁵ Agricultural and food related issues comprise initiated disputes which were raised under the following agreements: Agreement on Agriculture, Agreement on Safeguards, General Agreement on Tariffs and Trade, Agreement on Subsidies and Countervailing Measures, Agreement on Trade Related Investment Measures, Anti-Dumping-Agreement and the Agreement on Import Licensing Procedures.

dispute distribution model. They empirically supported the dependency of a member's activity as complainant from its export diversity, i.e. its number of different exported goods over all trading partners. The underlying principle lies in the expectation of an increased probability to encounter infringements if a member's export diversity increases. This is self-evident if we assume infringements to be uniformly distributed over all markets, products and trading partners. Hence, we expect the number of disputes to be positively related to members' amount of different bilateral export flows. The export diversification factor's explanation content is just confirmable by excluding all other variables. Export flows come from EURO CARE (2006) available on an aggregation level comparable to the HS⁶-4-level.

Induced costs of litigation

HORN, MAVROIDIS AND NORDSTRÖM (1999) were the first analysing the litigation costs involved and demonstrated their relevance. Their approach is followed through the implementation of a threshold for counting a member's bilateral export flows, thus excluding flows under a certain value not being worth to fight for. According to calculations of NORDSTRÖM (2005), average costs for dispute settlement proceedings range from \$128,500 to \$706,000, dependent on the degree of its complexity and the per hour rate of engaged lawyers. Hence, the analysis is conducted for four different litigation cost levels, i.e. excluding all flows below the respective threshold: \$0 when no threshold is applied, \$300K for low costs, \$500K for medium costs and \$700K for high litigation costs. The impact of the adopted cost-thresholds is shown for the restricted model, i.e. to the exclusion of all explanatory variables, thus comparing different cost thresholds with respect to the corresponding model's prediction quality.

Endured protectionism by trade partner

This is to our knowledge the first empirical effort to incorporate information about the distribution of

⁶ Harmonized Commodity Description and Coding System of the World Customs Organization (WCO)

WTO-inconsistent trade barriers to reduce the lack of information about the existence of actual infringements which is the precondition to each dispute. It is assumed that the more protective the trade policy of a country's trading partners is, the higher the probability that it faces disputable trade barriers. Hence, we expect the number of initiated disputes to be positively related to a country's faced trade restrictiveness. For this purpose the Market Access Overall Trade Restrictiveness Index (MA-OTRI) provided by KEE, NICITA AND OLARREAGA (2006) is used. It comprises a tariff equivalent of all barriers that exporters of the respective country face on average.

Own protectionist behaviour

Another hypothesis is that a country's tendency towards protectionism is negatively related to the number of its filed disputes. The rationale behind this is the assumption that a more protective member faces also a greater likelihood to become "victim" of an accusation. We presume a more protective country to pursue a defensive and peaceful strategy to not provoke to be challenged itself. On the other hand we hypothesize that more protective countries have a lower propensity to fight for market liberalisation. For this purpose the Overall Trade Restrictiveness Index (OTRI) by KEE, NICITA AND OLARREAGA (2006) is used as a measure for a country's inclination to restrictive policies. It is a tariff equivalent for all trade barriers which the respective country imposes in average upon the rest of the world. Consequently, it provides the mirror image of the aforementioned MAOTRI indicator, measuring the trade restrictiveness from the potential complainant's perspective.

Relevance of the agricultural sector

Independent from a country's contact to a trading partner we expect the overall importance of the agricultural sector as having a positive influence on initiating a case: the higher the overall economic relevance, the more sensitive a country may be regarding violations. To quantify the sector's importance the agricultural

share of a member's GDP is employed. This rather crude indicator is used due to missing data on the value of the countries' food industry. An improved measure should comprise information on the relevance of a member's whole agri-food sector. The data is drawn from the UNITED NATIONS CONFERENCE ON TRADE AND DEVELOPMENT (2003).

Capacity to absorb legal costs/wealth

The capacity to absorb legal costs is supposed to be essential for the accomplishment of disputes as explicit compensation for litigation costs is not intended by the system. Even though the expected gains from removing the trade barrier exceed the induced litigation costs, this potential payoff lies ahead and is uncertain. For this reason each potential plaintiff must anticipate substantial costs that are involved by prosecution and in case of need, enforcement of compliance. It is assumed that the number of complaints is positively related to a member's capacity to absorb legal costs. As proxy for such financial means we use a country's GDP, provided by the UNITED NATIONS CONFERENCE ON TRADE AND DEVELOPMENT (2002 AND 2003).

Legal capacity

HORN, MAVROIDIS AND NORDSTRÖM (1999) found empirical evidence on the matter of a country's legal capacity in respect of initiating disputes. We hypothesise that the larger a country's endowment with skilled legal personnel, the higher its capability to challenge arguable trade measures of its trading partners and we expect the number of bilateral complaints to be positively linked. The respective determinant should comprise the whole extent of a country's trade administration, i.e. its budget, its staff's size and quality. Since there is no differentiated information on members' legal capability we use like HORN, MAVROIDIS AND NORDSTRÖM (1999) their delegation size at Geneva as proxy. The respective information comes from the UNITED NATIONS (2004).

Influence of private actors and governmental efficiency

The influence of private pressure groups on the government is relevant as only the government may finally

enter a dispute. This power may differ among countries depending on the national framework for organizing private lobby activities and on their respective relevance. It is increasingly seen as especially relevant for developing countries in determining the use of the settlement system (SHAFFER, 2003; BOWN AND HOEKMAN, 2005).

SHAFFER (2003a) and SHAFFER (2003b) demonstrate the relevance of private-public partnerships for the initiation and prosecution of trade disputes at the WTO and BESSON AND MEHDI (2004) argue that domestic variables should be incorporated to handle the potential distortion sources of the dispute settlement procedure.

This is to our knowledge the first empirical attempt to capture some aspects of the aforementioned interaction between the public and the private sector regarding dispute initiation. For this purpose two domestic variables are included which are provided by KAUFMANN (2004): (i) the Corporate Legal Corruption Component (CLCC), measuring legal dimensions of undue political influence by the private sector and (ii) the Judicial/Legal Effectiveness Integrity Index (JLEI), assessing the effectiveness and integrity of the legal and judicial system. The greater the influence of lobbyists, e.g. by legal political finance or by the voice of interests of powerful firms, the more successful the private sector is supposed to be in achieving its export interests. Accordingly, the number of challenged disputes should be positively correlated to the amount of undue influence, aggregated in the CLCC variable. It is hypothesized, that the higher the efficiency and integrity of the legal and judicial system of a country, the higher its ability to identify illegal trade measures and to pursue a legal action. Hence, the probability for litigation is presumed to be positively dependent on the JLEI variable.

Membership time

The time of membership can express learning costs in terms of decreasing additional costs for running an additional dispute. Hence, we suspect a member's experience through its membership in the WTO to be positively related to its number of filed disputes. An index is created over the time since the inception of the

organization until 30 June 2006, thus relating each member's membership time to the whole observation period. The associated data is from WTO (2007c).

The following table provides a survey on all explanatory variables with their respective data and source and their predicted impact on the initiation of disputes.

Table 5: Survey on Explanatory Variables, Data and Predicted Sign

Explanatory variables	Data	Source	Predicted sign
Export Diversity*	Census of different export flows on HS-4 level	EuroCARE (2006)	(+)
Capacity to Absorb Legal Costs/Wealth*	Per capita Gross Domestic Product	UNCTAD - Statistical Yearbook (2001, 2003)	+
Legal Capacity*	Size of permanent delegation at Geneva	United Nations (2004)	+
Influence of Private Actors	Measure of legal dimensions of undue political influence by the private sector	Kaufmann (2004): Corporate Legal Corruption Component (CLCC)	+
Governmental Efficiency	Measure of effectiveness and integrity of the legal and judicial system	Kaufmann (2004): Legal and Judicial Effectiveness and Integrity Index (LJE)	+
Relevance of the Agricultural Sector	Percentage share of GDP produced in agriculture	UNCTAD - Statistical Yearbook (2001, 2003)	+
Endured Protectionism by Trade Partner	Average endured tariff equivalent	Kee, Nicita, Olarreaga (2006): Overall Trade Restrictiveness Index (OTRI)	+
Own Imposed Protectionism	Average imposed tariff equivalent	Kee, Nicita, Olarreaga (2006): Market Access Overall Trade Restrictiveness Index (MA-OTRI)	–
WTO Membership Time	Index basing on a members percentage membership share from 1. January 1995 to 30 June 2006	World Trade Organization (2006)	+

* Influencing factors already integrated in previous empirical investigations

Source: Own compilation

Results: Probabilities and relevance of determinants

For the restricted model the probability to complain is identical for all members and its estimate only dependent on the number of all observed disputes and of the sum of bilateral export flows between all trading

partners. Hence, improved model behaviour is merely owing to changes in the distribution of export flows over members by weighing the relevant exports flows, i.e. introducing thresholds for accounting only export flows beyond a certain value. The average number of export flows declines from 5530 in case of no threshold to 65 when the highest threshold of \$700,000 is used. The fit of the model is measured by two different indicators: the fraction of predicted members that lie inside a 25%-interval around their respective observed value and the mean sum of absolute deviations (MSAD) between observed and predicted disputes

$$(8) \quad MSAD = \frac{1}{m} \sum_i |c_i - \hat{c}_i|,$$

where c_i denotes the number of observed and \hat{c}_i the number of predicted disputes of member i and m assigns the sample size.

Both indicators prove that the weighing of export flows by employing thresholds is essential for the amendment of the model, i.e. the raise of the threshold increases the fit of the model. This result supports the findings of HORN, MAVROIDIS AND NORDSTRÖM (1999) who already identified weighted export flows as the most relevant determinant for explaining dispute initiations. Table 6 comprises the results for the restricted model. The threshold of \$300,000 is omitted as it has no substantial influences on the results compared to no threshold. For the middle cost threshold of \$500,000 the MSAD decreases by 23% to 1.34 compared to 1.75 for the model without threshold whereas the fraction of predicted members inside the 25%-bound increases from 45% to 57%. When the highest threshold is applied, the MSAD decreases further by 28% to 0.96 while the fraction of well predicted members slightly increases to 60%.

Table 6: Results for the restricted model subject to different thresholds for export flows

Threshold	\$0	Number of bilateral export flows		
BETA 0	-8.0133	min	max	avg
PROB	0.0003	127	115000	5530
		Mean sum of absolute deviations		1.75
		Fraction inside of 25% bound		45%
Threshold	\$500000	Number of bilateral export flows		
BETA 0	-5.2604	min	max	avg
PROB	0.0052	16	6210	354
		Mean sum of absolute deviations		1.34
		Fraction inside of 25% bound		57%
Threshold	\$700000	Number of bilateral export flows		
BETA 0	-3.5336	min	max	avg
PROB	0.0284	1	750	65
		Mean sum of absolute deviations		0.96
		Fraction inside of 25% bound		60%

Source: Own compilation.

For the unrestricted model the Akaike and Schwarz information criteria are utilized to select the relevant indicators. Based on Akaike and Schwarz information criteria the incorporation of additional variables is traded off against the increased fit of the model. By incorporating additional explanatory variables the goodness of fit is improved regardless of the number of free parameters in the data generating process. Both indicators penalize increasing complexity thus mitigating the danger of over-fitting. It is then sought after the model specification showing the lowest information criterion value. The proceeding is stepwise: After including one additional variable, the resulting model is estimated and the related information value is calculated. In the next step the variable that yielded the lowest information value is retained and the remaining variables are assessed based on the resulting information value. Additional variables are included as long as they reduce the information criteria. Subsequently, their joint significant influence is validated by test statistics that are based on bootstrap methods, thereby generating each coefficient's empirical distribution.⁷

According to this proceeding only three variables achieve an improvement of the model: (1) Endured

⁷ Estimation, selection of variables and the bootstrap re-sampling and testing procedure are implemented in GAMS (General Algebraic Modeling System). The standard errors of the coefficients are calculated for 2000 re-sampling iterations.

Protectionism, (2) Own Imposed Protectionism and (3) WTO Membership Time result in a sufficient increase in the goodness of fit for no threshold and the two thresholds \$300,000 and \$500,000. The remaining variables are discarded as they raise the model's complexity more than its fit. Table 7 comprises the results for the unrestricted model and \$500,000 threshold. All included variables show the hypothesized sign and their influence is proved to be significantly different from zero. Compared to the restricted model, the fraction of predicted members inside the 25%-bound remains unchanged. Nonetheless, the sum of absolute deviations between observed and predicted complaints decreases. This is due to improved model behaviour for members with a large number of observed disputes, predominantly for the EC and the U.S.

Table 7: Results for the unrestricted model and \$500,000 threshold

Results for variables	Explanatory Variable	Predicted Sign	Beta	Standard Error	Average Marginal Effect
	Endured Protectionism by Trade Partner	+	3.6687**	1.0019	0.0182
	Own Imposed Protectionism	–	-2.1573*	0.9887	-0.0107
	WTO Membership Time	+	3.9683*	1.4290	0.0197
Properties of the model	Threshold	\$500000	Number of bilateral export flows		
			min	max	avg
			16	6210	354
	BETA 0	-9.72			
	Mean sum of absolute deviations	0.81	Probability to complain per export flow		
	Fractions inside of 25% bound	57%	PROB min	PROB max	PROB avg
			0.0001	0.0137	0.0050

* statistically different from 0 at the 1% level

** statistically different from 0 at the 2.5% level

Source: Own compilation.

The probability to complain covers an interval from 0.0001 to 0.0137. A member's activity in dispute initiation cannot be inferred from its probability to complain without considering the number of its export flows: Being one of the two most active users of the system, the probability to complain of the EC falls into the lower

third whereas the probability of Australia, Canada and the U.S. belong to the highest. For the \$500,000 threshold the probability of the U.S. constitutes over three times the EC's probability. Corresponding to their reciprocal ratio with respect to their bilateral export flows (1 : 2.25) this results in 25 predicted disputes for the U.S. (but 26 actually observed) and 17 for the EC (only 14 actually observed).

The application of the highest threshold of \$700,000 for the three variables results in a further improvement as regards the MSAD, which falls to 0.68 and the fraction of well predicted members, which rises to 64%. Simultaneously, the significant influence of the variable "Endured Protectionism" disappears. According to Akaike and Schwarz criteria this variable would be discarded under the highest threshold. Its coefficient diminishes to -0.84 with a standard deviation of 0.96. The significant influence of the remaining variables remains virtually unchanged.

The findings of HORN, MAVROIDIS AND NORDSTRÖM (1999) on legal capacity as relevant could not be supported in our analysis of food related disputes. This can be explained by the fact that legal capacity is an internationally tradable good such that each member can purchase legal expertise, provided that it has sufficient financial resources. Hence, legal capacity must not necessarily be stocked by a member in order to get access to it. Contrariwise, this result may be based on a poor proxy, since a better indicator should incorporate all essential aspects of a member's trade administration, comprising its budget, the size and professional skill of its staff and its administrative efficiency. The findings of BOWN (2005) in respect of the influence of monetary means, is not confirmed by our results either.

It could be shown that the lack of information on the distribution of infringements is mitigated by incorporating the variables Imposed Protectionism and Endured Protectionism.

Operating experience seems to be relevant for a member's activity as shown by the significant influence of the variable WTO Membership Time, however experience gained from the overall GATT-membership prior to

1995 and from other international trade agreements are not considered.

The indicators on Governmental Efficiency, Influence of Private Actors and Relevance of the Agricultural Sector do not improve the model's explanatory power as they are all discarded according to Akaike and Schwarz criteria. In case of the latter one this could be due to its lacking information content, since it refers only to the agricultural sectors relevance. Actually, a measure for the relevance of a member's whole agri-food-industry is needed.

Conclusions

This paper presented an analysis of the determinants for initiating WTO disputes related to the agri-food sector. Apart from this new sectoral focus, the analysis extended the literature with a more in-depth analysis of potentially relevant determinants. The empirical model which represented the number of initiated disputes by a country as a sequence of Bernoulli trials with probabilities modelled by a logistic distribution was applied to 53 WTO member countries.

The results show that some of the determinants relevant in previous dispute studies such as legal capacity and monetary means could not be confirmed as statistically relevant in the context of the agri-food sector. Mitigating some shortcomings of earlier analysis, it could be shown that increasing own protectionist attitude lowered the probability to complain and the level of protection faced by a country lead to an increase. Both variables can be seen as highly relevant especially in the agri-food sector. At the same time, the duration of WTO membership time clearly contributed to a larger likelihood to initiate a WTO dispute. Further research should focus on the improvement of data quality as well as approaches which allow to simultaneously incorporating characteristics of the defendant country.

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