Gravitation or Discrimination?
Determinants of Litigation in the World Trade Organization

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ABSTRACT

The strong presence of large countries in WTO dispute settlement and the absence of very poor ones have raised concerns that increasing legalization in the global trading system has not diminished discrimination of less powerful countries as much as expected. We study dispute initiations in all WTO member state dyads in 1995-2003 to shed more light on this issue. The analysis suggests that the main driver of dispute initiation is a gravitational one: larger economies and bigger traders are more likely to become involved in trade disputes primarily because their economies are more diversified, and also because greater market size makes them more attractive targets of litigation. While we do not find evidence for discriminatory effects against countries with small legal capacity, our results point to a more complex form of power bias, namely a preponderance effect. They suggest that disputes among country dyads exhibiting a strong power asymmetry, i.e. dyads including a much more powerful defendant than complainant or vice versa, are dealt with outside the WTO. This finding is potentially worrying because it is, arguably, easier to reduce legal capacity differences than to reduce power differences.

1. INTRODUCTION

One of the most important issues in contemporary International Relations research is whether and under what conditions the rule of law, which is characteristic of modern democracies, can be extended beyond its cradle, the nation state, to solve international problems through legal means (Abbott et al. 2000; Goldstein et al. 2000; Zangl 2008). The dispute-settlement mechanism of the World Trade Organization (WTO) offers a great opportunity to study this issue. This mechanism is unique in that it offers the international community a tightly structured venue for resolving trade disputes through a judicial system rather than conventional state-to-state bargaining in which more powerful countries are usually better positioned for obtaining their preferred outcome.

One of the key issues in trying to understand the extent to which legalization in the global trading system has progressed or, conversely, remains incomplete concerns power and capacity biases in WTO dispute settlement. Descriptive evidence on WTO disputes shows that the major economic powers such as the United States, the EU and Japan are frequent users of this mechanism, while least developed countries are almost absent. Does this indicate an important power and capacity bias in WTO dispute settlement, in the sense that this system discriminates against smaller and poorer countries, i.e. countries that are less powerful and have smaller capacities to litigate?

We contribute to the existing literature on the subject (Horn et al. 1999; Allee 2004, 2005; Guzman and Simmons 2005; Busch et al. 2008; Kim 2008; Davis and Blodgett Bermeo forthcoming) in three novel ways. First, we estimate and explicitly compare the relative

importance of gravitational and discriminatory effects. The gravity argument holds that larger economies are more likely to become involved in trade disputes primarily because their economies are more diversified and greater market size makes them more attractive targets of litigation. Explanations emphasizing discrimination argue that variation in countries' involvement in WTO disputes is primarily due to differences in power and legal capacity. Second, besides analyzing more conventional, direct power effects, we also study a more complex, indirect power effect not considered in other studies on trade disputes, namely preponderance. Third, we use a combination of standard and zero-inflated count models. The latter allow us to distinguish between dispute-enabling and dispute-promoting factors.

The empirical analysis relies on a dataset that includes all directed WTO member state dyads from 1995 to 2003. The results strongly support the gravity argument; that is, we find that large economies are pushed towards WTO disputes, both as complainants and defendants, more often than the larger trade volume of large countries would suggest. In contrast to other studies our results do not support the legal capacity hypothesis. However, we identify a particular type of power-related bias that has not been analyzed before. Dyads with larger differences in power between complainant and defendant – in either direction – are less likely to become involved in a WTO dispute. This preponderance effect suggests that more powerful countries tend to obtain concessions from less powerful countries outside the WTO, and/or that less powerful countries tend to abstain from formal WTO litigation for fear of reprisals.

We conclude from these findings that optimism about legalization in the global trading system is warranted only in part (e.g., Zangl 2008). The positive news is that gravity effects, which from a

legalization perspective are rather unproblematic, are strong, and that our results do not support concerns about discriminatory legal capacity bias. The negative news is that we observe a considerable preponderance effect. This effect suggests that disputes among country dyads characterized by strong power asymmetry are dealt with outside the WTO. This finding is potentially worrying because it is much easier to reduce legal capacity differences (e.g. by providing legal support for poor countries through international organizations and NGOs) than to correct for power differences.

2. THE ISSUE

Even though the WTO dispute settlement system has been heralded as an institutional innovation that puts right before might, critics maintain that some countries in this system are „less equal" than others. In particular, less powerful countries may not initiate legal action against a more powerful country because they fear costly retaliation. Discriminatory effects are also assumed to emanate from the fact that involvement in a WTO case can be very costly because it requires specialized legal staff and disputes may last several years (Horn et al. 1999; Smith 2004; Bown 2005a; Busch et al. 2008; Kim 2008; Davis and Blodgett Bermeo forthcoming).

Is WTO dispute settlement biased against less powerful and poorer countries? A first, descriptive look at the available data on WTO dispute initiations produces an ambiguous picture. As shown in Figure 1, industrialized countries are by far the heaviest users of the dispute settlement system. They initiated more than 60% of the WTO disputes and acted as defendants in more than 70% of the cases. In contrast, less than 1% of the disputes were initiated by least developed countries,

and least developing countries never appear as defendants. Developing countries as a whole have made consistent use of the system, however.

<< Figure 1 about here >>

The picture changes if one weighs participation in dispute settlement by shares in world trade. In the 2000 – 2006 period, merchandise exports by developing countries were around 30-35% of total global trade (World Trade Report 2006). This share corresponds, by and large, to developing countries' share of dispute initiations in the WTO. These empirical patterns do not offer a conclusive answer concerning the extent of power and capacity related biases in WTO dispute settlement. Such an answer requires more nuanced theoretical arguments and systematic empirical testing.

3. DISCRIMINATION OR GRAVITATION?

Relative power and legal capacity play a prominent role in studies that account for litigation in the global trading system and variation of participation in dispute settlement (e.g., Conybeare 1985; Guzman and Simmons 2005; Busch et al. 2008; Kim 2008; Davis and Blodgett Bermeo forthcoming). We start by identifying propositions on power and legal capacity effects, including a proposition pertaining to preponderance (power asymmetry) effects, which has not been analyzed in the trade disputes literature before. Building on Hegre (2008), we then add a gravitational argument. This argument contends that larger economies are more likely to become involved in trade disputes for reasons unrelated to discrimination.

3.1 Discrimination associated with differences in power and legal capacity

Studies on international trade disputes commonly assume that the distribution of power within a country dyad affects the trade policy of one country towards the other. In particular, the more powerful country is presumably better positioned to impose its will on the less powerful one. For example, in his analysis of French-Italian trade disputes in the 1880s and 1890s Conybeare (1985: 147) notes that "… big powers can coerce small powers." Guzman and Simmons (2005: 557) state that "politically weak countries will refrain from filing complaints against politically powerful states for fear of costly retaliation."

The logic of this argument is that, if the complainant country is more powerful than the target country, it can impose greater costs on the target with less harm to its own economy. It thus faces lower costs of retaliation by the defendant when it considers whether or not to initiate a dispute against a less powerful country. Moreover, countries that obtain a favorable WTO verdict are themselves responsible for enforcement; more powerful complainants also have more power to enforce verdicts in their favor, while more powerful defendants are better able to resist the implementation of verdicts against them. A complainant is, therefore, more likely to get what she wants if the target country is less powerful. Vice versa, countries are more likely to refrain from initiating a WTO dispute against a more powerful country, even if they have reasons to believe that they could win the legal case.

A more complex version of the aforementioned hypothesis that has not been examined in this context takes into account that states are likely to interact outside the WTO before they take legal

action inside the WTO dispute settlement system. In that case, countries of different power will first negotiate bilaterally about barriers to trade, and powerful states, whether complainants or defendants, will try to obtain concessions from less powerful states. More powerful complainant countries will ask weaker defendant countries to lift disputed trade restrictions without WTO proceedings. Similarly, more powerful defendant countries will resist demands by weaker complainant countries to lift trade restrictions, but weaker complainants may not initiate a formal WTO dispute because they fear reprisals. The probability of an 'out-of-court' settlement then increases with larger power asymmetry – in either direction – between the complainant and defendant, and WTO dispute initiation becomes less likely. This hypothesis resembles the power preponderance hypothesis in research on armed interstate conflict.

The second discriminatory factor concerns legal capacity. Greater legalization has increased the complexity of the WTO dispute settlement process, and many observers of the WTO suspect that countries with smaller legal capacity are less likely to be able to use improved opportunities for taking legal action in the WTO (Horn et al. 1999; Busch et al. 2008; Kim 2008). Poor countries may not have the financial means and human resources to prepare and follow through with a WTO dispute. Taking legal action in the WTO can be very costly in several respects. It requires that countries monitor other countries' trade policies and import restrictions, collect evidence on policies and practices that violate international trade law, and hire legal staff, sometimes for years. Countries with larger legal capacity may also be more likely to resist attempts to settle a dispute outside the WTO and accept a greater risk that the complainant takes the dispute to the WTO. Thus, we should expect countries with a larger legal capacity to be more active users of the dispute settlement mechanism.

Some authors have pointed to circumstances under which the discriminating effect of low legal capacity may diminish. Previous experience with WTO dispute settlement can equip poor countries with expertise for future cases (Davis and Blodgett Bermeo forthcoming). This argument implicitly suggests that, unlike power relations in a dyad, legal capacity is not strictly exogenous to a country's propensity to initiate or become a target of legal action in the WTO. For instance, poor countries facing trade restrictions imposed by an important export destination may conclude that the expected benefits from taking legal action and eventually gaining better access to that market may be greater than the costs of acquiring a larger legal capacity. Once they have made this investment, the barrier to participation in future disputes is lower.

3.2 Larger economies gravitate into trade disputes

An alternative explanation of the empirical patterns outlined above contends that most variation in dispute initiation may not be due to discrimination, but is caused by gravitation. The gravitational argument holds that dispute propensity is primarily caused by economic size and trade volume. It postulates, moreover, that large economies participate in disputes disproportionately often, i.e. more often than their larger trade volume would suggest because their economies are more diversified and because greater market size makes them more attractive targets of litigation.

The idea that large countries gravitate towards international conflicts has its roots in the gravity model of trade. The latter model explains bilateral trade flows as a function of economic mass and distance between two countries (Bergstrand 1985). Translating this model to international

armed conflict has generated the proposition that larger and more powerful countries (in absolute terms) are more likely to become involved in militarized disputes (Hegre 2008). This 'gravitation' effect in interstate conflict implies that large (small) countries are involved in more (less) conflicts than the distance between two potential opponents suggests.

The gravity logic applies to trade disputes as well. Larger economies have more opportunities to become involved in a trade conflict because they tend to be more diversified than smaller economies and usually have a larger range of industries. Large economies, e.g. the United States, Japan or Germany, produce and trade all major goods and services, from agricultural products to steel and ships to sophisticated financial services and consumer electronics. Even highly developed small economies, such as Switzerland or New Zealand, do not have some of the industries that still play a considerable role in large economies, e.g. heavy industries. Consequently, it is more likely that a large exporting country encounters disputable trade restrictions in some other country. Conversely, given the greater diversity of imports it is also more likely that a trade partner is negatively affected by an import restricting measure of the large economy and decides to challenge this measure in the WTO.

The difference between large and small economies is particularly apparent in the case of developing countries. Most African economies, for instance, exhibit a low level of diversification. They are often heavily dependent on a few export products, usually from the primary sector. These countries have a much smaller chance to become involved in a trade dispute for reasons unrelated to power and legal capacity. Market size and diversification, rather

than legal capacity or power, may thus explain why least developed countries are largely absent from WTO dispute settlement.

The economic size of countries also affects motivations to become involved in a trade dispute. Large economies are particularly attractive targets for potential complainants because of their large market size, which ultimately affects the economic stakes of a case (Allee 2004; Guzman and Simmons 2005). If the WTO issues a verdict in favor of the complainant and the defendant complies, exporters from the complainant country can gain more the larger the destination market is. The incentive to take legal action is, therefore, particularly strong when suspected violations of trade law occur in a large economy.

The gravity logic postulates that both bilateral trade and economic size promote dispute initiation, and that large economies experience more disputes than predicted by their larger trade volume alone. Relating the gravity model of disputes to the classic gravity model, which explains trade as a function of economic mass and distance,[1] the role of trade in the dispute model corresponds to the role of distance in the classic model while economic mass is the same in both models.[2]

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[1] The classic gravity model of trade is $t_{ij} = g * \left(\left(m_i * m_j \right) / d_{ij} \right)$ where t_{ij} is bilateral trade between countries *i* and *j*, g is a constant, m_i and m_j are the economic masses of the two countries and d_{ij} is the geographic distance. The gravity model of disputes then is $\Pr(DS_{ij}) = f\left[g * \left(\left(m_i * m_j \right) / t_{ij} \right) \right]$ where DS_{ij} represents a trade dispute and $f[\cdot]$ is the link function.

[2] Variation in trade volume may also indicate differences in trade diversity that emanate from the economic size of countries, but only to a limited degree. For instance, small economies that are

The distinction of gravity effects from power and capacity effects is important not only from an analytical, but also from a policy perspective. If involvement in WTO trade disputes is driven primarily by gravitation, this is good news for proponents of legalization in the global trading system. We could then conclude that the WTO process is effective in putting right before might. To the extent we observe discriminatory effects emanating from differences in relative power and legal capacity, the news will be less negative if such effects emanate from differences in capacity rather than power. The reason is that it is much easier to design and implement policies than help in reducing differences in legal capacity than differences in power.

4. EMPIRICAL DESIGN

4.1 Approach

A comprehensive study of dispute initiation and its determinants must pay attention to all potential conflict dyads (country pairs), i.e. also those that have not experienced a dispute. Moreover, testing arguments concerning power requires that we use explanatory variables that capture the characteristics of both the complainant and the defendant country. While the

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close to each other are likely to trade more than distant countries, but trade between these two small countries is not necessarily very diverse. For now, we keep the conceptual distinction between trade reflecting distance and economic size representing diversity, but we will return to this issue when we empirically examine the distinction between conflict-enabling and conflict-promoting factors.

complainant ultimately decides whether or not to initiate a WTO dispute, this decision depends also on the defendant country's willingness to comply with demands by the complainant.

The design of our analysis thus follows the approach that has been used to study gravity and power effects in interstate armed conflict. The dataset includes all *directed* WTO member state dyads from 1995 to 2003.[3] Each dyad appears twice because the dependent variable measures not only the number of trade disputes in a dyad, but also which country is the complainant and which one the defendant. We restrict the analysis to the 1995-2003 period because of missing data for explanatory variables after 2003. We then drop 'irrelevant dyads'; in our context, these are dyads that have zero bilateral trade in either direction.[4]

We implement the empirical analysis in two steps. The first step relies on a cross-sectional design that examines the number of trade dispute initiations a directed dyad experienced in the 1995-2003 period. We opt for the cross sectional approach because dispute initiations among WTO dyads are very low probability events – even after excluding irrelevant dyads. The cross-sectional analysis reduces to some extent the large number of 'no events' in the dataset. In the second step

[3] In 2003, the WTO had 131 member states, implying that there were 8'515 dyads in that year. The number of dyads is smaller in earlier years because some countries joined the WTO only some time after its foundation.

[4] On irrelevant dyads in interstate war research see Maoz and Russett (1993), Russett and Oneal (1997), and Lemke and Reed (2001). Since trade conflicts are next to impossible if countries do not trade with each other, non-trading dyads are considered irrelevant. We keep all dyads with a positive bilateral trade volume (in either direction).

we re-examine the cross-sectional results with a dataset that includes dispute initiations across dyads and over time.

4.2 Variables

The dependent variable measures how many trade disputes a WTO member country initiated against another member country in a given year. This definition requires that we analyze annual country pairs and split disputes filed under the WTO dispute settlement mechanism by more than one country into dyads. This approach follows a common practice in the existing literature (e.g., Busch 2000). The reason is that disputes initiated by several countries can be settled (or escalated) bilaterally. The EU is treated as a single actor because its members generally pursue a common trade policy in the WTO context. A dispute initiation is coded as such if a formal request for consultations under the WTO dispute settlement system was made.[5]

The key explanatory variables in the gravity model are the log of bilateral trade and the log of economic size of potential complainants (country A) and defendants (country B). Trade is the sum of imports and exports between two countries in billion USD. Economic size is the GDP of the respective country. The data is taken from Gleditsch (2002) and updated with data from the IMF Directions of Trade Statistics and the Penn World Tables.[6]

[5] See, http://www.wto.org/english/tratop_e/dispu_e/dispu_e.htm

[6] We do not include the export dependence of countries A and B in our models. The export dependence of both countries is very highly correlated with bilateral trade and essentially

The key explanatory variable in the conventional power model is economic size in *relative* terms. **Relative power** is the difference between the log GDP of the complainant and log GDP of the defendant. This is a standard measure of relative power in international conflict research (see, e.g., Hegre 2008). It takes the value 0 if both countries are equally powerful. Negative values show that the defendant is more powerful than the complainant, positive values indicate that the complainant is more powerful. To test the preponderance hypothesis, we measure **power asymmetry** in terms of the absolute value of the relative power variable. High values indicate strong power asymmetry, but the variable does not specify which of the two countries is more powerful. We also examine whether **relative income** and **income asymmetry** have an effect on dispute initiation because differences in income may proxy for differences in power as well. Relative income and income asymmetry are defined in the same manner as the relative power variable, using the log of GDP per capita of the two countries. We include bilateral trade in all power models as a control variable.

The key variable in the capacity model is measured in terms of income and WTO delegation size; that is, the log of GDP per capita (**Log(Inc. A), Log(Inc. B**), and the number of delegates to the WTO in Geneva (**Delegates A, Delegates B**). Both indicators have been used as proxies for legal capacity in previous studies. GDP per capita reflects the idea that poor countries have less means

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measures the same phenomenon. Including the log of export dependence of countries A and B instead of the log of bilateral trade volume produces almost identical empirical results.

to engage in trade disputes (Bown 2005b). Delegation size captures the means invested in legal capacity more directly.[7]

The control variables are **democracy of A and B**, measured with the combined scores from Polity IV for each county in a dyad (Marshall et al. 2002), and **retaliation** in models using panel data. In line with other work, we expect that democratic institutions have a positive effect on dispute initiation (Reinhardt 1999; Busch 2000; Allee 2004; Rosendorff 2005; Davis and Blodgett Bermeo forthcoming). The retaliation variable, which is expected to have a positive effect, measures whether country A had become the target of a dispute initiation by B before it initiated a dispute against that country (Allee 2005). Its value is one if the defendant country (B) initiated a dispute against the complainant (A) during the same or the previous year, and zero otherwise.[8] Table 1 presents the descriptive statistics of the variables.

<< Table 1 about here >>

[7] This data is based on the WTO telephone directory in October 2002. See also: http://econ.worldbank.org/

[8] Whether a dispute is initiated may also depend on the characteristics of the economic sector concerned. The dyadic approach followed here, which is particularly useful for an analysis of gravity, power and capacity effects, does not allow for a sectoral explanation of disputes because the dependent variable can not distinguish between sectors. We believe that the omission of sectoral characteristics does not bias our estimates because there is no a priori reason why these should be correlated with our indicators for gravity, power, and capacity. For studies on sectoral effects, see Allee (2003; 2004) and Davis and Shirato (2007).

4.3 Method

We combine previous empirical modeling approaches by focusing on the characteristics of both complainant and defendant countries (e.g., Reinhardt 1999) and accounting for the exact number of disputes that were initiated (Davis and Blodgett Bermeo forthcoming). Moreover, we use a combination of cross-sectional and panel data (zero-inflated count) models. The latter help in dealing with excess zeros in the data and allow us to distinguish dispute-enabling and dispute-promoting factors.

We start with negative binomial models to estimate the expected number of trade dispute initiations by one country against another (King 1988; 1989b: 121-131; Long 1997, chapter 8). The data structure in this first step is cross-sectional. That is, we use 1995-2003 averages for the explanatory variables, and the cumulated number of disputes in a dyad in that time period. The risk of becoming involved in a WTO dispute is higher the longer a country is a WTO member. To account for differences in exposure time, our models include the log of the duration (years) of the complainant's WTO membership. The coefficient for this variable is constrained to 1.

As shown in Table 2, WTO dispute initiations are rare events, especially in the dataset that includes annual directed dyads.[9] To deal with the problem of excess zeros, i.e. the large number of non-events in the panel dataset, we employ zero-inflated negative binomial models (Greene 1994). The first stage of zero-inflated models (the inflation equation) uses a binary specification

[9] In the cross-sectional dataset, the maximum number of disputes in a dyad from 1995 to 2003 is 30 (USA-EU).

to estimate whether a dispute is possible (i.e. whether there is a positive probability of a dispute). The second stage (the conflict equation) accounts for variation in the number of initiated disputes among those dyads that have a positive probability of a dispute.

<< Table 2 about here >>

This approach has several advantages. The zero-inflated models split the dispute initiation process into two stages for statistical and theoretical reasons. It is unrealistic to assume that all dyads have a strictly positive probability of a trade dispute, as the standard models assume. Countries that trade very little (but more than nothing) are very unlikely to become involved in a dispute over trade restrictions. Since it is not obvious *ex ante* at what trade level a dyad becomes 'relevant', the two-step procedure separates observations with zero probability of dispute initiation from those with a positive probability.[10]

[10] Relevant, in this context, means that a dyad has a positive probability of a trade conflict. For theoretical reasons, we opt for the zero-inflated model instead of the related hurdle model (King 1989a). The latter assumes that an event always occurs when a specific threshold is crossed. This condition is not met in our empirical area. In the zero-inflated model, some dyads have a zero probability of becoming involved in a trade dispute, e.g. because they trade only very little, and hence can be classified into the "Always-zero" group. Dyads that trade more may be subject to a non-zero probability of a dispute, but this does not mean that a trade dispute will necessarily occur. These are the dyads in the "Not Always-zero" group. In practice, the estimates produced by the two models are often very similar (Zorn 1998).

5. RESULTS

Table 3 shows the results for the cross-sectional analysis. The Gravity Model in the first column offers strong support for the argument that large economies gravitate towards disputes. Absolute economic size of both the complainant and the defendant has a strong effect on the conflict propensity of a dyad. Large economies initiate more disputes than small ones, and they are more likely to become targets of dispute initiation. As expected, larger traders are also more likely to become involved in a dispute. Because all three explanatory variables are in logarithms, the results imply that the effect of an increase in trade or economic size on dispute propensity is larger for low levels of trade and small economies than for large traders and large economies.

<< Table 3 about here >>

The results for the Power Model specifications in columns two and three differ considerably. The model in the second column includes the relative economic size and relative income variables. This specification reflects the idea that it matters whether the complainant or the defendant is the more powerful country, and it corresponds to previously analyzed power arguments in the WTO disputes literature (e.g., Guzman and Simmons 2005). The results clearly reject the hypothesis that this form of power matters. Both the relative economic size and relative income variables are statistically insignificant and do not increase the explanatory power of the model. Compared to the Gravity Model, the Bayesian Information Criterion (BIC) for the relative Power Model increases by more than 19 points indicating that the former model fits the data better than the latter. Similarly, the dispersion parameter, $\hat{\alpha}$, increases from 1.65 for the Gravity to 2.58 for the

relative Power Model. The Gravity Model thus explains much more of the unexplained heterogeneity that generates variation in expected disputes across WTO dyads.

The second Power Model in the third column, which captures preponderance effects, produces different results. While income asymmetry does not have a statistically significant effect, economic size asymmetry is an important determinant of dispute propensity. The estimated coefficient indicates that, as expected, greater power asymmetry decreases the probability that a dyad experiences a WTO dispute. This result suggests that larger economies, both as complainants and defendants, tend to impose their will on smaller countries outside the WTO, which reduces dispute propensity as power asymmetry grows. The BIC indicates that the model fit for the power asymmetry model is almost as good as for the Gravity Model. The statistically insignificant effect of income asymmetry suggests that specifying power asymmetry in terms of economic size differences is more appropriate. We conclude from these first tests of the Power Models that power asymmetry, but not relative power, plays a significant role in WTO trade dispute initiation.

The results for the Capacity Models, shown in the fourth and fifth column, do not support the capacity hypothesis. The estimates imply that richer countries, as measured by GDP per capita, are less likely to initiate trade disputes and less likely to become targets of dispute initiation, at least when we control for bilateral trade or other indicators of gravitation. We carried out several additional tests to assess the robustness of this finding. The latter remains the same for different specifications as long as we control for gravity effects, i.e. whenever the model includes the log values of bilateral trade and / or export dependence and economic size. Only when we do not

account for gravity, the results change and indicate that poorer countries become involved in trade conflicts less often.[11] Given the importance of gravity effects, we believe that the specifications reported in Table 3, which include some or all gravity variables, are the most appropriate ones.

The Capacity Model in the fourth column uses a more direct measure of legal capacity, WTO delegation size of complainant and defendant countries. The effects of these two variables are not statistically significant.[12] A potential problem with the delegation size variable is that it may also capture gravity effects. Larger economies have a larger delegation because they are involved in more disputes. A country's delegation size then, to a considerable extent, reflects its dispute propensity. Vice versa, small economies have a small or no delegation because they are rarely or

[11] In an alternative specification, which includes the gravity variables without the logarithmic transformation, GDP per capita has the expected positive effect on dispute initiation. All previously discussed results concerning gravitation, relative power and power asymmetry hold for specifications with non-log variables. We opt for the logarithmic transformation, which is standard for gravity models, for two reasons. First, the idea that marginal effects at low levels of trade, economic size and income are larger than at high levels of these variables is theoretically plausible. Second, empirical tests clearly show that the specifications with the log-transformation are more appropriate.

[12] As for GDP per capita, the effect of delegation size in specifications with non-log gravity variables, or one that does not capture gravitational effects at all, changes. The results then imply that greater legal capacity increases dispute propensity. We opt for the specification with the log-transformation for reasons discussed in the previous footnote.

never involved in trade conflicts.[13] This may explain why the impact of delegation size disappears when we include the proper gravitation variables in the model.

The results reported so far remain the same when we include all key variables in one model. The results for these Full Models are shown in columns six and seven of Table 3. The results are also robust to estimating the models without dyads that include both the EU and the United States.

To what extent are the results reported so far substantively relevant? Table 4 shows the predicted probabilities that *no* trade conflict occurs, using the Gravity Model and the best-fitting Power- and Capacity Models (columns 3 and 4 of Table 3) for different levels of trade. The first row for each model in Table 4 shows the predicted probabilities from these models for a reference dyad. This is a dyad with all explanatory variables kept at their means of the subset of dyads with at least one conflict.[14] The second and third rows for the Gravity (Capacity) Model show the predicted probabilities when the complainant's and the defendant's economic size (income) increases by one standard deviation or to the maximum. The same rows for the Power Asymmetry Model show the probabilities when the complainant's economic size increases and the defendant's size decreases by one standard deviation or to the maximum/minimum. The 95% confidence intervals are listed in brackets below the point predictions.

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[13] Accordingly, the log of GDP is highly correlated with the delegation size of a country.

[14] This choice is motivated by the fact that trade disputes are highly rare events and probabilities at the mean levels of the full sample are always very close to zero, e.g. because most country dyads in our dataset trade very little. We would not be able to adequately judge the dispute-reducing effect of power asymmetry for dyads with a zero probability of a dispute.

<< Table 4 about here >>

The marginal effects are largest for the Gravity Model, and greater for the Power Asymmetry Model than for the Capacity Model. For the Gravity Model, the predicted probability of no conflict decreases by 8 (11) percentage points when we move from the reference dyad to the large (maximum) size dyad for a mean level of trade. The magnitude of the marginal effect differs depending on the volume of bilateral trade. The effects of a change in country size for the Gravity Model increase to -16 and -24 percentage points for a high level of trade and up to -23 and -32 percentage points at the maximum level of trade. For ease of interpretation, the mean trade level corresponds approximately to the trade level of dyads like the Czech Republic and Poland or Australia and Thailand. Trade between Argentina and Brazil is slightly more than half way between mean and high trade, while, e.g., Malaysia and Singapore or South Korea and Japan fall approximately into the high-trade category.

When power asymmetry increases by the same standardized amounts, the marginal effect of moving to the maximum asymmetry dyad is only 4 percentage points for the mean value of trade, but this effect increases to 22 percentage points for maximum trade. It is important to note that the dispute-reducing effect of asymmetry is only visible at larger levels of trade because at low levels the probability of a conflict is close to zero and therefore cannot decrease further. In comparison, changes in income have a smaller substantive impact with marginal effects that vary between 2 percentage points for the mean trade dyad up to 13 percentage points for a dyad with maximum trade.

Do these results remain the same when we pay greater attention to dynamics and use a more sophisticated statistical method to deal with the rare events problem? To that end we re-examine the best-fitting model in Table 3 using panel data and zero-inflated count models. This approach distinguishes between dispute-enabling and dispute-promoting factors. For instance, economic size and power asymmetry may primarily have a dispute-promoting effect because, controlling for legal capacity, countries of all sizes and with different asymmetries have the possibility to file a dispute, and large countries gravitate towards more conflicts. Capacity is primarily dispute enabling because countries with no legal capacity simply cannot participate in the WTO settlement system, while greater legal capacity should not lead to more disputes among those dyads that have sufficient legal means to engage in WTO trade disputes. We include the potentially dispute-promoting variables in the conflict equation, which estimates the expected number of conflicts. The potentially dispute-enabling variables are in the inflation equation, which estimates the probability that a conflict *never* occurs.[15]

Table 5 shows the results for the zero-inflated model. It includes the same variables as the model in the last column of Table 3, plus the retaliation variable. Overall, the results shown in Table 5

[15] The MLE estimator of zero-inflated negative binomial models often fails to converge if the models are not properly specified, i.e. if they include many variables that are not relevant for an equation. We therefore do not include all variables in both equations, but impose a number of assumptions about the data-generating process that we develop based on theoretical considerations (dispute-enabling vs. dispute-promoting factors) and empirical tests. While these assumptions can be challenged and improved through further research, the good performance and plausible results of our model suggest that these assumptions are reasonable.

confirm the earlier findings.[16] A notable result, which increases the confidence in our findings overall, is the large decrease of the dispersion parameter $\hat{\alpha}$. This parameter drops very close to zero, which means that a standard count (Poisson) model may also be used.[17] Re-estimating the model with a zero-inflated Poisson model yields almost identical results. We conclude from these results that much of the overdispersion in the models in Table 3 is due to the large number of zeros (no dispute initiations) in the dataset.

<< Table 5 about here >>

As expected, economic size of complainants and defendants, power asymmetry and retaliation are important dispute-promoting factors. The estimated coefficients of the size and power asymmetry variables in the conflict equation, the equation that estimates the expected number of disputes, are very similar to the ones in Table 3. The results are different for the capacity variables. We include these variables in the inflation equation, i.e. the equation that estimates the probability that a country is *never* involved in a trade dispute. This choice is motivated by the idea that, if legal capacity has any impact, it should be a dispute-enabling factor. Unlike in the cross-sectional models, the effect of the log of a country's income is not statistically significant. The results are the same for a specification that includes the number of delegates as a proxy for legal capacity. Hence the zero-inflated model offers no support for the capacity hypothesis.

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[16] Note that the signs of the coefficients for the variables that are included in both equations should point into opposite directions across equations.

[17] A Likelihood Ratio test suggests that the null hypothesis that α equals zero cannot be rejected at the 1% significance level.

The results also suggest that trade is only dispute enabling, but more trade does not have a dispute promoting effect – the coefficient on the log of trade is only statistically significant in the inflation equation, but not in the conflict equation. This finding supports our conceptual distinction between trade as the equivalent of distance in the classic gravity model and economic size as representing economic diversity and market size. If trade mainly represented diversity, we should observe an important dispute promoting effect, i.e. the coefficient on trade volume in the conflict equation should be statistically significant and positive, which is not the case. Overall, we conclude that the dispute-promoting effect of trade is considerably smaller than suggested by the models in Table. 4.

Table 6 illustrates the substantive gravitation and power effects predicted by the zero-inflated model.[18] The explanatory variables for the reference dyad are set to the same values as for Table 4. The large economic size (large asymmetry) dyad shows the predicted probabilities when complainant and defendant size (power asymmetry) increase by one standard deviation. The first row for each dyad (named 'Pr(Always 0)') indicates the estimated probability from the inflation equation that a dispute will never occur in this dyad. The second row (named 'Pr(0)') shows the overall probability from both equations that no conflict will occur. The predicted probabilities are computed for different levels of trade. Mean, high and maximal trade are defined as in Table 4.

<< Table 6 about here >>

[18] We do not report capacity effects because the models show that there are no significant effects of this kind.

The predicted probabilities confirm the results from the cross-sectional model, but the magnitudes change and are more realistic. The probability of being in the Always-zero group is 39% for a mean trade level (first column), which is rather low because the democracy and the trade levels of countries with at least one dispute are already fairly high.[19] When trade increases, the probability of being in the Always-zero group converges towards zero because of the dispute-enabling effect of trade (third column). The expected actual number of conflicts changes primarily when conflict-promoting factors like country size and power asymmetry vary. The probability of experiencing no conflict decreases by up to 30% when country size increases by one standard deviation.[20] Similarly, the same probability increases by up to 23% when power asymmetry increases by the same amount.

6. CONCLUSION

This paper contributes to clarifying whether variation in participation of countries in WTO dispute settlement is driven mainly by gravitational forces emanating from economic size and trade volume, or whether discriminatory power and capacity biases are also at work. We have placed this analysis in the larger context of International Relations research on legalization beyond the nation state. Unlike previous research, we examine different possible mechanisms of

[19] Setting trade to a low level and taking into account that many countries are not democratic, the same probability increases to above 90%, which is plausible for most dyads.

[20] Gravity effects are computed by subtracting Pr(0) for large country size (second row) from Pr(0) for the reference dyad (first row) for the different trade levels (columns one trough three). Power effects are computed accordingly.

power biases and also distinguish between dispute-enabling and dispute-promoting effects of gravity, power and capacity variables.

The analysis shows that the strong presence of large industrialized countries and the absence of least developing countries in WTO dispute settlement is caused primarily by gravitation, but to some extent also by power asymmetry. Larger economies, because of their greater economic diversity and market size, gravitate towards trade disputes to a greater extent than their larger trade volume alone predicts. In addition, country pairs characterized by a large power asymmetry are less likely to experience a WTO trade dispute. The latter finding suggests that trade disputes in such dyads are often dealt with outside the WTO.

By and large, our findings can be viewed as moderately good news for proponents of legalization in the international system. While it is obvious that legalization has advanced at varying speeds in different areas of international relations, the evidence for the WTO system shows that considerable progress has been made in at least one important realm. The finding that, controlling for other factors, larger economies and bigger traders become involved in more trade disputes (the gravitational effect) can, from our viewpoint, hardly be interpreted as discrimination. The fact that we were not able to identify discriminatory effects pertaining to legal capacity is good news as well, even though further research based on improved indicators of legal capacity and a better handling of endogeneity problems is needed.

Our results concerning power asymmetry (preponderance effect) are potentially worrying. It is, arguably, much easier to reduce legal capacity differences than to reduce power differences.

However, additional research, e.g. case studies on a larger scale, is required to establish under which conditions smaller and/or poorer countries experiencing costly trade restrictions are, due to power asymmetry, driven into concessions outside the WTO system.

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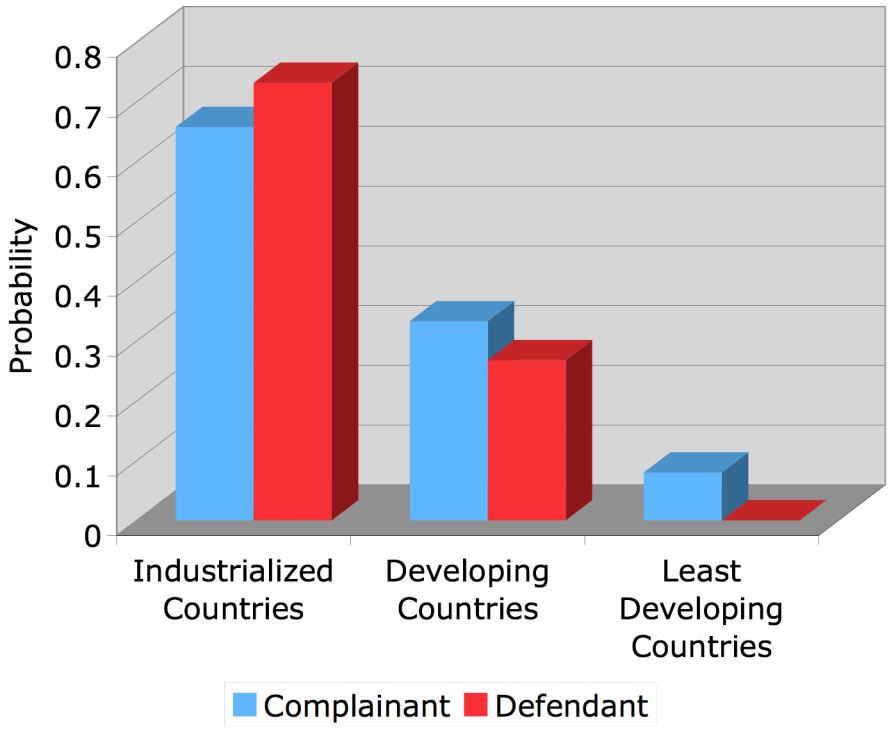
Figure 1: Dispute Initiators and Targets in the WTO System, 1995 – 2006



Source: Horn and Mavroidis (2008); see also Leitner and Lester (2008).

Table 1: Summary Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
Log(Trade)	64073	-4.90	3.18	-30.26	6.09
Log(GDP A)	64073	-2.69	1.90	-7.42	2.32
Log(GDP B)	64073	-2.69	1.90	-7.42	2.32
Relative Power	64073	0.00	2.88	-9.61	9.61
Relative Income	64073	0.00	1.61	-4.62	4.62
Power Asymmetry	64073	2.30	1.72	0.00	9.61
Income Asymmetry	64073	1.30	0.94	0.00	4.62
Log(Income A)	64073	1.66	1.12	-1.08	3.59
Log(Income B)	64073	1.66	1.12	-1.08	3.59
Delegates A	62289	5.97	4.53	0	23
Delegates B	62305	5.98	4.53	0	23
Democracy A	64073	4.33	6.09	-10	10
Democracy B	64073	4.33	6.07	-10	10
Retaliation	64073	0.00	0.05	0	1

Notes: The table shows the summary statistics for the directed annual dyads, i.e. for the time-series cross-section dataset.

Table 2: Frequency and probability distributions of trade dispute initiation

Dispute initiations	Frequency	Probability
0	82’090	99.71
1	190	0.23
2	34	0.04
3	8	0.01
4	6	0.01
5	1	0.00
6	1	0.00
8	2	0.00
Total	82’332	100

Notes: The table only includes observations for dyads with a positive bilateral trade volume.

Table 3: Cross-sectional (negative binomial) models of Gravity, Power and Capacity

	Gravity Model	Power Model (1)	Power Model (2)	Capacity Model (1)	Capacity Model (2)	Full Model (1)	Full Model (2)
Log(Trade)	0.424***	0.700***	0.707***	0.786***	0.704***	0.454***	0.521***
	(0.086)	(0.038)	(0.037)	(0.044)	(0.052)	(0.071)	(0.083)
Log(GDP A)	0.277**					0.312***	0.234**
	(0.118)					(0.110)	(0.097)
Log(GDP B)	0.367***					0.422***	0.343***
	(0.120)					(0.110)	(0.093)
Rel. Power		-0.034					
		(0.032)					
Rel. Income		-0.068					
		(0.066)					
Power Asym.			-0.238***			-0.231***	-0.243***
			(0.069)			(0.063)	(0.063)
Income Asym.			0.100				
			(0.126)				
Log(Inc. A)				-0.470***			-0.340***
				(0.114)			(0.131)
Log(Inc. B)				-0.240**			-0.207*
				(0.096)			(0.109)
Delegates A					-0.016	-0.028	
					(0.015)	(0.021)	
Delegates B					0.013	-0.021	
					(0.018)	(0.022)	
Democracy A	0.152***	0.168***	0.154***	0.202***	0.156***	0.158***	0.195***
	(0.026)	(0.030)	(0.024)	(0.037)	(0.029)	(0.025)	(0.035)
Democracy B	0.119***	0.122***	0.146***	0.155***	0.120***	0.119***	0.140***
	(0.023)	(0.024)	(0.026)	(0.028)	(0.026)	(0.024)	(0.028)
Constant	-6.117***	-6.747***	-6.370***	-5.631***	-6.593***	-5.032***	-4.809***
	(0.345)	(0.322)	(0.387)	(0.441)	(0.427)	(0.525)	(0.443)
$\hat{\alpha}$	1.65	2.58	2.18	2.48	2.60	1.38	1.57
N	9928	9928	9928	9928	9123	9111	9928
χ^2	658.53	494.83	512.53	507.75	486.96	690.05	809.21
Prob > χ^2	0.000	0.000	0.000	0.000	0.000	0.000	0.000
BIC	1184.12	1203.64	1189.07	1192.92	1201.15	1185.97	1183.11
Log Likelihood	-559.85	-569.61	-562.33	-564.25	-568.66	-547.40	-545.54

Robust standard errors cluster on dyad and are listed in brackets below coefficients. All models include the log of duration to account for differences in exposure time. * p<0.10, ** p<0.05, *** p<0.01

Table 4: Predicted probabilities of *no* conflict for standardized dyads at different trade levels

		Gravity Model	
Trade	*Mean*	*High*	*Max*
Reference dyad	0.96 [0.95, 0.97]	0.90 [0.85, 0.94]	0.76 [0.61, 0.91]
Large size countries	0.88 [0.81, 0.96]	0.74 [0.66, 0.82]	0.53 [0.46, 0.61]
Max size countries	0.83 [0.68, 0.98]	0.66 [0.51, 0.81]	0.44 [0.34, 0.53]
		Power Asymmetry Model	
Trade	*Mean*	*High*	*Max*
Reference dyad	0.94 [0.92, 0.96]	0.77 [0.70, 0.83]	0.45 [0.37, 0.54]
Large asymmetry	0.97 [0.95, 0.98]	0.85 [0.80, 0.89]	0.56 [0.47, 0.65]
Max asymmetry	0.98 [0.97, 0.99]	0.91 [0.85, 0.97]	0.67 [0.53, 0.82]
		Capacity Model	
Trade	*Mean*	*High*	*Max*
Reference dyad	0.96 [0.94, 0.97]	0.79 [0.74, 0.83]	0.46 [0.38, 0.54]
Large income countries	0.97 [0.97, 0.98]	0.86 [0.83, 0.89]	0.56 [0.49, 0.63]
Max income countries	0.98 [0.97, 0.99]	0.88 [0.84, 0.91]	0.59 [0.51, 0.66]

Notes: Predicted probabilities are shown for different trade levels because marginal effects differ depending on trade. Mean / High / Max trade suggests that Log(Trade) is kept at the mean of the subset of dyads with at least one conflict / one standard deviation above the mean / at the maximum. Reference dyad means that the independent variables (country sizes, asymmetries and income levels) are at the mean of the subset of dyads with at least one conflict. For large size / asymmetry / income dyads, the respective explanatory variables are set one standard deviation above their means. For maximum size / asymmetry / income dyads, the respective variables are set at the maximum. 95% confidence intervals are computed using the Delta Method and are listed in brackets below the point estimates.

Table 5: Panel (zero-inflated negative binomial) model for Full Specification

	Full Model (Zero-Inflated)	
	Inflation Eq.	Conflict Eq.
Log(Trade)	-0.487***	0.096
	(0.093)	(0.133)
Log(GDP A)		0.288***
		(0.078)
Log(GDP B)		0.364***
		(0.074)
Power Asym.		-0.231***
		(0.060)
Retaliation	-0.215	0.690***
	(0.417)	(0.142)
Log(Income A)	0.198	
	(0.158)	
Log(Income B)	0.180	
	(0.133)	
Democracy A	-0.182***	
	(0.045)	
Democracy B	-0.148***	
	(0.042)	
Constant	3.452***	-1.432
	(1.071)	(0.914)
$\hat{\alpha}$	0.25	
N (all / nonzero)	63833 / 230	
χ^2	120.65	
Prob > χ^2	0.000	
BIC	2266.48	
Log Likelihood	-1055.77	

Notes: The inflation equation estimates the probability that a dyads is never involved in a trade dispute (belongs to the 'Always-zero' group). The count equation estimates the expected number of trade disputes, weighted by the probability that a dyad belongs to the 'Not Always-zero' group. Robust standard errors cluster on dyads and are listed in brackets below the coefficients; * p<0.10, ** p<0.05, *** p<0.01

Table 6: Predicted probabilities of *no* conflict for zero-inflated model

Trade		*Mean*	*High*	*Max*
Reference dyad	Pr(Always 0)	0.39 [0.04; 0.63]	0.15 [0.01; 0.32]	0.08 [0.01; 0.19]
	Pr(0)	0.73 [0.63; 0.84]	0.56 [0.42; 0.72]	0.48 [0.30; 0.68]
Large size countries (Gravity Effect)	Pr(Always 0)	0.39 [0.04; 0.63]	0.15 [0.01; 0.32]	0.08 [0.01; 0.19]
	Pr(0)	0.50 [0.35; 0.67]	0.26 [0.17; 0.39]	0.18 [0.11; 0.29]
Large Asymmetry (Power Effect)	Pr(Always 0)	0.39 [0.04; 0.63]	0.15 [0.01; 0.32]	0.08 [0.01; 0.19]
	Pr(0)	0.86 [0.79; 0.91]	0.76 [0.65; 0.84]	0.71 [0.57; 0.83]

Notes: Pr(Always 0) is the probability that the dyad does not have any chance to be involved in a trade dispute, i.e. that the dyad is in the Always-zero group. This probability is estimated using the inflation equation of the model in Table 5. Pr(0) is the overall probability that no WTO trade conflict occurs. This probability is estimated using both the inflation and count equations of the model in Table 5. Reference dyads and large size / asymmetry are defined as in Table 4. The numbers in brackets below the point predictions are 95% confidence intervals that were computed using bootstrapping. The bootstrapping results are based on 1000 replications.