

LITIGATION FOR SALE:  
*Private Firms and WTO Dispute Escalation*

Ryan Brutger\*

ABSTRACT: This paper presents a theory of lobbying by firms for trade liberalization, not through political contributions, but instead through contributions to the litigation process at the World Trade Organization. In this “litigation for sale” model, firms signal information about the strength and value of potential cases, and the government selects cases based on firms’ signals. Firms play a key role in monitoring and seeking enforcement of international trade law by signaling information and providing a bureaucratic subsidy, which increases a state’s ability to pursue the removal of trade barriers and helps explain the high success rate for WTO complainants. The theory’s implications are consistent with interviews with trade experts and are tested through an analysis of WTO dispute initiation.

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\*Assistant Professor, University of Pennsylvania, Department of Political Science, Email: brutger@sas.upenn.edu

Given the consensus among economists that free trade is welfare enhancing, domestic interest groups are often blamed for the persistence of trade barriers. Yet even though “protection for sale” arguments have significant support,<sup>2</sup> domestic firms also play a prominent role in maintaining the liberal trading system and monitoring states’ international trade policies. In contrast to a significant body of work that examines when and why trade barriers arise, this paper studies how firms and governments monitor trade barriers and select which barriers to contest. While no agreement or institution has done more to liberalize the rules of the trading system than the General Agreement on Tariffs and Trade (GATT) and subsequently the World Trade Organization (WTO), states regularly impose barriers that are in conflict with their WTO obligations. In the presence of a multitude of potentially noncompliant trade barriers, states must decide how best to allocate their resources to monitor and enforce trade agreements. Building from theories of informational lobbying and bureaucratic subsidies, this paper analyzes the interaction between firms and their government and finds that a type of “litigation for sale” occurs. Unlike traditional models of lobbying, where interest groups make campaign contributions or offer election support, this paper identifies an alternative form of lobbying through litigation contributions – contributions to the fact-finding efforts, research costs, and litigation tasks – which play important roles by signaling the strength and value of potential trade disputes and mitigating bureaucracies’ resource constraints. In this manner, firms act as fire alarms (McCubbins and Schwartz 1984), allowing the government to screen cases and more efficiently monitor and enforce international trade agreements.

This paper examines the role and consequences of private firm participation in WTO dispute settlement, arguing that firms play an important role in monitoring WTO compliance and selecting potential complaints. Although the WTO restricts dispute initiation to national governments, I show that private firms play an active role in the dispute settlement process. The theory presented expands our understanding of firms’ liberalizing influence (Kim 2017; Milner 1988; Osgood 2017), showing how they help sustain the international trade system through monitoring and enforcement of international trade laws, and also contributes to burgeoning literatures in international relations on transnational versus interstate dispute settlement and the importance of formal versus informal rules of international organizations. I argue that the formal rules of the WTO Dispute Settlement Understanding allow its members to benefit from increased monitoring and enforcement provided

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<sup>2</sup>For examples, see Gawande and Bandyopadhyay (2000); Goldberg and Maggi (2001); Grossman and Helpman (1994).

by informal private firm participation, without governments taking on the additional risk associated with transnational dispute settlement, where private firms have direct legal access (Allee and Peinhardt 2010; Simmons 2014). Unlike their role in transnational dispute settlement mechanisms, where firms' access to international arbitration can often put them at odds with their home government, I show that the WTO rules allow governments to garner increased information and resources from firms, while preserving their role as legal gatekeepers.<sup>3</sup> This work builds on a growing literature on the strategic calculations of international dispute participation (Chaudoin 2014; Davis 2012; Johns and Pelc 2016, 2017) and shows that states are able to more efficiently select and monitor potential WTO cases.

I show that private firms monitor WTO compliance and motivate states to seek enforcement of treaty obligations in two complementary ways. From a purely economic perspective, firms can contribute resources to support the litigation of WTO disputes, which can reduce the costs of filing a complaint for the state and potentially increase the strength of the case. In this manner, litigation contributions are similar to what Hall and Deardorff (2006) refer to as legislative subsidies, however in this case they function as bureaucratic subsidies. Firms are also positioned to signal information regarding the legal strength of potential cases, which allows the government to more accurately predict the probability of success. As the gatekeepers, governments select cases based on potential strength and value, which helps explain the nearly 90 percent success rate of WTO complainants (Davis 2012). I extend the analysis to examine firms' incentives to monitor and seek enforcement of international legal obligations across industries. Moving beyond an analysis of just a firm and government, I analyze when dominant firms within industries are likely to provide litigation contributions, overcoming free riding problems, and when firms are less likely to seek enforcement of trade obligations. The implications of the theory are consistent with qualitative and statistical evidence, suggesting that private firms use informal mechanisms to lobby for enforcement of states' WTO obligations.

In the broader context of the international compliance and enforcement literature, this paper contributes to the debate over how and when non-state actors mobilize to encourage increased state compliance with international law. While many scholars agree that private actors play important roles in determining when states comply with and seek enforcement of international law, how and

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<sup>3</sup>For more on the importance of informal procedures in international dispute settlement, please see Busch (2000), Kleine (2013), and Koremenos (2013).

when these actors change state behavior remains a contested issue (Bown 2009, Chap. 5; Chaudoin 2014, 2016; Dai 2005; Davis 2012; Johns and Rosendorff 2009). Focusing on the WTO, which is arguably the most influential international economic institution, I demonstrate the impact of private firm mobilization on states' enforcement of international trade law.

This paper proceeds in the following manner; the next section frames the debate over dispute settlement participation and discusses key determinants of case selection. I then develop a theory of firm participation, which centers on firms' ability to alter the case selection process of states by contributing to the litigation process and signaling the potential legal strength and value of cases. The implications of the theory are tested using industry and firm-level data with a dataset of potential US trade disputes with major trading partners from around the world and are supported by interviews with international government officials and legal experts. Finally, the paper concludes with a discussion of some of the implications for theory and policy.

## Framing Dispute Settlement Participation

Much of the existing discussion over WTO dispute settlement examines determinants of participation, which can be divided into research regarding which states choose to participate and which cases those states choose to bring to the WTO. It is generally agreed that countries engage in strategic decision making when considering whether to participate in WTO disputes (Betz and Kerner 2015; Chaudoin 2014; Johns and Pelc 2014, 2016), and that they choose to initiate disputes when their expected benefits outweigh the expected costs (Bown 2005b). Understanding what factors states evaluate when considering the expected costs and benefits of a case is a critical step to delineating how private parties alter the cost-benefit calculation of states.

Significant research has focused on the costs of initiating a dispute. According to one trade official interviewed for this project, the average cost of litigation in most WTO cases is around one million dollars per year for the duration of the dispute (Trade Official 2014).<sup>4</sup> In addition to the direct costs of disputes, Horn and Mavroidis (2011) note that additional factors are often given causal weight in determining how states calculate the cost-benefit trade-off of WTO dispute settlement. One particular factor that has been examined in some detail is how political and power relations between potential disputants affect the probability a dispute is initiated. Research by Guzman and

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<sup>4</sup>Interviewees for this project had participated in multiple WTO disputes. Participants agreed to be interviewed anonymously, given that most are still involved in trade disputes. Participants agreed to be cited by either their *previous or current* professional position, or as anonymous.

Simmons (2005) found that the “threat of coercive tactics by the powerful” state does not appear to be a major problem for WTO law. On the other hand, Bown (2005b) finds that states’ retaliatory capacity can play a significant role in determining whether a country files a WTO complaint.

Another form of political power that influences dispute initiation is domestic political pressure. Davis (2012, 2) argues that adjudication is a tool used to manage domestic political pressure and that domestic constraints make it more likely that executives will turn to the WTO to resolve disputes.<sup>5</sup> Furthermore she finds that industries that exert significant pressure, measured by political contributions, are more likely to have barriers challenged at the WTO (Davis, 2012, 134). Davis’ work rightly emphasizes the role of domestic influences on the dispute escalation process, but overlooks complementary mechanisms that firms use to seek enforcement of states’ trade obligations, specifically litigation contributions and informational lobbying.

Litigation contributions and information are particularly significant in WTO disputes because they help alleviate capacity constraints of governments and provide information about the trade interest at stake and strength of the case.<sup>6</sup> Shaffer (2006) argues that two important capacity constraints on WTO participation are a lack of legal expertise in WTO law and financial constraints to organizing effective representation in the WTO legal system. Empirical tests of the effect of litigation resources and previous WTO experience on dispute initiation have shown both to have positive effects (Bown 2005a; Davis and Bermeo 2009; Horn, Mavroidis, and Nordstrom 1999). Yet even among the WTO members least constrained by legal knowledge and resources, such as the US and the EU,<sup>7</sup> the private sector often plays a role in relaxing these constraints, while also signaling the strength of the potential case. For example, in the disputes DS316/DS347 and DS317/DS353 between the United States (Boeing) and the European Community (Airbus) each firm hired legal representation for the dispute settlement process (World Trade Organization 2010b). Boeing

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<sup>5</sup>Cremer (2015) further argues that the rulings themselves can be written to mitigate domestic political costs of adjusting trade policies.

<sup>6</sup>The “trade interest” of a state captures the magnitude of injury a country experiences when facing a trade barrier, and has been shown to have a significant impact on dispute escalation (Bown 2005a). Recent work by Bechtel and Sattler (2015) argues that, when evaluated at the aggregate level of broad industries, trade from a complainant to the defendant increases about \$7.7 billion in the years following a ruling. Examining much more specific product lines affected by trade, Bown and Reynolds (2015) find significant heterogeneity with regard to the value of trade contested in disputes, with some cases concerning less than \$1 million and others over a billion. Chaudoin, Kucik, and Pelc (2016) provide a more skeptical assessment of the impact of WTO disputes on trade flows.

<sup>7</sup>The EU is considered as a single entity because trade policy is centrally coordinated (Meunier 2005).

employed the law firm Wilmer Cutler Pickering Hale & Dorr to assist in the WTO subsidy case and Airbus employed Sidley Austin LLP as counsel for the case (Sidley Austin 2009; Wilmer Hale 2010). The estimated contributions from the private firms to the litigation budget “were running at \$1,000,000 per month and could reach \$20,000,000 for each company...” (Shaffer 2008, 184). The striking role of private firms in the Airbus-Boeing disputes illuminates the importance of firms in mitigating resource constraints, while also playing an important informational role.

## The Argument

Existing arguments regarding private firms’ influence on dispute settlement participation are generally limited to firms’ ability to define the trade agenda of states through traditional lobbying or government established mechanisms, such as Section 301 petitions in the United States (Bown and Hoekman 2005; Davis 2012). Although these means of influence are significant, some firms will employ additional measures, specifically contributing to the litigation process in an effort to increase the likelihood a case is brought to the WTO.

I argue that firms protect their interests through the dispute settlement process by contributing to the litigation costs of a WTO dispute, while governments use firm contributions to screen potential WTO complaints.<sup>8</sup> Firms’ contributions can take many forms, including conducting research, preparing legal briefs, and even litigating the case on behalf of the state. When a government is unwilling to pursue a case due to high litigation costs or its belief that the case is weak, firms can step in to fill the gap between expected costs and expected profits and to signal the strength of the case. Of course, governments still retain control over the gatekeeping process, so if the diplomatic externalities of the case are too high, the government may choose not to bring the case, which is a key distinction between the legal procedures of the WTO and transnational dispute settlement mechanisms.

As the following sections discuss, firms’ contributions must do at least one of two things to alter the case selection process of states in the manner theorized here. First, litigation contributions can lead the government to update its beliefs about the strength or value of the case, such that the government becomes willing to initiate a dispute. This can occur due to the information signaled or by strengthening the case by providing improved argumentation, additional evidence, and expanding

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<sup>8</sup>Although the theory focuses on the interaction between the firm and government and firms within an industry, a trade association, advocacy group, or other non-state actor with a vested interest and private knowledge of the case could play a similar role as a firm.

the total litigation budget. Second, the firm’s contributions may sufficiently alter the government’s calculation of the value of the case relative to the costs, by acting as a bureaucratic subsidy and reducing the resource constraint for the government. If litigation contributions either reduce the cost to the state or update the state’s beliefs about the case, then firms can play a significant role in monitoring and seeking enforcement of international trade law at the WTO.

While firms have an incentive to signal the strength and value of cases to their government, the government and firms’ preferences are not necessarily aligned. To examine the strategic interaction of firms and the government, I formalize the argument in a simplified game that is particularly useful for demonstrating when and why firms’ signals are credible. A summary of the model and the extensive form version of the game are shown in the appendix, section A-1. I begin with a basic form of the model with just two players, Firm and Government. The subscripts  $F$  and  $G$  are used to identify the actions of each respective player. The model shows that a contribution threshold exists, such that the signal is sufficiently costly so the government can infer the credibility of the message. Without this threshold, firms could easily bluff and attempt to convince the government to pursue poor cases. Unlike traditional informational lobbying models (Chalmers 2013; Lohmann 1995; Potters and Winden 1991), the litigation contribution model incorporates the added effect of mitigating the government’s resource constraint, which expands the set of cases that are initiated in equilibrium, which is discussed in greater detail below.

The model begins when the players are presented with a potential WTO dispute and nature determines whether the particular case is strong or weak,  $\theta_S$  or  $\theta_W$ .<sup>9</sup> The potential case is exogenously given, as is the total cost of litigation, the probability the case is won, and the value of winning the case. The players’ priors over the strength of the case are that with probability  $P$  the case is strong and with probability  $1 - P$  the case is weak, and the total litigation cost for the case is  $L$ . The trade value of winning a case is defined as the benefits from trade with the trade barrier removed minus the benefits from trade with the trade barrier in place, which is written as  $\tau_j(0) - \tau_j(1)$ , where  $j \in \{F, G\}$ . The value of a case will depend on the the level of distortion caused by the trade barrier and magnitude of the affected trade flow, but for simplicity the payoffs can be normalized such that  $\tau_j(1) = 0$  and  $\tau_j(0) = 1$ , so the trade gains for both players are 1 if the case is won. Additionally, the model allows for the possibility of externalities to the government, which can take many forms, such

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<sup>9</sup>A strong case is defined such that the probability of winning the case is uniformly distributed between 0.5 and 1.0. A weak case is defined such that the probability of winning the case is uniformly distributed between 0.0 and 0.5.

as restricted foreign aid or greater domestic political support for the government from appearing to stand strong with domestic industry, which can be incorporated in the externality term,  $E_G$ .

### ***Firms' Informational Advantage***

I argue that firms have an informational advantage throughout the litigation process, given their position in perceiving and analyzing the trade barriers they face. The unique position of firms can best be illustrated by considering their role in the three phases of litigation known as “naming, blaming and claiming” (Felstiner, Abel, and Sarat 1981). The naming phase involves identifying an injury to one’s trading prospects (Shaffer 2006). The difficulty and cost of naming varies depending on the type of potential violation. For example, when antidumping duties are implemented the country imposing them must notify the exporting firms making them particularly easy to identify, whereas the provision of subsidies that lower the cost to a competitor and reduce a company’s market share will be much more difficult and costly to identify (Bown 2009). Whether the cost is high or low, the private industry has the greatest incentive and ability to identify an economic injury. Through regular business practices, firms will be the first to experience the negative effects of WTO inconsistent measures, which means the costs of naming for private firms are relatively low when compared to the potential costs to the government.

The “blaming” phase of a dispute determines who is responsible for the injury identified in the first phase (Shaffer 2006). Once the injury is perceived, the blaming phase can be relatively straightforward. If the lost profits are due to a trade disruption with a specific trading partner or to a flood of imports from a specific country, minimal costs should be associated with identifying who is to blame.

Once the naming and blaming have been completed, the most expensive and complex phase of dispute settlement begins - “claiming.” This final phase consists of developing and pursuing a legal claim through the WTO (Shaffer 2006), although much of the effort of claiming is done before the case is formally initiated at the WTO. Expenditures incurred during this phase include, but are not limited to, research costs, legal fees, administrative outputs, and travel expenses. A USTR official interviewed for this project estimates that half to three-quarters of the litigation expenses are devoted to the fact finding portion of claiming (USTR Official 2009). During this phase, private firms will quantify the value of lost revenue from trade, build the case connecting their losses to the barrier in question, and then work with the government to formalize the complaint through the

WTO dispute settlement process.

The comparative advantage of firms in naming, blaming, and claiming enables them to act as fire alarms, in the sense developed by McCubbins and Schwartz (1984), identifying and signaling the existence of harmful trade violations to their government. On the other hand, government efforts to act as “police patrols” are a relatively inefficient mechanism when compared to private firms. This creates an environment where private firms have an information advantage, uniquely positioning firms to monitor and signal cases to the government in an effort to protect their interests. This asymmetry is captured in the model when the firm receives a message about the strength of the case,  $m \in \{s, w\}$ , but the government does not. The firm’s private information means it has more accurate knowledge of the probability of winning a particular case than the government.<sup>10</sup> Once the firm knows whether the case is strong or weak, the firm decides to contribute or not. If the firm contributes it pays a cost,  $L_F > 0$ . The firm selects the exact cost it pays, which is deducted from the total cost of litigation.

The model deliberately focuses on the strategic interaction between the firm advocating to bring a case to the WTO and the government. A potential complication of the role of firms in the dispute escalation process would be the involvement of firms lobbying against dispute escalation. The model omits potential counter-lobbying to highlight the most prominent role of firms, since there are limited cases where domestic firms with the ability to counter-lobby the trade bureaucracy would be beneficiaries from a trade barrier violating WTO law imposed by foreign government. For example, when a new trade barrier harms US exporters, it is typically because their access to export markets has been curtailed. The most likely firms to benefit from such a policy are import-competing firms from the country imposing the trade barrier, or exporters from other countries that are not affected by the barrier. In either case, most firms benefiting from the trade barrier, who would have an incentive to lobby against initiating a dispute, would be foreign companies whose interests would not give them significant standing to lobby domestic bureaucracies. This situation is somewhat complicated by multinational corporations, who may seek to take advantage of differences in trade law across countries; however, empirically, the one study that examines firm-level lobbying and WTO disputes, found that total lobbying expenditures toward the US government by Fortune 500 companies was nearly seven times higher by firms supporting the complaint than those opposed to

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<sup>10</sup>The two-player version of the model focuses on asymmetric information about the strength of the case; however, a similar logic holds if the uncertainty is about the value of the case.

it (Ryu and Stone, 2017). While existing analysis only measures aggregate lobbying once a dispute has already been initiated, it suggests that any lobbying against complaints is relatively minor when compared to the efforts of firms to advocate in favor of WTO disputes. Given the existing evidence and limited domestic standing of most firms who could potentially oppose filing a dispute against a foreign country's trade barrier, I focus my analysis on the role of firms pursuing dispute escalation.

### *Mechanisms of Influence*

From the perspective of the government, private party contributions are important for relaxing the government's budget constraint, since the contributions act as a form of bureaucratic subsidy. This is captured in the model by the litigation cost function, where  $L - L_F = L_G$ , which states that as the firm pays more the government's share of the litigation cost is reduced.<sup>11</sup> The budget constraint will vary across countries, but even among the wealthiest members of the WTO, there are significant capacity constraints. For example, the USTR is responsible for initiating WTO complaints for the US, but their total budget is only about \$47.5 million annually (Cook 2013). Within their budget, the executive's top priorities are negotiating trade agreements – not litigating existing agreements (USTR 2014). This creates a situation where, as the USTR's top litigator noted, budget concerns limit the ability to initiate new legal complaints and seek enforcement of existing trade agreements (World Trade Online 2013). One attorney involved in numerous WTO disputes noted that there have been situations where governments were willing to file WTO disputes, but without litigation contributions from the affected firms, the government lacked the resources to move forward with the complaint (Associate Trade Attorney 2009a).<sup>12</sup> Private firms' contributions can thus make a significant difference in which cases are likely to be brought. Government officials charged with seeking enforcement of trade agreements can increase their chance of success and their effective litigation budgets by screening cases based on firm contributions.<sup>13</sup>

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<sup>11</sup>In the basic model I hold the total litigation cost constant, which is a simplification that overlooks the possibility that a firm's litigation contribution could expand the total litigation budget, which may increase the legal strength of the case. This simplification means that the model is *underreporting* the total influence of the firm, and thus yields a conservative estimate of the role of firms in WTO disputes.

<sup>12</sup>The importance of private firm contributions has increased since the GATT years as cases have become increasingly fact intensive, which requires significantly more litigation contributions from firms in the form of research and expertise (Associate Trade Attorney 2009b).

<sup>13</sup>As in the case of DS291, the government can reduce its legal expenses when firms contribute to litigation costs by taking on responsibilities that might otherwise be considered the role of the state. Rather than having the state use government attorneys or publicly financed representation

The firms' contributions also play an informational role as a signal of the strength of the case, which is a key factor in determining when the government is willing to challenge potential WTO violations. Examining the European context, Chalmers (2013) notes that the "currency of lobbying in the European Union (EU) is information." Firms' litigation contributions function as a signal of the firms' private information about the strength of the case, allowing the government to pursue the strongest complaints. The importance of changing beliefs about the legal strength of cases was emphasized by one trade attorney interviewed for this project, who noted that there have been cases where the government did not believe there was a viable case, and that it was only through the preparation of arguments and pitch to the government by private firms that the government was convinced to bring the case (Associate Trade Attorney 2009a).

Beliefs about the strength of the case are particularly important given governments' risk aversion when initiating WTO disputes. Two primary factors contribute to governments' heightened risk aversion, compared to firms. First, the government officials responsible for selecting cases face constrained budgets, and must choose from a broad set of potential cases and only initiate a select few. With this in mind, officials seek to pursue cases where they are most likely to use their resources effectively and be perceived as selecting the best cases. A European Commission official highlighted the importance of screening out weak cases, noting that the "strength of the legal issue" is of primary importance, while a USTR official noted that they seek "slam dunk" cases (USTR Official 2009; European Commission Official 2009). These statements reflect the unique concern of the government of pursuing a weak case. While firms also face resource constraints, each firm has a smaller set of potential disputes to choose from, and pursuing the firms' strongest case may still be somewhat of a gamble, whereas government officials have the opportunity to select a pool of strong cases, and are best off choosing only the strongest. Additionally, when a government pursues and loses a WTO complaint, they not only face the losses from the dispute in question, but they also face a changed legal landscape where the issue in question is given a green light by the WTO. This raises the cost of losing a complaint, because there may be potentially far reaching externalities from the adoption of similar policies by other trade partners that extend beyond the firm and industry involved in the losing dispute. For example, if the US were to file and lose a complaint against China regarding currency manipulation, not only would China be able to continue their policies, but other

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to prepare case-materials, firms can conduct research, prepare legal briefs, and even litigate the case on behalf of the state.

countries would now be able to adopt similar policies without fear of legal challenges (Davis 2012, 165-168). Due to the risks associated with losing a complaint, governments may fear a variety of potential externalities, and thus place significant weight on the strength of cases when evaluating whether to challenge potential WTO violations.

In the formal model, the government first observes the firm's action, which can signal information about the case, and then the government is faced with the decision whether to initiate a WTO complaint or not,  $I_G$  or  $\neg I_G$ . If the government initiates it pays  $L_G = L - L_F$ , and has an expected payoff of  $EU_G(I_G) = \widehat{\theta}_{W,S}(\tau_G(0)) - L_G + E_G$ . If the government does not initiate it has an expected payoff of  $EU_G(\neg I_G) = \tau_G(1)$ . The payoffs capture two of the most important elements of the case selection process, the probability the case is won and the value of the case. Using these payoffs as the selection criteria for WTO case initiation is supported by the case selection practices of trade officials. For example, a former General Counsel with the USTR noted in an interview that economic considerations are the most important factor in deciding if a complaint is initiated (USTR General Counsel 2009). Another USTR official stated in an interview that the magnitude of the expected profit is important, but the probability of success is the most important factor (USTR Official 2009). The model thus captures two of the key elements of the WTO dispute initiation process and provides useful insights into the dynamics of international trade law enforcement.

### *Implications of the Model*

For firms to play a pivotal role in WTO dispute selection, and thus in the monitoring and enforcement of international law, firm contributions must do at least one of two things. Either, the contributions lead to the government updating its beliefs about the strength of the case, such that the government is now willing to initiate a dispute, or the firm's contributions must sufficiently alter the government's calculation of the value of the case relative to the costs, by reducing the resource constraint for the government. I now walk through the implications of the theory, examining when and how firms play a critical role in monitoring compliance with international law and seeking enforcement of those laws through WTO dispute initiation.

A first implication of the theory is that a case will not be initiated if the litigation cost for a case is greater than the combined expected payoff to the government and firm, such that  $L > \widehat{\theta}_S(\tau_G(0)) + E_G + \widehat{\theta}_S(\tau_F(0))$ . Such cases, by definition, are not profitable to pursue and so neither the firm nor the government would contribute to them. A further general result of the theory is

that whenever the total litigation cost is less than the expected profit to the government, the firm will choose not to contribute, because the government will initiate the case without a contribution from the firm. This means that the litigation cost of the case is low enough relative to the expected payoff that it is beneficial for the government to unilaterally initiate the case. Although rare, these types of cases would likely be brought when the precedent value of a case is high, which occurred in some of the early intellectual property rights disputes (USTR Official 2009).<sup>14</sup>

The above results are affirmed in the Perfect Bayesian Equilibrium of the model, the proofs of which are in the appendix, section A-2. The most interesting results of the theory are from the set of cases where the government would be unwilling to initiate the case without a litigation contribution from the firm. The first set of such cases are those where the expected profit to the government is less than the total litigation cost. In a unitary actor model, these cases would be viewed as unprofitable, however the equilibrium result shows that the firm's litigation contribution can alter the expected payoffs to the state, making such cases profitable to the government and increasing the universe of profitable cases.<sup>15</sup> A second, and potentially overlapping, group of cases are those where the government's prior belief regarding the strength of a case is sufficiently low that the government does not believe case initiation is profitable. In this group of cases, if the firm knows that the case is strong, it can credibly signal the strength of case to the government, thus altering the expected payoffs of the government and motivating the government to initiate the case. When  $L_F \geq L - \widehat{\theta}_S(\tau_G(0)) - E_G$  and  $L_F \geq \widehat{\theta}_W(\tau_F(0))$  the Firm has contributed a sufficient amount, such that the government now believes its expected payoff from case initiation is greater than or equal to zero and the government initiates the case. For simplicity, I will refer to this contribution threshold for the firm as  $L_F^*$ .

In order for the firm's signal to be credible, the equilibrium condition requires that the litigation contribution of the firm,  $L_F^*$ , must be greater than the firm's expected profit from a weak case. The litigation contribution threshold means that the government does not update its beliefs about the strength of the case when the firm contributes less than  $L_F^*$ . This means there exists a unique separating equilibrium where firms will only contribute  $L_F^*$  when they know a case is strong.<sup>16</sup> This

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<sup>14</sup>It has become widely accepted that the *de facto* importance of precedent can be quite high in WTO disputes (Bhala 1999; Busch and Pelc 2010; Pelc 2014).

<sup>15</sup>The proof is provided in the appendix, section A-2.

<sup>16</sup>Proof of the equilibrium is provided in the appendix, section A-2. Proof of uniqueness is in the appendix, section A-3.

separating equilibrium helps explain the extremely high success rate of WTO complainants, given that governments are able to screen out potentially weak cases when working with private firms during the litigation process.<sup>17</sup>

*Hypothesis-1: Ceteris paribus, when firms contribute to the litigation process, the government's budget constraint is mitigated and/or the government updates its beliefs, which increases the probability a trade barrier will be challenged in a WTO dispute.*

The equilibrium contribution levels for both the firm and government (for  $P = .5$  and  $E_G = 0$ ) are shown in Figure 2. The figure shows that if the total litigation cost is low enough ( $L \leq .5$ ), then the firm pools on contributing nothing and the government pays the full amount and initiates on its own. In the next portion of the parameter space ( $.5 < L < .75$ ), the firm pools on contributing  $L - .5$ , which is just enough to make the government initiate the case, but does not convey a credible signal and thus the government does not update its beliefs about the strength of the case. In the next portion of the parameter space ( $.75 \leq L \leq 1.5$ ), the firm strategies fully separate, with contributions equal to zero when the case is weak (right panel) and contributions equal to  $L_F^*$  if the case is strong (left panel). In this range of potential disputes, the firm's signal is informative and allows the government to only pursue cases that are strong. Lastly, once cases become prohibitively costly ( $L > 1.5$ ), the firm again pools on contributing nothing and the government does not initiate. The figure illustrates that for any given set of parameters there is a unique contribution for both the firm and government.<sup>18</sup>

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<sup>17</sup>Although some models of judicial case selection would suggest that defendants would anticipate this selection process and avoid going to trial when cases are strong, Davis (2012, 88) explains why many members of the WTO “stonewall” trade settlements and instead go to trial at the WTO. Since the WTO does not include retroactive punishment, many defendants will go to trial, even when facing strong cases, to delay removing non-compliant measures.

<sup>18</sup>The proof is provided in the appendix, section A-2.

**Figure 1: Firm and Government Equilibrium Contributions**

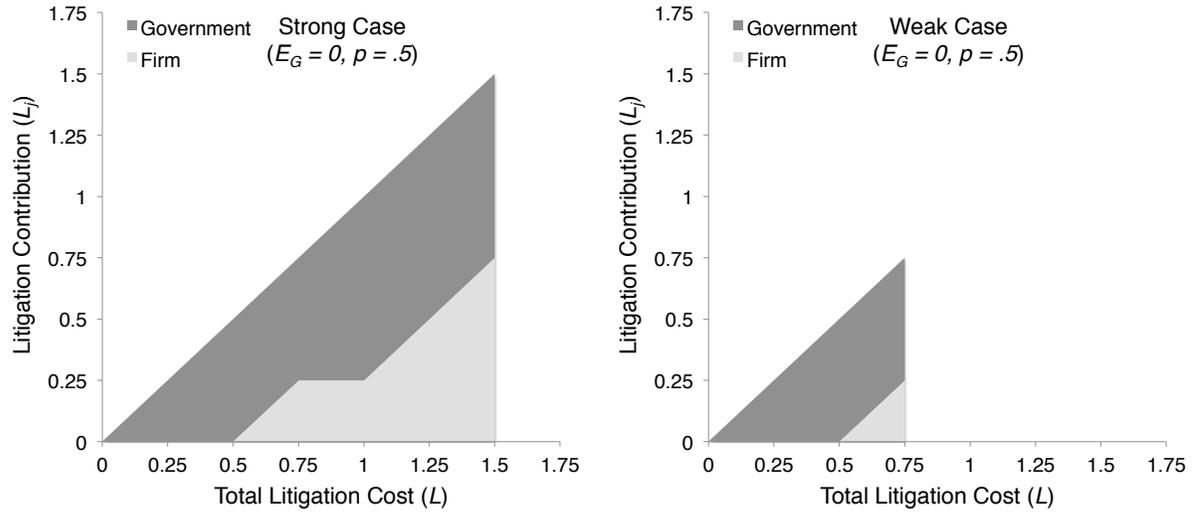


Figure 1 plots the unique equilibrium contributions for the firm and government over a range of total litigation costs ( $L$ ) and a set value for  $P$  and  $E_G$ . Comparing the left and right panels of the figure shows that for certain ranges in the parameter space firm strategies pool, but in the middle range of the parameter space ( $.75 \leq L \leq 1.5$ ) the strategies fully separate based on the strength of the case. Firms thus have a unique strategy profile with a unique contribution level for each combination of parameters, resulting in a separating equilibrium.

A further implication of the theory is that, all else equal, a case will be more likely to be initiated when the trade distortion caused by a particular trade barrier is greater. A higher level of distortion means that a country will be forgoing relatively more trade, which increases the value of  $\tau_j(0) - \tau_j(1)$ . Distortion also acts as a proxy for legal strength, given that proving economic harm can be an important facet of achieving compensation and securing a legal victory, and is indeed required for Article XXIII nullification or impairment complaints. Distortion impacts the expected profit and strength of the case, which means trade barriers with high levels of distortion should be contested in the WTO with a higher probability than similar barriers with lower levels of distortion.

*Hypothesis-2: Ceteris paribus, trade barriers that cause high levels of distortion have a higher probability of being challenged in a WTO dispute.*

### **Industry and Firm-Level Implications**

Analyzing the interaction between a firm and the government provides a useful starting point for understanding WTO case initiation, but I now consider the incentives for an industry with multiple firms. Evaluating the likelihood of firm contributions within an industry with multiple firms allows me to examine how heterogeneous preferences across firms affects the case selection process. I begin by considering the incentives of firms to contribute to the litigation process in the situation where multiple firms within an industry may be affected by a potential trade barrier and have heterogeneous preferences with regard to the potential dispute.

While firms may still have better knowledge about the strength of a case, I now examine how uncertainty over the heterogeneous valuations of the firms affect the likelihood they contribute to the litigation process.<sup>19</sup> This is formalized by the existence of  $N \geq 2$  firms in an industry where each firm  $i \in N$  values bringing the case with a utility of  $V_i$ , where  $V_i = \tau(0) - \tau(1)$  is independently drawn from a continuous distribution  $F$ .  $V_i$  is private information, known only by firm  $i$ , although firms are aware of the distribution from which other firms values are drawn. The model also allows for litigation contribution levels to vary across firms.

I assume the government receives a contribution from the industry, which is the sum of the contributions from all firms within the industry, which is still  $L_F$ . Given the separating equilibrium from the earlier analysis, when firms contribute a combined  $L_F^*$  the government will choose to initiate the WTO dispute. As in the previous analysis, the choice to bring the case by the government is dichotomous; it either does or does not initiate the case. This setup perfectly resembles a contribution game where private actors with incomplete information engage in a game to provide a discrete public good. In this case the public good can be thought of as the initiation of the case, where the good is the benefit from the case that accrues to the firms within a given industry. Of course, not all firms within an industry will benefit equally from a given trade dispute, which is why firm-level valuations for the case are heterogeneous. A more complete discussion of the model with multiple firms is provided in the appendix, section A-4.

To analyze the incentives and behavior of firms within an industry, I assume firms' decisions take place simultaneously in a one-shot contribution game. A contribution game specifies that all costs that are paid by firms to the litigation expenses are not refundable, which is consistent with

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<sup>19</sup>Since the expected payoffs to firms are a function of both the strength of a case and the firms' valuations, all else equal, firms are still more likely to contribute when the case is strong instead of weak. However, taking strength of case as a given allows me to examine how the structure of industries and firms valuations for disputes affects firm participation in the WTO dispute process.

the practice of the case selection process. This type of game has been analyzed in different contexts by Menezes, Monteiro, and Temimi (2001) in “Private Provision of Discrete Public Goods with Incomplete Information.” In the most simplistic version of the game, I consider firms strategies when the cost of contributing the good is low enough such that a single firm can initiate the case. In this situation, a symmetric equilibrium always exists where a single firm will contribute  $L_F^*$  and the good is provided (Menezes, Monteiro, and Temimi, 2001, 499), which means the government initiates the case. Although multiple firms could contribute to the cost of bringing the case, Menezes, Monteiro, and Temimi (2001, 499) show a symmetric equilibrium always exists where a firm with a sufficiently high payoff will provide the good on its own.

The first implication to emerge from the game with incomplete information and heterogeneous firms and contributions is that industries with dominant firms will be more likely to initiate cases, since it is more likely that a dominant firm will be able to afford to pay the contribution threshold. This finding hinges on the fact that an industry where a single firm has a relatively high expected payoff from a WTO case, such that  $L_F^*$  is less than or equal to  $V_i$ , has a strictly greater probability of contributing to the litigation cost of a dispute than an industry where no single firm has an incentive to pay  $L_F^*$ , in which case the probability that a case is initiated is strictly less than one (unless the case is initiated unilaterally by the Government). Furthermore, a dominant firm will also be most likely to have the capacity to pay  $L_F^*$ . All else equal, in industries where dominant firms have relatively high expected payoffs and capacity to pay the litigation contribution, the probability that there exists a single firm willing to pay will be greater than in an otherwise identical industry. Thus, we should expect to see more case initiation in industries with high capacity dominant firms.

*Hypothesis-3: Ceteris paribus, in industries where dominant firms have relatively high value and capacity to pay the litigation contribution threshold, it is more likely that trade barriers will be challenged through a WTO dispute.*

Next I consider the contribution game when no single firm can afford to pay the contribution threshold, and I find that a coordination problem exists that eventually becomes great enough that a symmetric equilibrium resulting in case initiation is no longer possible. For a wide range of costs of a public good, the coordination problem prohibits provision of the good (Menezes, Monteiro, and Temimi 2001, 496). Of particular importance is the finding that if the cost of the public good is

slightly above the aggregate mean of the valuations then the unique equilibrium of the contribution game is for each player to contribute zero no matter what its value is (Menezes, Monteiro, and Temimi 2001, 502). This implies that even when an industry as a whole may stand to benefit from the initiation of a WTO dispute, if no single firm can afford to pay the necessary litigation cost to motivate the government to file and the average valuation by all firms within the industry is low enough, the case will not be initiated.<sup>20</sup> From this, a second implication emerges – as the mean value and capacity for the industry increases, case initiation becomes more likely, since there is a greater chance that the mean value and capacity for the industry will exceed the cost of litigation, which makes it more likely firms will contribute to the litigation process.

*Hypothesis-4: Ceteris paribus, as the mean value and capacity for an industry increases, it becomes more likely that trade barriers will be challenged through a WTO dispute.*

The previous two hypotheses are derived from predictions regarding how firms within an industry overcome collective action problems when facing a trade barrier; however, other factors can also mitigate or remove collective action problems. Most importantly for an analysis of trade disputes is the specificity of the trade barrier in question — how many products within an industry are affected by the trade barrier — determines the extent of the coordination problem firms face. For example, a barrier that distorts trade for all firms within an industry will create a significant collective action problem, whereas a barrier that only affects a specific product will have a more concentrated impact, thus reducing or eliminating the collective action problem. This suggests that product-specific trade barriers should be more likely to be challenged, since firms will not face a collective action problem.

*Hypothesis-5: Ceteris paribus, product-specific trade barriers should have a higher probability of being challenged at the WTO than more diffuse trade barriers.*

Hypothesis-5 also provides a useful comparison against alternative theories of dispute initiation. If governments are *independently* evaluating whether to initiate a dispute at the WTO, then collective action problems at the industry level should not influence case selection. In fact, trade barriers that

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<sup>20</sup>It can also be shown that the probability that the good is provided in this situation is strictly less than one, even when the mean contribution does not exceed the prohibitive threshold and when the outcome would be efficient (Menezes, Monteiro, and Temimi 2001, 496).

harm entire industries would be more likely to be challenged, since the government could help more firms with a single case. In contrast, if product-specific cases are more likely to be initiated, then the government is choosing to bring cases that impact fewer firms, which is consistent with firms having to overcome collective action problems when pitching cases to the government during the litigation process.

## **Evidence of Firm Signaling and Contributions**

To examine whether the hypotheses put forth are consistent with the dispute escalation patterns and processes at the WTO, I conducted a series of interviews with top trade experts with the European Commission (EC), the USTR, and international law firms. All interviewees had engaged in numerous WTO trade disputes and were still actively engaged or anticipated being engaged in WTO disputes. The interviewees included a former USTR General Counsel, USTR Legal Advisor in the mission to the WTO, International Trade Counselor to the European Commission, and private international trade attorneys who were from or worked on cases involving Australia, Brazil, Canada, the EU, Korea, Mexico, the US, and other countries. The interviews are designed to examine the underlying mechanisms of the theory by illuminating how private firms engage governments and what effect they have on WTO case selection. I then turn to a systematic analysis testing the implications of the theory using a dataset of trade barriers that comprise potential WTO disputes, and find that the hypotheses have strong support in the interviews and quantitative evidence.

I begin by considering Hypothesis-1, which argues that firm contributions increase the probability of WTO dispute initiation by mitigating the government's resource constraint and providing information that allows the government to update its beliefs about the strength and value of the case. An empirical challenge in examining this hypothesis is that litigation contributions, such as fact-finding and research efforts, are private activities that are not publicly known across a broad range of disputes. Thus, I interviewed a wide range of individuals involved in WTO disputes to examine what role private firms played in the litigation process. Reflecting their varied backgrounds and nationalities, the interviewees highlighted notable variation in how private firms and governments work together, but regardless of whether they were discussing WTO complaints raised by countries in Latin America, Europe, the Asia-Pacific region, or North America, each commented on the important role of private firm contributions in the dispute escalation process. The USTR General Counsel noted that having firms actively engage in the fact-finding and development of the basic

legal arguments was invaluable (USTR General Counsel 2009). Another USTR official commented that the agency was “very needy” when it came to preparing the facts of WTO cases and that firms commonly did much of the leg work of the fact finding (USTR Official 2009). Similarly the EC official noted that the EC is ill equipped to independently evaluate and pursue fact intensive cases (European Commission Official 2009). The importance of firms’ contributions was highlighted by a trade attorney who noted that he was personally familiar with multiple cases where firms’ contributions were pivotal in deciding whether to initiate a dispute, due to both resource constraints and the government updating their beliefs about the case after the contributions were made (Associate Trade Attorney, 2009a). These characterizations are consistent with the informational advantage of private firms, and government’s reliance on firm’s contributions to provide information and mitigate the budget constraints faced by trade bureaucracies.

Although the consensus amongst those interviewed is that private firms play a critical role in the dispute settlement process, it was also noted that different cases and countries yield different styles of government-firm interactions. For example, according to a partner at a major international law firm involved with a WTO case involving Brazil (Embraer) and Canada (Bombardier), the government contributed a mere five percent of the total costs, while the private companies paid the remaining 95 percent (Trade Attorney 2009). This example is on the high-end of private party contributions, but the same partner estimated that the average cost breakdown across WTO disputes would be distributed 20 percent to the government and 80 percent paid by private parties. These figures illustrate the reliance of governments on private parties to identify strong cases, develop them, and provide bureaucratic subsidies when pursuing WTO complaints. The breakdown of costs illustrates that private parties not only play a significant role in identifying harmful violations, but also play a vital role in signaling the strength of the case and offsetting costs by contributing the majority of litigation expenses in many cases.

An example of this type of public-private relationship occurred in a WTO dispute over genetically modified foods between the European Community and the United States, DS291. In this case the United States, along with Argentina and Canada, requested the formation of a dispute settlement panel on August 7, 2003 (World Trade Organization 2012a). Prior to the initiation of consultations and the formal request for a panel, Monsanto, a producer of genetically modified foods, which had 15 products that had allegedly been adversely affected by the European Community’s actions (World Trade Organization 2012b), directly engaged the US government in an effort to ensure the case was

brought.

Although domestic pressure had been rising for years for the USTR to initiate a WTO dispute, the tipping point for filing a WTO complaint occurred when private firms signaled their beliefs about the case and contributed to the litigation process. According to interviews with a USTR official, when deciding whether to initiate the case, the CEOs from the affected companies met with USTR officials and agreed to support the litigation effort (USTR Official 2009). In order to convince the government to bring the case, the firms had to fund and complete a “laundry list” of fact-finding and litigation assignments (USTR Official 2009). In this case, a relationship was built where the private firms showed their beliefs about the value and strength of the case by taking on a substantial portion of the fact-finding responsibilities and expenses. In response to the firms’ contributions, the USTR moved forward with the case with greater confidence in the strength of the case and at a drastically reduced cost.

Interviews with government officials also provided support to the argument that firms act as a form of fire alarm and are the first movers of the dispute settlement process. Even though the WTO formally blocks private dispute initiation, both USTR officials noted that private parties typically initiate the naming and blaming phases that lead to WTO complaints (USTR General Counsel 2009; USTR Official 2009). Specifically, the former USTR General Counsel noted that private parties are generally responsible for identifying a trade violation, gathering the basic facts of the case, and preparing initial legal arguments, which are then presented to the government to be formally brought to the WTO (USTR General Counsel 2009). He also noted that in the US the agency does not actively seek out potential complaints to pursue in the WTO. Rather than acting as a police patrol the government responds to private companies who “pitch” cases to the government. Prior to the initial pitches the private parties have already substantially contributed to the litigation effort by identifying strong cases and conducting the fact finding and preliminary legal analysis of the case. In this manner, even though firms lack formal access to the litigation process such as in transnational arbitration, they still play a consequential role in the monitoring, enforcement, and litigation of WTO obligations.

The interviews illuminate some of the mechanisms of WTO case selection and lend general support to the theory and Hypothesis-1, that firms’ contributions significantly mitigate the governments resource constraint and provide invaluable information that lead to increased initiation of WTO disputes. In aggregate, the interviews, representing the experiences of trade experts who engaged in

WTO disputes for firms and governments from more than 30 countries, point to prominent informational and resource roles for private firms in helping governments around the world select potential cases and enforce WTO obligations.

### *Dispute Escalation Analysis*

To provide a more systematic test of the implications of the theory, I use firm-level data gathered from Compustat in conjunction with the Foreign Trade Barrier Dataset (FTBD), which allows me to test the effect of trade barrier-specificity, firms' litigation capacity, the level of trade barrier distortion, and competing theories on the probability of dispute initiation from a set of potential WTO cases. The FTBD is comprised of a set of potential disputes, which are defined as harmful trade barriers to US exports identified in the National Trade Estimate (NTE) annual reports (Davis 2012).<sup>21</sup> The NTE is compiled annually by the USTR and lists trade barriers that are implemented by US trade partners that are harmful to the US exporters. This dataset has a unique advantage over previous datasets that examined exclusively antidumping measures or self-reported trade barriers. Unlike previous datasets, the FTBD encompasses non-tariff barriers and regulations that affect a range of industries, investment policies, and trade standards as perceived by the "victim," the US, between 1995 - 2004. This means that the FTBD provides a much more comprehensive set of *potential* disputes than previous studies, which can be used to analyze dispute escalation patterns. The data allow me to test the hypotheses within a subset of potential trade barriers that have met a minimum threshold to be recognized by the government. Although some legal barriers may be omitted from the dataset if they have not been identified by exporters and raised in the NTE, any such omission would bias against my findings, since the most likely cases to be omitted would be those with low levels of distortion and a low chance of escalation. Furthermore, the data are restricted to trade barriers against the US, which has the advantage of holding the initiating country constant, which controls for a multitude of potential covariates.<sup>22</sup>

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<sup>21</sup>Trade barriers may be reported to the USTR, and thus enter the NTE reports, via numerous methods, including a telephone hotline or online reporting. This means there is a relatively low threshold for barriers to enter the dataset; however, if some low-value barriers are left out, this would attenuate the results and is thus not a major concern for this paper.

<sup>22</sup>The US acts as the requesting complainant in more than 25 percent of the disputes (Brutger and Morse 2015), making it the most active complainant at the WTO. Additionally, interviews with officials from the EU, who initiate about another 20 percent of WTO complaints (Brutger and Morse 2015), and officials representing more than 30 other countries show a similar reliance on private firms' signaling through litigation contributions.

The unit of analysis is the trade barrier, with an observation included for every year the NTE mentions the barrier in their report. Focusing on the trade barrier allows me to directly test Hypothesis-5, which says that product-specific trade barriers should have a higher probability of being challenged than more diffuse trade barriers, since product-specific barriers mitigate the collective action problem faced by firms within industries. The FTBD codes the specificity of each trade barrier by identifying the industry and product affected by the particular trade barrier. The industry affected by the trade barrier is coded at the level of the ISIC3 4 digit classification.<sup>23</sup> Of the 1635 trade-barrier-years analyzed in the data, 23 percent are product-specific. Product-specific barriers are coded as those where the policy affects trade for a specific product within the industry, which Hypothesis-5 argues are the most likely barriers to be challenged. An example of a product specific barrier was Canada’s import restrictions placed on periodicals. Canada implemented Tariff Code 9958, which prohibited imports of “special edition” periodicals (World Trade Organization 2010a). Such a specific barrier did not impact the media industry as a whole, or even the entire print-media, and thus its specificity reduced the collective action challenge faced by the affected firms. In response to the trade barrier, the United States escalated the dispute in 1997, which became DS31. The dispute was won by the United States when the WTO panel ruled that it violated Canada’s WTO obligations.

Next, I examine Hypothesis-2, testing the effect of distortion caused by a trade barrier on the probability that the trade barrier is challenged in the WTO. While each barrier in the dataset is assumed to cause some level of distortion, the hypothesis focuses on the relative difference between low and high distortion barriers. The *Distortion* variable for each trade barrier is thus coded as an indicator variable that identifies cases with significant market closure that are highly distorting. Significant market closure is defined as resulting from a ban, quota, or increase of tariff/duty of more than 10 percent, standards or rules of origin that create a de facto ban on imports, violation of intellectual property rights, or subsidies to competitors (Davis 2012). The expectation for distortion is positive, as the variable directly increases the payoff from the case and the expected legal strength.

To test Hypotheses 3 and 4, which focus on the connection between firms’ capacity to contribute to the litigation process and dispute initiation, I analyze the relationship between firms within affected industries and the likelihood of dispute escalation. The theory predicts that trade barriers

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<sup>23</sup>This classification is consistent with Davis (2012) and facilitates a comparison of results across studies.

that impact industries with dominant firms with the capacity to pay the litigation costs and with a sufficiently high value for the dispute are most likely to escalate to WTO disputes. To examine the capacity of dominant firms within industries, I compiled firm-level data using the Compustat database. For each industry, I test the effect of *Dominant Firm Capacity*, measured as the log of the earnings in a given year for the top earning firm in the industry.<sup>24</sup> This measure acts as a proxy for the firm's ability to pay the contribution threshold necessary to signal information and the firm's ability to mitigate the bureaucracy's resource constraint. I also test Hypothesis 4 using the *Average Firm Capacity* for each industry, which measures the average earnings of firms for each industry in a given year.

In addition to having the capacity to contribute, firms also need to have private information, which is not captured in the capacity variables. While a measure of information sharing would be ideal for differentiating between the mechanisms of information provision and resource provision, such a measure is not possible in the largely confidential world of WTO dispute escalation, except in a few cases as described in the interviews discussed above. With this in mind, the measure of dominant firms' capacity lets us test whether the empirical record is consistent with the hypotheses put forth, but the measure cannot help us distinguish between the dual mechanisms of the theory. It is also worth noting that Compustat only includes publicly traded companies, which tend to be larger than private companies. This means that the firm-level data analyzed here has less variation in the capacity variables than the complete universe of public and private firms, and under-represents smaller firms, which would bias against finding significant results for the capacity variables.

To control for other trade barrier-specific factors, I include a range of controls. First, I examine whether progress has been made in negotiating the removal of the trade barrier. *Progress* is coded on a four point scale indicating the level of progress toward resolving the disputed trade barrier (Davis 2012). In the FTBD, progress receives its lowest value if the NTE report notes that there has been negative or insufficient steps to resolve the barrier. At the other end of the spectrum progress is coded as high if the NTE report notes that considerable progress has been made to resolve the issue. Because a WTO dispute is a costly means of removing a trade barrier, I expect that if significant progress is being made through other means a WTO complaint will be less likely. I also control for the length of time, *Duration*, the trade barrier has been reported in the NTE. The expected sign for

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<sup>24</sup>The specific earnings are defined as "retained earnings", which are the cumulative earnings of the company less total dividend distributions to shareholders.

duration is negative, as barriers that have been constant over time are less likely to be challenged than new barriers that suddenly disrupt trade flows.

Using the variables described, I test their impact on whether a trade barrier escalates to a complaint being filed at the WTO. Because the dependent variable of interest is a dichotomous decision whether or not to file a WTO complaint for a particular trade barrier in a given year, I use a logistic regression to analyze the data. Since there could be industry-specific factors that impact dispute escalation, and because a number of the variables occur at the industry level, I employ a multilevel random effects model.<sup>25</sup> This selected model identifies intercepts for each industry, while allowing for the effects of the key variables of interest to be analyzed across the dataset.<sup>26</sup> The results are also robust to alternative fixed effects and ordinary least squares regression models, which are shown and discussed in the appendix, sections A-5, A-6, and A-7.

The results of the baseline model are reported in Table 1, Model 1. Hypothesis-5, receives strong support, with the results showing that product-specific barriers are much more likely to be challenged than their diffuse counterparts. This result is in stark contrast to theories where the government *independently* evaluates the value and strength of cases, since the government alone would want to challenge broader cases that benefit more firms, as opposed to product-specific barriers that have a narrower scope. This suggests that governments are not selecting cases that affect the most firms, and instead is consistent with firms contributing to the case selection process when the collective action problem is reduced or eliminated. Hypothesis-3, which states that industries that have a dominant firm with high capacity will be more likely to have their cases brought to the WTO, also receives strong support. The dominant firm capacity variable is highly significant and positively signed, showing that dominant firm capacity is associated with increased dispute initiation. Hypothesis-2 also receives significant support, shown by the strong positive relationship between the trade barrier's level of distortion and the likelihood a dispute is initiated. Lastly, the additional controls of Progress and Duration both perform as expected.

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<sup>25</sup>Using the Hausman test, I compared the random effects model to a fixed effects model (Hausman 1978), with both the random effects and fixed effects at the ISIC3 4-digit level, and found that the null hypothesis – that the random effects model is consistent – cannot be rejected ( $\text{prob} > \chi^2 = 0.29$ ), and thus I proceed with the random effects model for my main analysis.

<sup>26</sup>The results are robust to grouping on trade barrier as Davis (2012) does. It is also possible that certain industries are more or less likely to be involved in disputes, due to the type of business they do or other traits constant to the industry. To address this concern, I replicate the results with fixed effects at the industry level. The results are consistent with those reported in Table 1 and are discussed in the appendix, section A-2.

Table 1: Random Effects Logistic Regression of WTO Dispute Complaints

	Model 1	Model 2	Model 3	Model 4	Model 5
Product-Specific Barrier	1.531*** (0.52)	1.317** (0.57)	1.698*** (0.56)	1.460*** (0.52)	1.840*** (0.66)
Dominant Firm Capacity	0.330** (0.15)	0.331** (0.16)	0.334** (0.16)	0.343** (0.16)	0.320* (0.17)
Trade Barrier Distortion	2.234*** (0.77)	2.084*** (0.78)	2.048*** (0.78)	2.246*** (0.79)	1.914** (0.81)
Negotiation Progress	-1.185*** (0.45)	-0.980** (0.47)	-1.174*** (0.45)	-1.042** (0.45)	-0.922* (0.48)
Trade Barrier Duration	-0.227* (0.13)	-0.203 (0.14)	-0.227* (0.13)	-0.234* (0.14)	-0.0999 (0.16)
Industry Political Contributions		-0.0138 (0.29)			0.0249 (0.36)
Industry Production		-0.0111 (0.39)			0.165 (0.52)
US Exports to Trade Partner			0.183 (0.25)		-2.283* (1.38)
Active 301			1.966*** (0.66)		2.090** (1.06)
EU				0.870 (1.11)	1.849 (1.41)
Japan				0.659 (1.20)	0.468 (1.66)
Mexico				1.394 (1.31)	1.086 (2.08)
Korea				0.320 (1.26)	-3.650 (3.03)
NonOECD				-0.118 (1.18)	-5.407 (4.20)
Constant	-8.949*** (1.63)	-8.355* (4.42)	-13.72** (6.59)	-9.485*** (1.96)	46.45 (35.53)
Observations	1635	1407	1635	1635	1407

\*  $p < .1$ , \*\*  $p < .05$ , \*\*\*  $p < .01$

Random effect models calculated using xtlogit with STATA14. Random intercepts calculated for groups at the industry level, defined as the ISIC3 4 digit industry. Canada is the omitted comparison. P-values are calculated using a two-tailed test and standard errors are displayed in parenthesis.

While the results in the baseline model are compelling, a broad range of competing theories could be driving the results, which I address in the remaining models. The theory presented argues that dominant firms with the capacity to contribute to the litigation process play a critical role in the case selection of disputes by signaling information about the strength of a case and reducing the budget constraint of the bureaucracy, which is consistent with the strong effect for dominant firm capacity in Model 1. A plausible counter argument is that firms with high capacity are typically larger and are part of well-organized industries that could buy litigation through direct political lobbying such as campaign contributions and electoral support. While this competing theory cannot explain the strong results for product-specific barriers, I test it in Model 2 by evaluating the effect of industries' political contributions to political parties and politicians. This variable is coded as the log of total political contributions in constant year 2000 dollars for each industry, as reported by the Center for Responsive Politics (Davis 2012). In contrast to previous studies that found political contributions to have a strong positive effect on dispute initiation, I do not find there to be a significant relationship between the two. I also examine the possibility that the value of the industry might be accounting for the significance of the dominant firm's capacity, which would occur if the presence of a high capacity dominant firm was highly correlated with the production value of the industry. If high capacity firms are associated with larger industries that have political influence due to the importance of their production to the US economy, or because they employ more people, then dominant firm capacity could be picking up the effects of these mechanisms. To evaluate whether industry size is driving the results, Model 2 tests how the value of production of the industry, measured as the log of its total production (Davis 2012), affects dispute initiation. The results show that dominant firm capacity and the key variables of interest are all robust to inclusion of industries' production value, suggesting that the size of the industry is not driving the results. I also re-tested Model 2 using the industry's employment share in the economy, and the firm-specific number of employees for the largest employer in the industry and found neither to be significant, and the main results all retained significance.<sup>27</sup> These tests show that the significance of product-specific barriers and dominant firm capacity are robust to measures of size and employment of the industry and firm and suggest that governments are not selecting cases to benefit the largest producers or the biggest employers.

The remaining models introduce variables addressing competing theories of case selection, in

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<sup>27</sup>Results not shown here.

addition to controlling for an active Section 301 petition in Model 3. I first include a measure of the log of *US Exports to Trade Partner*. This variable tests whether the main results are robust to measures controlling for the relative economic power between the parties. Given that the WTO dispute settlement process relies on self-enforcement by the parties, the existing relationship may affect dispute escalation. Model 3 shows that the main findings are all robust to the inclusion of the trade variable; however the US exports to the trade partner are only inconsistently significant across models. Model 3 also controls for whether there is an active Section 301 petition (*Active 301*). An active 301 petition requires government attention and is expected to have a positive influence on the probability a case is initiated, which is the case in both models 3 and 5.

Model 4 controls for country specific effects among some of the primary trading partners of the US. This approach further addresses concerns that power relations with the trade partner, or the type of trade flows between specific countries, may be dominating the decision process to file a WTO complaint. While such relationships likely matter between some countries, none of the country-dummies are significantly associated with dispute initiation for the trade barriers examined. Lastly, Model 5 uses all of the previously discussed variable simultaneously and finds the results still hold. Across all models, the results consistently support the main hypotheses and illustrate a positive and significant effect of product-specific trade barriers, dominant firm capacity, and distortion on the probability a trade barrier is challenged.<sup>28</sup>

To evaluate the substantive significance of the findings, I estimate the predicted probabilities of filing a WTO complaint given varying levels of product-specific barrier, dominant firm capacity, trade barrier distortion, and negotiation progress. To calculate the change in predicted probabilities I evaluate the change in the probability of dispute initiation for a shift from one standard deviation below the mean to one standard deviation above the mean for significant variables, or a shift from zero to one for indicator variables, which are reported in the top panel of Figure 2. The remaining variables are set to their mean, or a value of zero for indicator variables, except for the defendant

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<sup>28</sup>The results from Model 5 are also consistent when controlling for the value of exports from the affected industry (instead of US Exports to Trade Partner), although data limitations result in more than a third of the observations being dropped, which results in some key variables losing statistical significance.

Due to data availability the number of observations fluctuates across models. To examine whether changes in significance are driven by changes in the sample, particularly for an active Section 301 petition, all results are replicated using the same sample of 1407 observations. The results are consistent with those reported in Table 1, and are displayed in the appendix, section A-1.

country (Mexico) and distortion, which are each set to a value of one.<sup>29</sup> I use Model 5 from Table 1, which controls for an array of competing variables and country effects, and thus is the preferred specification.

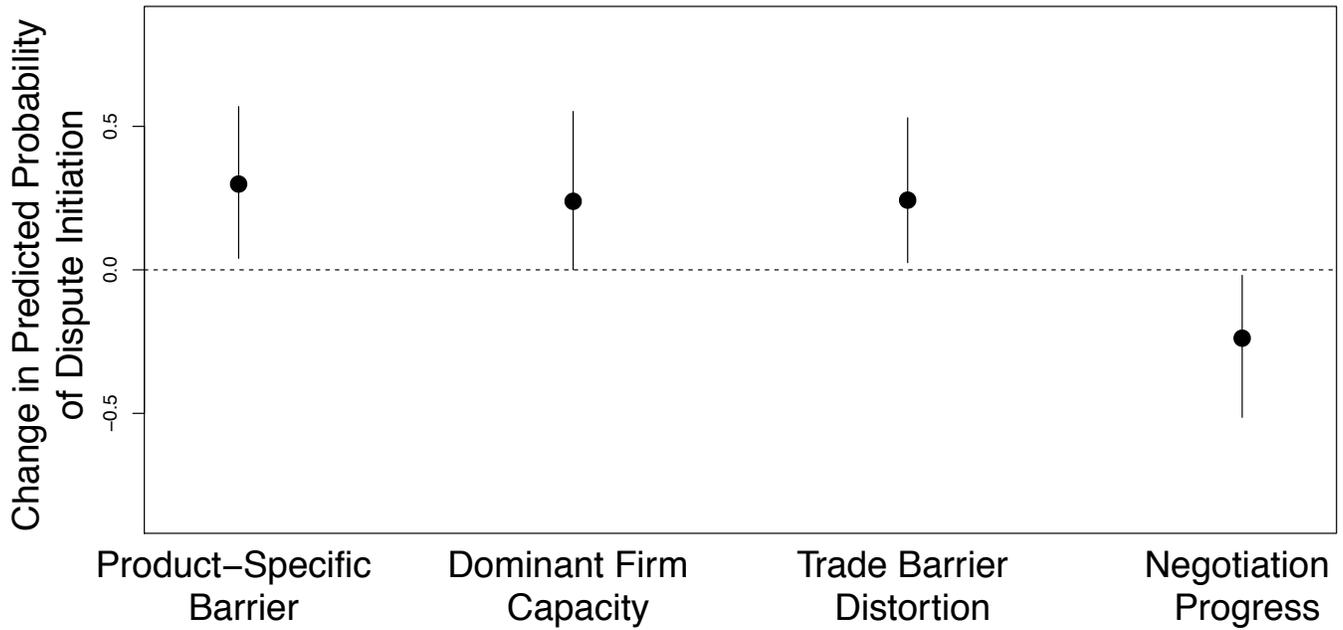
The predicted probability of filing a complaint with dominant firm capacity one standard deviation below the mean, when the hypothetical defendant is Mexico, is 0.28. The same probability with the dominant firm's capacity one standard deviation above the mean is 0.51. In practice, this change is approximately the effect of changing from an industry manufacturing games and toys to an industry manufacturing pharmaceutical products. Similarly, the predicted probability of case initiation for a trade barrier that is diffuse with distortion equal to zero is only 0.15, but the probability of a WTO dispute jumps to 0.40 when it is a product-specific trade barrier. These examples highlight the importance of product-specific barriers and dominant firm capacity for overcoming the collective action problems faced by firms that are considering making litigation contributions, in addition to the significant effects of trade barrier distortion and negotiation progress, which are also displayed in Figure 2.

To test Hypothesis-4, which states that increases in the average value and capacity of firms within an industry will make dispute initiation more likely, I progress through the same model specifications as Table 1, but now include the variable for average firm capacity (instead of dominant firm capacity). As predicted, average firm capacity has a strong positive effect on dispute initiation. The impact of average firm capacity is robust to the full range of controls for competing theories and country specific effects. Using the full specification from Model 5, I examine the substantive influence of average firm capacity on dispute initiation, with the results displayed in the lower panel of Figure 2. The change in average firm capacity increases the probability of case initiation by 0.17, which is about two-thirds of the effect of dominant firm capacity. This strong, but smaller effect than dominant firm capacity is consistent with the implications from the contribution game, where having a dominant firm that can make the contribution on its own is the most likely way for firms to contribute, followed by the influence of average firm capacity within the industry.

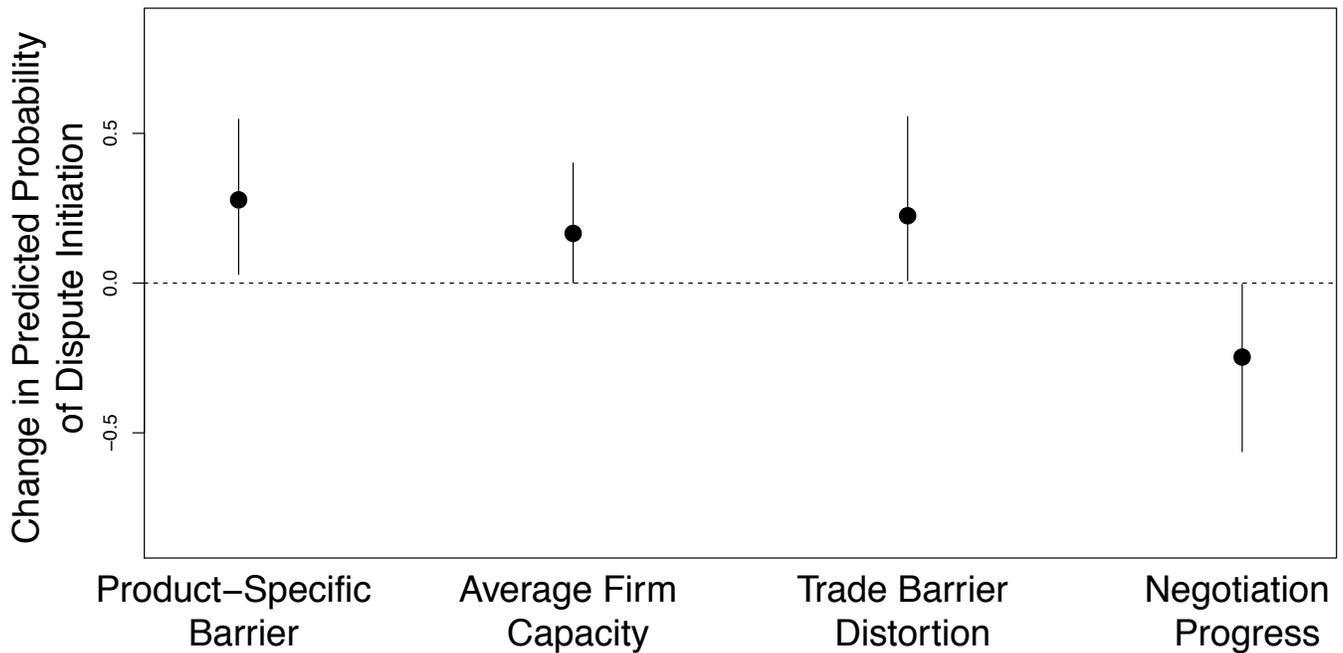
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<sup>29</sup>Similar results are obtained when using other countries or a value of zero for distortion.

Figure 2: Effect of Key Variables on the Probability of Dispute Initiation



Change in predicted probability is calculated from Model 5 of Table 1  
 None of the 95 percent confidence intervals overlap with zero, with the closest being dominant firm capacity (0.0006, 0.552).



Change in predicted probability is calculated from Model 5 of Table 2. Estimates and 95 percent confidence intervals are calculated using a quasi-bayesian simulation that samples 2000 times from a distribution based on the coefficients and variance. Changes in predicted probabilities represents a shift from one standard deviation below the mean to one standard deviation above the mean of the variable, or a shift from 0 to 1 for distortion and product-specific barrier. All other variables are set to their mean, or a value of zero, except for the defendant country (Mexico) and distortion, which are each set to a value of one. None of the 95 percent confidence intervals overlap with zero, with the closest being dominant firm capacity (0.001, 0.401).

Table 2: Random Effects Logistic Regression of WTO Dispute Complaints

	Model 1	Model 2	Model 3	Model 4	Model 5
Product-Specific Barrier	1.361*** (0.51)	1.158** (0.56)	1.462*** (0.54)	1.290** (0.52)	1.699*** (0.65)
Average Firm Capacity	0.000638** (0.00)	0.000711** (0.00)	0.000609* (0.00)	0.000777** (0.00)	0.000772* (0.00)
Trade Barrier Distortion	2.105*** (0.77)	1.925** (0.78)	1.940** (0.78)	2.068*** (0.78)	1.741** (0.79)
Negotiation Progress	-1.136** (0.45)	-0.978** (0.48)	-1.180*** (0.45)	-0.984** (0.46)	-0.969** (0.48)
Trade Barrier Duration	-0.214 (0.13)	-0.193 (0.14)	-0.214 (0.13)	-0.223* (0.13)	-0.0837 (0.16)
Industry Political Contributions		0.0494 (0.30)			0.126 (0.37)
Industry Production		-0.160 (0.39)			-0.111 (0.51)
US Exports to Trade Partner			0.198 (0.26)		-2.445* (1.40)
Active 301			1.930*** (0.67)		1.923* (1.08)
EU				0.925 (1.11)	1.671 (1.42)
Japan				0.546 (1.19)	0.0638 (1.70)
Mexico				1.398 (1.32)	0.790 (2.13)
Korea				0.299 (1.26)	-4.272 (3.17)
NonOECD				-0.300 (1.22)	-6.157 (4.35)
Constant	-6.263*** (0.82)	-4.796 (3.96)	-11.34* (6.51)	-6.660*** (1.27)	55.30 (36.39)
Observations	1635	1407	1635	1635	1407

\*  $p < .1$ , \*\*  $p < .05$ , \*\*\*  $p < .01$

Random effect models calculated using xtlogit with STATA14. Random intercepts calculated for groups at the industry level, defined as the ISIC3 4 digit industry. Canada is the omitted comparison. P-values are calculated using a two-tailed test and standard errors are displayed in parenthesis.

Taken together, the interviews and regression analysis are consistent with the theory of private firms playing a significant role in the WTO dispute escalation process. While the statistical analysis alone cannot test the micro-level mechanisms of the theory, the results are remarkably consistent with a story where cases are selected based on their strength and value (measured by distortion), where product-specific trade barriers that do not present collective action problems are most likely to be challenged, and where industries with high capacity dominant firms and high average capacity are most likely to make litigation contributions and seek dispute initiation. Additionally, the evidence provided by interviewees representing more than 30 countries emphasizes that governments are reliant on firms to “pitch” potential cases and provide information and resources that persuade the government to challenge trade barriers. Although empirical analysis of the largely confidential trade dispute escalation process is inherently challenging, the consistent accounts of leading trade experts and government officials from around the world, along with the empirical tests of the United States’ dispute escalation patterns, affirm that private firms’ litigation contributions play an important role in signaling information and mitigating capacity constraints in WTO dispute escalation.

## **Conclusion**

The theory presented in this paper has direct implications for our understanding of firms’ roles in influencing trade policy. The theory shows that enforcement of international trade obligations is significantly influenced by private firms’ role in monitoring and enforcing WTO obligations and suggests that unitary actor models that focus on the formal rules of the organization underreport the number of claims that are profitable for states to initiate. Specifically, cases where costs are only slightly higher than expected profits would be deemed unprofitable under previous models. In contrast, the theory presented here predicts that these cases become the most likely cases for firm participation.

The model also suggests that the branches of literature that focus on compliance with international trade law and increasing access to the dispute settlement process for developing countries have overlooked one of the most important mechanisms to achieve their goals. Informal private firm contributions can enhance WTO participation by helping governments effectively select potential disputes and more efficiently enforce WTO obligations. However, even though private firm participation allows states to more efficiently monitor and enforce WTO obligations, without facing the risks of formal access to private dispute initiation associated with transnational dispute settlement,

it may also raise new concerns about redistributive consequences. For example, industries with dominant firms are more likely to overcome collective action challenges, making them more likely to have their interests represented at the WTO, whereas more diffuse industries may find it harder to have their voices represented at the WTO. While a notable bias in favor of industries with dominant firms exists, there are cases of more diffuse industries coordinating their activities when the stakes are high. One such example resulted in Brazil filing a WTO complaint over sugar, where Brazilian farmers auctioned off some of their equipment to pay for the litigation contributions (Trade Attorney 2009). The contributions from Brazilian farmers demonstrate that even though the collective action problem may be significant, it is possible for less concentrated industries to coordinate their efforts and advocate for the enforcement of international trade obligations when the value of the case is high.

The theory presented here demonstrates the importance of understanding the role of firms for WTO participation and the enforcement of international trade law. While domestic interest groups are often blamed for trade protection, it is clear that private firms also promote trade liberalization by monitoring and enforcing international agreements. In a broader context, this paper contributes to the debate on the monitoring and enforcement of international law and the significance of formal and informal rules and procedures in international organizations. As presented, private firms are significant actors who play a valuable role in shaping how the international legal system functions. Even when formally denied access to dispute initiation, private parties actively engage in the international legal system and play a defining role in how states respond to violations of international trade law. Although non-state actors were omitted from the original text of the Dispute Settlement Understanding and were left out of much of the early literature on WTO dispute settlement, private parties' contributions to the litigation process allow governments to screen potential cases and represent a salient path that non-state actors use to effectively engage in and influence the international legal system.

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LITIGATION FOR SALE:  
*Private Firms and WTO Dispute Escalation*

Supplementary Online Appendix

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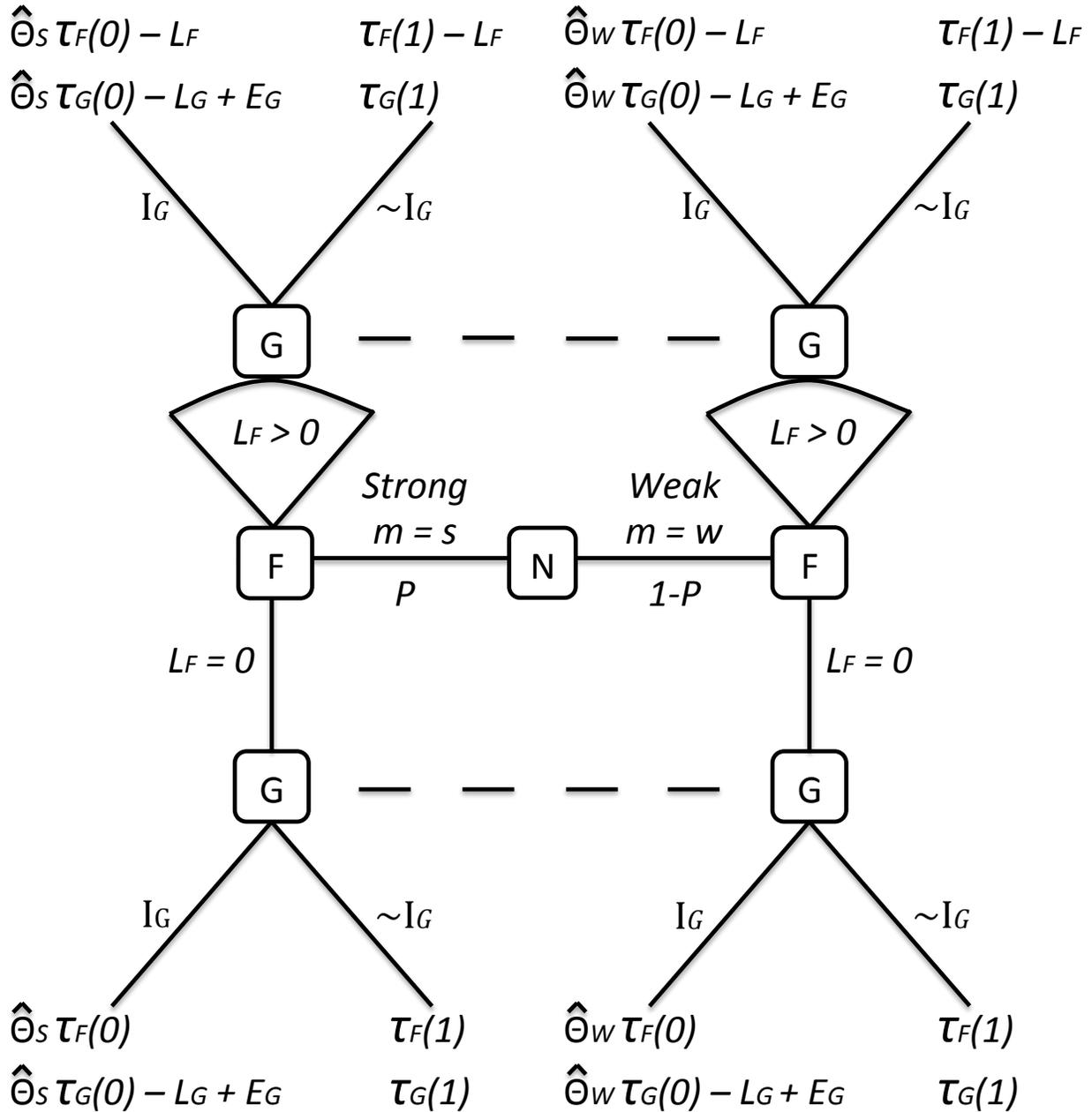
**A-6. Industry Level Fixed Effects**

**A-7. OLS Regression Analysis**

### A-1: Summary of Key Variables:

- $I_G$  = Government initiates a WTO complaint.
- $L$  = Total litigation cost for a case.
- $L_j$  = Litigation cost paid by  $j \in \{F, G\}$ .
- $\tau_j(1)$  = Value of trade for  $j$  with the barrier in place.
- $\tau_j(0)$  = Value of trade for  $j$  with the barrier removed.
- $\theta_S$  :  $Pr(\text{winning a strong case}) \sim U(0.5, 1.0)$ ,  $\widehat{\theta}_S = 0.75$
- $\theta_W$  :  $Pr(\text{winning a weak case}) \sim U(0.0, 0.5)$ ,  $\widehat{\theta}_W = 0.25$
- $E_G$  = Externalities to the government of bringing the case.

Figure 1:  
Extensive Form Signaling-Contribution Game



(A summary of the variables is included in the appendix.)

## A-2: Equilibrium Solution

### Overview of equilibrium solution:

The equilibrium consists of three regions of the parameter space and the equilibrium is unique within each:

For low cost cases, where  $L < \max\{\widehat{\theta}_W(\tau_G(0)) + E_G + \widehat{\theta}_W(\tau_F(0)), .5p + .5\}$ , the firm plays the same strategy regardless of whether the case is strong or weak and the case is initiated by the government.

In the middle parameter space, where  $L \geq \max\{\widehat{\theta}_W(\tau_G(0)) + E_G + \widehat{\theta}_W(\tau_F(0)), .5p + .5\}$  and  $L \leq \widehat{\theta}_S(\tau_G(0)) + E_G + \widehat{\theta}_S(\tau_F(0))$  the firm contributes if the case is strong, which leads to the government initiating the case, but will not contribute if the case is weak, in which case the the government does not initiate.

Lastly, for high cost cases, where  $L > \widehat{\theta}_S(\tau_G(0)) + E_G + \widehat{\theta}_S(\tau_F(0))$  the firm and government do not contribute and the case is not initiated, regardless of whether the case is strong or weak.

In the low and middle cost cases, if the firm chooses to contribute, it selects a litigation contribution from  $L_F > 0$  that is the minimum amount to convince the government to initiate the case. The equilibrium contribution levels for both the firm and government for strong and weak cases (for  $P = .5$  and  $E_G = 0$ ) are shown in Figure2 of the paper and are proven in the following pages.

### Proof of equilibrium solution:

For simplicity,  $\tau_j(0) = 1$ ,  $\tau_j(1) = 0$ , and  $E_G = 0$  in the following proofs.

**Low Cost Parameter Space:**  $L < \max\{\widehat{\theta}_W(\tau_G(0)) + E_G + \widehat{\theta}_W(\tau_F(0)), .5p + .5\}$

1. Firm's Strategy:

$$\sigma_F(m = s) = \sigma_F(m = w) : L_F = L - .5p + .25, \text{ if } L > .5p + .25$$

$$\sigma_F(m = s) = \sigma_F(m = w) : L_F = 0, \text{ if } L \leq .5p + .25$$

2. Government's Beliefs:

$$Pr(\theta_S) = p$$

The government does not update its prior, since the firm is pooling and thus no information is conveyed.

3. Government's Strategy: If  $L_G \leq .5p + .25$  then:

$$\sigma_G = I_G, \text{ where } L_G = L - L_F$$

$$EU_G(I_G) = p(\widehat{\theta}_S(\tau_G(0)) - L_G) + (1 - p)(\widehat{\theta}_W(\tau_G(0)) - L_G) = .5p + .25 - L_G$$

$$EU_G(\neg I_G) = \widehat{\theta}_W(\tau_G(1)) = 0$$

If  $L_G > .5p + .25$  then:

$$\sigma_G = \neg I_G$$

$$EU_G(I_G | L_G = L) = p(\widehat{\theta}_S(\tau_G(0)) - L_G) + (1-p)(\widehat{\theta}_W(\tau_G(0)) - L_G) = .5p + .25 - L_G < 0$$

$$EU_G(\neg I_G) = \widehat{\theta}_W(\tau_G(1)) = 0$$

#### 4. Sequential Rationality

We now consider whether the beliefs and strategies of the actors are sequentially rational.

If  $L \leq .5p + .25$ , the cost to initiate the case is low enough that the government initiates the case on its own and the firm has no incentive to deviate and contribute, since any additional contribution will be an unnecessary cost to the firm.

$$EU_F(L_F = 0) = 0.25 > EU_F(L_{F'} > 0) = .25 - L_{F'}$$

(No incentive for the firm to deviate by contributing.)

If  $L > .5p + .25$  (but still in the “low cost” space), the government will not initiate on its own, so the firm has an incentive to pay just enough to convince the government to initiate the case, up to the expected profit of winning a weak case. (No signaling occurs in this equilibrium - just a cost sharing of the litigation expenses.) If the firm deviated and chose to contribute less, the government would not initiate and the firm would lose the expected utility of initiating the case. If the firm paid any more than  $L_F = L - .5p + .25$  it would be over-contributing unnecessarily.

$$EU_F(L_{F'} < L - .5p + .25) = -L_{F'} \leq EU_F(L_F = L - .5p + .25) = .25 - L_F$$

(No incentive for the firm to deviate by contributing less.)

$$EU_F(L_{F'} > L_F = L - .5p + .25) = .25 - L_{F'} < EU_F(L_F = L - .5p + .25) = .25 - L_F$$

(No incentive for the firm to deviate by contributing more)

#### Middle Cost Parameter Space:

$$\max\{\widehat{\theta}_W(\tau_G(0)) + E_G + \widehat{\theta}_W(\tau_F(0)), .5p + .25\} \leq L \leq \widehat{\theta}_S(\tau_G(0)) + E_G + \widehat{\theta}_S(\tau_F(0))$$

##### 1. Firm's Strategy:

$$\sigma_F(m = s) : L_F = \max\{\widehat{\theta}_W(\tau_F(0)), L - \widehat{\theta}_S(\tau_G(0))\}$$

$$\sigma_F(m = w) : L_F = 0$$

The specification of  $L_F$  for the strong case is the threshold requirement that the firm contributes at least as much as it could expect to gain from pursuing a weak case ( $\widehat{\theta}_W(\tau_F(0))$ ), and thus the firm does not have an incentive to bluff with weak cases. The firm may contribute more than  $\widehat{\theta}_W(\tau_F(0))$  when the total cost of initiating the case is higher, in which case the firm contributes  $L - \widehat{\theta}_S(\tau_G(0))$ .

2. Government's Beliefs: The government's beliefs about the case are that a case is strong if the firm contributes at least  $\widehat{\theta}_W(\tau_F(0))$  and otherwise the government believes the case is weak.

$$\begin{aligned} Pr(\theta_S | L_F \geq \widehat{\theta}_W(\tau_F(0))) &= 1, \\ Pr(\theta_S | L_F < \widehat{\theta}_W(\tau_F(0))) &= 0 \end{aligned}$$

3. Government Strategy: First we consider the government's strategy when the firm has contributed enough to meet the litigation threshold,  $L_F \geq \widehat{\theta}_W(\tau_F(0))$ .

$$\begin{aligned} \text{If } L_F \geq \widehat{\theta}_W(\tau_F(0)), \text{ then } Pr(\theta_S | L_F \geq \widehat{\theta}_W(\tau_F(0))) &= 1 \\ EU_G(I_G) &= \widehat{\theta}_S(\tau_G(0)) - L_G + E_G \\ EU_G(\neg I_G) &= \tau_G(1) \end{aligned}$$

The government will initiate if the expected utility of initiating is greater than or equal to not initiating.

$$\Rightarrow I_G \text{ if: } \widehat{\theta}_S(\tau_G(0)) - L_G + E_G \geq \tau_G(1)$$

Substitute and rearrange using:  $\tau_G(0) = 1$ ,  $\tau_G(1) = 0$ ,  $\widehat{\theta}_S = .75$ , and  $L_G = L - L_F$

$$\begin{aligned} \Rightarrow I_G \text{ if: } L_F &\geq L - \widehat{\theta}_S - E_G \\ \Rightarrow I_G \text{ if: } .75 &\geq L - L_F - E_G \\ \Rightarrow I_G \text{ if: } .75 &\geq L_G - E_G, \text{ otherwise } \neg I_G \end{aligned}$$

Next we consider the government's strategy when the firm has contributed, but not enough to meet the litigation threshold,  $L_F \leq \widehat{\theta}_W(\tau_F(0))$ .

$$\begin{aligned} \text{If } L_F < \widehat{\theta}_W(\tau_F(0)), \text{ then } Pr(\theta_S | L_F < \widehat{\theta}_W(\tau_F(0))) &= 0 \\ EU_G(I_G) &= \widehat{\theta}_W(\tau_G(0)) - L_G + E_G \\ EU_G(\neg I_G) &= \tau_G(1) \\ \Rightarrow I_G \text{ if: } \widehat{\theta}_W(\tau_G(0)) - L_G + E_G &\geq \tau_G(1) \end{aligned}$$

Substitute and rearrange using:  $\tau_G(0) = 1$ ,  $\tau_G(1) = 0$ ,  $\theta_W = .25$ , and  $L_G = L - L_F$

$$\begin{aligned} \Rightarrow I_G \text{ if: } .25 &\geq L - L_F - E_G \\ \Rightarrow I_G \text{ if: } .25 &\geq L_G - E_G, \text{ otherwise } \neg I_G \end{aligned}$$

Next we consider the government's strategy when the firm has not contributed ( $L_F = 0$ ).

$$\text{If } L_F = 0, \text{ then } Pr(\theta_S | L_F < \widehat{\theta}_W(\tau_F(0))) = 0$$

$$\begin{aligned}
EU_G(I_G) &= \widehat{\theta}_W(\tau_G(0)) - L_G + E_G \\
EU_G(\neg I_G) &= \tau_G(1) \\
\Rightarrow I_G \text{ if: } &\widehat{\theta}_W(\tau_G(0)) - L_G + E_G \geq \tau_G(1)
\end{aligned}$$

Substitute and rearrange using:  $\tau_G(0) = 1$ ,  $\tau_G(1) = 0$ , and  $\widehat{\theta}_W = .25$

$$\Rightarrow I_G \text{ if: } .25 \geq L_G - E_G, \text{ otherwise } \neg I_G$$

#### 4. Sequential Rationality

We now consider whether the beliefs and strategies of the actors are sequentially rational.

If the case is strong and the litigation cost is in the middle range, then the firm will contribute and the government will initiate in equilibrium:

$$\begin{aligned}
EU_F &= .75 - L_F, \text{ if } L_F \geq L - E_G - .75 \\
\text{and } L_F &= \max\{\widehat{\theta}_W(\tau_F(0)), L - \widehat{\theta}_S(\tau_G(0))\}
\end{aligned}$$

Payoff from deviation:

$$\begin{aligned}
&\text{If the case is strong and the firm deviated and played } L_{F'} < \max\{\widehat{\theta}_W(\tau_F(0)), \\
&L - \widehat{\theta}_S(\tau_G(0))\}, \\
&\text{then the government would play } \neg I_G \Rightarrow EU_F = -L_{F'} \\
&\Rightarrow -L_{F'} \leq .75 - L_F \Rightarrow \text{Firm} \neq \text{deviate.}
\end{aligned}$$

If the firm deviated and chose to contribute less than the contribution threshold (including  $L_F = 0$ ), then the government would not initiate and the firm's expected utility would be  $-L_{F'}$ , which is weakly less than the expected utility of initiating ( $0 \leq .75 - L_F$ ), so the firm will not deviate.

Furthermore, the firm would never pay more than the contribution threshold, since any additional expenditure cannot influence the government's decision to initiate (since the government already chooses to initiate once the threshold is met), and thus any additional contribution only reduces the firm's expected payoff.

Next we consider whether there is an incentive to deviate from the equilibrium if the case is weak in the middle cost range.

If the case is weak and the litigation cost is in the middle range, then the firm will play  $L_F = 0$  and the government will play  $\neg I_G$ :

$$L_F = 0 \Rightarrow \neg I_G \Rightarrow EU_F = 0$$

Payoff from deviation:

If the case is weak and the firm deviated and played  $L_{F'} > 0$  and  $L_{F'} < \widehat{\theta}_W(\tau_F(0))$ , then the government believes the case is weak and plays  $\neg I_G$ .  
 $\Rightarrow EU_F = -L_{F'}$   
 $-L_{F'} < 0 \Rightarrow \text{Firm} \neq \text{deviate.}$

If the firm deviated and contributed some amount that was less than the threshold, the government would not initiate the case, and the firm's expected utility would be  $-L_{F'}$ , which is less than 0, so the firm will not deviate.

If the case is weak and the firm deviated and played  $L_{F'} \geq \widehat{\theta}_W(\tau_F(0))$ , then the government will believe the case is strong and play  $I_G$ .  
 $\Rightarrow EU_F = \widehat{\theta}_W(\tau_F(0)) - L_{F'}$   
 $\widehat{\theta}_W(\tau_F(0)) - L_{F'} \leq 0 \Rightarrow \text{Firm} \neq \text{deviate.}$

If the firm deviated and contributed at least the contribution threshold, the government would then initiate the case, and the firm's expected utility would be  $\widehat{\theta}_W(\tau_F(0)) - L_{F'}$ , which is no better than the payoff for not contributing (0), so the firm will not deviate. This demonstrates that the firm does not have an incentive to bluff and try to convince the government to initiate weak cases.

**High Cost Parameter Space:**  $L > \widehat{\theta}_S(\tau_G(0)) + E_G + \widehat{\theta}_S(\tau_F(0))$

1. Firm's Strategy:

$$\sigma_F(m = s) = \sigma_F(m = w) : L_F = 0$$

2. Government's Beliefs:

$$Pr(\theta_S) = p$$

The government does not update its prior, since the firm is pooling and thus no information is conveyed.

3. Government's Strategy:

$$\sigma_G = \neg I_G$$

$$EU_G(\neg I_G) = (\tau_G(1)) = 0$$

4. Sequential Rationality

We now consider whether the beliefs and strategies of the actors are sequentially rational.

If the case is strong and the litigation cost is in the high cost range, then the firm will not contribute and the government will not initiate in equilibrium:

$$L_F = 0 \Rightarrow \neg I_G \Rightarrow EU_F = (\tau_F(1)) = 0$$

Payoff from deviation:

If the case is strong and the firm deviated and played  $L_{F'} > 0$ , let us consider the maximum amount the firm would ever contribute,  $L_{F'} = \hat{\theta}_S(\tau_F(0))$

(the most the firm would ever contribute, since it is the most it could ever expect to win from the case). Since we are off the path let's assume the most favorable beliefs of the government for the case, and thus the government believes the case is strong.

$$EU_G(I_G) = \hat{\theta}_S(\tau_G(0)) - L_G, \text{ where } L_G = L - L_F$$

$$EU_G(\neg I_G) = \tau_G(1) = 0$$

Because it is a high cost case,  $L_G > \hat{\theta}_S(\tau_G(0))$

$$\Rightarrow \hat{\theta}_S(\tau_G(0)) - L_G < 0 \Rightarrow \text{Firm} \neq \text{deviate.}$$

Given that the firm contribution, even when it is at the maximum where the firm could break-even, cannot convince the government to initiate the case in the high cost range, there is no incentive for the firm to deviate and contribute in any amount if the case is in the high cost range.

### A-3: Uniqueness of Equilibrium

To show the uniqueness of the previously discussed equilibrium, the following pages conjecture alternative pooling, mixed, and semi-pooling equilibria and off-the-path beliefs, and demonstrate that none are sequentially rational.

#### Mixed Possibility

Here we consider the possibility that the firm adopts some form of mixed strategy. The proof shows that the firm has a profitable deviation to a pure strategy, and thus the firm will not mix.

$$1. \sigma_F(m = s): Pr(L_F > 0) = y, \sigma_F(m = w): Pr(L_F > 0) = q$$

This strategy profile is kept as generic as possible, only specifying that the firm makes some positive contribution with probability  $y$  or  $q$ , depending on the message it receives.

2. Government's Beliefs (using Bayes' rule):

$$Pr(\theta_S | L_F > 0) = \frac{yp}{yp+q-pq} = K$$

$$Pr(\theta_S | L_F = 0) = \frac{p-yp}{p-yp+1-p-q+pq} = J$$

3. Government Strategy:

$$\text{If } L_F > 0, Pr(\theta_S) = K$$

$$EU_G(I_G) = K\widehat{\theta}_s(\tau_G(0)) + (1 - K)\widehat{\theta}_w(\tau_G(0)) - L_G$$

Substitute and rearrange using:  $\widehat{\theta}_s = .75, \widehat{\theta}_w = .25, \tau_G(0) = 1$

$$EU_G(I_G) = .75K + .25(1 - K) - L_G$$

$$= .5K + .25 - L_G$$

$$= .5K + .25 - L + L_F$$

$$EU_G(\neg I_G) = 0$$

For the government to be indifferent when the firm contributes, it must be that the expected utilities of initiating and not initiating the dispute are equal, which requires:

$$\text{1st Indifference Condition: } 0 = .5K + .25 - L + L_F$$

$$\Rightarrow L - L_F - .25 = .5K$$

$$\text{If } L_F = 0, Pr(\theta_S) = J$$

$$EU_G(I_G) = .75J + .25(1 - J) - L_G$$

$$= .5J + .25 - L_G$$

$$= .5J + .25 - L$$

$$EU_G(\neg I_G) = 0$$

For the government to be indifferent when the firm does not contribute, it must be that the expected utilities of initiating and not initiating the dispute are equal, which requires:

**2nd Indifference Condition:**  $0 = .5J + .25 - L \Rightarrow L - .25 = .5J$

4. Sequential Rationality:

To show that the mixing strategy is not sequentially rational, the following demonstrates that the firm has a dominant pure strategy when the case is strong. (This is followed by showing that the firm also has a dominant pure strategy when the case is weak.)

If  $m = s$ , and the firm contributes  $L_F > 0$  then:

1.  $EU_F = .75 - L_F$ , when  $L - L_F - .25 \leq .5K$  (Government initiates)
2.  $EU_F = -L_F$ , when  $L - L_F - .25 > .5K$  (Government does not initiate)

If  $m = s$ , and the firm does not contribute,  $L_F = 0$ , then:

3.  $EU_F = .75$ , when  $L - .25 \leq .5J$  (Government initiates)
4.  $EU_F = 0$ , when  $L - .25 > .5J$  (Government does not initiate)

The 1st and 2nd indifference conditions correspond to the threshold conditions in lines 1 and 3 of the sequential rationality proof. Thus, when the indifference conditions are met, the firm is faced with a choice between a payoff of  $.75 - L_F$  (Line 1), or a payoff of  $.75$  (Line 3). The firm is strictly better off contributing nothing and receiving  $.75$  and thus the firm is unwilling to mix.

If  $m = w$ , and the firm contributes  $L_F > 0$  then:

5.  $EU_F = .25 - L_F$ , when  $L - L_F - .25 \leq .5K$  (Government initiates)
6.  $EU_F = -L_F$ , when  $L - L_F - .25 > .5K$  (Government does not initiate)

If  $m = w$ , and the firm does not contribute,  $L_F = 0$ , then:

7.  $EU_F = .25$ , when  $L - .25 \leq .5J$  (Government initiates)
8.  $EU_F = 0$ , when  $L - .25 > .5J$  (Government does not initiate)

Similar to the strong case, the 1st and 2nd indifference conditions correspond to the threshold conditions in lines 5 and 7 of the sequential rationality proof. Thus, when the indifference conditions are met, the firm is faced with a choice between a payoff of  $.25 - L_F$  (Line 5), or a payoff of  $.25$  (Line 7). The firm is strictly better off contributing nothing and receiving  $.25$  and thus the firm is unwilling to mix.

Since the firm has a dominant pure strategy when the indifference conditions are satisfied, a mixing equilibrium is not sequentially rational.

### Alternative Semi-Pooling Possibilities:

It is also possible that the firm could use a semi-pooling strategy, where it mixed strategies only when a case is strong or weak (but not both). Such semi-pooling equilibria would be special cases of the potential mixed equilibria, where  $y$  or  $q \in \{0, 1\}$ . Given that these are a special subset of the previously analyzed mixed equilibria, and the mixed equilibria is not sequentially rational for any values of  $y$  and  $q$ , it follows that the semi-pooling equilibria are not sequentially rational and thus are not sustainable perfect bayesian equilibria.

### Alternative Separating Possibility:

In this potential alternative equilibrium, we conjecture that the firm could choose to contribute  $L_F > 0$  for weak cases, but not for strong cases. The equilibrium does not hold, because the firm deviates when the case is weak.

1. Firms Strategy:

$$\begin{aligned}\sigma_F(m = s) &: L_F = 0 \\ \sigma_F(m = w) &: L_F > 0\end{aligned}$$

2. Government's Beliefs:

$$\begin{aligned}Pr(\theta_S | L_F = 0) &= 1 \\ Pr(\theta_S | L_F > 0) &= 0\end{aligned}$$

The government updates their beliefs, and given the fully separating strategy of the firm, accurately deduces the strength of the case.

3. Government's Strategy:

If  $L_F > 0$ , then:

$$\begin{aligned}\sigma_G &= I_G, \text{ when } .25 - L_G \geq 0; \neg I_G \text{ otherwise.} \\ EU_G(I_G | L_F > 0) &= \widehat{\theta}_W(\tau_G(0)) - L_G = .25 - L_G \\ EU_G(\neg I_G | L_F > 0) &= 0\end{aligned}$$

Government plays  $I_G$  if  $.25 - L_G \geq 0$ ;  $\neg I_G$  otherwise.

If  $L_F = 0$ , then:

$$\begin{aligned}\sigma_G &= I_G, \text{ when } .75 \geq L; \neg I_G \text{ otherwise.} \\ EU_G(\neg I_G | L_F = 0) &= 0 \\ EU_G(I_G | L_F = 0) &= \widehat{\theta}_S(\tau_G(0)) - L_G = .75 - L\end{aligned}$$

Government plays  $I_G$  if  $.75 \geq L$ ;  $\neg I_G$  otherwise.

4. Sequential Rationality:

We now consider whether the beliefs and strategies of the actors are sequentially rational. If the case is weak, the equilibrium conjecture says that the firm will contribute to the the case,  $L_F > 0$ .

Consider the cases when the total litigation cost is less than the expected payoff of a strong case:  $L \leq \widehat{\theta}_S(\tau_j(0)) \Rightarrow L \leq 0.75$

The only incentive for the firm to contribute is to encourage the government to initiate the case, which requires  $L_F \geq L - .25$ . The best payoff the firm can receive in this situation is:

$$EU_F(L_F > 0) = \widehat{\theta}_W(\tau_F(0)) - L_F = .25 - L_F$$

If the firm deviates and chooses not to contribute ( $L_F = 0$ ), then the government infers the case is strong and chooses to initiate the case (given  $L \leq .75$ ), which results in the following expected payoff to the firm:

$$EU_F(L_{F'} = 0) = \widehat{\theta}_W(\tau_F(0)) = .25$$

$$EU_F(L_{F'} = 0) = .25 < .25 - L_F = EU_F(L_F > 0)$$

The expected payoff to the firm for deviating and not contributing is strictly greater than the payoff for contributing, and thus the firm will deviate, so the equilibrium is not sequentially rational.

**Pooling Possibility 1a:**

In this potential alternative equilibrium, we conjecture that the firm contributes for both weak and strong cases. The equilibrium does not hold, because firms would deviate when the case is strong, such that the government would initiate the case without the firm contributing.

We consider this equilibrium under multiple belief structures. In each set of beliefs the government believes the case is strong with probability  $p$  when the firm contributes (on the path). We then look at two extremes for off the path beliefs, where the government first believes the case is strong when the firm does not contribute, followed by the belief that the case is weak when the firm does not contribute.

1. Firm's Strategy:

$$\begin{aligned} \sigma_F(m = s) &= \sigma_F(m = w) : L_F = L - p \widehat{\theta}_S(\tau_G(0)) + (1 - p) \widehat{\theta}_W(\tau_G(0)), \\ &\text{when } L > p \widehat{\theta}_S(\tau_G(0)) + (1 - p) \widehat{\theta}_W(\tau_G(0)); L_F = \epsilon \rightarrow 0 \text{ otherwise.} \end{aligned}$$

This states that the firm contributes just enough to make the government indifferent between initiating the case and not initiating, or if the total litigation cost is less than the expected payoff to the government of initiating, the firm contributes some arbitrarily small amount.

2. Government's Beliefs:

$$Pr(\theta_S | L_F > 0) = p$$

$$Pr(\theta_S | L_F = 0) = 1$$

In this belief structure, the government maintains their prior when the firm contributes since the firm has a pooling strategy and contributes on the path, but updates their belief that the case is strong if the firm does not contribute off the path (see the following proof for alternative beliefs).

3. Government Strategy:

If  $L_F > 0$ , then:

$$\sigma_G = I_G \text{ when } L_G - .25 \leq .5p; \neg I_G \text{ otherwise.}$$

If  $L_F > 0$ ,  $Pr(\theta_S) = p$

$$EU_G(I_G) = p(\widehat{\theta}_S(\tau_G(0)) - L_G) + (1 - p)(\widehat{\theta}_W(\tau_G(0)) - L_G) = .5p + .25 - L_G$$

$$EU_G(\neg I_G) = 0$$

$I_G$  if  $L_G - .25 \leq .5p$ ;  $\neg I_G$  otherwise.

If  $L_F = 0$ , then:

$$\sigma_G = I_G \text{ when } .75 \geq L; \neg I_G \text{ otherwise.}$$

If  $L_F = 0$ ,  $Pr(\theta_S) = 1$

$$EU_G(I_G) = \widehat{\theta}_S(\tau_G(0)) - L_G = .75 - L$$

$I_G$  if  $.75 \geq L$ ;  $\neg I_G$  otherwise.

4. Sequential Rationality:

We now consider whether the beliefs and strategies are sequentially rational.

The equilibrium conjectures that the firm will always contribute  $L_F > 0$ .

Consider the situation when the case is strong and  $L \leq \widehat{\theta}_S(\tau_j(0)) \Rightarrow L \leq 0.75$ .

If the firm contributes  $L_F > 0$  such that  $L_G - .25 \leq .5p$  then the government will initiate the case. This results in the following expected payoff to the firm:

$$EU_F(L_F > 0) = \widehat{\theta}_S(\tau_F(0)) - L_F = .75 - L_F$$

Payoff from deviation:

$$EU_F(L_{F'} = 0) = \widehat{\theta}_S(\tau_F(0)) = .75$$

$$EU_F(L_{F'} = 0) = .75 > .75 - L_F = EU_F(L_F > 0)$$

The expected payoff to the firm for deviating and not contributing is strictly greater than the payoff for contributing, and thus the firm will deviate, so the equilibrium is not sequentially rational.

### Pooling Possibilities 1b:

We now examine the same strategy profile for the firm, but under an alternative belief structure.

#### 1. Firm's Strategy:

$$\sigma_F(m = s) = \sigma_F(m = w) : L_F = L - p \widehat{\theta}_S(\tau_G(0)) + (1 - p) \widehat{\theta}_W(\tau_G(0)),$$

$$\text{when } L > p \widehat{\theta}_S(\tau_G(0)) + (1 - p) \widehat{\theta}_W(\tau_G(0)); L_F = \epsilon \rightarrow 0 \text{ otherwise.}$$

This states that the firm contributes just enough to make the government indifferent between initiating the case and not initiating, or if the total litigation cost is less than the expected payoff to the government of initiating, the firm contributes some arbitrarily small amount.

#### 2. Government's Beliefs:

$$Pr(\theta_S | L_F > 0) = p$$

$$Pr(\theta_S | L_F = 0) = 0$$

In this belief structure, the government maintains their prior when the firm contributes since the firm has a pooling strategy and contributes on the path, but updates their belief that the case is weak if the firm does not contribute off the path.

#### 3. Government Strategy:

If  $L_F > 0$ , then:

$$\sigma_G = I_G \text{ when } L_G - .25 \leq .5p; \neg I_G \text{ otherwise.}$$

If  $L_F > 0$ ,  $Pr(\theta_S) = p$

$$EU_G(I_G) = p(\widehat{\theta}_S(\tau_G(0)) - L_G) + (1 - p)(\widehat{\theta}_W(\tau_G(0)) - L_G) = .5p + .25 - L_G$$

$$EU_G(\neg I_G) = 0$$

$I_G$  if  $L_G - .25 \leq .5p$ ;  $\neg I_G$  otherwise.

If  $L_F = 0$ , then:

$\sigma_G = I_G$  when  $.25 \geq L$ ;  $\neg I_G$  otherwise.

If  $L_F = 0$ ,  $Pr(\theta_S) = 0$

$$EU_G(I_G) = \widehat{\theta}_W(\tau_G(0)) - L_G = .25 - L_G = .25 - L$$

$$EU_G(\neg I_G) = 0$$

$I_G$  if  $.25 \geq L$ ;  $\neg I_G$  otherwise.

#### 4. Sequential Rationality:

We now consider whether the beliefs and strategies are sequentially rational.

Consider the situation when the case is weak and:

$$\widehat{\theta}_W(\tau_F(0)) < L - p \widehat{\theta}_S(\tau_G(0)) + (1 - p) \widehat{\theta}_W(\tau_G(0)), \text{ and}$$

$$L > p \widehat{\theta}_S(\tau_G(0)) + (1 - p) \widehat{\theta}_W(\tau_G(0))$$

The firm's strategy is to contribute the minimum amount necessary to make the government indifferent between initiating and not, which is:

$$L_F = L - p \widehat{\theta}_S(\tau_G(0)) + (1 - p) \widehat{\theta}_W(\tau_G(0)) > .25.$$

Having contributed enough, the government will then initiate the case. This results in the following expected payoff to the firm:

$$EU_F(L_F = L - p \widehat{\theta}_S(\tau_G(0)) + (1 - p) \widehat{\theta}_W(\tau_G(0))) = \widehat{\theta}_W(\tau_F(0)) - L_F$$

$$= .25 - L_F < 0$$

Because the firm contribution is greater than the firm's expected payoff for a weak case, the expected payoff to the firm is strictly negative.

Payoff from deviation:

If the firm chooses to contribute nothing, the government will not initiate the case and the expected payoff to the firm is:

$$EU_F(L_F = 0) = 0$$

The expected payoff to the firm for deviating and not contributing is strictly greater than the payoff for contributing, and thus the conjectured equilibrium is not sequentially rational.

### Pooling Possibility 2a:

In this potential alternative equilibrium, we conjecture that the firm does not contribute ( $L_F = 0$ ) for both weak and strong cases. The equilibrium does not hold, because the firm would deviate when the case is strong and a contribution up to the firm's expected payoff of a strong case is sufficient to convince the government to initiate the case.

We consider this equilibrium under multiple belief structures. In each set of beliefs the government believes the case is strong with probability  $p$  when the firm does not contribute (on the path). We then look at two extremes for off the path beliefs, where the government first believes the case is strong when the firm does not contribute, followed by the belief that the case is weak when the firm does not contribute.

1. Firm's Strategy:

$$\sigma_F(m = s) = \sigma_F(m = w) : L_F = 0$$

2. Government's Beliefs:

$$Pr(\theta_S | L_F = 0) = p$$

$$Pr(\theta_S | L_F > 0) = 1$$

In this belief structure, the government maintains their prior when the firm does not contribute since the firm has a pooling strategy and does not contribute on the path, but updates their belief that the case is strong if the firm does contribute off the path.

3. Government Strategy:

If  $L_F = 0$ , then:

$$\sigma_G = I_G \text{ when } L \leq .5p + \widehat{\theta}_W(\tau_G(0)); \neg I_G \text{ otherwise.}$$

If  $L_F = 0$ ,  $Pr(\theta_S) = p$

$$\begin{aligned} EU_G(I_G) &= p(\widehat{\theta}_S(\tau_G(0)) - L_G) + (1 - p)(\widehat{\theta}_W(\tau_G(0)) - L_G) = .5p + .25 - L_G \\ &= .5p + .25 - L \end{aligned}$$

$$EU_G(\neg I_G) = 0$$

$$I_G \text{ if } L \leq .5p + .25$$

If  $L_F > 0$ , then:

$\sigma_G = I_G$  when  $L - \widehat{\theta}_S(\tau_G(0)) \leq L_F$ ;  $\neg I_G$  otherwise.

If  $L_F > 0$ ,  $Pr(\theta_S) = 1$

$$EU_G(I_G) = \widehat{\theta}_S(\tau_G(0)) - L_G = .75 - (L - L_F) = .75 - L + L_F$$

$$EU_G(\neg I_G) = 0$$

$I_G$  if  $L_F \geq L - .75$ ,  $\neg I_G$  otherwise.

#### 4. Sequential Rationality:

We now consider whether the beliefs and strategies are sequentially rational.

Consider the situation when the case is weak and:

$$.5p + \widehat{\theta}_W(\tau_j(0)) < L < \widehat{\theta}_W(\tau_j(0)) + \widehat{\theta}_S(\tau_j(0)) = 1$$

The firm's strategy is to not contribute ( $L_F = 0$ ). Because  $L > .5p + \widehat{\theta}_W(\tau_j(0))$ , the government does not initiate the case. This results in the following expected payoff to the firm:

$$EU_F(L_F = 0) = 0$$

Payoff from deviation:

If the firm chooses to contribute, it will contribute the minimum amount to make the government indifferent between initiating and not initiating, which is:

$$L_F = L - \widehat{\theta}_S(\tau_G(0)) = L - .75$$

Because the government believes the case is strong when the firm contributes, the government initiates the case once the firm contributes, which results in the following expected payoff to the firm:

$$EU_F(L_F = L - .75) = \widehat{\theta}_W(\tau_F(0)) - L_F = .25 - L_F$$

Given that  $L < \widehat{\theta}_W(\tau_j(0)) + \widehat{\theta}_S(\tau_j(0)) \Rightarrow L < 1$

$$\Rightarrow L_F = L - .75 < .25 \Rightarrow L_F < .25$$

$$\Rightarrow EU_F(L_F = L - .75) = .25 - L_F > 0 = EU_F(L_F = 0)$$

The expected payoff for the firm deviating and contributing just enough to convince the government to initiate the case is strictly greater than the payoff for not contributing, and thus the conjectured equilibrium is not sequentially rational.

### Pooling Possibility 2b:

We now examine the same strategy profile for the firm, but under an alternative belief structure.

1. Firm's Strategy:

$$\sigma_F(m = s) = \sigma_F(m = w) : L_F = 0$$

2. Government's Beliefs:

$$Pr(\theta_S | L_F = 0) = p$$

$$Pr(\theta_S | L_F > 0) = 0$$

In this belief structure, the government maintains their prior when the firm does not contribute since the firm has a pooling strategy and does not contribute on the path, but updates their belief that the case is weak if the firm does contribute off the path.

3. Government Strategy:

If  $L_F = 0$ , then:

$$\sigma_G = I_G \text{ when } L \leq .5p + \widehat{\theta}_W(\tau_G(0)); \neg I_G \text{ otherwise.}$$

If  $L_F = 0$ ,  $Pr(\theta_S) = p$

$$\begin{aligned} EU_G(I_G) &= p(\widehat{\theta}_S(\tau_G(0)) - L_G) + (1 - p)(\widehat{\theta}_W(\tau_G(0)) - L_G) = .5p + .25 - L_G \\ &= .5p + .25 - L \end{aligned}$$

$$EU_G(\neg I_G) = 0$$

$$I_G \text{ if } L \leq .5p + .25$$

If  $L_F > 0$ , then:

$$\sigma_G = I_G \text{ when } L - \widehat{\theta}_W(\tau_G(0)) \leq L_F; \neg I_G \text{ otherwise.}$$

If  $L_F > 0$ ,  $Pr(\theta_S) = 0$

$$EU_G(I_G) = \widehat{\theta}_W(\tau_G(0)) - L_G = .25 - (L - L_F) = .25 - L + L_F$$

$$EU_G(\neg I_G) = 0$$

$$I_G \text{ if } L_F \geq L - .25, \neg I_G \text{ otherwise.}$$

#### 4. Sequential Rationality:

We now consider whether the beliefs and strategies are sequentially rational.

Consider the situation when the case is weak and:

$$.5p + \widehat{\theta}_W(\tau_j(0)) < L < \widehat{\theta}_W(\tau_j(0)) + \widehat{\theta}_S(\tau_j(0)) = 1$$

The firm's strategy is to not contribute ( $L_F = 0$ ). Because  $L > .5p + \widehat{\theta}_W(\tau_j(0))$ , the government does not initiate the case. This results in the following expected payoff to the firm:

$$EU_F(L_F = 0) = 0$$

Payoff from deviation:

If the firm chooses to contribute, it will contribute the minimum amount to make the government indifferent between initiating and not initiating, which is:

$$L_F = L - \widehat{\theta}_W(\tau_G(0)) = L - .25 \Rightarrow L_G = \widehat{\theta}_W(\tau_G(0))$$

Because the government believes the case is weak when the firm contributes, the government only initiates the case once the firm contributes enough, such that  $L_G \leq \widehat{\theta}_W(\tau_G(0))$ , which results in the following expected payoff to the firm:

$$EU_F(L_F = L - .25) = \widehat{\theta}_S(\tau_F(0)) - L_F = .75 - L_F$$

Given that  $L < \widehat{\theta}_W(\tau_j(0)) + \widehat{\theta}_S(\tau_j(0)) \Rightarrow L < 1$

$$\Rightarrow L_F = L - .25 < .75 \Rightarrow L_F < .75$$

$$\Rightarrow EU_F(L_F = L - .25) = .75 - L_F > 0 = EU_F(L_F = 0)$$

The expected payoff for the firm deviating and contributing just enough to convince the government to initiate the case is strictly greater than the payoff for not contributing, and thus the conjectured equilibrium is not sequentially rational.

#### A-4: Multiple Firms with Incomplete Information

This section discusses the role of private firm contributions when there are heterogeneous firms within an industry and uncertainty among the firms about how much they each value initiating the WTO dispute. Rather than focusing on the government's uncertainty about the strength of the case, this extension holds the strength of the case constant and examines how uncertainty over heterogeneous valuations by firms within an industry affect the likelihood that firms contribute a sufficient amount for the case to be brought.

Building from the previously discussed model, I examine the set of cases where the litigation cost is sufficiently high such that the government will not initiate the case on its own ( $L > .5p + .25$ ). It is helpful to consider the government's decision to initiate the dispute as a provision of a public good, where each firm in the industry values initiating the case at  $V_i = \tau_i(0) - \tau_i(1)$ .<sup>1</sup> The values for individual firms are independently drawn from a continuous distribution  $F$ , and each firm only knows its own value, although each knows the distribution from which the values were drawn.<sup>2</sup>

In the two player game, it was shown that for given parameters, the firm could contribute  $L_F^*$  which was the necessary threshold for the government to initiate the case. In this extension,  $L_F^*$  is the cost of the "public good," or the necessary contribution threshold that the firms must reach for the government to bring the case. I allow  $L_F$  to be the sum of litigation contributions ( $L_i$ ) from all firms within the industry. Because firms' litigation contributions involve sinking costs into the litigation process through fact finding and preparation of materials, I consider firms' contributions to be non-refundable in the model. This means that if firms contribute and fail to reach the necessary threshold ( $L_F^*$ ), the costs are sunk.

Given this setup, which is based on a set of realistic assumptions drawing upon how the

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<sup>1</sup>In the two-player game, the value would be multiplied by the probability of winning the case; however, since this extension holds the strength of the case constant, this component is dropped from the analysis since it does not affect the comparative statics.

<sup>2</sup>In this way, each firm has private information about their value, although they all share a common distribution within the industry, which provides a level of commonality for all firms within a given industry.

WTO litigation process functions, this game is best described as a contribution game with uncertainty and heterogenous preferences. The game is formalized through the existence of  $N \geq 2$  firms, where each firm  $i, i, \dots, N$ , only knows his own value ( $V_i$ ) for initiating the case, which will be brought if the the firms contribute a combined  $L_F^*$ . This type of game has been analyzed in the generic form (for the provision of any discrete public good) by Menezes, Monteiro, and Temimi (2001) in “Private Provision of Discrete Public Goods with Incomplete Information.”

Since the game has been thoroughly analyzed elsewhere, I draw from the earlier insights and discuss the key implications for dispute initiation in the WTO. To illustrate the connection between between the specifics of the game here and the work of Menezes, Monteiro, and Temimi (2001), the following lines specify how the games are linked.

1. In each game there are  $N \geq 2$ , where  $i, i, \dots, N$ , knows its own value ( $V_i$ ), but only knows the distribution of others’ values ( $F$ ).
2. The cost of providing the public good for Menezes, Monteiro, and Temimi (2001, 496) is  $c$ , which is equivalent to  $L_F^*$ . This holds, given that for any set of constant parameters there exists an  $L_F^*$  such that the government will initiate the case.
3. In each game, the individual players make a simultaneous decisions to contribute, where the contribution is any amount greater than or equal to zero ( $L_i \geq 0$ ).
4. The “public good” is dichotomous, as shown by the government’s decisions to either initiate ( $I_G$ ) or not initiate ( $\neg I_G$ ) the case.

In this set up, Menezes, Monteiro, and Temimi (2001) prove the following theorem.

Theorem 1. Suppose  $F: [0, \infty) \rightarrow \mathbb{R}$  is a continuous distribution. Suppose there are  $N \geq 2$  players for a project with cost  $c > 0$  and that  $F(c) < 1$ . Then there exists an  $\alpha > 0$ , where  $\alpha$  solves  $\alpha F(\alpha)^{N-1} = c$  such that

$$b(v) = \begin{cases} 0, & \text{if } v \leq \alpha \\ c, & \text{if } v > \alpha, \end{cases}$$

is an equilibrium strategy for the contribution game.

Theorem 1 implies that when the cost of the provision is not prohibitively high as to prevent a single player from providing the good, there always exists an equilibrium where a player with a *sufficiently large valuation* provides the good himself. (emphasis in original)

From this, we can consider the situation when there are multiple industries, each with multiple firms. All else equal, in expectation the industry that has the firm with the highest valuation (and ability to contribute) will be the most likely to have at least one firm where  $v > \alpha$ , and is thus the most likely industry in which a firm would contribute and a dispute would be initiated. Based on this, in the empirical section I examine how the size of dominant firms within industries affects the likelihood of WTO dispute initiation.

Menezes, Monteiro, and Temimi (2001, 503) also show that, when no single firm can afford to pay the cost of providing the public good, and the cost of the good is high enough (“slightly above the aggregate mean of the valuations”) then the unique equilibrium of the game is to contribute nothing.

Theorem 2. If the public project cost is higher than  $C_N$ , then the unique equilibrium of the contribution game is the strong free riding equilibrium, i.e.  $(b_1(\cdot), \dots, b_N(\cdot))$ , where  $b_i(v) \equiv 0$ .

This theorem implies that as the average value for firms within an industry declines, it is increasingly likely that they contribute nothing and the dispute will not be initiated. Conversely, as the average value for firms within an industry increases, it is increasingly likely that they contribute and the dispute will be initiated. Based on this, in the empirical

section I examine how the average size of firms within industries affects the likelihood of WTO dispute initiation.

## A-5. Sample Variation in Empirical Models

Due to data limitations, the number of observations varies in the empirical analysis of the paper. In the following table, the models from Table 1 are replicated, but use the same constrained sample across all models. The results show that the main results are not an artifact of the changing samples across models.

Table 1: Random Effects Logistic Regression of WTO Dispute Complaints

	Model 1	Model 2	Model 3	Model 4	Model 5
Product-Specific Barrier	1.329** (0.54)	1.352** (0.55)	1.325** (0.54)	1.526** (0.60)	1.840*** (0.66)
Dominant Firm Capacity	0.330** (0.16)	0.360** (0.17)	0.340** (0.16)	0.296* (0.16)	0.320* (0.17)
Trade Barrier Distortion	2.089*** (0.78)	2.093*** (0.80)	2.117*** (0.78)	1.925** (0.78)	1.914** (0.81)
Negotiation Progress	-0.982** (0.47)	-0.918* (0.48)	-0.925** (0.47)	-1.073** (0.48)	-0.922* (0.48)
Trade Barrier Duration	-0.202 (0.14)	-0.212 (0.14)	-0.211 (0.14)	-0.201 (0.13)	-0.0999 (0.16)
EU		0.809 (1.11)			1.849 (1.41)
Japan		0.371 (1.28)			0.468 (1.66)
Mexico		1.307 (1.47)			1.086 (2.08)
Korea		0.209 (1.26)			-3.650 (3.03)
NonOECD		-0.137 (1.18)			-5.407 (4.20)
US Exports to Trade Partner			0.148 (0.24)		-2.283* (1.38)
Industry Production			-0.00794 (0.30)		0.165 (0.52)
Industry Political Contributions				-0.00725 (0.23)	0.0249 (0.36)
Active 301				1.660** (0.73)	2.090** (1.06)
Constant	-8.719*** (1.70)	-9.353*** (2.09)	-12.39 (7.83)	-8.464** (4.18)	46.45 (35.53)
Observations	1407	1407	1407	1407	1407

\*  $p < .1$ , \*\*  $p < .05$ , \*\*\*  $p < .01$

This table reports results using the smallest subset of data with results reported in Table 1 of the main paper. Random effect models calculated using xtmeologit with STATA14. Random intercepts calculated for groups at the industry level, defined as the ISIC3 4 digit industry. Canada is the omitted comparison. P-values are calculated using a two-tailed test and standard errors are displayed in parenthesis.

## A-6. Industry Level Fixed Effects

It is possible that certain industries are more or less likely to engage in trade disputes, regardless of dominant firm capacity. In the main analysis this concern is addressed by using a multilevel random effects model, which allows each industry to have its own intercept, while allowing for the effects of the key variables of interest to be analyzed across the dataset. However, to isolate the effect of *within* industry variation the following table replicates the models from Table 1, but uses fixed effects models, with fixed effects for each industry. In the main paper, the choice to use the random effects model was evaluated using a Hausman test, comparing the random effects model to a fixed effects model (Hausman 1978), with both the random effects and fixed effects at the ISIC3 4-digit level. The finding showed the null hypothesis – that the random effects model is consistent – cannot be rejected ( $\text{prob} > \chi^2 = 0.29$ ). However, using a fixed effect model at the ISIC 4-digit level would result in 51 groups being dropped due to lack of variation in the dependent variable. To compensate for the lose in efficiency, the fixed effect model shown here is run with fixed effects at the ISIC 2-digit level. This allows us to examine how changes in the variables of interest affect dispute initiation within industries. The results are consistent with those reported in the body of the paper, showing that Dominant Firm Capacity is not just capturing other traits of the industry.

Table 2: Fixed Effects Logistic Regression of WTO Dispute Complaints

	Model 1	Model 2	Model 3	Model 4	Model 5
Product-Specific Barrier	1.191* (0.61)	1.069* (0.65)	1.151* (0.64)	1.302** (0.65)	1.486* (0.79)
Dominant Firm Capacity	0.563** (0.26)	0.664** (0.33)	0.554* (0.29)	0.478* (0.27)	0.734* (0.39)
Trade Barrier Distortion	2.525*** (0.81)	2.560*** (0.86)	2.410*** (0.81)	2.343*** (0.82)	2.314** (0.94)
Negotiation Progress	-1.328*** (0.48)	-1.167** (0.49)	-1.192** (0.51)	-1.327*** (0.49)	-1.026** (0.51)
Trade Barrier Duration	-0.189 (0.13)	-0.183 (0.13)	-0.178 (0.14)	-0.183 (0.14)	-0.0336 (0.17)
EU		1.100 (1.29)			3.071 (2.22)
Japan		0.613 (1.43)			0.960 (2.57)
Mexico		0.814 (1.41)			1.260 (2.85)
Korea		-0.199 (1.46)			-4.068 (4.65)
NonOECD		-0.0198 (1.36)			-5.253 (6.37)
US Exports to Trade Partner			0.193 (0.30)		-2.552 (2.00)
Industry Production			-0.346 (1.05)		0.153 (2.08)
Industry Political Contributions				-0.127 (0.93)	0.317 (1.18)
Active 301				1.467 (0.94)	2.157 (1.54)
Observations	1059	1059	999	1056	996

\*  $p < .1$ , \*\*  $p < .05$ , \*\*\*  $p < .01$

Fixed effect models calculated using xtlogit with STATA14. Fixed effects are at the industry level, defined as the ISIC3 2 digit industry. Canada is the omitted comparison.

P-values are calculated using a two-tailed test and standard errors are displayed in parenthesis.

## A-6. OLS Regression Analysis

To further probe the robustness of the results, I also replicate the analysis from Table 1 of the main paper, but now do so with ordinary least squares (OLS) regression. The OLS results show that the results are consistent regardless of model choice.

Table 3: OLS of WTO Dispute Complaints

	(1)	(2)	(3)	(4)	(5)
	Model 1	Model 2	Model 3	Model 4	Model 5
Product-Specific Barrier	0.0236*** (0.01)	0.0208*** (0.01)	0.0242*** (0.01)	0.0242*** (0.01)	0.0241*** (0.01)
Dominant Firm Capacity	0.00344*** (0.00)	0.00337*** (0.00)	0.00286** (0.00)	0.00337*** (0.00)	0.00293** (0.00)
Trade Barrier Distortion	0.0204*** (0.01)	0.0199*** (0.01)	0.0185*** (0.01)	0.0204*** (0.01)	0.0197*** (0.01)
Negotiation Progress	-0.0101*** (0.00)	-0.00919** (0.00)	-0.0107*** (0.00)	-0.0104*** (0.00)	-0.0102** (0.00)
Trade Barrier Duration	-0.00141 (0.00)	-0.00141 (0.00)	-0.00158 (0.00)	-0.00115 (0.00)	-0.000357 (0.00)
Industry Political Contributions		-0.00167 (0.00)			0.000324 (0.00)
Industry Production		0.00206 (0.00)			0.00155 (0.00)
US Exports to Trade Partner			0.00233 (0.00)		-0.0276** (0.01)
Active 301			0.0473*** (0.01)		0.0362*** (0.01)
EU				0.0110 (0.01)	0.0167 (0.01)
Japan				0.00889 (0.01)	-0.00397 (0.01)
Mexico				0.0344** (0.02)	0.00411 (0.02)
Korea				0.00414 (0.01)	-0.0497** (0.02)
NonOECD				-0.000194 (0.01)	-0.0688** (0.03)
Constant	-0.0242** (0.01)	-0.0223 (0.04)	-0.0779 (0.06)	-0.0301** (0.01)	0.661** (0.29)
Observations	1635	1407	1635	1635	1407

Canada is the omitted comparison. Standard errors in parentheses

\*  $p < .1$ , \*\*  $p < .05$ , \*\*\*  $p < .01$

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