ABSTRACT

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With 150 member countries, and 29 more currently in the process of accession, the World Trade Organization (WTO) is the most important body governing international trade. However, there is little theory on how governments choose between alternative redistribution policies and no work has been done on the role of the WTO in this choice. In this dissertation we develop a theoretical model that explains how a particular set of WTO rules, the Agreement on Subsidies and Countervailing Measures (SCM), affect the choice and the level of tariffs and subsidies -- two of the most important and frequently observed redistribution policies -- in an acceding country. The WTO SCM agreement guides the subsidies that could be used by a member country, as well as, provides other members with retaliatory measures if these subsidies hurt their interests. We show that, as a country joins the WTO, there will be an increase in its tariffs in those sectors that face a threat of retaliation against subsidies. Our model also offers a new explanation for why a

country would want to join the WTO. According to our model, the government would like to be a part of the organization since that would increase its utility through an improved bargaining position vis-à-vis the domestic lobbies. We provide a numerical example to illustrate this channel.

In the second part of the dissertation we test the prediction of our theoretical model that the sectors, which after accession face a positive probability of retaliation to subsidization, will experience a switch towards tariffs as an alternative instrument of income redistribution. Since Countervailing Duties (CVD) are the most frequently used measure to retaliate against subsidies, we construct a product level database on CVD duties imposed during 1995-2001 by four major users of CVD -- Australia, Canada, the EU, and the US -- and use it to test the above prediction of the model for the case of China's accession to the WTO in 2001 and Taiwan's accession to the WTO in 2002. We use the underlying variation in the way countervailing duties are targeted across different industries to derive a proxy for the threat of retaliation faced by Chinese (Taiwanese) industries at the time of the country's accession to the WTO. We show that in case of both countries accession to the WTO led to a relative increase in tariffs for sectors facing a higher threat of retaliation by CVD. We also show that, as predicted by the model, the increase in tariffs was larger in sectors with higher costs imposed by retaliation.

WTO ACCESSION AS COMMITMENT: THEORY AND EVIDENCE
FROM THE CHOICE OF REDISTRIBUTION POLICIES

By

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DEDICATION

To Mummy, Papa, Chhotu, and Dabloo Da

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INTRODUCTION

One of the leading explanations for the existence of trade barriers is that they are used by the government to redistribute income towards the domestic private sector. However this explanation is incomplete, as it ignores the question of why trade barriers are chosen for redistribution when other domestic policies could also achieve the same goal, and possibly at a lower cost. This dissertation addresses this question of the choice among alternative policies by looking at production subsidies and tariffs – two such widely used instruments in practice – and how external commitments imposed on their members by international organizations can affect that choice. In particular, we analyze the decision of a country to become a member of the World Trade Organization (WTO) and show how the WTO rules guiding production subsidies and tariffs can affect the choice and the level of these policies used in the acceding country. We also provide a new explanation for why a country would like to become a member of the WTO and provide evidence in support of our theoretical model of the impact of these WTO rules by using China's and Taiwan's accession to the WTO as case studies.

The dissertation consists of four chapters. The first chapter provides a brief overview of the relevant branches of the literature on the choice of redistribution policy and on the accession to the WTO. We also include a brief outline of the WTO accession process and the WTO Agreement on Subsidies and Countervailing Measures (SCM), since in our theoretical model we show that the WTO regulations on subsidies serve as an important commitment device for its member governments. Note that according to the WTO accession process member countries are bound by terms agreed to at the time of accession, which include the SCM agreement. The SCM agreement defines what constitutes subsidies, lays down the rules regarding subsidies that can be used by the member countries, and also guides the retaliatory actions that other members can take against the

subsidizing country if subsidies hurt their interests.

The second chapter outlines the theoretical model we use to explain how the levels of tariffs and subsidies are decided by taking into account the rules under the SCM agreement. We show that the government would gain from constraining its use of subsidies, as doing so improves its bargaining position vis-à-vis the lobbies. The government would seek membership of the WTO as the threat of retaliation against subsidies inherent in the SCM agreement makes the government's commitment to not use subsidies more credible. This source of gain to the government is distinct from what has been argued in the literature and hence provides a new explanation for why a country would like to join the WTO. We derive conditions under which the government would gain from joining and provide a numerical example to illustrate how the proposed channel works.

In Chapter 2 we also show that entry into the WTO increases the incentive to use an alternative, relatively less efficient form of redistribution policy (tariffs), for those products where the government's commitment to not use subsidies is more credible i.e. in the sectors where the threat of retaliation against subsidies is higher. This is an important testable prediction since not all subsidies are subject to automatic retaliation under the SCM agreement, as we explain in Chapter 1. Furthermore, existing evidence suggests that some products tend to be retaliated against much more than others, indicating that different sectors face different levels of threat of retaliation.

This result that tariffs will go up for some products is especially interesting given that the WTO accession is generally associated with a decline in tariffs. Whether that is true is in itself debatable, with some recent papers suggesting that GATT/WTO membership does not result in lower trade barriers (Rose (2004b)). However, there are special features of the WTO rules (SCM) that have the opposite effect, and, according to our model, it is precisely these features that determine

the government's desire to join the WTO.

In Chapter 3 we empirically test the above prediction of the model that tariffs will come to be used as a tool for redistribution in those sectors that face a threat of retaliation against subsidy. We test this hypothesis using China's accession to the WTO in December 2001 as a case study. One of the most important variables needed to conduct this exercise is a measure of China's perceived threat of retaliation against Chinese subsidies by other members. Since according to the SCM agreement, Countervailing Duties (CVD) are one of the main instruments that member countries can use against the subsidizing country, we derive the measure of threat of retaliation using data on past CVD duties used by the members. Hence, to this end, we construct a novel dataset on CVD duties used by four majors users of CVDs – Australia, Canada, the EU, and the US (that together account for approximately fifty percent of China's trade) – against all other members of the WTO between 1995 and 2001 i.e. since the inception of the WTO to the accession of China to the WTO.

Note that, according to several scholars, the primary role of the CVD is to act as a deterrent against 'unfair' subsidy practices of the member governments. Along these lines Hoekman & Kostecki (1995) note, "...There are two possible rationales for responding to foreign subsidies [via CVD]. The first [rationale], to offset injurious effects of such policies on domestic industries, ...has little economic merit. [Instead] the argument that [the CVD is used to restrict] imports of products that have benefited from unfair government assistance, ..as a means of inhibiting the use of such measures, has greater economic merit..." (page 332).[1]

The results in Chapter 3 show that there was a relative increase in China's tariffs, as it acceded to the WTO, for sectors that faced a positive probability of getting retaliated against. This adverse impact on tariffs is not only statistically

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[1] [] and commas added. Also see Deardorff & Stern (1987).

but also economically significant. According to our most conservative estimates, as China entered the WTO there was a relative increase in its tariffs of at least 0.5 percentage points, or of about 9%, for those products that faced a threat of retaliation against subsidies compared to those that did not. We also find that, consistent with the theoretical model, the impact of the threat of retaliation was higher for those sectors that faced a greater cost due to retaliation. In fact, according to our estimates, while for those sectors that did not face a threat of retaliation a 1% increase in exports would lead to a 1.2% decrease in tariffs, the same 1% increase in exports would result in a 3% *increase* in tariffs for sectors that faced a threat of retaliation.

In order to test the validity of our results we perform several sensitivity and robustness exercises. We show that these results are robust to alternative specifications, sample sizes and outliers. In one of the more interesting counterfactual exercises to confirm that the results are indeed due to the threat of retaliation and not to some underlying unobservables, we show that we do not get the same results if we use the sample years before China entered the WTO i.e. before it faced the threat of retaliation.

While the robustness of these results and the counterfactual exercises show that our main hypothesis is supported by the data, some questions still remain unanswered. Are these empirical results specific to China or can they be generalized to other countries? The theoretical model assumes a small country, while China is a large country according to most measures, so should we expect to find similar results in the case of a small country? The fourth chapter attempts to answer these questions by using the case of Taiwan's accession to the WTO to test the hypothesis of the theoretical model presented in Chapter 2. The case of Taiwan is especially interesting since Taiwan acceded to the WTO in January 2002, around the same time China did, hence making the timing of the two studies

comparable.

Looking at the case of Taiwan we again find support for our hypothesis that there was a relative increase in its tariffs for those sectors that faced a threat of retaliation against subsidies compared to the sectors that did not. The threat of retaliation in the case of Taiwan seems to have been even more significant owing to the fact that Taiwan was a relatively free economy even before acceding to the WTO. Our estimates indicate that, as Taiwan entered the WTO, the threat of retaliation led to a relative increase in its tariffs of about 1 percentage point or about 65% for those products that faced retaliation. We also find similar results for the counterfactual exercise: the threat of retaliation was not important in the period before Taiwan entered the WTO.

This dissertation contributes to the literature in many ways. First, it provides a model that explains the equilibrium level of tariffs and production subsidies chosen by the WTO members and non-members in the presence of special interest groups. Thus, it contributes to the literature on the political economy of trade policy that seeks to explain the existence of trade barriers as a result of a politically-motivated government that trades policy favors in exchange for contributions from special interest groups. Second, this model can explain why the government would want to chose a relatively inefficient policy such as a tariff, to achieve the same goal that could be met through a less distortionary policy, production subsidy. Hence, it shows a new motive for the government to join the WTO: as a commitment device that makes subsidies costly, thereby improving its bargaining position vis-à-vis the lobbies and hence increasing its own utility.

Third, by looking at the case of China's and Taiwan's accession to the WTO, and finding that the threat of retaliation on subsidies has an impact on the level of tariffs in the acceding country, this dissertation contributes to two branches of empirical literature. First, since the threat of retaliation is against subsidies, which

in turn affects the level of tariffs, this study is one of the few empirical studies to show a link between these two important policies. Second, this dissertation also contributes to a relatively small but growing literature that tries to find the impact of the WTO membership on member countries.

While the evidence in the literature is mixed, with some studies concluding that the accession to the WTO does not have an impact on a member's trade policy, we show that there is convincing evidence of an impact once we take into account the specific rules more carefully and go beyond the aggregated data typically employed. Showing that the WTO SCM rules hinder tariff liberalization is especially important and timely given the fact that the WTO World Trade Report (2006), which focuses on subsidies and the associated role by the WTO, recognizes the importance of this question but admits that there are no existing studies with evidence to this effect so far.

Apart from the above contributions, as with any new topic of research, this dissertation also raises a number of interesting and exciting questions to be pursued in future work which we discuss in the conclusion of each chapter.

CHAPTER 1

1 Literature Review, WTO Accession and SCM Rules

1.1 Introduction

Despite a considerable decline in trade barriers in the past fifty years, there still exist significant barriers to trade across the world. This is especially puzzling given the fact that, once we take the retaliation by the trade partners into account, these tariff barriers are typically welfare reducing even for the large countries. This puzzle of the existence of tariff barriers has been explained by several political economy models as a natural outcome when the policy maker places different weights on the welfare of different groups in society.

However, this explanation for tariffs raises a puzzle of its own: if the objective is to favor a particular group, then why use trade policy, a relatively inefficient instrument, to meet this goal. In fact, as pointed out by Rodrik (1995), the entire political economy literature of trade policy actually is a literature of re-distribution (page 1470). Thus according to him the yet unresolved puzzle is why we see inefficient redistribution policies being used in the equilibrium. In Grossman & Helpman (1994), one of the most prominent political economy models of trade policy, this outcome arises because the government is constrained to have access only to trade policies. In fact Dixit, Grossman & Helpman (1997) show that once we allow government access to efficient policies to transfer resources, in addition to the inefficient ones, we will see only the efficient policies being used in equilibrium.[2]

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[2] The paper describes how interactions among lobbies give rise to a prisoner's dilemma in which the more efficient policy is used, but the lobbies are worse off, and hence, inefficient

In this dissertation we present a model to explain the choice between tariffs and subsidies and we show how the WTO accession affects this choice. In this chapter we provide the necessary information to motivate our theoretical and empirical strategies adopted in subsequent chapters. The rest of the chapter is structured as follows. In Section 1.2, we review two existing branches of literature that this dissertation brings together: the literature on the choice of redistribution policies especially in the context of the trade policies, and the literature discussing some of the reasons why countries join the WTO. Section 1.3 briefly describes the WTO accession process and Section 1.4 presents the rules that guide subsidies.

1.2 Literature Review

1.2.1 Redistribution Policies

As mentioned in the introduction to this chapter, a puzzle in the trade policy literature is why tariffs are used for redistribution, when the same goal can be achieved through a more efficient instrument such as production subsidies? A number of theoretical explanations have been given in order to resolve this puzzle and they typically fall in one of two categories. The first branch of literature, while maintaining the traditional benevolent role of the government, explains this puzzle by arguing that the ranking of various alternative policies themselves might get reversed under different circumstances.

In the early literature the traditional view was that, in the absence of any market power, direct instruments (production subsidies) are better than trade policy (e.g. tariff) to redistribute income (Bhagwati & Ramaswami (1963)). However, Bhagwati & Srinivasan (1980) and Krueger (1974) show that in presence of rent seeking behavior (Directly Unproductive Activities), the welfare ranking of subsidies and tariffs might get reversed even in a small economy. Similarly,

policies can arise if the lobbies can coordinate their actions.

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Rodrik (1986) argues that allowing for endogenous policy making would lead to a *perverse* welfare ranking given the firm-specific nature of subsidies.[3] Thus, these arguments posit that the policy maker is a benevolent agent who chooses the best instrument available for the task, though the ranking of instruments might itself be different (See Becker (1983)).

Another branch of literature, on the other hand, maintains the "traditional" ordering of policy instruments, but argues that inefficient policy would exist in equilibrium due to the strategic choice made by the players. For example, Coate & Morris (1995), formalizing the idea put forward by Tullock (1983), argue that government might use relatively inefficient instruments as a means of disguised transfer to special interest groups in the presence of asymmetric information. They note, however, that this explanation requires asymmetric information about both the type of the politician as well as the effect of the policies and, hence, can not be used to explain the existence of tariffs.

A separate argument is made by Staiger & Tabellini (1987), who show that tariffs might be preferred by the government over subsidies as a result of the government's inability to commit to a future policy. They explore the case of a small open economy where the government has an incentive to redistribute income in the face of a terms of trade shock. They show that, if the government is restricted to using time-consistent policies, it may rationally choose a regime where only tariffs are used and no subsidies.

In the Staiger & Tabellini (1987) framework protection arises due to redistribution concerns and not due to lobbying pressures. On the other hand, in their "protection for sale" model, Grossman & Helpman (1994) argue that, in the presence of intense lobby competition, lobbies themselves would prefer the inefficient

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[3] A similar argument is made by Mitra (2000) in the context of lobbying and the free rider problems associated with tariffs, though in his model it is the capitalists, who favor tariffs over subsidies.

instrument, i.e. the tariffs over subsidies. According to this model the government is a self-interested agent, who values both general welfare and contributions from special interest groups. These special interest groups in turn provide the government with contributions in exchange for protection. Since, due to intense competition among lobbies, their efforts cancel out, but they have to pay higher contributions in the presence of subsidies, lobbies would prefer a political regime that only allows for tariffs.

Inherent in all this discussion about the choice of different instruments is the notion of these instruments being substitutes. However, as most of the above explanations predict only one instrument being used in equilibrium, the question of why both instruments are used, and more importantly, what is the effect of change in one policy on the other, remains.

In a recent paper, Drazen & Limão (2004) provide another explanation for why we see an inefficient instrument being used in equilibrium and show that in equilibrium efficient and inefficient policies may coexist. They consider the choice between lump-sum transfers and subsidies, as redistribution instruments, and show how the government would like to restrict the lump-sum transfer to improve its own welfare. The main idea in that paper is that the government might want to put a binding cap on the lump-sum transfers as that leads to an improvement in its bargaining position relative to the lobbies. Thus, while the size of the surplus is smaller, the increased bargaining position gives the government an ability to extract a larger fraction of the surplus. Furthermore, they show that, as in equilibrium there remains an opportunity to extract further surplus, we would see relatively less efficient instrument also being used. In chapter 2 of this dissertation we extend the model in Drazen & Limão (2004) to the choice between tariffs and production subsidies and to the context of accession to the WTO.

Empirical studies relating two instruments are even more scarce. One of the earlier papers to explicitly take the effect of one instrument over another in to account was Ray (1981). While trying to estimate the determinants of tariff and non-tariff barriers (NTBs) in the US, Ray (1981) used tariffs as an explanatory variable in the NTB equation along with other variables. He found a positive and significant effect of tariff on NTB in each of the specifications of NTBs that he used.[4] Thus, he observed that "...while it is not clear if the high non tariff barriers were the result of a tariff ceiling, or not, what is clear is that the same industries which are able to obtain high rate of tariff protection also get high non tariff barriers...".

There are two recent papers by Mitra, Thomakos & Ulubasoglu (2004) and Ederington & Minier (2006) that try to empirically test the choice between tariffs and subsidies.[5] The paper by Ederington and Minier uses cross-country data to explain the determinants of choice of policies at the aggregate level. On the other hand, Mitra et. al. study the choice of *protection* (tariffs) versus *promotion* (subsidies) using industry data in Turkey. This paper derives two separate estimating equations based on the Grossman & Helpman (1994) framework. In one case they constrain the government to have access to only tariffs while in the other case they limit the government's access to only production subsidies. Then they use the ratio of predictions from these different specifications to test determinants of the policy mix. However, doing so misses any interaction between the two policies by assumption and they themselves note the limitation of their theoretical model.[6]

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[4] He also checked the sequential ordering of tariff vs non tariff barriers and concluded that, while tariffs were important in determing NTBs, the reverse was not true.

[5] In another paper Ederington & Minier (2005) point out that papers estimating Grossman & Helpman (1994) are biased as they exclude domestic policies. Ederington & Minier (2005) derive expressions by including production subsidy in the Grossman & Helpman (1994) framework and use it to test the resulting predictions. However, in their empirical part, they focus on explaining total protection (subsidies+tariffs) and not on the choice between subsidies and tariffs.

[6] Mitra, Thomakos & Ulubasoglu (2004) notes that, "...introducing both trade taxes and subsidies and output taxes and subsidies in the same model can lead to a corner solution in

In our theoretical model the government has access to both tariffs and subsidies, and we show how threat of retaliation against subsidies affects the level of tariffs both theoretically and empirically.

1.2.2 WTO Accession

The General Agreement on Tariffs and Trade (GATT) was founded in 1947, after the end of the second world war, as an interim agreement between 23 contracting parties (see Hoekman & Kostecki (1995)). While several countries and custom territories had become a member of GATT since then, it was not until January 1995 that the World Trade Organization (WTO) was established as an international organization with a formal institutional structure.[7] Since then 22 countries have acceded to the WTO, Vietnam being the latest member to join on 11th January 2007. Vietnam's accession brought the total membership of WTO to 150 countries, while 29 more countries are currently in the process of accession.

There are two main lines of argument as to why a country would like to join the WTO. One branch of literature highlights the terms-of-trade reasons for joining the WTO, while the other suggests commitment reasons. According to the terms-of-trade motive (highlighted by Bagwell & Staiger (1999), (2002)), countries would like to be a part of these agreements since they provide a way to escape from the prisoners dilemma associated with unilateral liberalization. These papers emphasize the fact that a country that has some market power could gain from imposing tariffs as it improves the country's terms-of-trade by reducing the foreign export price. Since the cost of tariff protection is partly shared by the foreign country, the unilateral equilibrium involves greater protection for each

which only one type of policy instrument is used... Developing a model, ...[to explain both being used simultaneously, is] ...clearly beyond the scope of this paper which we view primarily as an empirical contribution to the literature." [ ] Added

[7] For an excellent book length treatment of the GATT/WTO as an institution and its rules see Hoekman & Kostecki (1995), (2001).

country making everyone worse off. Hence, the reciprocal liberalization inherent in the GATT/WTO agreement can increase welfare for every country.

In a recent paper Broda, Limão & Weinstein (2006) provide evidence that countries use their market power in setting trade barriers. In our model we assume a small open economy that is unable to influence the world price, hence, the terms-of-trade motive for trade agreement highlighted here does not apply.

The other group of papers focuses on the interaction between the government and domestic residents and emphasizes the commitment role of the trade agreements. Along these lines, Staiger & Tabellini (1987) argue that, in the presence of redistribution concerns following terms of trade shocks, the government would like to surprise workers with protection. However, since workers can not be systematically surprised, this leads to a time consistent but suboptimal equilibrium with excessive protection. Hence, the role of the GATT/WTO is to provide the government with a credible commitment mechanism through which it can achieve the optimal equilibrium.

A second channel through which the WTO provides the government of a small country with a commitment mechanism with respect to its domestic residents is highlighted by Maggi & Rodríguez-Clare (1998).[8] They show that, if capital is fixed in the short run but mobile in the long run, a politically motivated government with low bargaining power vis-a-vis the domestic lobbies might benefit from joining the trade agreement that leads to free trade. In their model this result arises because, while the government gains in the short-run from the contributions provided by domestic lobbies in exchange for protection, that leads to a resource misallocation in which the capital moves to the protected sector. Hence, the government would want to "tie its hands" by joining these agreements, as otherwise the short-run gains might be more than offset by the long-run losses

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[8] In a recent paper Maggi & Rodríguez-Clare (forthcoming) extend this framework to the case of a large country.

due to excessive investment in the protected sector.[9]

In this dissertation we highlight the role of the WTO as a commitment mechanism that is distinct from all these channels previously explored in the literature. In our model there is no time-inconsistency problem as the one outlined in Staiger & Tabellini (1987), nor is there any divergence between short and long-term objectives of the government as in Maggi & Rodríguez-Clare (1998). We also do not assume capital to be mobile across sectors. Instead, we highlight the role of the threat of retaliation against subsidies under the SCM agreement (explained below) as providing the commitment mechanism by which the WTO helps the government restrict its use of subsidies. More importantly, all the above papers highlight the role of the WTO in decreasing the level of tariffs. In contrast, according to our model tariffs will increase in precisely those sectors where the WTO subsidy rules provide a commitment role.

The empirical literature on the role of the GATT/WTO as a commitment mechanism is even more limited. In one of the first attempts to examine the role of GATT/WTO as a commitment device, Staiger & Tabellini (1999) study the tariff exclusions provided by the US government to certain sectors under the Tokyo round and under the GATT's escape clause. According to their empirical strategy, they expect the exclusion decisions associated with the Tokyo round to be negatively associated with the underlying production distortions, but those associated with the GATT escape clause to be positively associated if the GATT rules are used as a commitment device. Their results are mixed, but provide some support for the commitment role of the GATT/WTO.

In a recent paper, Bown (2004) tries to investigate the source of the commitment ability provided by the GATT/WTO. He looks at the dispute settlement

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[9] Mitra (2002) shows that if there are fixed costs of lobby formation, the government with low bargaining power with respect to the lobbies would commit to a free trade agreement, even in the absence of inter-sectoral mobility.

data for 1973-98 in an attempt to identify the economic and institutional determinants of the commitment power provided by GATT. He shows that it is the threat of retaliation of the trading partner that provides the government with the commitment ability to commit to tariff liberalization. This result is consistent with the theoretical and the empirical approach in our study that the government's commitment power is derived from the threat of retaliation provided under the WTO rules. However, there is an important difference: in contrast to the channel in Bown (2004), in our study the threat of retaliation is against subsidies which in turn leads to an increase in tariffs.

1.3   WTO Accession Process

Despite WTO's claiming a total membership of 150 countries, there is little guidance in terms of the specific rules to be followed during the process of GATT (and now WTO) accession. In fact, the WTO Article XII that guides the process of accession is remarkably brief, mentioning only that accession is to take place on the "terms to be agreed" between WTO members and the Applicant (WTO (2005)). While this lack of guidance in the WTO rules regarding the accession process implies that each case is unique in terms of its details and the total time involved, the steps of accession have followed an established pattern evolved over time and are outlined in a note drafted by the WTO Secretariat (Lanoszka (2001)).[10]

The process of accession to the WTO starts when a country or a customs territory submits an application to the General Council for membership. The General Council then establishes a working party consisting of all interested parties to guide the accession process. The applicant country submits a memorandum about its foreign trade regime including relevant statistical information, as well

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[10] For instance, the accession process of Kyrgyz Republic was completed in only 2 years and 10 months, while that of China took a total of 15 years and 5 months, since its application for membership.

as information about existing legislation. The working party members examine the memorandum and may ask questions to assess the conformity of the trade regime of the applicant with the WTO rules by establishing a fact finding committee. This is followed (accompanied) by the bilateral (plurilateral) negotiations between the applicant and interested members. During the bilateral negotiations the negotiations over market access largely take place over the trade policy of the applicant, while the benefit to the applicant is that it gets MFN treatment from the member countries.[11]

Thus, as we can see, the WTO negotiation process does not provide an explicit set of rules regarding the level of tariffs, which are to be determined according to the negotiations between the acceding country and the interested existing WTO members. We use this relative flexibility of the government in choosing tariffs in our theoretical model.

While the applicant's market access commitments on goods and services (such as levels of tariffs) are a result of bilateral negotiations, according to the GATT-94 undertaking, the multilateral rules agreed to in the WTO are applicable to all members and hence apply to the applicant at the date of accession.[12] In this respect the WTO (GATT-94 undertaking) is different from original GATT-47 in that under the original GATT treaty countries were free to choose if they wanted to become a party to a given agreement. One such agreement that is binding to all members on the date of accession, and is central to our work, is the one that guides subsidies and the legal actions available against subsidizing members – the Agreement on Subsidies and Countervailing Measures (SCM) – which we describe in more detail in the next section.

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[11] Note that, according to Article XIII any member can opt out of being a party to the agreement with an applicant at the time of its accession. However, this decision can only be made before accession.

[12] The exact details of the rules and the transition period can be negotiated during the accession process, however there is no fixed rule that allows for the transition period.

Once the country has finished the bilateral negotiations, the final outcome is summarized in a Schedule of Accession. At the same time the Working Party submits its report and the Protocol of Accession. These documents form the final "accession package" with which the applicant can become a member once the General Council approves with a two thirds majority, subject to ratification by the national parliament of the applicant country.

1.4 Subsidies and Countervailing Duties

The WTO Agreement on Subsidies and Countervailing Measures (SCM) defines subsidies and describes a set of rules that discipline both the use of subsidies and the actions that other members can take against subsidies. Any financial contribution from the government, or its agent, in the form of a direct transfer or grant, or acts which unfairly decrease the costs of domestic producers by providing incentives such as low interest loans, low priced raw materials or inputs such as water or electricity, or forgoing tax revenues etc. are considered to be subsidies in the sense of this agreement.[13]

According to the Agreement on Subsidies and Countervailing Measures, there are two main categories of subsidies: prohibited subsidies and actionable subsidies. Subsidies that are based on export performance or encourage use of domestic goods over imports fall into the category of prohibited subsidies. The second category – actionable subsidies – refers to those 'specific' subsidies that adversely affect or cause injury to the domestic industry of any member government.[14] A third category called non-actionable subsidies was also originally classified under this

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[13] Thus the WTO agreement gives a more precise definition of subsidy than the original Tokyo round subsidy agreement under GATT. However, there still is considerable ambiguity in the wording of the agreement, and the way it is interpreted by member countries. This ambiguity is evident from the discussions of members and can be seen from WTO reports involving several dispute settlement cases.

[14] Specific subsidies are the subsidies which target a particular industry or group of firms, either de jure or de facto.

agreement. Subsidies that either were non-specific or that were given for R&D or regional development were listed in this category. However, this third category expired on 31st December,1999 and has not been extended.[15],[16]

Classifying subsidies into different categories as prohibited and actionable points to the fact that a government is free to use actionable subsidies to pursue its own industrial policy as long as they do not hurt the interests of another member nation.[17] Thus, the WTO does not prohibit all forms of subsidies, nor does it imply that all subsidies will lead to automatic retaliation. Hence, in our theoretical model we allow for production subsidies to be used. However, as given in the SCM rules, we also include the possibility of retaliation by other WTO members.[18]

The SCM rules allow for two courses of retaliatory actions that member governments can take if they are hurt (or threatened) by the subsidies provided by a member. Subsidies are thought as hurting another member's interests if they hurt the domestic industry of "like products" in the complaining country, lead to a displacement of complaining member's exports to the subsidizing country, or cause displacement of its exports in a third country. Hence, we see that the WTO rules allow for retaliation against subsidies given to both import competing as well as the exporting sectors.

According to the SCM rules if the bilateral negotiations between the subsidizing country and another country which is hurt by the subsidies fails, the members

[15] (Source: Legal texts - Agreement on Subsidies and Countervailing Measures, Understanding the WTO) http://www.wto.org/english/thewto_e/whatis_e/tif_e/agrm8_e.htm#subsidies)

[16] Note that even when the third category (non-actionable subsidies) existed, member governments could file a complain with the WTO's dispute settlement panel if, an otherwise non-actionable subsidy was seriously affecting its interests.

[17] According to Juris international, a database on international trade laws, "...The SCM Agreement recognizes that governments utilize subsidies to attain various policy objectives. However, it restrains the right of governments to grant subsidies that have significant trade-distorting effects. Its rules are complex..." http://www.jurisint.org/pub/06/en/doc/C08.pdf

[18] Also note that, while the WTO rules are the same for all sectors in any acceding country, it is the a priori difference in the threat of retaliation by other members, that helps us in identifying the different commitment ability of the government across sectors.

can complain against the subsidizing member in the WTO's Dispute Settlement Body (DSB). Alternatively, member governments are allowed to unilaterally retaliate against the subsidizing member by imposing a countervailing duty on the subsidized imports if the subsidy hurts their interests. Note that, the WTO also provides for dispute settlement mechanisms, which a member government could resort to if it believes that it has been treated unfairly by another member, or if it believes that its trading partner's actions are not consistent with the SCM rules.[19] Hence, these rules put a lot of discipline on a member country's use of subsidies, as well as the retaliatory actions available to its trading partners.

According to article XXV of the SCM agreement, every three years WTO members are required to submit comprehensive notifications of all subsidies given on goods and services, with annual updates for the intervening years. These notifications should include information about the volume of the subsidy, the policy objective, the intended length of the subsidy program, as well as the relevant statistics that can help identify the impact of the respective subsidy on trade (Hoekman & Kostecki (1995)). Members are also required to notify the WTO about their CVD laws, as well as submit semi-annual notifications of any CVD actions taken during the reporting period. While these notifications are sometimes patchy, they can serve as a principle source of information against harmful subsidies provided by any WTO member.

Note that, other members may cross-notify subsidies if these are not reported by the member country that engages in subsidization. In fact, in its 1999 report

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[19] According to the SCM rules, in order for a member country to impose a countervailing duty, it needs to show both the existence of a subsidy and the resulting injury to its domestic industry (Hoekman & Kostecki (2001)). Thus, not only is it required to show that the subsidy exists, and that the domestic industry is hurt, but also to establish a causal link between injury and subsidies. However, in cases when the ad valorem subsidy is above a certain level (5 percent), the burden of proof that the subsidies have not harmed the complaining party lies with the subsidizing member. On the other hand, if ad valorem subsidy is below the threshold level of one percent (two or three percent for developing countries) it will be considered *de minimus* and no countervailing duties can be imposed.

to Congress, the US Department of Commerce notes that "...These subsidy notifications have played an important role in the United States' monitoring and enforcement activities to protect U.S. rights and benefits under the Subsidies Agreement...".[20] The report also notes that the US carries out extensive reviews of other members' notifications to identify unreported subsidies. Hence, these measures can lead to an increased transparency and a means to ensure compliance with the SCM agreement.

Thus, to conclude, the rules regarding tariffs in the WTO accession process are flexible and are open to negotiations, whereas the subsidy rules are fixed and become binding to every member on the date of accession. We make use of this difference in the WTO rules regarding tariffs and subsidies, among other insights from this chapter, later in our theoretical and empirical sections.

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[20] http://ia.ita.doc.gov/esel/reports/scm0699/scm-0699.htm

CHAPTER 2

2 Theoretical Model

2.1 Introduction

The World Trade Organization (WTO) is the most important body governing international trade in goods and services. It currently has 150 member countries that account for more than 95 percent of the world trade, while around 29 countries are currently in the process of accession. Hence, the interest regarding WTO rules and functioning has grown at a tremendous pace, both in academic circles and outside. However, there is no consensus in the literature about how the membership in the GATT/WTO affects the volume of trade or the trade policies of member countries. While some papers suggest no effect of membership on the trade volume (Rose (2004a)) or trade policy of the member countries (Rose (2004b)), others (Subramanian & Wei (forthcoming) and Tomz, Goldstein & Rivers (forthcoming)) view it as having a positive and significant effect on the volume of trade.

Despite its importance, and the growing interest in the functioning of the WTO, it is surprising that the existing literature is relatively scant on the issues of how the WTO rules might affect the decision by a prospective applicant to join the organization, and the impact that they may have on trade and domestic policies of the acceding country. In this chapter we focus on one particular set of WTO rules, the Agreement on Subsidies and Countervailing Measures (SCM), which are binding to all members at the date of accession, and show how these rules affect the level and choice of redistribution policies used by the government.[21]

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[21] Thus, in the following, we will use the terms "the decision to join the WTO" and "the decision to join the agreement on subsidies and countervailing duties" (the rule governing subsidies and countermeasures) interchangeably.

In particular, we show that as the country joins the WTO there will be an increase in its tariffs for those products that face a threat of retaliation against subsidies as provided in the WTO rules. This is an interesting result as WTO accession is generally associated with a decrease in tariffs. Interestingly, we show that it is precisely these effects that lead a country to seek accession to the WTO.

In particular, we identify a new reason for the government to want to join the WTO, previously unexplored in the literature. In our model the government might gain from joining the WTO, by credibly committing to lowering subsidies, as this improves its bargaining position vis-à-vis the domestic lobbies. Identifying this gain from joining the WTO, due to increased commitment power, can explain why countries join the WTO even in the face of "increasing costs".[22] This is even more important given the fact that recently several observers have noted that the welfare gains to the acceding country due to tariff liberalization associated with joining the WTO (the usual explanation given for why countries would join the WTO) are often not big (at least in the short-run). For example, Rumbaugh & Blancher (2004) note "...Most models show that the overall welfare effects of WTO-induced tariff changes in China.. are not sizable, since ..China's tariffs have already been lowered substantially..." (page 12). Similarly, in a statement to the House Ways and Means Committee, Nicholas Lardy noted that the benefits to China from joining the WTO are limited as it had already received a permanent MFN status from all major countries except the United States even before applying for the WTO membership.[23]

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[22] In addition to the costs involved with restructuring the economy to bring it in conformity with the WTO rules, several papers have noted that the cost of joining the WTO has been rising as the new members are forced to undertake additional commitments (WTO plus) that go beyond those in the WTO rules (see for example, Evenett & Primo Braga (2005), Langhammer & Lucke (1999)).

[23] In his September 1996 statement to the House Ways and Means Committee, Nicholas Lardy notes, "..the benefits China would attain through WTO membership are relatively modest. China's size and geopolitical influence are both sufficiently large that the single most important economic benefit associated with membership in the WTO–permanent most-favored-nation (MFN) trading status in the markets of member countries–was bestowed by all countries, except

This chapter contributes to two separate, though related, branches of literature.[24] The first deals with the political economy of trade policy, while the second examines the incentives to join a multilateral organization such as the GATT/WTO. According to a large group of papers that seek to explain the existence of trade barriers such as tariffs, these barriers are the result of optimizing behavior by policy makers who act in their own interest. The main message of this branch of literature is that trade policy is a means to redistribute income towards certain groups in the economy. For instance, in their widely cited paper, "Protection for Sale", Grossman & Helpman (1994) argue that trade barriers are the equilibrium outcome of negotiations between a politically motivated government and organized interest groups (lobbies) when the incumbent government also values contributions from the lobbies in addition to social welfare.[25]

A drawback of most of the papers in this body of literature is that they rule out instruments for income redistribution other than tariffs by assumption, even though many, possibly more efficient, instruments exist in practice (Rodrik (1995)). Although some arguments about when and why one instrument or another should be preferred exist in the literature, Rodrik (1995) views them as being "too specific" and "often an afterthought". This issue was addressed in a recent paper by Drazen & Limão (2004), who argue that the inefficient policies might arise in

the United States, in advance of even any indication on China's part that it was interested in participating in the GATT system. And the United States has provided MFN status for China on a year-by year basis for more than fifteen years. With the principal benefit of membership already in hand, what is the incentive for China to incur the considerable costs of domestic restructuring and adjustment that would inevitably accompany the dismantling of their remaining import barriers? In short, the costs of conforming to expectations of the West on openness to trade are relatively high for China while the gains from membership in the GATT/WTO are relatively small...." (STATEMENT TO THE HOUSE COMMITTEE ON WAYS AND MEANS Hearings on Accession of China and Taiwan to the World Trade Organization By Nicholas R. Lardy Senior Fellow, Foreign Policy Studies The Brookings Institution, Washington, D.C. Accessed http://www.mtholyoke.edu/acad/intrel/chinwto1.htm)

[24] Here we highlight the relevent literature briefly. We provide a more comprehensive review in Chapter 1.

[25] See Rodrik (1995) for a detailed survey of the literature on the political economy of trade policy. Also see Gawande & Krishna (2003) for a recent survey of the empirical literature in trade policy.

practice as the government would like to put a cap on the efficient policy in order to improve its bargaining position vis-à-vis the lobbies. In this paper we extend the analysis in Drazen & Limão (2004) to the choice between production subsidies and tariffs and to the context of the WTO accession.

The second related branch of the literature attempts to explain why a country would want to join a multilateral organization such as the WTO. The existing literature provides two main explanations. The first explanation highlights the role of the WTO as a way to overcome the terms-of-trade driven prisoner's dilemma faced by large countries (Bagwell & Staiger (1999), (2002)). Here we focus on the case of a small open economy, which is unable to affect its terms-of-trade.

The second set of explanations for why a country would wish to join the WTO highlights the role of these trade agreements as a means to provide a credible commitment mechanism against higher protection. For example, it is argued that small countries may want to join the multilateral agreement in order to avoid the dynamic inconsistency problem in the presence of income redistribution concerns (Staiger & Tabellini (1987)). On the other hand, Maggi & Rodríguez-Clare (1998) argue that in the presence of inter-sectoral mobility of capital and lobbying à la Grossman & Helpman (1994), the government might prefer to join the agreement if the long-run costs due to inefficient resource allocation more than outweigh the short-run gains to the government from lobbying.

Again, we see that these arguments typically focus on tariffs, while ruling out other instruments by assumption.[26] However, if we want to know the effect of the WTO accession on protection, looking at tariffs is not sufficient because, as shown in Chapter 1, there are no common terms and conditions guiding the accession process that relate to tariffs. In fact, Article XII of the WTO that deals

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[26] One exception to this is the paper by Staiger & Tabellini (1987), which deals with both production subsidies and tariffs. However, in their model the government joins the trade agreement as a commitment to provide lower tariffs.

with accession "...gives no guidance on the 'terms to be agreed', which are left to negotiations between the WTO Members and the Applicant...." (WTO (2005)).[27] Furthermore, the tariff commitments made by the acceding country at the time of accession usually concern bound rates of tariffs – the ceiling rates above which the tariffs can not increase – which can be very different from the applied tariff rates, especially for small developing countries.[28]

Thus, commitments made on tariffs are lax and open to negotiations. Subsidies, on the other hand, are guided by a strict set of WTO rules, the Agreement on Subsidies and Countervailing Measures (SCM), which are binding to all members at the time of accession. As explained in detail in Chapter 1, the SCM agreement disciplines both the use of subsidies and the available retaliatory actions against subsidization by its members. The agreement prohibits the use of certain subsidies, while other subsidies are actionable i.e., other member countries can take retaliatory actions (by imposing a countervailing duty (CVD) against the subsidized imports or by appealing to the dispute settlement body of the WTO) against the subsidizing member.[29] Since tariffs and subsidies are obvious substitutes, WTO accession provides a natural experiment for testing the effect of these rules on the choice of redistribution policies.

In this chapter we use these facts to extend the model in Drazen & Limão (2004) to the case of WTO accession and the choice between production subsidies and tariffs. In particular, we show that a self-interested government could gain from being part of the agreement, as that may help increase its utility by improving its bargaining position vis-à-vis the domestic lobbies. We derive algebraic conditions

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[27] For a detailed outline of the WTO accession process see WTO (2005) and Lanoszka (2001).

[28] For instance, according to the tariff levels negotiated since the Uruguay round, the average bound rate in 2005 for Costa Rica was 44.6%, whereas the average applied tariff rate in 1998 was only 6.4%. Similarly, the average bound rate in 2000 for Turkey was 42.6%, but the applied tariff rate in 1996 was only 7.5%. (WTO (2001)).

[29] For more details on the SCM measures see Legal texts - Agreement on Subsidies and Countervailing Measures. http://www.wto.org/english/docs_e/legal_e/24-scm.pdf

under which the government gains through this channel and then illustrate, using a numerical example, a situation under which these conditions would hold.

In order to highlight our channel we abstract from any other motives for the existence of tariffs and subsidies and focus only on their role as a tool used by the government to redistribute income towards special interest groups. In terms of the choice of redistribution policy, the model predicts that, when both subsidies and tariffs are available, the government will use only subsidies before accession to the WTO. However, once the country joins the WTO, both tariffs and subsidies will be used for products that face a positive probability of retaliation if the country engages in subsidization. This result implies that with accession we should see an increase in tariffs imposed on products that face a threat of retaliation if subsidized.

The first part of the result, that only subsidies will be used before accession to the WTO, is in line with a vast literature on instrument targeting. It is widely known that a welfare maximizing government would use subsidies for redistribution purposes when both subsidies and tariffs are present, as subsidies distort only production, whereas tariffs distort both production and consumption (Bhagwati & Ramaswami (1963)). Similarly, Dixit, Grossman & Helpman (1997) show that, when faced with a choice between available instruments, even a self-interested government would like to choose the more efficient instrument.

In this chapter we abstract from other motives for the existence of tariffs, however, in reality there exist several other reasons why tariffs might be used even prior to accession. For example, in the case of a large country, tariffs might be used to improve its terms-of-trade against the trade partners (see Johnson (1954)). Evidence that countries use their market power in setting trade policies was recently provided by Broda, Limão & Weinstein (2006). Similarly, tariffs might also be used as a way to generate revenue if other means of generating revenue are costly

(Aizenman (1987), Corden (1974)). In the appendix we show that our main results remain qualitatively unchanged if we allow for collection costs for raising revenues to finance production subsidies.

The rest of the chapter is structured as follows. Section 2.2 describes the underlying theoretical model and presents our theoretical results.[30] After presenting the underlying structure of the model and describing the stages of the game, Section 2.2 is divided in to three subsections: Subsection 2.2.1 discusses the choice of policies once the regime has been chosen, Subsection 2.2.2 explores the question of whether to become a member of the WTO and finally Subsection 2.2.3 presents a numerical example. Section 2.3 summarizes the results in this chapter and provides some directions for future research.

2.2 Theoretical Model

Let us assume an open economy populated with consumers with homogenous preferences. Assume that the preferences are given by the following utility function,

$$u = x_0 + \sum_{i=1}^{n} u_i(x_i) \tag{1}$$

where x_0 is the numeraire good and $u_i(x_i)$ is an increasing and concave function representing the utility from consuming the good x_i. The consumers maximize their utility subject to their budget constraint, $x_0 + \sum_{i=1}^{n} p_i^d x_i \leq E_i$ where, p_i^d is the price paid by consumers and E_i is the total income consisting of wage income and any rent earned from the ownership of specific factor i.[31] We assume that each individual provides one unit of labor and owns at most one specific factor.

Due to the additive separability in the utility function the demand for a good

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[30] All proofs are provided in the appendix.

[31] Note that, as explained below, the price paid by the consumer p_i^d might differ from the producer price p_i^s due to tax/subsidy given by the government.

x_i depends on its own price p_i^d, and is given by $d_i(p_i^d) = (u_i'(x_i))^{-1}$; and the demand for the numeraire is $d_0 = E_i - \sum_{i=1}^n p_i^d d_i(p_i^d)$. Hence, the indirect utility function and consumer surplus will be given by,

$$V(P, U) = E_i + S(P)$$

and

$$S(P) = \sum_{i=1}^n u_i(d_i(p_i^d)) - \sum_{i=1}^n p_i^d d_i(p_i^d) \qquad (2)$$

respectively.[32]

We assume that the production of the numeraire good requires only labor and is given by $x_0 = L_0$. Assuming that the labor supply is not binding fixes the wage rate, which we normalize to unity. Production of the non-numeraire good x_i requires both labor and an industry specific factor i, and takes place through a constant returns to scale technology. Given that the wage rate is fixed at unity, the returns to the owners of specific factor i will depend only on the domestic producer price of that good. Hence, the quasi-rent earned by the specific factors in industry i is given by $\pi_i(p_i^s)$, where p_i^s is the producer price. The Hotelling's lemma implies that the supply function of good i is given by $y_i(p_i^s) = \pi_i'(p_i^s)$.

We assume that at any given time there are an exogenously given set of sectors in which the owners of specific factors have overcome their free rider problem and are organized in to lobbies. These lobbies interact with the government in order to determine the total level of a transfer that can take the form of a production subsidy or tariff (to be determined endogenously). Furthermore, following the existing literature, we assume that tariff revenue (or the net revenue generated to finance subsidies) is distributed back to the population in a lump-sum manner.

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[32] In what follows we will suppress the arguments of the these functions whenever it is clear from the context.

Thus the gross welfare of lobby i will be given by

$$W_i = l_i + \pi_i(p_i^s) + \alpha_i N[S(P) + R(P)] \tag{3}$$

where l_i is the total number of individuals that own factor i and so it represents their total wage income. $S(P)$ is the consumer surplus, $R(P) =$ Net tariff/tax revenue and $\alpha_i =$ fraction of the population N that own specific factor i. Without loss of generality we can normalize the population to one. In order to bring out our result more clearly, we assume that ownership of the specific factors is concentrated, i.e. only a negligible fraction of the population owns the specific factor k_i ($\alpha_i \approx 0$). Assuming concentrated ownership enables each lobby to interact with the government separately (see Drazen & Limão (2004), Maggi & Rodríguez-Clare (1998)). This may also be closer to the reality as we normally see lobbying primarily done for policies in one's own sector. This assumption helps us simplify the model, as we can assume away counter-lobbying by other organized interest groups.

We assume that lobby i provides contributions (C_i), in the form of lobby goods, to the government in exchange for production subsidy and/or tariffs. Thus the net welfare of the lobby is

$$V_i = W_i - C_i \tag{4}$$

Finally, the government maximizes its own utility which is a function of the lobby goods, C_i, and the social welfare, W, defined as the sum of utilities of all individuals in the economy. Following Drazen & Limão (2004), we assume that the objective function of the government can be written as

$$G = W + \frac{1}{a} \sum_{i \in T} \Psi_i(C_i) \tag{5}$$

where $\frac{1}{a}$ is the weight that the government puts on contributions relative to gen-

eral welfare.[33] As $a \to \infty$ the model reduces to one with a welfare maximizing government. We assume that Ψ is an increasing and concave function such that, $\Psi'(C) > 0, \Psi''(C) < 0$.[34] The idea is that the contributions from lobbies takes the form of goods or services that the lobby could provide, such as keeping employment artificially high (Shleifer & Vishny (1994)) or arranging a trip to the golf course.[35]

The timing of the game is as follows. In the first stage the government decides whether to be a part of the WTO. In the second stage lobbies and the government negotiate on the level of redistribution policies. We assume that the government can use either production subsidies (t_i) or tariffs (τ_i) (or both) as instruments for redistribution. Note that a positive t implies a subsidy. We also allow both t_i and τ_i to be negative, implying taxes and import subsidies.

We consider the case of a small open economy. Assuming small economy implies that at any given point in time the world price for a product i, p_i^w, is independent of the actions of the individuals in this economy. The government's interventions will create a wedge between the world prices and the consumer and the producer prices in the domestic economy. Specifically, the domestic prices would be given by, $p_i^d = p_i^w + \tau_i$ and $p_i^s = p_i^w + \tau_i + t_i$ where p_i^w = world price, p_i^d = domestic consumer price and p_i^s = domestic producer price.[36]

Given our assumption of concentrated ownership which implies that each lobby interacts separately with the government, and treats the prices in other sectors as

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[33] The objective function in their paper is written as $G = aW + \sum \Psi_i(C_i)$. Here it is rewritten in this formulation to make some of the expressions below more explicit without changing anything qualitatively.

[34] We also assume $\lim_{C \to 0} \Psi'(C) = \infty$ that ensures an interior solution as shown in the appendix.

[35] While for simplicity we assume that contributions enter linearly in the lobby's objective function, we can also have contributions entering as an increasing and convex cost in the lobby's utlity function to reflect more clearly the lobby goods and services interpretation without changing much of our result.

[36] Here the world prices are fixed, as we assume a small open economy with perfect competition in the products markets. For a discussion of optimal levels of tariffs and production subsidies under monopolistic competition in the lobbying framework see Chandra (2006a).

given, we can omit the subscript i from here on. Hence, without loss of generality, we will concentrate on the case of interaction between the government and a single lobby.

2.2.1 Stage Two: Bargaining over Policy Levels

In the second stage, once the regime has been chosen, i.e. once the country has decided whether to be a part of the agreement, the Nash bargaining between the lobby and the government determines the equilibrium level of tariffs, production subsidies and the amount of lobby goods paid by the lobby in return for these policies. Hence, the equilibrium levels of C, t and τ will be given by:

$$\underset{C,t,\tau}{Max}\mathcal{F} = (G - g_0)^\gamma (V - v_0)^{(1-\gamma)} \quad s.t.\ G \geq g_0, V \geq v_0 \tag{6}$$

where g_0 and v_0 are the respective disagreement points and γ is the bargaining power of the government with respect to a given lobby. Since in the absence of any lobby goods, the utility function of the government reduces to that of a benevolent social planner, we know that in this case there will be free trade in equilibrium and no subsidies. Hence, at the bargaining equilibrium, the levels of policies and the lobby goods will be such as to yield at least as high a utility level for both players as the disagreement utility given by the free trade levels.[37]

Before joining the agreement   Let us first look at the benchmark case where the country has decided not to join the WTO (and hence, decided not to be a part of the Agreement on Subsidies and Countervailing Duties). In this case the country is free to choose its policies without any threat of retaliation from the other members.[38]   Hence, the equilibrium level of contributions and policies will

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[37] Note that the disagreement level of utility is at the level of free trade in the sector in question however, other sectors might still be protected.

[38] The absence of retaliation is due to the small country assumption, which implies that this country's policies will not have an effect on the rest of the world. If we extend the model to the

be given by solving the Nash bargaining problem in equation (6), where the utility functions of the government and the lobby are given by:

$$G \;=\; G(C, t, \tau) = 1 + \pi(t, \tau) + \tau * [d(\tau) - \pi'(t, \tau)] - t\pi'(t, \tau) + S(\tau) + \frac{1}{a}\Psi(C)$$

$$V \;=\; V(C, t, \tau) = l + \pi(t, \tau) - C \tag{7}$$

where we write the expressions directly as functions of the underlying choice variables. Note that $\pi(t, \tau)$ is the rent to the specific factors such that $\pi' > 0, \pi'' > 0$ (by Hotelling's lemma). Even though tariffs and subsidies affect profits in the same way (by increasing the producer price), we can see that, unlike tariffs, subsidies do not affect the consumer surplus, $S(\tau)$, since they affect only the producer price, while leaving the consumer price unchanged. This is because we assume a small open economy, and hence, the consumers can buy the good from abroad.

In the above equation, equation (7), $\tau(d(\tau) - \pi'(t, \tau))$ is the total tariff revenue collected for any given level of tariff and subsidies, whereas $-t\pi'(t, \tau)$ is the revenue needed to finance the subsidy. For notational clarity, henceforth we will omit the arguments of these functions. We will also assume linear supply and demand functions, even though our main results are valid as long as the demand and supply curves are not too convex or too concave.

The first order conditions for the problem in equation (6) can be simplified to get the following three equations,

$$\gamma \left(\frac{1}{a}\Psi'\right)(V - v_0) - (1 - \gamma)(G - g_0) \;=\; 0 \tag{8}$$

$$(-\tau\pi'' - t\pi'') + \left(\frac{1}{a}\Psi'\right)(\pi') \;=\; 0 \tag{9}$$

$$(\tau(d' - \pi'') - t\pi'') + \left(\frac{1}{a}\Psi'\right)(\pi') \;=\; 0 \tag{10}$$

---

large country case then we would have to model the possibility of retaliation even if the country was not a WTO member.

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Equations (9) and (10) give the contract curves in $C - t$ and $C - \tau$ space respectively. From (9) we get

$$\frac{(-\tau\pi'' - t\pi'')}{\left(\frac{1}{a}\Psi'\right)} = \frac{(\pi')}{-1}$$

which is the expression for the contract curve in $C - t$ space, $-\frac{G_t}{G_C} = -\frac{V_t}{V_C}$. Similarly rewriting (10) gives us

$$\frac{(\tau(d' - \pi'') - t\pi'')}{\left(\frac{1}{a}\Psi'\right)} = \frac{(\pi')}{-1}$$

which is the expression for the contract curve in $C - \tau$ space, $-\frac{G_\tau}{G_C} = -\frac{V_\tau}{V_C}$. Thus, these two equations give the set of Pareto efficient combinations of the levels of contributions, tariffs and subsidies which are candidates for equilibrium. Equation (8) picks out the exact point on this contract-surface that will be chosen for any given distribution of bargaining power between lobbies and the government. Rewriting (8) we get the usual Nash bargaining equilibrium expression

$$\left(-\frac{1}{a}\Psi'\right) = -\frac{(1 - \gamma)}{\gamma}\frac{(G - g_0)}{(V - v_0)}$$

where, as we will see later, $\left(-\frac{1}{a}\Psi'\right)$ is the slope of the Pareto frontier at the equilibrium point (when government's utility G is on the vertical axis and the lobby's utility V is on the horizontal axis).[39]

In Figure 2.1a we show the indifference curves for the government and the lobby in the $C - t$ space and the corresponding contract curve for any given level of tariffs τ. We put the lobby goods C on the vertical axis and the subsidies t on the horizontal axis. The indifference curves for the government are upward sloping with its utility increasing in the north-west direction; as it will need more lobby goods from the lobby in exchange for higher subsidies to remain on the

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[39] See for example, Osborne & Rubinstein (1990).

same indifference curve. The concavity in C also implies that the government's indifference curves are convex. Similarly, lobby's indifference curves are upward sloping with its utility increasing in the South-East direction. The tangency points of the two indifference curves trace out the contract-curve.[40]

Substituting (9) in (10) implies that $\tau d' = 0$ which is only possible if $\tau = 0$. This gives us the well known targeting result that, when the government has access to two or more instruments of income redistribution, it will use the one which is least distortionary. Here, while production subsidy generates only production distortion, an equivalent tariff distorts both production and consumption. Hence, in the absence of any constraints on the level of subsidies, only subsidies would be chosen. Plugging $\tau = 0$ in to the above expressions also gives us the equilibrium values of subsidies and contributions.

The equilibrium can be written in the implicit function form:

$$
\begin{aligned}
\tilde{\tau} &= 0 \\
\tilde{t} &= \frac{1}{a}\Psi'\frac{1}{\varepsilon^s} \\
\frac{1}{a}\Psi' &= \frac{(1-\gamma)}{\gamma}\frac{G-g_0}{V-v_0}
\end{aligned}
\tag{11}
$$

where a $\tilde{\ }$ denote ad valorem rates and ε^s is the elasticity of supply.

Thus, consistent with earlier literature, when both subsidies and tariffs are present, the level of tariffs is zero, whereas subsidies are chosen to fulfill any redistributive role. Note that, here we have only assumed redistributive roles for tariffs. The tariffs might be positive even in the presence of subsidies if the country is large, or if raising revenue to finance subsidies is costly. In the appendix we show that allowing for this last channel does not change our main result.

We can also see that for the welfare maximizing government (i.e. $a \to \infty$) the

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[40] We can also show that as long as the demand and supply curves are not too concave or too convex the contract curve in the $C - t$ space will be downward sloping.

optimal subsidy is also zero. The optimal subsidy decreases with a, the weight on welfare and ε^s, the elasticity of supply. That the level of subsidy will vary inversely with the elasticity of supply reflects the Ramsey concerns. Finally, the level of redistribution policy also depends on the level of C and hence on the bargaining power of the government vis-à-vis the lobbies. This is in contrast to the results in Grossman & Helpman (1994), where tariffs are independent of the level of C (because of their assumption of quasi-linearity in C for both the lobby and the government).

After joining the agreement If the country decides to join the WTO, it automatically becomes a party to the Agreement on Subsidies and Countervailing Duties. As mentioned earlier, this agreement prohibits the use of export subsidies, however it allows member countries to use domestic subsidies subject to the qualification that if these subsidies are found to cause injury to, or adversely affect the interests of other member countries (in the subsidizing country itself, in the home market of the country that is hurt by subsidization or in a third market), they can take appropriate retaliatory actions. Furthermore, as explained in Chapter 1, other member countries can either retaliate unilaterally by imposing a countervailing duty on the imports of the subsidized product from the offending country or take the subsidizing country to the Dispute Settlement Body (DSB) of the WTO. Thus, even though the export subsidies are prohibited, the WTO rules impose a threat of retaliation against *production* subsidies given to both import competing as well as the exporting sectors.[41]

Note, however, that the agreement does not say anything about a country's use of tariffs as long as it does not exceed the binding limit that the country agreed to at the time of accession. This ceiling level of tariffs is called the bound

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[41] We account for the different costs of retaliation to sectors with a higher share of exports explicitly in the empirical part in Chapter 3.

tariff. According to the WTO rules, the country is free to set tariffs at any level (applied tariff) as long as it is below the bound tariff. Since for most developing countries there is a big difference between the bound and the applied tariff, we will assume that this binding limit is not reached and, hence, the country is free to use tariffs even after accession.[42]

An alternative is to recognize that the level at which the tariffs are bound is negotiable at the time of accession and hence is subject to pressure from the domestic lobbies, whereas the subsidy rules are nonnegotiable and become binding on the date of accession. Thus, the government's ability to commit in the case of subsidies is higher than in the case of tariffs.

The SCM agreement allows countries to use certain kinds of subsidies, however these are actionable i.e. other members can retaliate if these subsidies hurt their interests. This implies that while not all subsidies are automatically retaliated against, countermeasures are allowed in principle. Hence, in this model we assume that joining the agreement implies that, when a country subsidizes its production, other member countries can retaliate with some probability $\mu \in [0,1]$, with the probability of retaliation varying across industries.

Furthermore, we assume that the lobby has to incur an extra cost $R(t)$ whenever it gets a subsidy, which is then retaliated against.[43] The SCM agreement provides two separate channels of retaliation and hence at least two separate ways in which $R(t)$ could arise. On the one hand the SCM agreement allows the other member countries to file a case against the subsidizing member (on behalf of its domestic industry) to its Dispute Settlement Body (DSB) if these subsidies hurt their interests. Upon receipt of the allegations the DSB forms a panel to establish the merit of the case, and if the defendant is found guilty, it is asked to remove the

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[42] We will use the applied tariff for our empirical tests in Chapter 3 and Chapter 4.

[43] Here we treat the cost of retaliation as an additive cost for simplicity without highlighting the exact source of the costs which would depend on the nature of retaliation. For a model where the cost of retaliation arises endogenously see Chandra (2006b).

subsidy itself or for removal of its adverse effects (for example, by taxing the industry at an equivalent rate). The cost to the lobby of the subsidy being removed is obviously significant. Additionally, the resource costs associated with the legal and administrative fees to participate in the DSB procedures can in itself be quite substantial.[44]

On the other hand, according to the SCM agreement other members can retaliate against subsidies by imposing a countervailing duty on the imports of subsidized product. There is a direct cost associated with the imposition of countervailing duties on the producers of these goods. Since we have assumed the country to be small, the world price facing the producers remains fixed. This implies that the effective price for the producers for each unit of subsidized good sold abroad increases by the amount of the subsidy, $p_i^s = p_i^w + t$. If the trade partner imposes a countervailing duty on the subsidized products, the effective price to the producers decreases by the amount of the subsidy. If the CVD duty is equal to the amount of the subsidy, as provided by the WTO rules, the producers returns to the same situation as she was before the lobbying process, however, at a lower level of welfare due to the costs incurred during lobbying.[45] The uncertainty associated with the outcome of the CVD or the DSB case can also impose a cost for producers in the affected sector.

In our model we assume that the retaliation only affects the lobby's utility, for simplicity. However, as we point out below, our results remain unchanged if we allow the retaliation to affect the government's welfare as well. The results will

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[44] Note that the legal and administrative cost could also arise in the alternative form of retaliation involving the imposition of the CVD duty by the trading partners. Several papers that study the use of anti-dumping duty (a duty with similar administrative procedures as CVD) note that these costs can be quite significant (see for example Finger & Fung (1993)).

[45] An alternative strategy for the domestic producers to avoid paying the CVD duty is to shift the exports to another country. However, it is not feasible to shift exports to another country in the short run due to the fixed costs involved. Moreover if *all* trade partners impose the CVD, the domestic producers will get a lower export price, to the extent that they sell part of the output abroad and that the CVD duty is not prohibitive.

also remain unchanged if we assume retaliation to only affect the government's utility while leaving the lobby's utility unaffected. We provide the corresponding results for the latter case in the appendix. There are at least two channels through which the retaliation lowers the government's utility. One is through a decrease in the aggregate welfare. For example, an equivalent CVD imposed on a small country brings the equilibrium back to the one before the subsidy. However, the net effect is a transfer of revenue from the subsidizing government to the importing country. This loss in welfare could be even higher if raising revenue to finance subsidies is costly. A second source of loss in utility for the government could arise due to the stigma of not fulfilling its international obligations (see Kovenock & Thursby (1992)).[46]

One final question remains: if the subsidizing country is small, as assumed in our model, why would other countries retaliate.[47] In the case of a small country, which faces a fixed world price, all the benefits of subsidies goes to the producers of the good in the subsidizing country, with the equilibrium remaining unchanged elsewhere. Hence, the trading partners do not have an incentive to retaliate. One explanation for why the retaliation still exists in such a case is that the other countries are trying to enforce the WTO rules in order to deter future violations and/or to discourage "socially wasteful" subsidy practices.[48] For example, Sykes (2005) notes "...Outside of the strategic trade area, the only plausible defense of countervailing duties is the suggestion that they enhance global welfare by discouraging wasteful subsidy practices..." (page 24).[49]

One explanation for why countries might chose to retaliate against subsidies

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[46] See Bown (2004) for an empirical study of whether the variables associated with international stigma or the economic costs are more important for ensuring compliance with DSB.

[47] In the case of large countries, the gains in terms-of-trade due to retaliation might outweigh the loss due to forgone cheap subsidized products at foreign country's expense.

[48] See Sykes (2005)

[49] Also see Jackson (1997). For a disucussion of countervailing duties and its impacts see Sykes (1989).

by imposing a CVD, even though the CVD might be harmful for the country imposing the duty (at least in the short-run), is that the resulting gains from the enforcement of subsidy rules could be jointly optimal for all countries. That the deterrence of subsidies is one of the objectives behind retaliation against subsidies can also be seen from the fact the focus of the WTO discipline on subsidies is on the amount given, not on the extent to which the subsidy harms trading partners (see Hoekman & Kostecki (1995)). The same argument might explain why members would retaliate against a small subsidizing member, even though those subsidies do not pose an explicit threat to the country imposing the duty. In fact, in the real world we see that a lot of the countervailing duties are directed towards small economies. Hence, here we abstract from this question and take the possibility of retaliation from the trading partners as given.

Assuming that there might be retaliation against subsidies, the lobby's net utility can be expressed as:

$$V(C, t, \tau; \mu) = L + \pi(t, \tau) - C - \mu R(t) \tag{12}$$

where $R'(t) > 0$, $R''(t) > 0$ for $t > 0$ i.e., these retaliation costs are increasing and convex in the level of subsidy.[50] We also assume that $\pi(t) - \mu R(t) > 0$ i.e., these costs are not too high, so there exist positive gross profits in equilibrium. Furthermore, we assume $\pi'(t) - \mu R'(t) > 0$ (subject to a boundary condition) i.e., the marginal profit from an extra dollar of subsidy is positive so that there are gains from lobbying for subsidy.

Figure 2.1b shows the indifference curves for the lobby and the government in $C - t$ space similar to those in Figure 2.1a. The threat of retaliation causes the lobby's indifference curves to become flatter to the horizontal axis. This implies

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[50] We also assume $R(t) = 0$ for $t \leq 0$ to reflect the fact there would not be any retaliation against production taxes. Finally, assuming $R'(0) = 0$ ensures an interior solution.

that due to the threat of retaliation, subsidies are now less valuable to the lobby than before accession. In other words, for a given level of contribution, it would require a higher level of subsidy for the lobby to achieve the same utility as before. We can also see that the maximum utility available to the government now (G'^m), is lower than it was before the retaliation (G^m). The same is true for the lobby. Hence, the threat of retaliation reduces the total surplus to be bargained over.

Nash bargaining between the government and the lobby, after the country joins the WTO, takes a form similar to equation (6) with the only difference that the utility function of the lobby is now given by (12).[51] The new equilibrium policies will be implicitly given by,

$$
\begin{aligned}
\tilde{\tau} &= \frac{1}{a}\Psi'\frac{1}{d\varepsilon^d}\mu R' \\
\tilde{t} &= \frac{1}{a}\Psi'\frac{1}{\varepsilon^s} - \frac{1}{a}\Psi'\frac{1}{z}\left(\frac{\varepsilon^m}{\varepsilon^d\varepsilon^s}\right)\mu R' \\
\frac{1}{a}\Psi' &= \frac{(1-\gamma)}{\gamma}\frac{G-g_0}{V-v_0}
\end{aligned}
\tag{13}
$$

where, $\tilde{\tau}$ and $\tilde{t}$ are ad valorem tariff and subsidy rates; $\varepsilon^d, \varepsilon^s, \varepsilon^m$ are total demand, supply and import demand elasticities and z is the inverse import penetration defined as $z = \frac{d}{m}$ (inverse of the share of imports in the total demand).

Comparing equations (13) with those in (11) we see that, while the equilibrium tariff was zero when the country was not a party to the agreement, once the country becomes a party to the SCM agreement, the equilibrium tariff is positive whenever there exists a positive probability of retaliation $(\mu > 0)$. Stated differ-

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[51] Note that here we are assuming that the costs of retaliation does not enter government's objective function directly. Including these does not change the main qualitative results. The reason is straightforward, when we include the costs of retaliation in the government's objective function, it works to reinforce the loss due to retaliation. More specifically, retaliation costs make the lobby's indifference curves flatter in $C - t$ space (with C on vertical axis - see fig 1b). If we include these costs in the government's objective function as well, it makes its indifference curves steeper reinforcing the results that the contract curve in $C-t$ space shifts to the left. Also note that the formulation here might also be closer to the reality in that the retaliation directly hurts the producer interests against which the retaliation is aimed rather than the government.

ently, there will be an increase in tariffs when the country is faced with a positive probability of retaliation if subsidy is provided.

We summarize the above results in the following proposition.

Proposition 1 *Impact of retaliation against subsidies on tariffs: As the country joins the WTO (and hence the Agreement on Subsidies and Countervailing Measures), there will be an increase in its tariffs for those sectors where the probability of retaliation against subsidies is strictly positive compared to the case of no retaliation.*

Proof. The proof follows immediately from the equilibrium conditions derived earlier. ∎

Intuitively, when the country is not a part of the WTO, it is not under the purview of the SCM agreement, hence, it is relatively free to use its subsidy policies. Given the fact that subsidies create less distortion in the economy than tariffs, tariffs will not be used. However, post-accession there are strictly positive costs to using subsidies for products that face a threat of retaliation. Hence, for these products tariffs would also be used. Thus, for products that face a threat of retaliation we expect tariffs to increase with accession. It is this prediction of the model that we test in the empirical part of the dissertation.

Note that, while there is an increase in tariffs as a redistribution tool when the threat of retaliation increases from zero to a strictly positive level, once the country is faced with a positive probability of retaliation, a marginal increase in the threat has an ambiguous effect on tariffs. This is because while there is a direct positive effect of retaliation on tariffs, there is also an indirect effect through equilibrium contributions. In the appendix, we provide sufficient conditions that ensure that the tariffs increase with the probability of retaliation. We can show that if lobby goods fall following an increase in μ, that is a *sufficient condition*

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for an increase in tariffs. While puzzling at first, the intuition behind this result is straightforward. As lobby goods fall, given the concavity of Ψ, the marginal utility of an extra dollar worth of lobby goods to the government is higher, thus the government would like to provide more protection. However, due to an increase in the threat of retaliation, it is more costly to give the protection through subsidies, hence the government uses tariffs instead.

2.2.2 Choice of Regime

Once the country joins the WTO it faces a positive probability of retaliation if subsidies are used. Thus the question is, can the government be better off by joining such an agreement? If the answer is yes, then we have found a motive for the government to sign such an agreement.

Here we identify a new channel through which accession to the WTO serves to increase government's utility. Specifically, we show that the government would like to be a part of the agreement as that improves its bargaining position vis-à-vis the domestic lobbies. Thus, even though, with retaliation the total surplus from the bargaining is lower, the government can benefit as it gets a higher share of the surplus.

In order to show this mechanism, we rewrite the maximized Nash product for the generalized Nash bargaining problem between the government and the domestic lobby in terms of government's utility:

$$\hat{L}: \underset{G \geq 0}{Max} \left(G - g_0\right)^{\gamma} \left(\Omega(G) - v_0\right)^{(1-\gamma)} \tag{14}$$

where $\Omega(G) = V$ is the equation for the Pareto frontier (Muthoo (1999)).[52]

In the first stage, the government wants to choose between the two alterna-

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[52] In the following we will suppress the arguments for notational clarity. Also a subscript denotes partial derivative.

tives: whether to join the agreement or not. The condition that helps us to determine which of the two regimes it prefers makes use of the derivative of the maximized value of L in equation (14) under each of these situations when $\gamma \to 0$. Before providing the condition we explain the underlying idea with the help of the following figure.

In Figure 2.2 we plot the government's utility as a function of its bargaining power γ before and after the agreement. Since the disagreement utilities are the utilities under zero tariffs, zero subsidies and zero contributions, these utilities remain unchanged regardless of whether the country becomes a party to the agreement. Thus the government has no incentive to join the agreement if it has zero bargaining power $(\gamma = 0)$. Because, regardless of its decision about accession, it will receive its reservation utility, which has the same value in both cases.

On the other hand, as illustrated in Figure 2.1b, the maximum level of utility attainable by the government (or the lobby) after joining the agreement is lower than the maximum it could attain before joining i.e. $G^{\max}|_{\mu>0} < G^{\max}|_{\mu=0}$ (similarly, $V^{\max}|_{\mu>0} < V^{\max}|_{\mu=0}$). That is because, post-accession, there is a positive probability of retaliation, if subsidies are used $(\mu > 0)$, which reduces the total available surplus. Hence, when the government has full bargaining power $(\gamma = 1)$, such that it receives the maximum surplus available, it would choose not to be a part of the agreement as doing so decreases its utility.

Thus, whenever government has zero or full bargaining power, it has no incentive to join the agreement. Since the government is always worse off by joining the WTO if it has full bargaining power, a sufficient condition for the government to join the agreement is if the following holds:

$$\lim_{\gamma \to 0} \frac{dG}{d\gamma}\Big|_{\mu>0} > \lim_{\gamma \to 0} \frac{dG}{d\gamma}\Big|_{\mu=0} \tag{15}$$

In the appendix we show that using the maximized Nash product given in equation (14) the above condition can be written as:

$$\lim_{\gamma \to 0} \left(\frac{[1/\Omega_G]_{\mu>0}}{[1/\Omega_G]_{\mu=0}} \right) > \lim_{\gamma \to 0} \left(\frac{[\Omega - v_0]_{\mu>0}}{[\Omega - v_0]_{\mu=0}} \right) \qquad (16)$$

We call this the "Bargaining position improvement condition due to the WTO subsidy commitment". The expression on the left hand side of equation (16) is the ratio of the slope of the Pareto frontier for the lobby and the government before and after the country has joined the WTO, for the case where the threat of retaliation is positive, i.e. where the subsidy rules provide a commitment mechanism to the government. This ratio captures the improvement in the bargaining position of the government. The right hand side of equation (16), on the other hand, reflects the loss in the lobby's surplus due to the threat of retaliation under the WTO SCM agreement. When, the government has zero bargaining power i.e. $\gamma \to 0$, the lobby gets the entire surplus from bargaining; hence, it represents the aggregate loss in surplus which is no longer available for bargaining.

Thus, this gives us our next proposition,

Proposition 2 *Government's optimal accession decision: A self-interested government will gain from the Agreement on Subsidies and Countervailing Duties and hence would want to be a member of the WTO if:*

- *the "bargaining position improvement condition due to the WTO subsidy commitment" is met.*

  and only if:

- *Both agents have some bargaining power and the utility is non transferable.*

  Proof. *See appendix* ∎

The first part of the proposition states that, the government wants to be a part of the agreement if the loss in bargaining surplus from joining the agreement $\left(\frac{[\Omega - v_0]_{\mu>0}}{[\Omega - v_0]_{\mu=0}}\right)$, is lower than its gain $\left(\frac{[1/\Omega_G]_{\mu>0}}{[1/\Omega_G]_{\mu=0}}\right)$ due to improvement in bargaining position. The agreement involves being faced with a positive probability of retaliation when subsidies are used. That makes production subsidies costlier for the lobby and, hence, leads to an improvement in the terms of trade in favor of the government. However, as the retaliation by other countries also means a decrease in the potential surplus that can accrue to the government from its relationship with the lobby, the gain from an improved bargaining position should be sufficiently big to compensate the government for the loss due to reduction in the size of the surplus. Below we show that this condition holds under reasonable parameters.

This expression is similar to the proposition 3 in Drazen & Limão (2004), where they find that the government with a small bargaining power would find it optimal to forego the more efficient instrument (lump-sum transfers) and instead uses a relatively less efficient instrument (production subsidy) for redistribution as it improves its bargaining position vis-à-vis the lobbies. However, there are two important differences: (a) the choice of instruments is different in the two cases, and (b) more importantly, they are interested in the binary choice between the instruments whereas here both the instruments are available but the regime (the threat of retaliation) is different.

The second part of the above proposition states the necessary conditions under which a rational government is willing to join the WTO. One of the necessary conditions is that the value of the government's bargaining power be strictly positive and strictly smaller than one. We have seen earlier how both the extreme cases (i.e. a bargaining power of zero or one) imply that the government does not have an incentive to join.

However, allowing only for intermediate values of bargaining power is not enough. We must also have contributions entering non-linearly in the government's objective function. The reason is that in order to get any improvement in the bargaining position, it must be the case that the slope of the Pareto frontier becomes steeper due to the threat of retaliation for a given level of government's utility. However, assuming quasi-linearity in contributions implies that the slope of the Pareto frontier is constant, so the effect of the improvement in bargaining position is ruled out by construction. Intuitively, assuming that contributions enter linearly in both the lobby and the government's objective function implies that the contributions can be used to transfer utility. Under this scenario, trade policies are designed to maximize the surplus, while the respective bargaining powers only determine how the surplus will be divided. Thus, any reduction in surplus in the presence of transferable utility makes both parties worse off. Hence, we see that both intermediate bargaining power and non-transferable utility are crucial for the results derived in this chapter.

2.2.3 Simulations

Note that, while the above "bargaining position improvement condition due to the WTO subsidy commitment" says that the government would gain from joining the WTO, whether this condition will be satisfied will depend on the underlying functional forms assumed. In order to verify that these conditions for improvement in the bargaining position are plausible, we conduct the following simulation exercise. We assume that the contribution function that enters the government's utility function is given by, $\Psi(C) = C^n$ where $n \in (0, 1)$. The production function is assumed to be a standard Cobb-Douglas function, $y = Ak^{1-\alpha}l^\alpha$ and the consumer's utility from consuming good x is assumed to be quadratic, $u(x) = 10x - \frac{b}{2}x^2$. Finally, we assume that in the event of a retaliation ($\mu > 0$), when the country is

a part of the agreement, the cost of being retaliated against is given by $R(t) = Bt^\theta$ where $\theta > 1$. These functional forms are consistent with earlier assumptions made in this chapter.

We derive the equilibrium level of tariffs and subsidies for both when the country is a member of the WTO and when it is not, and calculate the corresponding value of $\lim_{\gamma->0} \frac{dG}{d\gamma}$ under both scenarios. In Figure 2.3a we plot the values obtained for $\lim_{\gamma->0} \frac{dG}{d\gamma}$ against different values of n, the degree of concavity of contributions in the government's objective functions. The solid red curve depicts the values of $\lim_{\gamma->0} \frac{dG}{d\gamma}$ at the optimum level of tariffs and subsidies before the country joins the WTO i.e. when $\mu = 0$. Whereas, the dashed blue curve depicts the values of $\lim_{\gamma->0} \frac{dG}{d\gamma}$ when $\mu > 0$.

According to the simulation results, the condition in equation (15) is more likely to be satisfied for low values of n, i.e. when the government's utility function is more concave. Hence, the government with a more concave utility function is more likely to gain from improved bargaining position due to joining the WTO. Figure 2.3b shows that this conclusion is robust to other parameter values.

The equilibrium values of tariffs and subsidies from the simulation exercise are reported in Table 2.1. The simulations confirm the result derived in section 2.2.1 of the chapter that when the threat of retaliation (μ) is zero, only subsidies will be used in equilibrium. However, both tariffs and subsidies will be used if the threat of retaliation is positive. Note that, we see zero tariffs prior to accession because we abstracted from other motives for the existence of tariffs. In the appendix we show that the tariffs will be positive even in the absence of retaliation if it is costly to raise revenues to finance subsidies. In the appendix we provide a similar numerical example in the presence of collection costs. Those simulation results confirm that tariffs will be positive even in the absence of retaliation.

According to the results in Table 2.1 both before and after accession the degree

of protection takes a U-shape, i.e. the protection levels first decrease and then increase as the degree of concavity of contributions in the government's objective function increases. Finally, we see that for the parameter values used in the simulations, the total level of protection (tariffs+subsidies) is higher when the country is not a member of the WTO, than when it becomes a member, for all values of n. It suggests that since the total protection is lower, the general welfare is also higher under the WTO regime.

Another interesting question is to see what happens to the equilibrium levels of tariffs and subsidies as the threat of retaliation goes up i.e. a comparative-static exercise. As we saw earlier in Section (2.2.1), we can't answer this question unambiguously unless we assume explicit function forms.[53] The results for this comparative-static exercise is reported in Table 2.2. We can see that for the functional forms (and the parameters) assumed here the tariffs unambiguously increase with μ, while the subsidies decline, as μ goes from zero to one. Since the sectors differ in the threat of retaliation against subsidies, the change in tariffs due to μ will also be different across sectors. We will explore this difference in the threat of retaliation across sectors more in the empirical sections. Interestingly, the total protection also goes down as the threat of retaliation increases. In the appendix we show that these results are robust to inclusion of collection costs.

2.3 Conclusion

A leading explanation in the literature on the political economy of trade policy is that tariffs are primarily used for redistributing income towards special interest groups. This literature typically assumes that tariffs are the only instrument available to the government. In reality, however, a variety of instruments are available to the government for redistribution purposes, with tariffs and production subsi-

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[53] In the appendix we provide sufficient conditions for tariffs to go up following an increase in retaliation.

dies being the two most important ones. In this chapter we show how the WTO accession process and the associated rules affect the choice and level of tariffs and production subsidies used in the acceding country.

We also identify a source of gain to the government from joining the WTO previously unexplored in the literature. We argue that joining the WTO can be a rational decision by a self-interested government that wants to increase its own welfare. In particular, we believe that the current structure of the Agreement on Subsidies and Countervailing duties can act as a credible device that helps the government improve its bargaining position vis-à-vis the lobbies.[54] Moreover, we show that this source of gain can never arise if utility is assumed to be transferable or if one party has complete bargaining power, two assumptions that are commonly made in the literature. An interesting insight of the model is that, contrary to common belief, the gains to the government from entering the WTO is not because it allows them to lower tariffs but because it allows them to reduce subsidies even if in the process they actually increase some tariffs.

While this, to the best of our knowledge, is the first theoretical model that explores the question of how WTO accession and its associated rules might affect the choice between tariffs and production subsidies, a lot of work remains to be done. For simplicity, the current model focuses on the case of a small country. This assumption helped us focus on the policies in the acceding country, while treating the rest of the world as exogenous. However, it would be interesting to extend the model to the case of large countries. Such an extension could be important for understanding how the terms-of-trade motive and the commitment

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[54] This, of course, is not the only explanation for why countries join the WTO as we note in the text. In fact, one source of gain to the acceding member that is usually pointed out, is that arising from the improved market access. However, as most countries already receive MFN treatment from their trade partners even without being a member of the WTO, this particular gain is probably not sizeable. Note that there might still be some gains due to the removal of uncertainty related to securing MFN status. Whether this benefit is significant enough to warrant WTO accession is a question for future research.

motive analyzed here interact to affect a country's incentive to join the WTO.

Another important extension would be to move away from the perfectly competitive market structure assumed in this chapter and to examine whether the results could be generalized to alternative settings. In particular, it is important to understand the optimum level of tariffs and subsidies under alternative market structures such as monopolistic competition, which is able to explain the existence of widespread intra-industry trade, and oligopoly, as they are in the center of many existing subsidy debates e.g. Boeing vs. Airbus. It is also interesting to study how the WTO subsidy rules and the associated threats of retaliation against subsidies affect the levels of tariffs and subsidies in these settings, a task that I have recently undertaken.

CHAPTER 3

3 Evidence using China's Accession to the WTO

3.1 Introduction

In this chapter we provide empirical evidence in support of one of the main predictions of the theoretical model developed in Chapter 2 of this dissertation. According to the model, accession to the WTO will lead to an increase in a country's tariffs for products that face a positive probability of retaliation when subsidized, as some of the subsidies will be substituted by tariffs. We test this prediction of our model using the case of China's accession to the WTO in December 2001. This is an important prediction as it highlights a direct, yet unexplored, channel through which WTO rules affect the policies in the acceding country. In doing so, this chapter also contributes to a small but growing empirical literature on the impact of the GATT/WTO membership on member countries.

While, in recent years, several papers have tried to measure the impact of GATT/WTO accession, the results have been mixed. In one of the most important contributions to this literature, Rose (2004a) finds that there is a negligible impact of the GATT/WTO membership on a country's trade volume or a country's trade policy (Rose (2004b)). Since then, several papers have tried to explore this seemingly puzzling result. Subramanian & Wei (forthcoming), for example, point out that, while a significant impact of the GATT/WTO membership does not seem to exist for developing countries, the membership has increased trade for the industrial countries. Similarly, Tomz, Goldstein & Rivers (forthcoming) argue that, once we also take into account the countries that had the same rights and obligations as members, even though they were not members of the GATT

formally, membership seems to have increased the volume of international trade.[55]

While these papers have tried to explore the impact of WTO membership on a country's volume of trade, the question of whether WTO membership affects the acceding country's trade policy is still relatively unexplored. By providing evidence in support of our main hypothesis, we also fill this gap in the literature. In particular, in this chapter we provide robust evidence that accession to the WTO and the associated threat of retaliation against subsidies had an impact on the level of its tariffs as China joined the WTO.

However, quantifying the inherent substitution across instruments is an important exercise in its own right. By shedding light on the mechanisms underlying the switch across instruments, we hope to understand the channel through which the choice of instruments is made in the first place. In fact, Drazen & Limão (2006) point out that it is important to understand the mechanism behind why and how the choice of one instrument out of several is made as "...Models that fail to explain why apparently more efficient polices are not used are incomplete and likely to generate incorrect predictions..." (page1).

Even in the narrow confines of the trade policy, it is important to understand the link between production subsidies and tariffs as they are among the most widely used instruments of trade policy. However, despite there being several important theoretical papers discussing the optimal levels of production subsidies and tariffs, especially in the strategic literature, there are relatively few empirical studies that focus on this issue. In one of the few empirical papers along these lines, Mitra, Thomakos & Ulubasoglu (2004) study the determinants of tariffs (protection) and production subsidies (promotion) using Turkish industry-level data and find that the mix of protection versus promotion is inversely related to the ratio of their respective dead weigh losses. Ederington & Minier (2006), on the other

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[55] For other recent papers along these lines see Felbermayr & Kohler (2006) and Liu (2006).

hand, look at the aggregate cross-country data to explore the determinants of the choice of tariffs over subsidies.

Given the well-known efficiency of subsidies over tariffs, the WTO rules that discourage subsidies are quite puzzling. In fact, Bagwell & Staiger (2004) write, "...when viewed in the light shed by the existing theoretical literature on domestic subsidies in trading economies,...attempts to discipline the use of production subsidies appear misguided, if they simply redirect government interventions toward the use of second-best instruments of intervention such as tariffs..." (page 1). The 2006 WTO World Trade Report recognizes the importance of the issue but says "...The extent to which stronger subsidy rules have inhibited commitments to reduce tariffs is obviously an empirical matter in respect of which we have no evidence..." (page 196). Our theoretical model in Chapter 2 provides an explanation for this puzzle as it argues that the WTO subsidy rules serve as a commitment mechanism that improves the government's welfare. In this chapter we provide empirical evidence that shows that the WTO subsidy rules and the associated channel we highlight can have a strong effect on tariffs.

An important task, in order to carry out this test, is to identify a proxy for the "threat of retaliation". According to the WTO rules, existing members can retaliate against another member country's use of subsidies either by imposing a CVD on the imports of the subsidized product or by going to the Dispute Settlement Body of the WTO. However, in reality CVD duties are much more frequently used means to retaliate as compared to the DSB, hence we will focus on the countervailing duties.[56] In explaining the role of CVDs and the WTO subsidy rules, Hoekman & Kostecki (1995) note that given weak substantive discipline on sub-

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[56] Since CVD duties are targeted at subsidized exports, these will be effective as a retaliation tool only if China exports in that sector. However, this is not a constraint for us, as there is a lot of bilateral trade even at the HS six digit level. According to our sample, out of a total of 4776 products that China traded with the world during 1999 there were only about 132 products where China engaged in one way trade i.e. it only imported or exported.

sidies in the GATT (and now in the WTO), the threat of imposing countervailing duties can be thought of as the primary disciplining device.[57]

Looking at the countervailing duty actions taken in the WTO, we see that some products and industries have been targeted much more frequently than others. Furthermore, the existing empirical evidence suggests that variables such as political economic strengths of the industry are very important in determining whether it will be successful in getting a countervailing duty imposed on its counterparts in the subsidizing country. Since these political economy factors are relatively persistent, past retaliations can help in predicting future actions. Hence, we use past countervailing duties imposed by China's major trade-partners (against members other than China) to derive a proxy for the "threat of retaliation" faced by China when it entered the WTO.

We construct a product level dataset on Countervailing Duties imposed by Australia, Canada, the EU, and the US – four of the heaviest users of countervailing duty measures and also major trade partners of China – between 1995-2001 by using their WTO notifications and official government publications. To the best of our knowledge, this is the first empirical study to use six-digit product level countervailing duty data for a broad set of countries. We use the underlying variation in the way countervailing duties are targeted across different industries to derive a proxy for the threat of retaliation faced by Chinese industries at the time of the country's accession to the WTO. Thus, this chapter also contributes to the relatively scant, though growing, empirical literature on the impact of retaliation by a trading partner on a country's trade policy.[58]

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[57] While subsidies can also be challenged through the WTO Dispute Settlement System, the instances of disputes invoking the SCM are considerably fewer than those invoking the GATT (Bown (2002), Leitner & Lester (2006)).

[58] See Feinberg & Reynolds (2006), Blonigen & Bown (2003) and Prusa & Skeath (2005). Note however that both Blonigen & Bown (2003) and Prusa & Skeath (2005) look for retaliation at the country level. While Feinberg & Reynolds (2006) looks at the individual HS section level retaliation, that is still very broad compared to our product or industry specifications. Also note that all these papers deal with anti-dumping duties, whereas here we use CVD duties.

We find that there was a relative increase in Chinese tariffs in sectors where there was a higher threat of getting hit by countervailing duties when China joined the WTO. According to our most conservative estimates, there was a relative increase of at least 0.5 percentage points (or about 9%) in ad valorem tariff rates, for products that faced a positive probability of retaliation, compared to those that did not. In further support of the model, we show that the impact of the threat of retaliation was higher in sectors with higher exports – precisely the sectors in which the cost due to retaliation would also be high.[59] We perform numerous sensitivity and robustness checks and find our results to be robust across specifications.

The rest of the chapter is structured as follows. Section 3.2 outlines our empirical strategy and describes the rationale for adopting this strategy. Section 3.3 gives a description of the data. Section 3.4 presents the main empirical results of the chapter and Section 3.5 concludes.

3.2 Empirical Strategy

Accession to the WTO implies that the country faces a probability of being retaliated by other members if it engages in subsidization. Our theoretical model predicts that joining the SCM agreement, which implies a positive probability of retaliation when subsidies are used, would lead to an increase in tariffs as an instrument for redistribution. In what follows we test this prediction of the model using a disaggregated product level data on applied tariffs for the case of China's accession to the WTO in December, 2001.

Before moving any further with the empirical exercise, we must note an important qualification of our empirical strategy. It is important to note that a test of this prediction is not a direct test of the model for two reasons: a) A structural

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[59] In our case the relevant threat of countervailing duty is the threat of CVD being imposed by China's trade partners on imports of subsidized Chinese products. Hence, for any given level of CVD duty, the losses to Chinese producers will be higher the higher its exports of that product.

test of the model would require data on lobby contributions linked to the policies in question or require us to make some explicit assumptions about the parameters of the model. In the absence of these one can only attempt to perform a reduced form estimation. b) The hypothesis that there will be an increase in tariff when faced with a positive threat of retaliation in a related instrument is not a unique prediction of this model.

However, having said that, even though we may obtain a similar prediction about tariffs going up if we add subsidies and the threat of retaliation to some of the existing models trying to explain gains from accession to WTO, adding subsidies as another redistribution device to those models reduces the strength of their main results. For example, according to Maggi & Rodríguez-Clare (1998) the reason a small country joins the multilateral agreement is because it leaves the government better off in the long run by avoiding capital misallocation towards the protected sector. Once we add subsidies to their model and allow the tariffs to rise following accession, these long-term gains are no longer as large, hence weakening the main force behind their result. Furthermore, while this hypothesis looks obvious in hindsight, this is the first study to examine and attempt to quantify this result despite widely acknowledged substitutability between tariffs and subsidies.

As noted in Chapter 2, countries generally negotiate on the bound tariffs at the time of accession and not the applied rate. Since the bound rates are the ceiling rates above which the tariffs can't increase, we use the applied rates in our empirical section which are generally much lower, and hence flexible, which is consistent with the assumptions of our model. For example, Ecuador bound most of its tariffs at the rate of 30 percent lower when it joined the WTO in January 1996, whereas the average applied tariffs were at a much lower level at about 17 percent ad valorem (USTR (1997)). However after accession Ecuador increased

its tariffs across the board, "something that was possible in view of the binding overhang of its WTO tariff commitments" (Evenett & Primo Braga (2005)).

Thus we can focus on the applied tariff rates for our empirical analysis. However, the average applied tariffs also *usually* go down with accession due, for example, to unilateral liberalization efforts by the country.[60] For example, Ecuador had undertaken unilateral liberalization since 1990. Similarly, China was also undergoing a unilateral liberalization during this period so its applied tariffs were decreasing even before the accession. Thus, instead of focusing on the strict version of the prediction, that tariffs will increase with accession in sectors that face a higher threat of retaliation when subsidized, we look at *relative* increase in tariff.

3.2.1 Countervailing Duties and Existing Evidence

In order to motivate our strategy of looking at the past retaliation to get a proxy for the threat of retaliation, it is instructive to look at the CVD duties used in the WTO by the members, and some of the existing empirical literature in the area, before moving on to discuss our methodology.

Table 3.1 provides a sectoral breakdown of the CVD duties imposed during 1995-2004 as reported in WTO statistics on subsidies and countervailing measures.[61] The WTO reports these data based on the semi-annual notifications of the members. In this table each countervailing duty order in a sector against a given country is counted once though every order may contain several products. As we can see from the pattern of countervailing duties, some industries are much more likely to be targeted by CVDs than others. For example the Steel industry (HS section XV) alone accounts for almost 40% of the total new CVD measures

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[60] Note, that there are actually many products (43) in our sample where the tariff rates went up following accession and it remained same for about 625 products. As shown in the next chapter, Chapter 4, for Taiwan the number of products for which tariffs increased following accession is even higher (about 400 products).

[61] Source: http://www.wto.org/english/tratop_e/scm_e/scm_e.htm

between 1995-2004 (source- SCM gateway, WTO). On the other hand, there are some industries widely known to be the recipient of subsidies, like Paper and Pulp (HS section X) or Footwear and Umbrellas (HS section XII), which did not have a single new measure imposed during this period. The simple correlation between the CVD measures imposed by the US and the EU, two major users of CVD duties is very high (0.66). Classifying countries into groups of developed and developing countries, we again find that the correlation between the two groups across sectors that had a CVD imposed is 0.68, indicating that similar set of industries have been targeted by the CVD by different countries.

Thus, we use the information contained in the past countervailing duties by major trade partners to predict the probability that a countervailing duty would be imposed if subsidy were to be given.[62] Industries which have been frequent targets of the CVD are expected to have a higher probability of being retaliated against.[63] Hence, for those industries where the probability of a countervailing duty being imposed is higher, we would expect the protection in the acceding country to switch towards using less efficient means - such as tariffs.

One of the most important anecdotal evidence in support of our strategy relates to the paper and pulp industry. As mentioned earlier, there has not been a single incidence of positive countervailing duties in this industry between 1995-2004. Thus, according to our hypothesis we should see subsidies being used in this industry in China, as our strategy predicts low probability of getting hit

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[62] Past CVD duties give a picture about the probability of CVD being imposed not only because it gives an idea about the political strength of the industry in the partner country, but also because a number of studies have shown, a) the trend of industries filing for relief in the same products where the duty was imposed earlier and b) the higher probability of finding a positive outcome if a duty had been in place in past. For example, Blonigen (2006) suggests that the past experience in filing for AD petitions helps the firms to lower the cost of petitions as well as affects the likelihood of successful outcomes.

[63] That some industries are targeted more frequently than others, has also been noted elsewhere. For example, Chu & Prusa (2004) note that, while most of the three-digit (ISIC) Chinese manufacturing industries have been targeted by anti-dumping duty, four sectors - Chemical, Machinary & Equipment, Textile and Basic Metals - account for 80 percent of all cases.

by a countervailing duty based on past CVD activities. According to a recent report prepared by American Forest & Paper Association (June 2004) and draft statement of US-China Joint Commission on Trade Working Group on Structural Issues (May 04), this indeed seems to have taken place in China. The report mentions, as one of its key findings, plans by the central government to provide subsidies to this industry through a number of financial and tax incentives.[64]

Note that, this may also just reflect the fact that all countries are subsidizing this sector and so if one uses a CVD against another it will also face CVDs on its own exports. This again is consistent with our approach that not all sectors that use subsidies would automatically face a retaliation. Hence, there exists a differential probability of retaliation for different products even if they all use subsidies; which is what we exploit in the empirical strategy.

Finally, in order to be able to provide a suitable proxy for retaliation we need to understand what elicits retaliation against subsidies. Hence, we look at the existing literature that looks at the determinants of CVD from the point of view of the country imposing the duty. Most of the existing empirical studies in this area either focus exclusively on Anti-dumping duties (AD) or lump both AD and CVD duties together. This is not surprising, since the administrative procedure for imposition of AD and CVD are similar. Two papers that focus exclusively on CVD are Marvel & Ray (1995) and Baldwin & Steagall (1994). Marvel & Ray (1995) focus on the determinants of countervailing duties in the US from 1980-1993, and observe that the "same protectionist forces" that lead to anti-dumping duty also give rise to the countervailing duties. On the other hand, Baldwin & Steagall (1994) show that besides the economic variables indicating

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[64] (Source-https://www.bipac.net/afpa/pdf/China_Key_Findings6-3-04.pdf, http://ia.ita.doc.gov/download/us-china-jcctwg/comments/afpa-jcctwg-cmt.pdf

Note that, recently after a long gap of not applying a countervailing duty against a non market economy, the first countervailing duty initiated by the commerce department is on imports from paper industry of China.

injury to the domestic industry a number of other factors are also responsible for a positive CVD outcome (imposition of duty). Though, they note that economic variables are more important in the CVD cases as compared to the AD cases.

There are a number of other papers that pool both AD and CVD duties together and conclude that political economy variables are important determinants of these types of protection. Some of the pioneering papers in this literature are Finger, Hall & Nelson (1982) and Hansen (1990). Along similar lines, in one of the recent studies using US ITC decisions on antidumping and countervailing duties, Hansen & Prusa (1997) find both economic and political variables to be important.[65]

Thus, whether a CVD will be imposed depends on factors such as political economy variables of the country that is hurt by subsidization. Since, these factors are likely to be exogenous to the political economic factors of the country whose subsidy decisions we want to study, we can use the CVD measures imposed by its major trading partners (against other countries) to get the expected probability of getting hit by CVD in an industry if the acceding country engages in subsidization.

3.2.2 Empirical methodology

Baseline Model The reduced form equation for tariff rates in China can be written as

$$\tau_{jt} = \alpha_j + \alpha_t + \beta \Pr(Retaliation)_{jt} + \gamma Y_{jt} + \upsilon_{jt} \qquad (17)$$

where α_j are a set of product specific factors. α_t are the time dummies and Y_{jt} is a vector of other variables leading to the imposition of tariffs. $\Pr(Retaliation)$ is zero for all products before the country signs the agreement. However, once the country becomes a part of the WTO there is a positive probability of retaliation if

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[65] While most of these studies relate to the US there have been some studies related to EU and Australia with similar conclusions.

the country engages in subsidization. Furthermore, this probability of retaliation might differ across industries depending on the product and the political economic characteristics of the trading partners. We proxy China's perceived threat of retaliation were it to use subsidies, by the countervailing duties imposed by these four countries on other WTO members between 1995 to 2001 (inception of WTO and China's accession). More specifically, we assume the expected probability of retaliation for any product j to be given by

$$\Pr(Retaliation)_{jt} = (a_t + cCVD_j) * WTO_t \tag{18}$$

where WTO_t is an indicator that takes the value one when the country is a member of the WTO (and hence the SCM agreement), and is zero otherwise. Similarly, CVD_j is an indicator that takes the value one if at least one of the above four trading partners of China had imposed a countervailing duty against another WTO member for that product during 1995-2001. A priori, we expect that $c \geqslant 0$.

Thus, if we take the time difference of (17), taking a period before and after accession we can write it as,

$$\Delta \tau_j = \alpha + \beta cCVD_j + \gamma Z_j + \varepsilon_j \tag{19}$$

where $\alpha = (\alpha_t - \alpha_{t-1}) + \beta a_t$ and $Z_j = \Delta Y_j$ is a vector of other variables which affect changes in tariff rates. This transformation into the difference form has the advantage that all unobserved time-invariant product-specific effects are being controlled for in the regression.

According to our main hypothesis, when there is a higher probability of being hit by a CVD the government will give protection through tariffs. Thus, there will be a relative increase in tariffs in sectors that face a higher threat of retaliation,

ceteris paribus. Thus we expect the coefficient (βc) to be positive. Note that we are taking change in tariffs i.e. $\Delta\tau$ = tariff after accession-before accession, thus a positive coefficient on CVD_j indicates a relative increase in tariffs.

Interaction Model   While the earlier model gives us the average effect of the probability of getting hit by a countervailing duty on the change in tariff, in order to see whether this is indeed due to retaliation one needs to go further. More specifically, as suggested by the theory, the threat of retaliation will only be important if the cost due to retaliation is also high. If the cost imposed by retaliation is negligible, the threat will not have any effect in the way a country chooses its policies. As CVD duties mentioned here are the duties that would be imposed by China's trade partners on the Chinese exports of the subsidized product, the cost of retaliation for China will be higher in a sector where it has higher exports. Thus we expect the threat of retaliation to be more effective when China's exports in that sector are also high. In order to test this hypothesis we write our second specification by modifying (19) as

$$\Delta\tau_j = \alpha + \beta cCVD_j + \lambda Exp_j + \delta cCVD_j * Exp_j + \gamma Z_j + \varepsilon_j \qquad (20)$$

where Exp_j indicates China's exports of product j (as a measure of cost of retaliation) and $CVD_j * Exp_j$ is the interaction between the threat and the cost of retaliation. Here the coefficient of interest is δ which we expect to be positive. A positive δ would mean that the effect of retaliation on relative increase in tariffs is higher when exports are also high. Furthermore, we should also expect $(\beta + \delta Exp_j)$ (the marginal effect of threat of retaliation) to be positive.

The coefficient on exports, λ (our proxy for cost of retaliation), is also interesting in its own right. The coefficient λ measures the average effect of an increase in exports on the change in tariffs when there is no threat of retaliation. We

expect this coefficient to be negative, i.e., sectors with higher exports will see a relative decline in tariffs. According to the literature there are at least two channels through which this effect may work, a) when the export sector is large (has a comparative advantage) it is less dependent on the protection in the home market and b) other countries will be more successful in negotiating a decline in tariffs if there does not exist a powerful domestic import competing lobby demanding protection.

Predicted Probability Model   The above two approaches give equal weights to the products where the countervailing duty was imposed by only one country as compared to that when it was imposed by all countries. Thus, the above models only give us the average effect for those products which face a positive threat of retaliation versus those which do not. Hence, as our third strategy we follow a two step procedure. First we predict the probability of CVD in a given industry i by using bilateral, out-of-sample data, and then use this in the regression for change in tariffs by plugging it as a regressor in (19) instead of the indicator for CVD. These predicted probability would give us the measure of the Chinese government's expectation of the threat of retaliation in any given industry at the time of China's accession to the WTO.

In order to predict the probability that a CVD would be imposed if the government decides to use subsidies, we use panel information on past countervailing duty actions by the four users of CVDs in our sample. While we use a number of different specifications, the basic equation to be estimated in the first stage, using stacked data for all four countries in our sample, can be written as

$$CVD_{jict} = \pi_i + \varpi_c + \varpi_t + \theta W_{jict} + \epsilon_{jict} \qquad (21)$$

where CVD_{jict} is a binary variable that equals one if the country c had imposed a

CVD duty against one or more of its trading partners for any product j of industry i at a given time t, and is zero otherwise. We include industry dummies (two digit Chinese industry codes), π_i, for industries that had a positive countervailing duty imposed in at least one of the products in the given period. Thus, dummies for only those industries that had previously been retaliated against were included in the regression.[66]

An alternative way to interpret π_i is as $(\varpi_i * I_i)$ where ϖ_i is the full set of industry dummies and I_i is an indicator that indicates whether that industry has been targeted by a CVD in the past. Thus we can treat industries with zero observed CVD as the omitted category, and π_i can be interpreted as the average probability of getting hit by a CVD relative to the industries which never got retaliated against. Here ϖ_c and ϖ_t are the full set of country and time dummies respectively. and W_{jict} refers to other possible determinants of CVD duty. As shown in section (3.2.1), according to the existing empirical literature, the main determinants of the imposition of CVD are either the industry-specific political economy factors or country- and time-specific factors like real exchange rates.[67] The idea here is that once these other variables and time and country specific factors are accounted for, the industry dummies π_i will capture the factors specific to an industry that make it a more or less likely target of CVDs. Thus the estimated coefficient of industry dummies from the model gives the average probability of imposition of CVD on a product belonging to that industry.

[66] Otherwise it doesn't make sense for an industry to have a predicted probability of retaliation based on past CVD if the observed instances of CVD are zero. Another reason why we want to include only industry dummies with at least one CVD duty in the specification (but include all observations) is to make the regression results between linear probability and logit estimations comparable. Note that Logit and Probit can not estimate the group dummies if the outcome is the same for all observations belonging to that group (see for example, Caudill (1987)).

[67] Apart from studies mentioned earlier that suggested the political economy determinants of AD and CVD duties, Mah (2003) has shown that the imposition of countervailing duties in US is positively correlated with macroeconomic variables such as growth rates. Similarly, Knetter & Prusa (2003) have shown positive relationship between antidumping filings and macroeconomic variables like real GDP growth and real exchange rates.

Since the dependent variable (CVD_{jict}) is binary we use both the linear probability model and the logit specification to estimate the above equation. In the next step we use these predicted industry coefficients from the first stage as the probability of retaliation. Thus we estimate an equation similar to (20), except that instead of the CVD_j indicator we use the predicted coefficients from the first stage. Thus step 2 involves the following regression,

$$\Delta\tau_{ji} = \alpha + \beta c\hat{\pi}_i + \lambda Exp_j + \delta c\hat{\pi}_i * Exp_j + \gamma Z_j + \varepsilon_j \tag{22}$$

where $\hat{\pi}_i$ is the industry effects measures in the first stage. Note that, since the probability of retaliation is based on an estimated regressor it will be measured with error and so we have to take this in to account when interpreting our results. In order to correct for this problem we use the method outlined in Gawande (1997) and Gawande & Bandopadhyay (2000).[68]

3.3 Data

Since the four traditionally heavy users of countervailing duties – Australia, Canada, the EU[69] and the US – are also some of the main trading partners of China, we use countervailing data from these countries to predict China's perceived threat

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[68] Gawande (1997) follows the methodology suggested by Fuller (1987) for correcting the error-in-variables. The main idea is to treat the difference in the variance of the estimated coefficients and the mean of the measurement error variance as an estimate of the true measurement error. Thus, whenever the variance of the estimated coefficient exactly equals this value it can be treated as one measured without error and otherwise can be scaled up or down according to the following formula,

$$\tilde{\pi}_i = \bar{\hat{\pi}} + \frac{\left(\sigma^2_{\hat{\pi}} - \overline{\hat{\sigma}^2_e}\right)}{\hat{\sigma}^2_{ei}} \left(\hat{\pi}_i - \bar{\hat{\pi}}\right) \tag{23}$$

where, $\tilde{\pi}_i$ = corrected coefficient for industry i, $\hat{\pi}_i$ = estimated coefficients from the first stage, $\bar{\hat{\pi}}$ = mean of the estimated coefficients, $\sigma^2_{\hat{\pi}}$ = sample variance of the estimated coefficients, $\hat{\sigma}^2_{ei}$ = estimated measurement error for a given coefficient (variance of the estimated coefficient for industry i), and $\overline{\hat{\sigma}^2_e}$ = mean of the estimated measurement errors.

[69] The EU is considered to be a single partner for our case comprising of the 15 countries before its enlargement in 2004.

from facing countervailing duties in a given industry at the time of its accession to WTO. According to article 25.11 of SCM agreement of the WTO, each member country is required to submit a semi-annual report to the committee on subsidies and countervailing measures, notifying the countervailing actions (both measures and initiations) taken during the period in question. While these reports are relatively incomplete, it is the only source of information on countervailing duties for all countries in a consistent way and is easily publicly accessible at one point.[70]

We take the countervailing duties in force information from the semi-annual reports of these four countries for the period 1995-2001 (The period from the date of establishment of WTO to the date of accession of China). Since, these semi-annual reports only state the names (besides the date in force) of the cases (broad category) and not the actual products involved, the information about the products on which these countervailing duty were imposed was taken from respective government publications for each of the four countries. For US, the information regarding the products involved in a given case was taken from various issues of the *Federal Register*. For the European Union, the relevant information is regularly published as council regulations in the *Official Journal*. For Canada the product codes involved were taken from the *Canada Border Service Agency*'s Dumping and Subsidy information section (for some cases the information came from the *Canada Gazette* and the *Canada International Trade Tribunal*). Finally, for Australia the corresponding product codes were taken from the *Australian Customs Service's* Dumping and Countervailing Duties status reports.

Since, the most disaggregated level at which the product codes are consistent across countries is at the six digit level of Harmonized Schedule (HS6), we do our analysis at this level. The data on bilateral imports for these four countries were

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[70] Note that most of the countries publish their countervailing duty (or trade remedy) information in their government publications. However, to be consistent across countries the information in these WTO notifications was taken as the starting point.

taken from COMTRADE database at the HS6 digits from 1993-2003. Import and export data for China are also from the same source. In addition the data on tariffs from 1996-2003 for China at the HS6 digits were taken from TRAINS database.[71]

The data on the manufacturing industries in China was taken from various issues of the *China Statistical Yearbook* (published annually by China Statistical Bureau). The information on manufacturing industries is at the two digit level of Chinese industrial classification (39 mining and manufacturing industries). This industrial classification is based on the three-digit ISIC classification, though it is sometimes more detailed than that (Source - United Nations Statistics Division).[72] In order to get the concordance between HS6 digits and Chinese industrial codes, the concordance table between six digit HS products and four digit ISIC industries (about 80 manufacturing industries) from WITS software (World Bank) was used. Hence, the six digit trade and tariff data were concorded to the four digit ISIC industries, which were then matched in to different Chinese industrial codes.

The average (applied) tariff levels in China for the years 2000 and 2003 for Chinese two digit industries are given in Table 3.2.[73] We can see that there is a lot of variation in tariff structure both before and after accession to the WTO. Some industries have very high tariffs as compared to others. The fact that these industries also happen to be industries where tariff rates are higher in other countries around the world (e.g., Tobacco processing, Beverage manufacturing, Textile and garment industries), suggests that similar kind of political economy forces are at play in China.[74] The third set of columns in that table refers to the (absolute) change in tariffs within this period.

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[71] Tariff information for 2002 for China was not available.

[72] http://unstats.un.org/unsd/cr/ctryreg/ctrydetail.asp?id=191,
http://www.oecd.org/dataoecd/32/24/33982319.pdf)

[73] These are simple unweighted averages.

[74] Note that for tobacco industry the standard deviation for tariffs in 2000 is zero i.e. all six digit product categories belonging to this industry had the same high rate of tariff.

The average tariff rates in China have gone down with accession to WTO (from 17% to 11% ad valorem rate). However, we can see that the changes in tariff rates have not been uniform across industries, and range from reductions as low as 1 percentage point to as high as 27 percentage points. In fact, while for the paper industry the average tariff rates have fallen from 14.9% to about 7.4% (a reduction of 49%), for chemical fiber industry – an industry with roughly equal initial tariff rates – the tariffs have gone down from 14.9% to 9.1% (a reduction of only 39%).

Note that, in light of our earlier observations, this is exactly what we expected to find. Paper industry, an industry with relatively few instances of countervailing duties, will have a higher reduction in tariffs than another industry like chemical fiber, where a number of countervailing duties have been imposed in past, as subsidies can no longer be given to the chemical producers freely.[75]

3.4   Results

In this section we report the results of the three approaches to test our main hypotheses described in the methodology section. The results are provided in following sub-sections depending on the model being discussed.

3.4.1   Main Results

Baseline Model   Our dependent variable is the change in applied tariffs in China, tariffs in 2003-tariffs in year 2000, which is regressed on the CVD indicator and other controls.[76] The most obvious covariate that one should control for is the initial level of tariffs, as the amount of the change in tariffs is likely to depend on the initial tariff level. However, it is not immediately clear what the sign of

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[75] Note, as mentioned earlier, the US paper and pulp association has alleged that China engages in rampant subsidization.

[76] In order to minimize any possible problems due to endogenity of regressors, we use the controls from a year before the initial year in the dependent variable.

the coefficient of initial tariffs should be. On the one hand, because the outcome of WTO negotiations generally takes the form of a given percentage reduction in *average* tariff levels, we would expect the reduction in tariffs to be higher for the industries where the initial tariff rate is higher. This would also be true if we think of accession to the WTO as a commitment device by the benevolent government, and hence expect the tariff reductions to be larger where, pre-accession reform was not possible due to some sociopolitical factors. On the other hand, if tariffs were a result of lobbying, a high initial tariff would indicate the political (bargaining) power of that group and hence we would expect this group to be successful in getting lower cuts.

Table 3.3 reports the regression results of the baseline model as given by (17). The first column reports the results when we regress the change in tariffs on CVD and the tariffs in year 1999. We can see that not only is the coefficient on CVD positive and statistically significant at one percent level, but it is economically significant as well. According to these estimates, there was a relative increase of 0.8 percentage points (or about 14%) in tariffs for products where a CVD had been imposed in the past. Furthermore, the coefficient on initial tariff is negative and significant implying that products that had a high initial tariff were faced with higher reductions as China joined the WTO.

Since tariffs will not decrease any further if they were zero to begin with, the next column reports the results of a regression where we add a dummy indicating whether the product had positive tariffs in 2000. The SCM agreement concerns the industrial subsidies and the WTO subsidy rules for agricultural products are slightly different. Therefore, the third column restricts the sample size to products belonging to the mining and manufacturing industries. As we can see from the table, the qualitative results remain unchanged, even though the value of the coefficient in the restricted sample is slightly lower.

In the above regressions we included tariffs in 1999, one year before the initial year in the dependent variable, in order to minimize any bias arising from the endogeneity of tariffs. However, if the same political economy variables that give rise to tariffs in 1999 also affect the change in tariffs, omitting them would lead to biased and inconsistent coefficients. Hence, in column four we include additional variables suggested by earlier literature that can explain the level of tariffs. Note that, while the coefficient on CVD is now significant only at 10 percent level of significance, the size of the coefficients has increased compared to the case with only initial tariff as control.[77]

Finally, in the last column of Table 3.3, we use an instrumental variables approach to tackle the potentially endogeneity of tariffs. We use, a) the average of year 1999 applied tariffs of four countries with similar levels of per capita income as China – Brazil, India, Indonesia and South Africa – and b) the applied tariff of Taiwan in the year 1999 as instruments for China's tariff in 1999. The idea is the following: since before accession China is relatively free to choose its tariff level (at least theoretically), it will set tariffs according to its comparative advantage and political economy factors. Hence, its tariff level and structure is likely to be similar to countries with similar stages of development. At the same time, because these countries are not big trade partners of China, they will not have a say in the negotiated reduction in Chinese tariffs, hence, the proposed instruments will not be correlated with the dependent variable.[78] Again, the results are similar to the ones we got before.[79]

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[77] In this as well as all the following specifications where industry level data is used as explanatory variables the reported standard errors allow for clustering at the industry level.

[78] Note that, Taiwan *is* one of the major trade partners of China. However, it was not a member of the WTO during the period of analysis and hence did not participate in tariff negotiations with China. Dropping Taiwan and using only the average tariffs for the other four countries leaves the results unchanged.

[79] Note that we are using applied tariff rates for these countries, and moreover an average over them, thus there is even fewer chance that the instrument only reflects a negotiated agreement with other countries such as US. Furthermore, the simple correlation between chinese tariff and any of the other developing countries included is only around (0.4-0.5), however the correlation

Thus, according to the regressions reported in Table 3.3, there is an evidence of a relative increase in tariffs for products that faced a threat of retaliation. In order to check that the results derived earlier are due to retaliation, and not to some unobserved industry characteristics that *happen to be* correlated with the CVD indicator, we conduct the following counterfactual exercise. If the results are truly driven by the threat of retaliation, then retaliation should not have the same effect *before* China joined the WTO. In Table 3.4a we replicate the regressions in Table 3.3, but instead of using time period 2000-2003 we use the period 1997-2000, before China joined WTO in 2001. Thus, in these regressions, the dependent variable is the change in tariffs between 1997 and 2000 and is regressed on similar controls as in Table 3.3. As we can see from the results reported in Table 3.4a, the coefficient on CVD is no longer positive for any of the specifications.[80] In fact, in almost all cases the coefficient is negative and significant, indicating a relative decrease in tariffs for these products. These results indicate that if indeed there are some omitted characteristics that are correlated with the CVD variable, they would lead to a downward bias in our earlier estimates.

Another concern with the evidence provided in Table 3.3 is that it could be driven by sectoral shocks that affected tariffs for these products around the world, and our proxy for retaliation is just picking up that effect. In order to verify that the effect we identify is indeed a threat of retaliation related to accession, we look at the tariff changes during the same period for the four developing countries mentioned earlier – Brazil, Indonesia, India and South Africa. While applied tariffs in these countries also declined during this period on an average by about 2 percentage points, there exists a lot of variation. The biggest drop was for a product in South Africa which saw a tariff decline of about 32 percentage points,

is 0.7 when we take the average over these countries hence indicating that the results are not driven by any single one of these countries.

[80] Note that for the IV specification in the case of counterfactual exercises the instruments fail the overidentification test.

whereas for a product in India the tariff went up by 60 percentage points during the same period. A simple correlation between the *change* in tariffs for these countries and China does not show any relationship, with the correlation varying between -0.07 for India to about 0.16 for Indonesia and South Africa. This is in sharp contrast to a very high positive correlation observed earlier, between the *levels* of applied tariffs for 1999 among these countries and China (The correlation varies between 0.46 for Brazil and for South Africa to about 0.59 for Indonesia; the correlations increase to 0.66 if we take an average.)

In order to further support our claim we exploit the variation in average tariff changes for these countries between the period under consideration (2000-2003). The results of this counterfactual exercise are reported in Table 3.4b. The first column reproduces the results from column 1 of Table 3.3 for comparison. In column 2 of this table we include the average change in tariffs for these four developing countries as an additional control variable. We can see that, not only the coefficient on the threat of retaliation is still positive and significant at 1% level, the size of the coefficient is also similar. As an alternative strategy, in the third column we regress the average change in tariffs for these countries by using a similar specification – our measure of threat of retaliation and the level of tariffs for these countries in 1999. As expected, the threat of retaliation is no longer significant. Thus, the evidence in Table 3.3 along with these counterfactual exercises seem to make a strong case for the validity of our hypothesis.

Interaction Model   In this model we test the alternative hypothesis where we interact the threat of retaliation with the associated cost of retaliation. The threat of retaliation by itself would be of little significance if the stakes involved were very small. The more China exports in any given sector, the higher the costs of facing a countervailing duty, and hence, the more effective the threat

of retaliation. Note that using the post-accession level of exports could lead to inconsistent estimates, since post-accession exports will be endogenous to the changes in tariffs if the goods are close substitutes. Hence, we use exports values for year 1999 that are more likely to be exogenous to the changes in tariffs.[81]

In Table 3.5 we present the results for the interaction model. In the first column we report the results where we use as proxy for the threat of retaliation China's exports to the four trading partners enumerated before. The interaction term is positive and significant at the one percent level, indicating that the threat of retaliation is more effective when the associated costs are higher. This result remains unchanged when we restrict the sample to the industrial sector, add other political economy variables, use alternative measure of cost of retaliation (use China's exports to the world), or use instrumental variable estimation. The results for these specifications are reported in columns 2-5 of Table 3.5. According to the results in column 1, for products with average exports the impact of retaliation is 3% higher as compared to those with zero exports.[82]

Note also that the coefficient on exports is negative and significant in almost all cases. Thus, for those industries that do not expect to be retaliated against, higher exports are associated with a larger decline in tariffs. Indeed, we would expect industries where China is already exporting to need less protection. Even if they do need protection, if these industries are less likely to be targeted by CVD, then it is more efficient to use subsidies instead of tariffs, and hence we

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[81] Note that in our theoretical model we assume a small open economy that does not have any market power. However, in reality even small countries might have some degree of market power in the products they specialize in. This is certainly true for the case of China. To the extent that a country's market power in a given product/sector is reflected in its volume of trade of that product, we control for that market power by including exports in these regressions. As noted earlier, we have also included the import volumes in some of our specifications without changing our results.

[82] Note that COMTRADE only reports the data for which positive exports were recorded. Hence, if we do not observe exports in our sample, it could mean either that the data is missing or that there were no exports. In the results shown here we only look at the non-missing exports as reported in our data source. However, the results remain unchanged if we make the other extreme assumption and treat missing observations as cases of zero exports.

would expect a negative sign for exports. In contrast, the effect of exports is lower for industries with a positive threat of retaliation. The evidence from the regression reported in the first column suggests that for products that do not face any retaliation, a 1% increase in mean exports leads to 1.2% decrease in tariffs. However, for those products that face a retaliation against subsidy a 1 % those products that face a retaliation against subsidy a 1 % increase in mean exports will lead to a 3 % *increase* in tariffs.

Table 3.6 reports the results from a counterfactual exercise using pre-accession data, as earlier. These regressions use specifications similar to those in Table 3.5, but use the 1997-2000 sample, from before China's accession. Again, if earlier results were not due to accession, but rather, to some other omitted characteristics, we should expect to see similar signs on the coefficients. As we can see from the results, the coefficient on the interaction term is negative and insignificant for all the specifications, which further supports the validity of our results.

Predicted Probability Model In our final specification we exploit the variation in the threat of retaliation across sectors. In the first step we use pooled cross-section data on countervailing duties imposed between 1995-2001 by the four countries in the sample – Australia, Canada, the EU, and the US – to get an estimate of the probability of retaliation as perceived by China at the time of accession. In the second step we use the estimated probability of retaliation in specifications similar to the ones used in the interaction model.

The first stage results are presented in Table 3.A1. We estimate the probability of retaliation using both linear probability model and the logit model.[83] The first three specifications belong to the linear probability model, while the next three use the logit model. In both specifications, the first regression includes only the industry dummies as regressors, whereas the second specification also includes

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[83] These regressions report odds ratios in case of logit specifications.

country, as well as the time dummies. Finally, the third regression also includes some other variables that might help explain the CVD – the Herfindahl share of exporters, the number of exporters and the growth of imports in that product category.[84] We see that results are very similar across the two models. In fact, the lowest correlation between the coefficients from different specifications is 0.94 between column (3) (full specification in the linear probability model), and the odds ratios from column (5) (the regression with only industry, country and year dummies in case of logit specification). In what follows, we use the coefficients from column (2) as a measure of the predicted probability of retaliation in an industry in the second step.

In the second stage we reestimate the specification given by (20), but instead of using the CVD indicator, we use the estimated coefficients from the first stage ($Pr(Retaliation)$). The results are reported in Table 3.7. As these are estimated regressors we should take this fact in to account. If the null hypothesis is that the coefficient on the estimated probability is zero, the standard t-statistics are valid (see Wooldridge (2002)). Thus, the first three columns in Table 3.7 report the estimation results using the estimated proxy for retaliation but without making any corrections. In all the specifications we use coefficients from the first stage regression that included all industry, country and year dummies. In line with our earlier results, these regressions show that the coefficients on the interaction term are positive and significant in all cases.

However, because we reject the null hypothesis that the coefficient on estimated probability of retaliation is zero, we need to take the measurement error into account before we can make further inferences. Thus, in order to tackle the problems that arise from the fact that we use estimated regressors, we use the

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[84] Besides these we also estimated specifications that control for yearXcountry specific factors to control for country specific shocks which did not necessarily coincide with a global shock. The coefficients on industry dummies again remain similar. Table A2 lists simple correlation across the different specifications.

procedure outlined in Gawande (1997). The last three columns in Table 3.7 replicate the first three regressions but using the corrected coefficients. We again see that the coefficient of interest, the interaction between the probability of retaliation and the cost of retaliation, is positive and significant across all specifications. Furthermore, the signs and significance of other variables are also similar. Thus, we can conclude that the threat of retaliation is more effective when the cost of retaliation is also high.

3.4.2   Robustness tests

In addition to the robustness tests discussed earlier, we conduct a number of additional robustness tests to check the validity of our results. While one set of robustness tests deal with the robustness of results to the selected sample, the other set looks at whether the results are sensitive to the presence of outliers in the data. Table 3.8 reports the results for some of these robustness exercises for the first specification in the interaction model.[85] Columns (1) and (2) report results where the sample is constrained to include only the manufacturing sector or only those industries where at least one of the products had been a target of the CVD in the past, respectively. Column (3) reports results for a regression where, instead of using data from 1999, which is likely to be correlated with 2000, we go further back and use the first year in our sample (1996) for which the data is available. We see that the results are not sensitive to any of these alternative specifications.

The next three specifications try to rule out the possibility that our results are driven by potential outliers in the data. The first of these regressions uses median regression, which is less sensitive to the presence of outliers. In the second specification the observations which were detected as outliers using the Hadi

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[85] Other robustness results are available but not reported to conserve space.

criterion were dropped. The final specification uses an alternative technique to minimize the sensitivity of results to outliers in the export data. According to this strategy, we create dummies that categorize exports depending on whether they take a value below, above or fall between the 33rd and the 66th percentile. If our hypothesis is correct, we should expect the interaction terms on the highest category dummy to be positive. According to the results in Table 3.8 the coefficients on the interaction terms for the *hi* dummy (exports higher than 66th percentile) is positive and significant. Hence, the earlier results are robust to the presence of outliers.

3.5   Conclusion

The existing literature on the political economy of trade policy suggests that it is mostly is used for redistribution purposes. This literature typically assumes that tariffs (trade taxes/subsidies) are the only instruments available to the government. In reality, however, a variety of other instruments are available to the government, with tariffs and production subsidy being the two most important ones. In this chapter we show how the WTO accession process and the associated rules affect the choice and level of redistributive policies used in the acceding country.

We empirically test one of the important predictions of the theoretical model that accession to the WTO will lead to an increase in tariffs in sectors that face a threat of retaliation in response to subsidization. We construct a unique product level dataset on countervailing duties imposed by four major users of CVD and use the underlying variation in the way countervailing duties are targeted across different industries as a proxy for the threat of retaliation. In particular, we use this variation to explain the differences in changes in tariff rates across industries as China joined the WTO. Consistent with our hypothesis, we show that indus-

tries with higher probability of getting hit by countervailing duties experienced a relative increase in tariffs. Furthermore, the threat of retaliation seems to have had the strongest effect in industries where the costs of retaliation would also have been high.

Apart from providing evidence in support for one of the main hypothesis of the theoretical model that explains a puzzle regarding inconsistency of WTO subsidy rules noted by many, this chapter is also the first to show how the WTO rules on subsidies can affect the extent of tariff liberalization at the time of accession. In this chapter we have tried to check the robustness of the result and provide interesting counterfactual evidence to support the main result. However, whether this result is generalizable, or specific to China, is an important question that one must answer before any broad conclusions can be made. In order to answer this question we look at the case of Taiwan's accession to the WTO in January 2002 in the next chapter.

CHAPTER 4

4   Empirical Evidence using Taiwan's Accession to the WTO

4.1   Introduction

In this chapter we provide evidence in support of the main hypothesis of our theoretical model using the case of Taiwan's accession to the WTO in January 2002. One of the main goals of the chapter is to see whether the evidence in Chapter 3 can be generalized to other countries. Recall that in Chapter 3 we show that there was a relative increase in its tariffs as China entered the WTO for those products that faced a threat of retaliation against the use of subsidies versus those that did not.

The case of Taiwan is interesting in its own right for a number of reasons. First, Taiwan joined the WTO as its 144th member on 1 January 2002, and China acceded on 11 December 2001, hence the timing of the events makes the two studies natural cases to compare. Second, unlike China, which is the third largest player in the world with a total share of around 7% of the world trade, Taiwan ranks 16th in terms of the total world merchandise trade.[86] Given that our theoretical model in Chapter 2 assumes a small economy, it is important to see whether we get the same results in the case of Taiwan as the case of China. Third, Taiwan had already undertaken significant unilateral liberalization starting in 1980s, bringing down its tariffs to low levels. In fact, in the view of many observers, Taiwan had already met the necessary requirements for accession to the WTO and was just waiting for China's entry (Mastel (1999), Tsai (1996)).[87]

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[86] (Source: WTO Statistics Gateway available at http://stat.wto.org)

[87] The People's Republic of China strongly insisted that Taiwan not be allowed to join the

We find strong evidence in support of our hypothesis. Our estimates also indicate that the impact of threat of retaliation for Taiwan was similar in magnitude (in terms of the percentage points increase) to that for China. However, given the fact that Taiwan was already a highly liberalized economy as compared to China even prior to its WTO accession, the similarity in numerical magnitude is even more striking. In fact, according to our estimates, the threat of retaliation against subsidies led to a 65% increase in relative tariffs for products that faced this threat as compared to those that did not, as Taiwan joined the WTO.

The rest of the chapter is structured as follows. In Section 4.2 we provide some background information on Taiwan's trade policies and its accession to the WTO. We describe the econometric strategy in Section 4.3. In Section 4.4 we discuss the main results as well as the robustness of these results and finally we conclude in Section 4.5.

4.2 Taiwan's Trade Policies and WTO Accession

Taiwan applied for membership to the GATT on 1 January 1990 under the name of "Separate Customs Territory of Taiwan, Penghu, Kinmen and Matsu" also known as "Chinese Taipei".[88] The working party for its accession was established in September 1992, and was later transformed into a WTO working party following the establishment of World Trade Organization (WTO) in January 1995. The working party met ten times before its final meeting on 18 September 2001 when it successfully completed 12 years of negotiations and agreed to forward Taiwan's terms of accession. Note that, only a day before, on 17 September 2001, the working party for China's accession to the WTO had successfully completed its

WTO before its own accession. This view of letting China become a member before Taiwan's accession was also shared by many other existing WTO members.

[88] Taiwan applied for the membership under GATT Article XXXIII and hence its status in application was different from that of Hong Kong or Macau which acceded under Article XXVI on the sponsorship of a contracting party.

negotiations over China's terms of accession (source: www.wto.org).

This timing of almost simultaneous accessions is no coincidence, of course. Even though Taiwan had successfully completed its negotiations with most members by late 1999, the formal acceptance was postponed, since China insisted that Taiwan should not be allowed to accede to the WTO before China did (Anderson (1997), Hsieh (2005)). While formally many WTO members believed that the two accession process should run their separate courses, there was a tacit understanding to not allow Taiwan to join the WTO before China did, lest China be offended (Morrison (2003)). The exact timing of Taiwan's accession, and hence the date when the WTO rules became applicable, was made even more uncertain by the fact that the timing of China's own accession was uncertain.[89]

As part of its accession to the WTO, Taiwan agreed to lower its tariffs from 20% to 12.8% in agriculture and from 6% to 4.1% for industrial goods. According to the WTO trade statistics database, in 2006 the average applied tariffs on all goods was 6.4% below the final bound rate of 6.6%.[90] The total value of Taiwan's merchandise exports was $198,169 million and its total merchandise imports were up to $182, 708 million in 2005, making it 16th rank country in the world in terms of both exports and imports. Taiwan's biggest trade partners are China and Japan, with China accounting for 21.6 % of Taiwan's total merchandise exports and 25.3% of its merchandise imports. The US and the EU are also two of the

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[89] Despite 12 long years of wait since it applied for membership, even as late as 1999, China's entry to the WTO was still uncertain as it had not completed its negotiations with most of the important members. While, US and China reached a record agreement after Chinese Premier Jhu Rongjie's visit to US in Apr 1999, the talks stalled again due to US bombing of Chinese embassy in Belgrade. (China, Still Angry at U.S., Won't Resume WTO Talks, International Herald Tribune June 30, 1999). The talks stumbled again in Oct 2000 over the issue of legal reforms (China's Entry to WTO Unraveling, John Pomfret & Philip P. Pan, International Herald Tribune October 11, 2000); and in January 2001 over farm subsidies (Discord Over Farm Subsidies Snarls Entry : China Delayed at WTO. International Herald Tribune January 18, 2001).

It was not until June 2001 that its bilateral negotiations with EU were complete).
(http://archives.cnn.com/2001/WORLD/asiapcf/east/09/18/china.wto.timeline/
provides a concise timeline of China's accession history).

[90] (Source: country profile, Chinese Taipei www.wto.org)

important trade partners for Taiwan, with both of them together accounting for 26.7% of the exports and 21.2% of the total imports.

As an economy with heavy reliance and engagement in international trade, Taiwan was well on its way to liberalization even before its accession to the WTO. Note that until 1980, Taiwan had actively pursued a policy of export promotion and import substituting industrialization in key industries according to its industrial plan. Even during 1979-1980 the average tariff rate in Taiwan was as high as 40% along with very high non-tariff barriers. However, the resulting trade surplus, and a potential for inflation, led Taiwan to start liberalizing the economy (Liu (2002)). Due to the liberalization episodes that followed the average tariffs had already decreased to below 10% by 1995.

According to Liu (2002), who looks at the determinants of the two phases of trade liberalization in Taiwan (between 1986-92 and 1992-95), the former phase was associated with unilateral reform, as opposed to the latter phase, when external interventions were more apparent. Hence, the structure of 1992 tariffs is more likely to reflect domestic considerations, including the pattern of domestic pressure groups. By contrast, the tariff cuts in the latter period were the result of negotiations with the US and hence are likely to reflect the industrial lobbying interests in the US, at least to some extent. We take this fact into account in our empirical section .

Table 4.1 reports the average applied tariff in Taiwan for years 2000 and 2003 and the change in tariffs during this period at the level of 3 digit ISIC industries. We can see that even before its formal accession, Taiwan's tariffs were much lower than those in China. The average ad valorem tariff for year 2000 was 7.7 percent. With its accession in January 2002, tariffs declined further by about 1 percentage point to approximately 6.7 percent.[91] Despite its low tariff barriers, there was a

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[91] Note that, the average decline is slightly masked by the fact that for many products the tariffs did not decline (for example, those with zero initial tariff); and in fact it went up for more

huge variation in both the levels and the changes in tariffs. Agriculture, Food Manufacturing and Processing enjoyed high levels of protection, with Tobacco Manufacturing being the most protected sectors both before and after accession. In our estimations below we try to explain part of this variation in the change in tariffs associated with accession and to see how this variation depends on the threat of retaliation against subsidies.

4.3 Econometric Strategy

In order to make the analysis as similar as possible to the one used in Chapter 3, we use identical econometric strategies in both cases. Hence, we employ a difference-in-difference methodology across years and across products to identify the impact of the threat of retaliation on the acceding country's tariffs.

Reproducing our final econometric equation from Chapter 3, we estimate:[92]

$$\Delta \tau_j = \alpha + \beta c CVD_j + \gamma Z_j + \varepsilon_j \tag{24}$$

where $\Delta \tau_j = \tau_{jt} - \tau_{jt-1}$ is the change in tariffs on product j between period $t-1$ (before accession) and the period t (after accession). Since Taiwan acceded to the WTO in January 2002, we use the same time period (2000-2003) as in the case of China, to measure the change in its tariffs due to accession.[93] Choosing such short

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than 400 products in our sample.

[92] The original reduced form equation for tariffs is $\tau_{jt} = \alpha_j + \alpha_t + \beta \Pr(Retaliation)_{jt} + \gamma Y_{jt} + \upsilon_{jt}$, where where α_j are a set of product specific factors and α_t are the time dummies. The $\Pr(Retaliation)$ is zero for all products before the country signs the agreement. However, once the country becomes part of the WTO there is a positive probability of retaliation if the country engages in subsidization. We measure the $\Pr(Retaliation)$ by $\Pr(Retaliation)_{jt} = (a_t + cCVD_j) * WTO_t$, where WTO_t is an indicator that takes the value one when the country is a member of the WTO (and hence the SCM agreement), and zero otherwise. We expect $c \geq 0$. Similarly, CVD_j is an indicator that takes the value one if at least one of the member trading partners of had imposed a countervailing duty against another WTO member for that product during 1995-2001. Plugging this measure of $\Pr(Retaliation)$ in the reduced form tariff equation and taking a time difference we get equation (24).

[93] Since most of Taiwan's bilateral negotiations for its accession to the WTO had been completed by 1999, an alternative is to use the tariff change between 1999-2003 as our dependent

span of time helps us minimize the possible impact of any other events during the period under investigation.

Our main coefficient of interest is that on the proxy for the threat of retaliation, which in our case is the CVD indicator, which takes on a value of one for those products that had suffered a retaliation in the WTO before Taiwan became a member. In addition to this indicator we also include the level of pre-accession tariffs from a year before Taiwan became a WTO member to capture the political economy considerations and other reasons determining the level of tariffs.

Since we have the same time period of analysis, the perceived threat of retaliation against subsidies by the two countries (China and Taiwan) would also be the same.[94] Hence, as in the case of China, we use the countervailing duties (CVDs) imposed by Australia, Canada, the EU and the US on any other member of the WTO between 1995 - 2001 to measure the threat of retaliation as perceived by Taiwan. We expect the coefficient β to be positive if our hypothesis is correct. As in the case of China we carry out our analysis at the six digit level of HS codes, the most disaggregated level at which the product nomenclature is the same across countries.

4.4   Results

In this section we present our empirical results. The rest of the section is structured as follows. We first provide our baseline results followed by two counterfactual exercises to confirm the validity of our results. We then look at only a subset of the data where the tariffs went up (or did not decline), because, strictly speaking, our model suggests that the tariffs will go up following accession. We

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variable. Our results remain unchanged if we use this period instead.

[94] Since the two countries share the same information set about the existing use of countervailing duties, they are likely to have identical structure of perceived threat of retaliation, except for a country-specific effect which gets subsumed in the constant term when we estimate in differences.

conclude this section by confirming the robustness of our results to alternative specifications and sample selections.

4.4.1 Baseline Results and Counterfactual Exercises

Our baseline results are provided in Table 4.2. The first column of Table 4.2 replicates a result from Chapter 3 for the case of Taiwan. In this case we use the Taiwan's tariff levels in the year 1999 as a measure of the pre-accession level of tariffs. The coefficient on CVD indicates that there was a relative increase of 0.9 percentage points in tariffs imposed by Taiwan for those products that had suffered a retaliation against subsidy through imposition of a CVD in the past. This estimate is roughly the same as the 0.82 percentage points that we obtained for China. Note, however, that Taiwan was already a relatively open country as compared to China and once we take into account the total average liberalization in Taiwan during this period, the evidence is even more striking. According to these estimates the relative increase in tariffs for products that faced a threat of retaliation was approximately 63%.

In the first column we used Taiwan's tariffs for the year 1999, a year before the first year used in constructing the dependent variable, as a measure of pre-accession tariffs. However, as noted in Section (4.2), Taiwan had already completed its negotiations by 1999. Hence these tariffs might already reflect concessions granted by Taiwan, so we must consider going back to avoid endogeneity. According to Liu (2002), the first phase of liberalization in Taiwan (1986-92) was largely free of external interventions and reflected the domestic industrial policies and strengths of the domestic pressure groups. Hence, we use the Tariff in 1992 as the pre-accession level of tariffs in all subsequent regressions, unless otherwise noted. The results reported in column 2 of Table 4.2 indicate that both the economic magnitude as well as the statistical significance of our coefficient of interest

have increased, with the threat of retaliation leading to a relative increase in tariffs of 1.1 percentage points.

In the third column of this table we add a dummy that takes the value one for those products that had positive tariffs in year 2000, and zero otherwise. Note that if the tariffs were already zero they would not be lowered any further. In our data there are about 600 products that already had zero applied tariffs in 2000. Since these products may share a common unobserved product specific characteristic we need to control for them (Limão (2006)). We see that including this dummy does not change any of our results.

In all the above regressions not only does the coefficient of interest suggest that our hypothesis is true, the coefficient on our measure of pre-accession tariff is also negative and significant. This result is similar to the one we obtained in case of China and suggests that the tariffs decreased faster for those products where the initial tariff rate was high.

These regressions did not include any explanatory variables other than the CVD and the pre-accession tariffs, however, our results may be biased if there are some omitted characteristics that influence the change in tariffs. Since these omitted characteristics are generally industry specific, such as the ones reflecting political economy strength, and are likely to remain unchanged over such a short span of time, in column 4 we include industry dummies (classified as 3 digit ISIC rev. 2 Industries). While including these fixed effects slightly decreases the magnitude and the level of significance of our coefficient of interest, the qualitative results remain unchanged.

Finally, if the omitted variables mentioned earlier are correlated with the level of pre-accession tariff, that would lead to inconsistent estimates. Hence, we adopt the same instrumental variable strategy as in the case of China. We use the average tariffs of four developing countries – Brazil, Indonesia, India and South Africa –

for the year 1999 and year 1996 as an instrument for the Taiwan tariffs in 1999 and 1996, respectively. These results are shown in columns 5 and 6 and suggest that our results remain unchanged in both cases. The Durbin-Wu-Hausman test indicates that the endogeneity of pre-accession tariff is not a concern for these results.

Counterfactual 1 We next present two counterfactual exercises along the lines of those presented in Chapter 3 to verify our results. One issue with the evidence documented in Table 4.2 is whether our measure of the threat of retaliation is actually capturing retaliation or some unobserved product characteristics that happen to be correlated with our measure of retaliation. Since the rules regarding subsidies and countervailing measures became binding only when Taiwan entered the WTO, our measure of retaliation against subsidies should not have the same impact on tariffs *before* Taiwan entered the WTO. In order to verify that this is not the case, we reestimate specifications similar to those presented in Table 4.2, but using an earlier sample.

The results of our first counterfactual exercise are reported in Table 4.3. The dependent variable in these regressions is the change in Taiwan's tariffs between 1996 and 1999 (Tariff1999-Tariff1996), which is regressed on the CVD indicator and on the Taiwan's tariff in 1992.[95] While the first column corresponds to the similar specification as in columns 1 and 2 of Table 4.2, the second column adds a dummy that takes the value one if tariffs in 1996 were positive. Similarly, we add industry fixed effects (3 digit ISIC) in column 3 and present the results from IV estimation in column 4. As expected, in all these cases the coefficient on CVD is

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[95] Note that, we use a similar period of 3 years for calculating the change in tariffs for the counterfactual exercise, in order to be consistent with the one in our baseline specifications. Since, Taiwan's tariffs in 1997 are not reported in TRAINS database we picked 1996 and 1999 to calculate this change. However, one possible explanation for the result in this counterfactual is that the tariffs for Taiwan did not change much during this period. Our counterfactual results remain the same if we take a longer sample period e.g. 1992-1999.

insignificant. Hence, the results indicate that our measure does capture the threat of retaliation against subsidies associated with accession to the WTO.

Counterfactual 2 A second potential issue with the evidence presented in Table 4.2, and implicitly with our measure of the threat of retaliation, is that our results might be driven by some other exogenous shock that affected the tariffs for these products around the world during this period and has nothing to with the accession to the WTO and the SCM rules. In Table 4.4 we present evidence that this is not the case. In column 1 of Table 4.4 we replicate the baseline results from column 2 of Table 4.2 for comparison. In order to capture the product specific effects on tariffs around the world (or at least on the tariffs in similar countries) during this time, we include in the regression the average of the change in tariffs during this period for the four developing countries mentioned earlier – Brazil, Indonesia, India and South Africa. Our qualitative results remain unchanged. In fact the magnitude of our coefficient of interest slightly increases, while the coefficient on the average change for these developing countries is insignificant.

In column 3 of Table 4.4 we take a slightly different approach and regress the average change in tariffs in these four countries on our measure of retaliation to verify if it explains the change in tariffs around the world and hence has nothing to do with accession per se. The coefficient on CVD has the opposite sign and is significant, indicating that, if there was such a common shock that was correlated with our proxy for the threat of retaliation, that lead to a downward bias in our estimates.[96] Finally, in column 4 of Table 4.4 we include a counterpart to the results of counterfactual 1 (presented with the pre-accession sample), where we regress the change in tariffs between 1996 and 1999, and also include the average tariff during that time period for these countries. Again the results support our

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[96] Note that this is consistent with our results presented in the earlier column that including the average change as another explanatory variable increased the magnitude of our estimates.

earlier conclusion.

4.4.2 Robustness and Other results

In the previous sub-section we presented evidence in support of our main hypothesis that as the country enters the WTO, there will be an increase in tariffs for those products that face a threat of retaliation against subsidies versus those that did not. As on average tariffs go down with accession due to various other reasons, we looked at the relative decline in tariffs during this period, i.e. we showed that tariffs did not decline as fast for those products that faced a threat of retaliation against subsidies as for the others, ceteris paribus. However, strictly speaking, our model suggested that the tariffs should go up with accession. In our data we see that even during the period between 2000 and 2003 there were indeed roughly 400 products for which there was a strict increase in tariffs. If we include the products with no change in tariffs during this period, there were a total of 2075 products for which the change in tariffs was weakly positive.

In Table 4.5a we present the evidence using a similar specification as for that in equation (24) but using only those products for which tariffs did not decline during the period under consideration, 2000-2003. Since these observations are censored from below at zero we use Tobit model instead of OLS for our estimations. Columns 1 and 2 of Table 4.5a use tariffs for 1999 and 1992 respectively as a measure of pre-accession tariffs. As we can see, our results remain qualitatively unchanged: the threat of retaliation against subsidies has a positive impact on tariffs. This result remains unchanged as we add industry fixed effects (column 3) or control for change in tariffs across other four developing countries over this time period (column 4). Finally, Table 4.5b corresponds to counterfactual 1 – we use the sample prior to Taiwan's accession to the WTO and find that we do not get the same results in the pre-accession sample.

Note, however, that unlike in the case of the OLS results, one needs to go further to interpret the magnitude of the Tobit coefficients. The Tobit coefficients on an independent variable include both the marginal impact on the probability of the dependent variable being uncensored and the impact of the independent variable on the dependent variable conditional on the latter being observed (see for example, Roncek (1992)). Using the results presented in column 2 of Table 4.5a we find that the threat of retaliation increases the probability of getting a strict increase in tariffs by 0.14 percentage points. The results also show that, conditional on there being an increase in tariffs, tariffs increased by 1.83 percentage points for those products that faced a positive threat of retaliation. Thus these results support our hypothesis.

Table 4.6 presents further evidence that our results are robust to alternative specifications and sample selection. One concern with the dependent variable is that, because it reflects the change in tariffs as Taiwan entered the WTO, the actual extent of the decline was not in the hands of Taiwan, as the decline in tariffs is negotiated prior to the accession and, hence, would reflect foreign interests as well. This concern is valid to some extent, even though (a) we are using applied tariffs, whereas the negotiations take place on the level of bound tariffs and (b) the negotiations also involve a period of implementation over which the level of tariffs would be decreased to the level of the final bound.

While this is admittedly a cause for concern, we are not sure about the direction in which it would bias our coefficient of interest. In those cases where the foreign lobby is stronger, such that the negotiated level of tariff binding is less than that in the year 2000, tariffs will have to decrease to the level of binding even in the presence of a threat of retaliation against subsidy. On the other hand, if the domestic interests in the acceding country are powerful enough, then the level of tariff bindings itself will be so chosen as to be the same or higher than the existing

applied rate (WTO (2005), page 10).

In order to capture the extent by which the decline in tariffs was due to the negotiated commitment, we construct a dummy variable, Bound_Accession_Document. This dummy variable takes the value 1 if Taiwan's applied tariffs in 2003 were greater than or equal to the level of the bound tariffs on the date of accession (as given in its accession document) and zero otherwise. Since in these cases the tariff rates were higher than the negotiated bound rate even after accession, at least part of the decline in tariffs during this period would be due to a lower bound rate.

The evidence in column 1 shows that, not only is the coefficient on CVD still positive and significant at the 1% level, but even the size of the coefficient is similar to that obtained earlier. We also find that the coefficient on the bound dummy variable is positive and significant, showing that these products have experienced a relatively lower decrease in tariffs since they are still above the bound rate. In column 2 we repeat this exercise by including industry fixed effects. Our results remain unchanged, even though, as in Table 4.2, the size and the significance of the coefficient of interest is slightly lower.

In column 3 of this table we use an alternative measure to capture the effect of bound tariffs. In this case we create a dummy (Not_Bound_Trains) that takes the value 1 if tariffs in 2000 were strictly less than the level of final bound tariffs according to the TRAINS database. Since these tariffs were already below the final ceiling level, even before Taiwan joined the WTO, they might share common unobserved characteristics that we should control for. Our results remain unchanged even after including this dummy.

Finally, in the last two columns of Table 4.6 we present evidence that our results are robust to sample selection. Since the SCM agreement primarily deals with industrial subsidies, while the subsidies in the agricultural sector being also

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guided by the WTO Agreement on Agriculture, in column 4 we restrict our sample to the products belonging to the manufacturing sector. Next, in column 5 we restrict our sample to products belonging to only those three digit ISIC industries that had at least one product that faced a threat of retaliation. Our results remain unchanged in both cases. Hence, we can conclude that the evidence presented in this chapter in support of our hypothesis is robust.[97],[98]

4.5 Conclusion

One of the most important rules in the WTO is the Agreement on Subsidies and Countervailing Measures. This agreement guides subsidies that a member government can provide, as well as, guides the retaliatory actions available to other WTO members against the subsidizing member if these subsidies hurt their interests. It is especially important to understand the impact of the WTO subsidy rules as the agricultural subsidies given by the developed countries to their farmers is currently one of the leading contentious issues in the ongoing Doha development round.

That subsidies have increasingly become an important issue in the multilateral trade can be gauged from the fact that, the 2006 WTO world trade report focuses exclusively on the subsidies, on the impact of subsidies on trade and the role of the WTO in its regulation. Despite this increasing interest in matters related to the subsidies, and the recognition that they are an alternative measure of trade barriers just like the tariffs, the choice of tariffs and subsidies and the impact of the WTO rules is still unclear.

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[97] Also in results not shown here, but available on request, we show that the results are not driven by presence of any outliers.

[98] Unlike for China, for Taiwan we did not find robust results for the case of the interaction model. In fact, in most cases the coefficient on exports was insignificant and in some cases positive. This result is consistent with that in Liu (2002), who finds that export-oriented industries experienced lower tariff reductions over the period 1992-95. According to Liu (2002), this is probably because the export-oriented industries in Taiwan had already reached a low level of protection.

Recognizing this point, the 2006 WTO world trade report mentions that "...The extent to which stronger subsidy rules have inhibited commitments to reduce tariffs is obviously an empirical matter in respect of which we have no evidence. But the essential point that choices among policy alternatives can matter is well taken"(page 196).

In this chapter we provide such an evidence using the case of Taiwan's accession to the WTO in January 2002. We show that the WTO SCM rules and the associated threat of retaliation against subsidies had a substantial impact on the extent of tariff liberalization. Our evidence suggests that as Taiwan entered the WTO the products which faced a threat of retaliation against subsidies saw a relative increase in tariffs of about 1 percentage points or an increase of about 65% as compared to those that did not face this threat. We provide interesting counterfactuals and various robustness exercises to support our claim that the impacts we measure is indeed due to the threat of retaliation.

APPENDIX

A Appendices for Chapter 2

A.1 Equilibrium with Collection costs

According to the model presented in Chapter 2 we found that, when the country is outside the WTO, only subsidies will be used in the equilibrium and there will be no tariffs. This is because we wanted to highlight the commitment mechanism associated with the WTO rules, hence, we abstracted from any other potential roles for subsidies and tariffs, apart from as a means to make transfers to the special interest groups. However, in reality there are several other reasons for the existence of tariffs. For example, in the case of a large country, tariffs might serve to improve a country's terms-of-trade vis-a-vis the other members.

Similarly, tariffs might arise in the equilibrium, even for a small country, if it is costly to collect revenue to finance subsidies (Aizenman (1987), Corden (1974)). These tax collection costs can potentially be very high especially for small developing countries like the one assumed here. Here, we take in to account the collection costs for generating revenues to see if our results are affected in any way.

Collection of tariffs is generally thought to be relatively less costly as compared to any other form of taxes. As Corden (1974) writes "..."The central point is that collection costs for trade taxes are generally much lower than for other taxes. This is mainly because foreign trade usually flows through a few ports or bottllenecks(italics), and even when it does not, it is easier to police a border and collect taxes on goods passing across it than to seek out a large number of individual taxpayers, whether persons or firms, or to ensure that they produce accurate tax returns. The point is really quite obvious..." (page 40).

Hence we assume that there are no collection costs in case of tariffs, while raising revenue through other types of taxes are costly. Specifically, we assume that in order to finance a subsidy equal to t the government has to raise $(1 + \beta) * t$ in revenues. To leave the model otherwise unchanged, we assume that the government raises this revenue through lump-sum taxes.

The equilibrium levels of lobby goods and the transfers (tariffs and subsidies) are determined by the Nash bargaining between the government and each individual lobby. Hence, reproducing equation (6) here, the equilibrium levels of C, t

and τ is determined by:

$$\underset{C,t,\tau}{Max}\mathcal{F} = (G - g_0)^{\gamma}(V - v_0)^{(1-\gamma)} \quad s.t. \ G \geq g_0, V \geq v_0 \tag{25}$$

where the government's and the lobby's utility function is given by (for the case of before joining the WTO)

$$\begin{aligned}
G(C, t, \tau) &= 1 + \pi(t, \tau) + \tau * [d(\tau) - \pi'(t, \tau)] - (1 + \beta) * t * \pi'(t, \tau) \\
&\quad + S(\tau) + \frac{1}{a}\Psi(C) \tag{A.26} \\
V(C, t, \tau) &= l + \pi(t, \tau) - C
\end{aligned}$$

Note that, for a given level of t due to the collection costs incurred in financing the subsidies, the government's utility is lower, ceteris paribus, as compared to that in equation (7). On the other hand, the utility of the lobby remains unchanged as, given our assumption of concentrated ownership, each individual lobby has very little to contribute to the total tax collection.

The equilibrium in this case can be shown to be given by:

$$\begin{aligned}
\tilde{\tau} &= \frac{\beta y}{d\varepsilon^d} \\
\tilde{t} &= \frac{1}{(1 + \beta)}\left[\frac{1}{a}\Psi'\frac{1}{\varepsilon^s} - \frac{\beta\varepsilon^m}{z\varepsilon^s\varepsilon^d}\right] \tag{A.27} \\
\frac{1}{a}\Psi' &= \frac{(1 - \gamma)}{\gamma}\frac{G - g_0}{V - v_0}
\end{aligned}$$

where the ε's are the elasticities, and z the inverse import penetration, as defined in the text. We can see that, unlike earlier, the tariff is positive even before joining the WTO. Furthermore, the level of tariffs will be higher the more costly it is to finance subsidies. Also note that, if we set the collection cost β to zero, we get back to our original equilibrium.

Now, once the country accedes to the WTO, the lobby faces retaliation against subsidies with probability μ. Hence the lobby's utility will now be given by, $V(C, t, \tau) = l + \pi(t, \tau) - C - \mu R(t)$, while the government's utility remains as in

equation (26). The equilibrium values of C, t and τ will now be now given by,

$$
\begin{aligned}
\tilde{\tau} &= \frac{\beta y}{d\varepsilon^d} + \frac{1}{a}\Psi'\frac{1}{d\varepsilon^d}\mu R' \\
\tilde{t} &= \frac{1}{(1+\beta)}\left[\frac{1}{a}\Psi'\frac{1}{\varepsilon^s} - \frac{\beta\varepsilon^m}{z\varepsilon^s\varepsilon^d}\right] - \frac{1}{(1+\beta)}\left[\frac{1}{a}\Psi'\frac{\varepsilon^m}{zy\varepsilon^s\varepsilon^d}\mu R'\right] \quad \text{(A.28)} \\
\frac{1}{a}\Psi' &= \frac{(1-\gamma)}{\gamma}\frac{G-g_0}{V-v_0}
\end{aligned}
$$

In order to verify that the government might gain from joining the WTO even in the presence of the collection costs we use the numerical simulations provided in Chapter 2, however we include an explicit cost to using subsidies. Hence, we assume the production function to be given by a Cobb-Douglas function $y = Ak^{1-\alpha}l^\alpha$, and the consumer's subutility of consuming the non-numeraire good by a quadratic function $u(x) = 10x - \frac{b}{2}x^2$. We also assume the cost of retaliation to be increasing and convex $R(t) = Bt^\theta$, and that the contribution function that enters the government's utility function is given by, $\Psi(C) = C^n$ where $n \in (0,1)$.

A sufficient condition that the government gains from joining the WTO is if the bargaining position improvement condition due to the WTO subsidy commitment holds, i.e. if

$$
\lim_{\gamma \to 0}\frac{dG}{d\gamma}\Big|_{\mu>0} > \lim_{\gamma \to 0}\frac{dG}{d\gamma}\Big|_{\mu=0}
$$

In Table 2.A1 we show that these conditions will be satisfied for low values of the parameter n i.e. when the rate of decrease in the government's utility due to an increase in lobby goods is higher. Recall that it is the same condition that we found in the text as well.

Table 2.A2 and Table 2.A3 reproduce other results from the text for the case when collection costs are present. According to Table 2.A2 we find that, indeed in the presence of collection costs to finance subsidies, there will be positive tariffs in equilibrium even before the country's accession to the WTO. We also find that once the country joins the WTO and hence faces a positive threat of retaliation against subsidies, the subsidy goes down while the tariff goes up for all values of the parameter n. Note that the total protection $(t + \tau)$ also goes down with accession in each case. Finally, as shown in Table 2.A3, these effects of the threat of retaliation (μ) are higher, the higher the level of μ. Hence, we can see that our results remain unchanged even after the inclusion of collection costs to finance subsidies.

A.2 Case When the Retaliation Affects the Government not the Lobby

In the text we have assumed that, as the country joins the WTO, there is a positive probability (μ) of retaliation against subsidies. We assumed that these retaliation by other WTO members impose a cost $R(t)$ on the lobby, and that these costs are increasing and convex in the level of the subsidy. For simplicity, we assumed that the retaliation leaves the government's utility unaffected. In this section we show that our main results remain unchanged even if we make the other extreme assumption: that the retaliation is costly for the government but leaves the lobby's utility unchanged.

Hence, under this scenario, the equilibrium levels of C, t and τ are determined by the Nash bargaining between the lobby and the government as given in equation (6), except that now the respective utilities for the government and the lobby are given by

$$
\begin{aligned}
G &= 1 + \pi(t,\tau) + \tau * [d(\tau) - \pi'(t,\tau)] - t\pi'(t,\tau) + S(\tau) + \frac{1}{a}\Psi(C) - \mu R(t) \\
V &= V(C,t,\tau) = l + \pi(t,\tau) - C \tag{A.29}
\end{aligned}
$$

where μ is the probability of retaliation against subsidies in a given sector, and $R(t)$ is the cost to the government due to the retaliation. The equilibrium in this case will be given by

$$
\begin{aligned}
\tilde{\tau} &= \frac{1}{d\varepsilon^d}\mu R' \\
\tilde{t} &= \left[\frac{1}{a}\Psi'\frac{1}{\varepsilon^s} - \frac{1}{y\varepsilon^s}\left(1 + \frac{1}{d\varepsilon^d}\right)\mu R'\right] \tag{A.30} \\
\frac{1}{a}\Psi' &= \frac{(1-\gamma)}{\gamma}\frac{G - g_0}{V - v_0}
\end{aligned}
$$

Thus we find that, similar to the results given in Chapter 2, there will be an increase in tariffs for those products that face a positive probability of retaliation against subsidies, if the retaliation is costly to the government but leaves the lobby's utility unchanged. We can also verify that our other results also remain unchanged. For instance, Table 2.A.4 provides results from the numerical example to illustrate the bargaining position improvement codition due to the WTO subsidy commitment. Consistent with our previous results, we find that this condition is more likely to be satisfied for low values of parameter n.

A.3   Proof of Proposition 2

Rewriting equation (14), the optimized value of the Nash product in terms of the government's utility is given by,

$$\hat{L}: \underset{G \geq 0}{Max}\, (G - g_0)^\gamma \, (\Omega(G) - v_0)^{(1-\gamma)} \tag{31}$$

The first order condition will be given by,

$$L_G : \gamma\, (G - g_0)^{\gamma-1} + (1 - \gamma)\, (G - g_0)^\gamma \, \Omega^{-\gamma} \Omega_G = 0 \tag{32}$$

Solving this equation we get the usual Nash bargaining equilibrium condition, $\Omega_G = -\frac{\gamma}{(1-\gamma)} \frac{(\Omega(G)-v_0)}{(G-g_0)}$ where Ω_G is the inverse of the slope of the Pareto frontier. Thus this expression says that the Nash equilibrium of the bargaining game in the utility space will be such that the slope of the Pareto frontier at the equilibrium will be equal (in absolute value) to the slope of the ray from the disagreement point to the equilibrium.

Totally differentiating the above first order condition and using the implicit function theorem, we get, $\frac{dG}{d\gamma} = -\frac{L_{G\gamma}}{L_{GG}}$

where,

$$L_{GG} = L \left[-\frac{\gamma}{(G - g_0)^2} + (1 - \gamma) \left(\frac{\Omega_{GG}}{(\Omega_G - v_0)} - \frac{\Omega_G^2}{(\Omega_G - v_0)^2} \right) \right]$$

and

$$L_{G\gamma} = L \left[\frac{1}{(G - g_0)} - \frac{\Omega_G}{\Omega_G - v_0} \right]$$

Thus, plugging this in the expression for $\frac{dG}{d\gamma}$ and simplifying, we get,

$$\frac{dG}{d\gamma} = -\,(1 - \gamma) \left[\frac{\Omega_G}{(\Omega_G - v_0)} - \frac{\gamma \Omega_{GG}}{\Omega_G} \right]$$

Hence,

$$\lim_{\gamma \to 0} \frac{dG}{d\gamma} = -\frac{\Omega_G}{(\Omega_G - v_0)}$$

Hence, the condition for joining the agreement, as given in equation (15), i.e.

$$\lim_{\gamma \to 0} \frac{dG}{d\gamma}\big|_{\mu>0} > \lim_{\gamma \to 0} \frac{dG}{d\gamma}\big|_{\mu=0}$$

will be satisfied when,

$$\lim_{\gamma \to 0} \left(\frac{[1/\Omega_G]_{\mu>0}}{[1/\Omega_G]_{\mu=0}} \right) > \lim_{\gamma \to 0} \left(\frac{[\Omega - v_0]_{\mu>0}}{[\Omega - v_0]_{\mu=0}} \right).$$

The proof of the second part is outlined in the text. Q.E.D.

A.4 Proof: Interior solution exists for C, t and τ

In the following we provide proof of existence of interior solution for the Nash bargaining over policies in the second stage for the case when $\mu > 0$. The proof for the case when the country is not a member is similar.

Since, we know that the Nash bargaining solution will lie on the Pareto frontier we can show existence of interior solution by showing that the equation for Pareto frontier involves positive values of C, t and τ.

The Pareto frontier can be given by solving,

$$\underset{(C,t,\tau)\geq 0}{Max} \; V(t,\tau,C;\mu) \; sub.to. \; G(t,\tau,C;\mu) \geq \bar{G} \tag{33}$$

we can write the above problem as

$$\begin{aligned}
\mathcal{L} &= \pi(p^s) - \mu R(t) - C + \lambda[\pi(p^s) + \tau * \left[d(p^d) - \pi'(p^s) \right] \\
&\quad - t\pi'(p^s) + S(p^d) + \frac{1}{a}\Psi(C) - \bar{G}] + \eta C + \theta t + \delta \tau
\end{aligned}$$

The Kuhn-Tucker conditions after simplification can be in terms of the first order conditions

$$\begin{aligned}
C &: & -1 + \lambda\frac{1}{a}\Psi' + \eta = 0; \; \eta C = 0; \; \eta \geq 0; \; C \geq 0 \\
t &: & \pi' - \mu R' + \lambda\left(-\tau\pi'' - t\pi''\right) + \theta = 0; \; \theta t = 0; \; \theta \geq 0; \; t \geq 0 \\
\tau &: & \pi' + \lambda\left(\tau\left(d' - \pi''\right) - t\pi''\right) + \delta = 0; \; \delta\tau = 0; \; \delta \geq 0; \; \tau \geq 0 \\
\lambda &: & \left[\pi + \tau\left(d - \pi'\right) - t\pi' + S(p^d) + \frac{1}{a}\Psi - \bar{G}\right] = 0; \\
\lambda &\geq & 0; \; \left[\pi + \tau\left(d - \pi'\right) - t\pi' + S(p^d) + \frac{1}{a}\Psi - \bar{G}\right] \geq 0
\end{aligned}$$

We can rule out the corner solutions using the properties of the functions as assumed in the model.

$Case \; 1: C = t = \tau = 0$

From f.o.c. with respect to τ, $\pi' + \delta = 0$.

But $\delta \geq 0$. Contradiction.

$Case\ 2 : C = \tau = 0,\ t > 0$

$t > 0 \Longrightarrow \theta = 0$. From f.o.c. with respect to C, $-1 + \lambda \frac{1}{a} \Psi' + \eta = 0$.

But $\Psi'(0) = \infty$. Contradiction.

$Case\ 3 : C = t = 0,\ \tau > 0$

Not possible due to the same reason.

$Case\ 4 : C > 0, t = 0, \tau > 0$

$C > 0 \Longrightarrow \eta = 0; \tau > 0 \Longrightarrow \delta = 0$. From f.o.c. with respect to C $\Longrightarrow \lambda = \frac{a}{\Psi'}$

f.o.c. with respect to $t \Longrightarrow \pi' + \frac{a}{\Psi'}\left(-\tau\pi''\right) + \theta = 0$

and f.o.c. with respect to $\tau \Longrightarrow \pi' + \frac{a}{\Psi'}\left(\tau\left(d' - \pi''\right)\right) = 0$

Thus, from these two equations we get, $\theta - \frac{a}{\Psi'}\tau d' = 0$.

But $\theta \geq 0$. Contradiction.

$Case\ 5 : C > 0, t > 0, \tau = 0$

$C > 0 \Longrightarrow \eta = 0; t > 0 \Longrightarrow \theta = 0$. From f.o.c. with respect to C $\Longrightarrow \lambda = \frac{a}{\Psi'}$

f.o.c. with respect to $t \Longrightarrow \left(\pi' - \mu R'\right) + \frac{a}{\Psi'}\left(-t\pi''\right) = 0$

and f.o.c. with respect to $\tau \Longrightarrow \pi' + \frac{a}{\Psi'}\left(-t\pi''\right) + \delta = 0$

Thus, from these two equations we get, $-\mu R' - \delta = 0$.

But $\delta \geq 0$. Contradiction.

$Case\ 6 : G(t, \tau, C; \mu) > \bar{G}$

$G(t, \tau, C; \mu) > \bar{G} \Longrightarrow \lambda = 0$

From f.o.c. with respect to $\tau, \pi' + \delta = 0$.

But $\delta \geq 0$. Contradiction.

Thus from the above exercise we see that the only possible equilibrium is one where all variables (C, t, τ) are strictly positive and where the constraint on the government's utility is binding; the case that we discuss in the text.

A.5 Sufficient condition for increase in tariffs with probability of retaliation

Here we show that if the two following conditions $\left(\pi' - 2\mu R'\right) \geq 0$ and $\left(-1 + \frac{1}{a}\Psi'\right) \leq 0$ are met, then they are sufficient to ensure that an increase in the threat of retaliation (μ) will lead to an increase in tariffs.

We use Cramer's rule to get the sufficient condition for increase in tariffs with the threat of retaliation, μ. By totally differentiating the first order conditions of the Nash bargaining problem in the second stage, when country has joined the

WTO, and simplifying the expressions we get

$$\mathbf{A} \begin{bmatrix} dC \\ dt \\ d\tau \end{bmatrix} = \begin{bmatrix} \gamma \left(\frac{1}{a}\Psi'\right) R \\ \left(\frac{1}{a}\Psi'\right) R' \\ 0 \end{bmatrix} d\mu;$$

where,

$$A = \begin{bmatrix} \gamma g'\left(v - v_0\right) - g & gh & g\pi' \\ g'h & \left(-\pi'' + gh'\right) & \left(-\pi'' + g\pi''\right) \\ g'\pi' & \left(-\pi'' + g\pi''\right) & \left(d' - \pi''\right) + gh' \end{bmatrix}$$

where $g = \frac{1}{a}\Psi'$; $g' = \frac{1}{a}\Psi''$; $h = \left(\pi' - \mu R'\right)$ and $h' = \left(\pi'' - \mu R''\right)$. Expanding the above determinant, canceling out common terms and collecting terms we can rewrite it as

$$
\begin{aligned}
|A| &= \left(-\pi'' + g\pi''\right)\left[\left(\gamma g'\left(v - v_0\right) - g\right)\left(d' - g\mu R''\right) - \left(g'\mu R'\right)\left(g\mu R'\right)\right] \\
&\quad + \left(g\pi'\right)\left(g'\right)d'\left(2\mu R' - \pi'\right) + \left(g\pi'\right)\left(g'\pi'\right)g\mu R'' \\
&\quad - d'\left(g'\right)\mu R'\left(g\right)\mu R' - d'\left(g\right)\mu R''\left(\gamma g'\left(v - v_0\right) - g\right)
\end{aligned}
$$

In general it is not possible to sign this expression unless one assumes explicit functional forms as the expressions involve a term containing $\left(v - v_0\right)$. However, notice that except for the first two terms in the above expression, all the other expressions are negative. The first two expressions will also be negative, if $\left(\pi' - 2\mu R'\right) \geq 0$ and $\left(-1 + \frac{1}{a}\Psi'\right) \leq 0$. Thus these two conditions are sufficient to ensure that the determinant of matrix A is negative.

Now using Cramer's rule, $\frac{d\tau}{d\mu} = \frac{|\mathbf{B}|}{|\mathbf{A}|}$; where,

$$|\mathbf{B}| = \begin{vmatrix} \gamma g'\left(v - v_0\right) - g & gh & \gamma gR \\ -g'\mu R' & \left(-\pi'' + gh'\right) & gR' \\ g'\pi' & \left(-\pi'' + g\pi''\right) & 0 \end{vmatrix}$$

$$
\begin{aligned}
|\mathbf{B}| &= \gamma gR\left[\left(-g'\mu R'\right)\left(-\pi'' + g\pi''\right) + \left(g'\pi'\right)g\mu R''\right] - \left(gR'\right) \\
&\quad * \left[\left(\gamma g'\left(v - v_0\right) - g\right)\left(-\pi'' + g\pi''\right) - \left(g'\pi'\right)gh\right]
\end{aligned}
$$

Again we see that $\left(-1 + \frac{1}{a}\Psi'\right) \leq 0$ is a sufficient condition that ensures that the determinant is negative.

Hence,

$$sign\left(\frac{d\tau}{d\mu}\right) = sign\left(\frac{|\mathbf{B}|}{|\mathbf{A}|}\right) > 0 \; if \; (\pi' - 2\mu R') \geq 0 \; and \; \left(-1 + \frac{1}{a}\Psi'\right) \leq 0$$

Q.E.D.

Figure 2.1: Equilibrium Before Accession (No Retaliation):
### Indifference Map in C-t Space
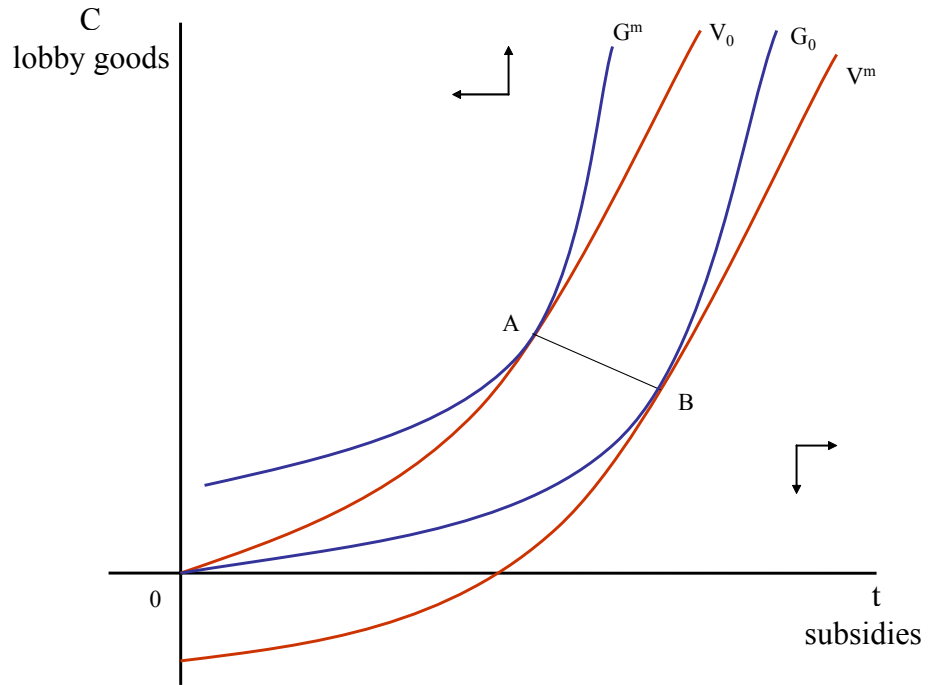
Figure 2.1: Equilibrium After Accession (Positive Probability of Retaliation):
### Indifference Map in C-t Space
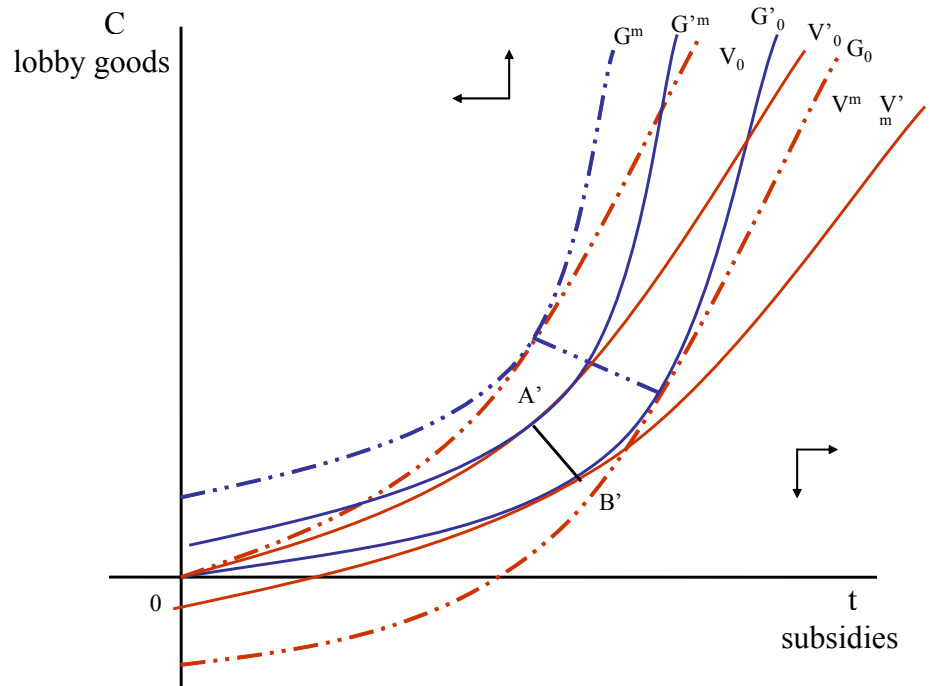
Figure 2.2: Gains to the Government from Joining the WTO (SCM): Government's Utility and Probability of Retaliation

Government's Utility

$G^{max}|_{\mu=0}$

$G^{max}|_{\mu>0}$

$(0, g_0)$

1
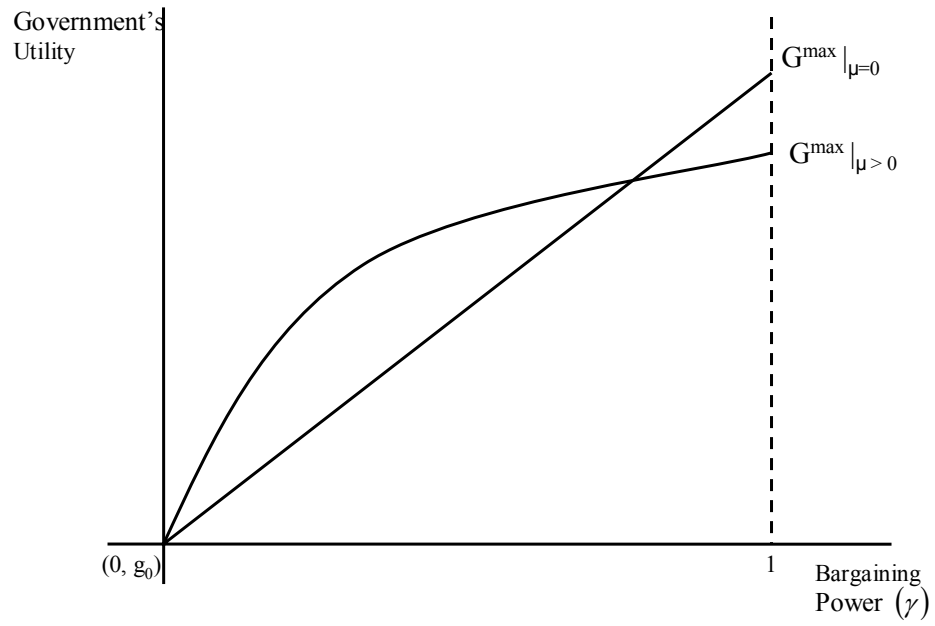
Bargaining Power (γ)

Figure 2.3a: Numerical Example to Check if the Bargaining Position Improvement Condition due to the WTO Subsidy Commitment Holds

The condition will be satisfied if the following holds:
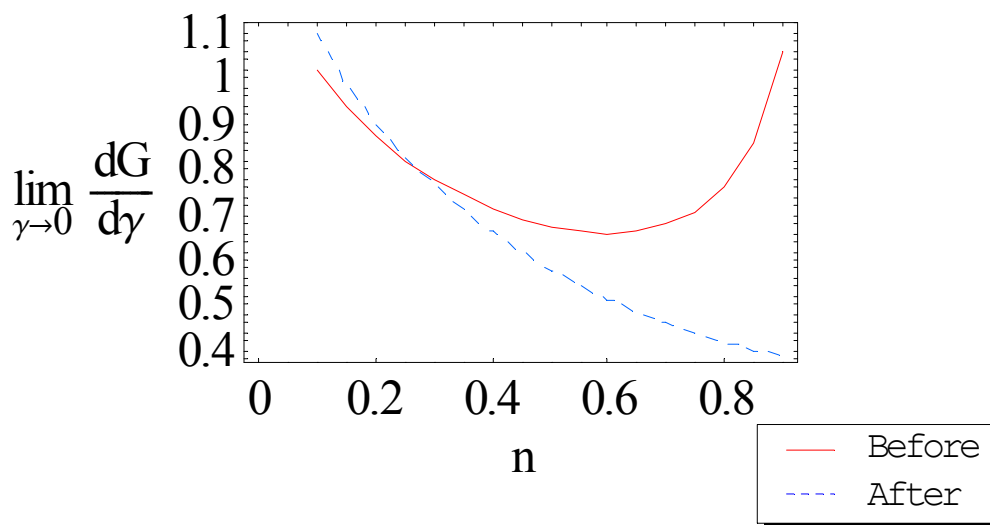
$$\lim_{\gamma \to 0} \frac{dG}{d\gamma}\Big|_{\mu>0} > \lim_{\gamma \to 0} \frac{dG}{d\gamma}\Big|_{\mu=0}$$

Functional forms:

Production Function: $q = A k^\alpha l^{1-\alpha}$

Consumer's Utility Function: $u(x) = 10x - \frac{b}{2}x^2$

Retaliation Cost: $R(t) = Bt^\theta$

Government's Utility from lobby goods: $\Psi(C) = C^n$

Parameter Values:

$A = a = b = p = k = 1$; $\alpha = 0.5$, $B = 0.5$, $\mu = 0.5$, $\theta = 2$

Figure 2.3b: Sensitivity Check for Different Parameter Values

Case μ = 0

$$\lim_{\gamma \to 0} \frac{dG}{d\gamma}$$

n

— Before
--- After

Case μ = 0.3

$$\lim_{\gamma \to 0} \frac{dG}{d\gamma}$$

n

— Before
--- After

Case μ = 1

$$\lim_{\gamma \to 0} \frac{dG}{d\gamma}$$

n
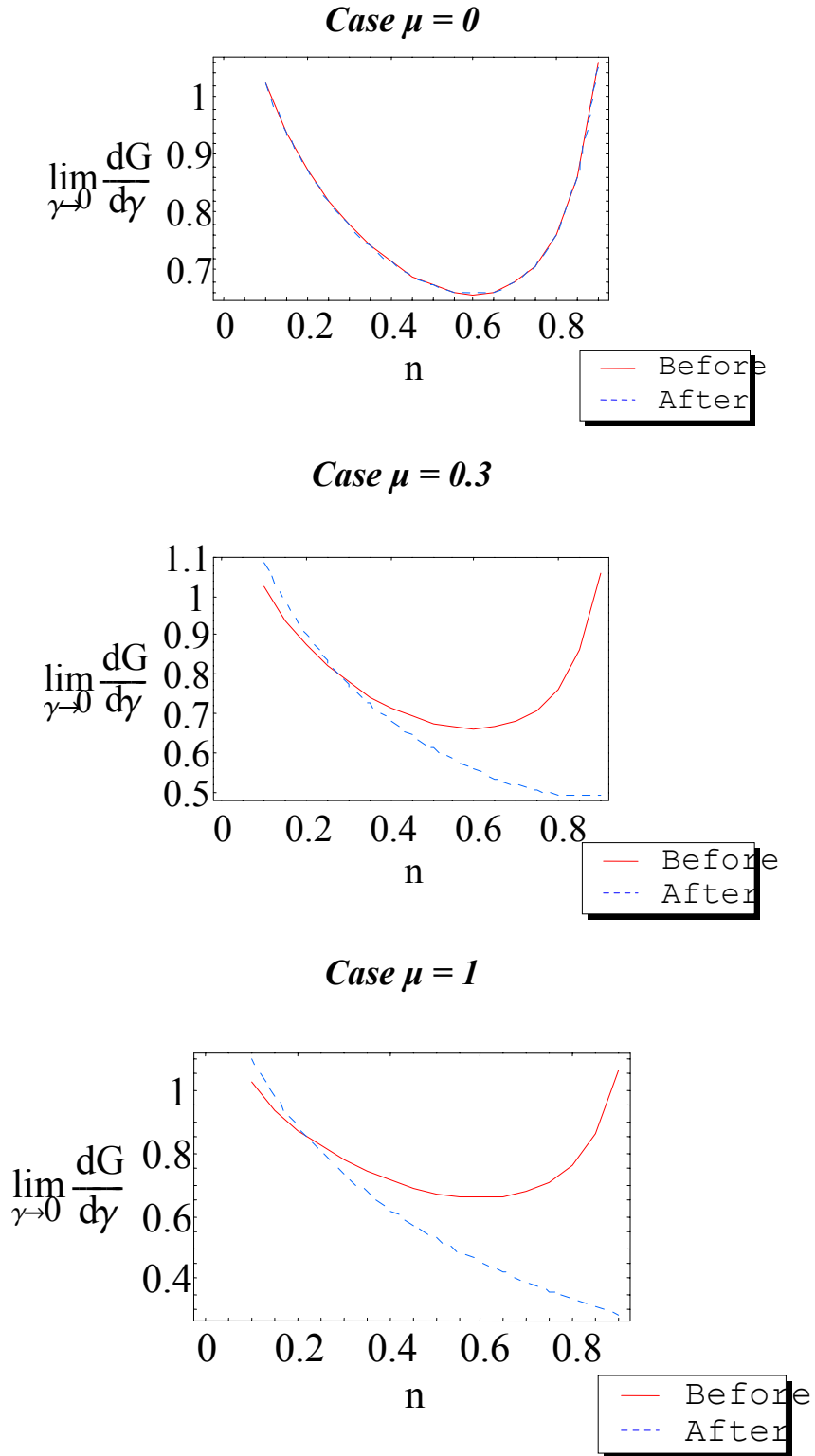
— Before
--- After

$A = a = b = p = k = 1; \alpha = 0.5, B = 0.5, \theta = 2$

Table 2.1: Equilibrium Policies for the Numerical Example

	Before Accession		After Accession		
n	Subsidies	Tariffs	Subsidies	Tariffs	Subsidies + Tariffs
0.1	1.804	0.000	1.045	0.538	1.584
0.2	1.731	0.000	0.990	0.492	1.482
0.3	1.706	0.000	0.952	0.461	1.413
0.4	1.717	0.000	0.926	0.439	1.365
0.5	1.769	0.000	0.908	0.425	1.333
0.6	1.878	0.000	0.898	0.417	1.315
0.7	2.084	0.000	0.898	0.416	1.314
0.8	2.506	0.000	0.908	0.425	1.333
0.9	3.676	0.000	0.937	0.448	1.384
Parameters : A = a = b = p = k = 1, α = 0.5, B = 0.5, μ = 0.5, θ = 2					

Table 2.2: Comparative Static Exercise with respect to the Threat of Retaliation

	n = 0.1			n = 0.9		
μ	Subsidies	Tariffs	Subsidies + Tariffs	Subsidies	Tariffs	Subsidies + Tariffs
0	1.804	0.000	1.804	3.676	0.000	3.676
0.3	1.337	0.359	1.696	1.392	0.382	1.775
0.5	1.045	0.538	1.584	0.937	0.448	1.384
0.8	0.749	0.694	1.443	0.618	0.489	1.107
1	0.621	0.754	1.376	0.501	0.503	1.004
Parameters : A = a = b = p = k = 1, α = 0.5, B = 0.5, θ = 2						

Table 2.A1: Verification that the Bargaining Position Improvement Condition due to the WTO Subsidy Commitment Holds in Presence of Collection Costs to Finance Subsidies

n	$\lim\limits_{\gamma \to 0} \dfrac{dG}{d\gamma}\big|_{\mu=0}$	$\lim\limits_{\gamma \to 0} \dfrac{dG}{d\gamma}\big|_{\mu>0}$
0.2	0.781	0.822
0.8	0.379	0.294

Parameters : A = a = b = p = k = 1, α = 0.5, B = 0.5, μ = 0.5, θ = 2, β = 0.2

The condition will be satisfied if the following holds:

$$\lim\limits_{\gamma \to 0} \frac{dG}{d\gamma}\big|_{\mu>0} > \lim\limits_{\gamma \to 0} \frac{dG}{d\gamma}\big|_{\mu=0}$$

Functional forms:

Production Function: $q = Ak^{\alpha}l^{1-\alpha}$

Consumer's Utility Function: $u(x) = 10x - \frac{b}{2}x^2$

Retaliation Cost: $R(t) = Bt^{\theta}$

Government's Utility from lobby goods: $\Psi(C) = C^n$

Parameter Values:

A = a = b = p = k = 1; α = 0.5, B = 0.5, μ = 0.5, θ = 2

Table 2.A2: Equilibrium Policies for the Numerical Example in Presence of Collection Costs

	Before Accession			After Accession		
n	Subsidies	Tariffs	Subsidies + Tariffs	Subsidies	Tariffs	Subsidies + Tariffs
0.1	1.150	0.239	1.389	0.671	0.619	1.290
0.2	1.070	0.230	1.300	0.622	0.567	1.189
0.3	1.020	0.224	1.245	0.587	0.530	1.117
0.4	0.991	0.221	1.212	0.560	0.502	1.062
0.5	0.979	0.220	1.199	0.539	0.480	1.019
0.6	0.987	0.221	1.208	0.522	0.464	0.985
0.7	1.022	0.225	1.246	0.509	0.451	0.961
0.8	1.100	0.233	1.334	0.502	0.444	0.946
0.9	1.278	0.253	1.532	0.500	0.442	0.942
Parameters : A = a = b = p = k = 1, α = 0.5, B = 0.5, μ = 0.5, θ = 2, β = 0.2						

Table 2.A3: Comparative Static Exercise with respect to the Threat of Retaliation in Presence of Collection Costs

	n = 0.1			n = 0.9		
μ	Subsidies	Tariffs	Subsidies + Tariffs	Subsidies	Tariffs	Subsidies + Tariffs
0	1.150	0.239	1.389	1.278	0.253	1.532
0.3	0.835	0.502	1.337	0.670	0.402	1.073
0.5	0.671	0.619	1.290	0.500	0.442	0.942
0.8	0.504	0.727	1.231	0.359	0.474	0.833
1	0.429	0.772	1.201	0.302	0.487	0.789
Parameters : A = a = b = p = k = 1, α = 0.5, B = 0.5, θ = 2, β = 0.2						

Table 2.A4: Verification that the Bargaining Position Improvement Condition due to the WTO Subsidy Commitment Holds When Retaliation is Costly to the Government not to the Lobby

n	$\lim_{\gamma \to 0} \frac{dG}{d\gamma} \big|_{\mu=0}$	$\lim_{\gamma \to 0} \frac{dG}{d\gamma} \big|_{\mu>0}$
0.2	0.874	1.147
0.8	0.762	0.599
Parameters : A = a = b = p = k = 1, α = 0.5, B = 0.5, μ = 0.5, θ = 2, β = 0.2		

Table 3.1: Sectoral Distribution of CVD Measures By Reporting Member (01/01/95 - 30/06/04)

Reporting Member / HS Sectors	I	II	III	IV	V	VI	VII	IX	XI	XV	XVI	Total
Argentina	0	1	1	2	0	0	0	0	0	0	0	4
Australia	0	0	0	1	0	0	0	0	0	0	0	1
Brazil	0	5	0	0	0	0	0	0	0	0	0	5
Canada	0	0	0	1	0	0	0	0	0	6	0	7
Chile	2	0	0	0	0	0	0	0	0	0	0	2
Costa Rica	0	0	1	0	0	0	0	0	0	0	0	1
European Community	1	0	0	0	0	2	5	0	4	7	2	21
Mexico	0	0	0	0	0	0	0	0	0	7	0	7
New Zealand	0	0	0	4	0	0	0	0	0	0	0	4
Peru	0	1	1	1	0	0	0	0	0	0	0	3
South Africa	0	0	0	0	0	0	1	0	1	2	0	4
United States	1	1	0	2	4	1	1	1	0	32	1	44
Venezuela	0	0	0	1	0	0	0	0	0	0	0	1
Total	4	8	3	12	4	3	7	1	5	54	3	104

The sectors refer to one digit Harmonized Schedule sectors.
Source: www.wto.org

The list of Sectors as classified in the Harmonized Schedule (HS)

Section	Description
I	Live animals; animal products
II	Vegetable products
III	Animal or vegetable fats; prepared edible fats; animal or vegetable waxes
IV	Prepared foodstuffs; beverages, spirits and vinegar; tobacco
V	Mineral products
VI	Products of the chemical or allied industries
VII	Plastics and articles thereof; rubber and articles thereof
VIII	Raw hides and skins, leather, travel goods, handbags and similar containers;
IX	Wood and articles of wood; manufactures of straw; basket ware and wickerwork
X	Pulp of wood; paper and paperboard and articles thereof
XI	Textiles and textile articles
XII	Footwear, headgear, umbrellas, feathers and articles made therewith; etc.
XIII	Articles of stone, plaster, cement; ceramic products; glass and glassware
XIV	Natural or cultured pearls, precious or semi-precious stones, jewellery; coin thereof;
XV	Base metals and articles of base metal
XVI	Machinery and mechanical appliances; electrical equipment; parts thereof;
XVII	Vehicles, aircraft, vessels and associated transport equipment
XVIII	Instruments, apparatus; clocks and watches; musical instruments; parts and accessories thereof
XIX	Arms and ammunition; parts and accessories thereof
XX	Miscellaneous manufactured articles
XXI	Works of art, collectors' pieces and antiques

Note: The names of the industries are abbreviated for brevity. See the source for complete list of products in each sector.
source: www.wto.org

Table 3.2: Average Tariff in (Chinese) Two Digit Manufacturing Industry

Chi2digit	Industrial Name	2000		2003		Change		
		Mean	Std Dev	Mean	Std Dev	Mean	Std Dev	Coef. Var.
13	Food Processing	29.44	23.26	19.79	13.93	9.74	11.91	0.82
14	Food Manufacturing	28.11	19.21	18.34	8.22	9.11	16.30	0.56
15	Beverage Manufacturing	57.38	15.59	29.70	16.18	26.99	15.77	1.71
16	Tobacco Processing	65.00	0.00	45.80	15.59	22.00	16.49	1.33
17	Textile Industry	21.62	7.63	13.65	5.69	7.99	4.90	1.63
18	Garments and Other Fiber Products	26.72	2.99	19.43	2.34	7.34	2.03	3.62
19	Leather, Furs, Down and Related Products	20.56	6.10	18.22	4.16	6.36	4.00	1.59
20	Timber Processing, Bamboo, Cane, Palm Fiber and St	12.06	6.24	5.65	3.82	6.34	3.62	1.75
21	Furniture Manufacturing	19.68	4.42	10.24	5.12	9.44	5.92	1.59
22	Papermaking and Paper Products	14.85	8.80	7.44	4.96	7.32	5.11	1.43
23	Printing and Record Medium Reproduction	18.11	6.58	9.52	3.44	8.59	3.22	2.66
24	Cultural, Educational and Sports Goods	16.27	3.93	15.23	3.52	1.05	1.56	0.67
25	Petroleum Processing and Coking	8.94	3.36	7.30	2.13	1.67	1.74	0.96
26	Raw Chemical Materials and Chemical Products	10.80	6.14	7.96	6.36	3.38	4.35	0.78
27	Medical and Pharmaceutical Products	9.60	2.03	4.39	1.00	5.18	1.60	3.24
28	Chemical Fiber	14.89	2.81	9.11	2.02	5.77	2.42	2.39
29	Rubber Products	15.75	6.65	12.45	4.95	3.89	3.55	1.10
30	Plastic Products	19.41	3.66	13.23	5.43	6.18	3.48	1.78
31	Nonmetal Mineral Products	17.48	8.24	13.73	6.09	3.99	4.89	0.82
32	Smelting and Pressing of Ferrous Metals	9.23	4.28	5.69	3.07	3.55	2.56	1.39
33	Smelting and Pressing of Nonferrous Metals	7.18	3.47	5.07	2.29	2.38	2.07	1.15
34	Metal Products	13.99	5.16	11.44	4.53	2.65	2.96	0.89
35	Ordinary Machinery	15.16	5.95	9.98	4.88	5.16	3.49	1.48
36	Special Purpose Equipment	12.46	3.82	7.72	3.05	4.73	3.74	1.26
37	Transport Equipment	23.76	23.10	14.10	12.62	9.50	12.24	0.78
40	Electric Equipment and Machinery	17.18	7.37	11.39	7.92	5.83	4.40	1.33
41	Electronic and Telecommunications Equipment	16.78	10.24	10.11	10.17	7.39	5.03	1.47
42	Instruments, Meters, Cultural and Office Machinery	16.10	5.92	10.15	7.01	5.95	4.33	1.37
	Total	17.15	11.53	11.44	7.86	5.78	6.47	0.89

Chi2digit = Chinese 2 digit industries. The tariffs with zero initial tariffs were dropped before calculating these averages. Simple average of the six digit HS tariff data from TRAINS.
Source: Authors calculation

Table 3.3: Baseline Model - Effect of Probability of Retaliation on Change in Tariff

Dependent Variable = (Tariff 2003 - Tariff 2000)	(OLS)	(OLS)	(OLS)[1]	(OLS)[2]	(IV)
CVD	0.822***	0.814***	0.578***	1.007*	0.523**
	[0.242]	[0.241]	[0.224]	[0.528]	[0.231]
Pre-accession tariff	-0.422***	-0.424***	-0.398***	-0.436***	-0.352***
	[0.019]	[0.019]	[0.018]	[0.035]	[0.022]
Positive tariffs		1.489***			
		[0.289]			
Total output				-0.003**	
				[0.002]	
Wage				0.002*	
				[0.001]	
Number of firms				0.256**	
				[0.095]	
Share of state owned enterprises				-0.031**	
				[0.015]	
Capital labor ratio				-0.089	
				[0.370]	
Labor productivity				0.243	
				[0.420]	
ln(Import from rest of the world)				-0.376***	
				[0.095]	
Constant	1.432***	0.000	1.098***	-1.432	0.247
	[0.279]	[0.000]	[0.260]	[1.674]	[0.370]
Observations	4659	4659	4350	4087	4442
Adj R^2	0.48	0.48	0.49	0.55	0.48
Shea Partial R^2					0.396
Test of Excluded Instrument, p					0.000
Overidentification, Hansen J test, p					0.162

Robust standard errors in brackets. * significant at 10%; ** significant at 5%; *** significant at 1%
Centered R^2 reported in case of IV regression.
CVD is an indicator that takes value one if a countervailing duty (CVD) has been imposed between 1995-2001 in that product by any of the four trading partners of China – Australia, Canada, EU and US against any existing WTO member, and zero otherwise. Positive tariffs is a dummy that takes the value one if the tariffs were positive (not zero) in year 2000 to begin with, and zero otherwise. All other regressors, except wage, are from year 1999. The wage data is for 2002.
1. Restricts sample to products belonging to industrial sector (mining and manufacturing industries).
2. Clustered at industry level as the political economy controls are available only at the aggregate industry level.
Instrumented variable: Pre-accession tariff (tariff in China for year 1999)
Instruments used: (a) avg_tariff - Average tariff in year 1999 of four developing countries with similar per capita income as of China - Brazil, India, Indonesia and South Africa - and (b) tariffTWN - tariff in 1999 for Taiwan.
The test of excluded instruments reports the test for relevance of the instruments in the corresponding first stage regression. The associated value of the F-statistics is $F(2, 4438) = 355.26$. Additionally both the Anderson-canonical correlations likelihood-ratio test statistic and the Cragg-Donald statistics suggest that the equation is identified (p-val 0.00). The first stage centered R^2 is 0.41. Note that the Shea partial R^2 reported above is the same as the squared partial correlation between the excluded instruments and the endogenous regressor when there is a single endogenous regressor.

Table 3.4a: Counterfactual 1 for the Baseline Model – Using Pre-Accession Sample

Dependent Variable = (Tariff 2000 - Tariff 1997)	(OLS)	(OLS)	(OLS)[1]	(OLS)[2]	(IV)
CVD	-1.724***	-1.727***	-1.634***	-1.107	-1.618***
	[0.197]	[0.197]	[0.195]	[0.678]	[0.167]
Pre-accession tariff	-0.030***	-0.030***	-0.033***	-0.019	-0.065***
	[0.003]	[0.003]	[0.002]	[0.012]	[0.006]
Positive tariffs		0.401***			
		[0.086]			
Total Output				-0.004***	
				[0.001]	
Wage				0.000	
				[0.001]	
Number of firms				0.049***	
				[0.016]	
Share of State Owned Enterprises				0.037**	
				[0.018]	
Capital Labor ratio				0.266	
				[1.155]	
ln(Import from rest of the world)				0.266	
				[0.762]	
Labor productivity				0.103	
				[0.067]	
Constant	0.386***	0.000***	0.358***	-1.818**	1.188***
	[0.083]	[0.000]	[0.063]	[0.724]	[0.159]
Observations	4872	4872	4539	4441	4683
Adj R2	0.05	0.05	0.10	0.16	0.04
Shea Partial R2					0.415
Test of Excluded Instrument, p					0.000
Overidentification, Hansen J test, p					0.00

Robust standard errors in brackets. * significant at 10%; ** significant at 5%; *** significant at 1% Centered R^2 reported in case of IV regression.

CVD is an indicator that takes value one if a countervailing duty (CVD) has been imposed between 1995-2001 in that product by any of the four trading partners of China – Australia, Canada, EU and US against any existing WTO member, and zero otherwise. Positive tariffs is a dummy that takes the value one if the tariffs were positive (not zero) in year 1997 to begin with, and zero otherwise. All other regressors, except wage, are from year 1996. The wage data is for 2002.

1. Restricts sample to products belonging to industrial sector (mining and manufacturing industries).
2. Clustered at industry level as the political economy controls are available only at the aggregate industry level.

Instrumented variable: Pre-accession tariff (tariff in China for year 1996)
Instruments used: (a) avg_tariff - Average tariff in year 1996 of four developing countries with similar per capita income as of China - Brazil, India, Indonesia and South Africa - and (b) tariffTWN - tariff in 1996 for Taiwan.

The test of excluded instruments reports the test for relevance of the instruments in the corresponding first stage regression. The associated value of the F-statistics is $F_{(2, 4679)} = 427.47$. Additionally both the Anderson-canonical correlations likelihood-ratio test statistic and the Cragg-Donald statistics suggest that the equation is identified (p-val 0.00). The first stage centered R^2 is 0.42. Note that the Shea partial R^2 reported above is the same as the squared partial correlation between the excluded instruments and the endogenous regressor when there is a single endogenous regressor.

Table 3.4b: Counterfactual 2 for the Baseline Model – Using Average Change in Tariffs for Similar Countries during the Sample Period (2000-2003)

Dependent Variable = (Tariff 2000 - Tariff 1997)	(OLS)	(OLS)[1]	(OLS)[2]
CVD	0.822***	0.728***	0.019
	[0.242]	[0.235]	[0.083]
Pre-accession tariff	-0.422***	-0.433***	-0.087***
	[0.019]	[0.020]	[0.004]
Change in Average Tariffs (BRA, IDN, IND, ZAF)		-0.351***	
		[0.091]	
Constant	1.432***	0.995***	-0.435***
	[0.279]	[0.265]	[0.067]
Observations	4659	4622	4792
Adj R2	0.48	0.50	0.22

Robust standard errors in brackets * significant at 10%; ** significant at 5%; *** significant at 1%

1. Includes average change in tariff between 2000 and 2003 for four developing countries - Brazil, South Africa, India & Indonesia.

2. The dependent variable is the change in average tariffs of the above countries between 2000 and 2003. The pre-accession tariffs is average tariff for these countries for 1999.

Table 3.5: Interaction Model - Effect of Retaliation Depends on the Cost of Retaliation

Dependent Variable = (Tariff 2003 - Tariff 2000)	(OLS)	(OLS)[1]	(OLS)	(OLS)[2]	(IV)
CVD	0.484*	0.149	0.556**	0.598	0.223
	[0.283]	[0.241]	[0.253]	[0.520]	[0.263]
Pre-accession tariff	-0.391***	-0.359***	-0.414***	-0.403***	-0.331***
	[0.025]	[0.019]	[0.020]	[0.028]	[0.024]
Export to the world			-0.186***		
			[0.047]		
CVD X Export to the world			0.408***		
			[0.099]		
Export to Sample Partners[3]	-0.377***	-0.391***		-0.255***	-0.395***
	[0.102]	[0.107]		[0.067]	[0.110]
CVD X Export to Sample Partners	0.630***	0.662***		0.412**	0.607***
	[0.231]	[0.239]		[0.182]	[0.228]
Total output				-0.003*	
				[0.002]	
Wage				0.001*	
				[0.001]	
Number of firms				0.238**	
				[0.094]	
Share of state owned enterprises				-0.034**	
				[0.016]	
Capital labor ratio				0.027	
				[0.350]	
Labor productivity				0.079	
				[0.475]	
ln(Import from rest of the world)				-0.363***	
				[0.095]	
Constant	1.181***	0.699**	1.394***	-1.279	0.163
	[0.371]	[0.286]	[0.296]	[1.664]	[0.396]
Observations	3911	3708	4498	3516	3813
Adj R^2	0.43	0.43	0.47	0.49	0.43
Shea Partial R^2					0.457
Test of Excluded Instrument, p					0.000
Overidentification, Hansen J test, p					0.446

Robust standard errors in brackets. * significant at 10%; ** significant at 5%; *** significant at 1% Centered R^2 reported in case of IV regression.

CVD is an indicator that takes value one if a countervailing duty (CVD) has been imposed between 1995-2001 in that product by any of the four trading partners of China – Australia, Canada, EU and US against any existing WTO member, and zero otherwise. Positive tariffs is a dummy that takes the value one if the tariffs were positive (not zero) in year 2000 to begin with, and zero otherwise. All other regressors, except wage, are from year 1999. The wage data is for 2002.

1. Restricts sample to products belonging to industrial sector (mining and manufacturing industries).
2. Clustered at industry level as the political economy controls are available only at the aggregate industry level.
3. China's total exports to Australia, Canada, EU and US.

Instrumented variable: Pre-accession tariff (tariff in China for year 1999)

Instruments used: (a) avg_tariff - Average tariff in year 1999 of four developing countries with similar per capita income as of China - Brazil, India, Indonesia and South Africa - and (b) tariffTWN - tariff in 1999 for Taiwan.

The test of excluded instruments reports the test for relevance of the instruments in the corresponding first stage regression. The associated value of the F-statistics is $F(2, 3807) = 306.25$. Additionally both the Anderson-canonical correlations likelihood-ratio test statistic and the Cragg-Donald statistics suggest that the equation is identified (p-val 0.00). The first stage centered R^2 is 0.48. Note that the Shea partial R^2 reported above is the same as the squared partial correlation between the excluded instruments and the endogenous regressor when there is a single endogenous regressor.

Table 3.6: Counterfactual for the Interaction Model – Using Pre-Accession Sample

Dependent Variable = (Tariff 2000 - Tariff 1997)	(OLS)	(OLS)[1]	(OLS)	(OLS)[2]	(IV)
CVD	-1.864***	-1.829***	-1.710***	-1.225*	-1.565***
	[0.203]	[0.203]	[0.203]	[0.652]	[0.202]
Pre-accession tariff	-0.035***	-0.039***	-0.031***	-0.022	-0.077***
	[0.003]	[0.003]	[0.003]	[0.014]	[0.006]
Export to the world			-0.049*		
			[0.029]		
CVD X Export to the world			-0.031		
			[0.115]		
Export to Sample Partners[3]	0.097**	0.128***		0.111	0.246***
	[0.042]	[0.044]		[0.085]	[0.073]
CVD X Export to Sample Partners	-0.028	-0.047		-0.068	-0.065
	[0.151]	[0.152]		[0.130]	[0.156]
Total output				-0.004***	
				[0.001]	
Wage				0.000	
				[0.001]	
Number of firms				0.047***	
				[0.014]	
Share of state owned enterprises				0.038**	
				[0.019]	
Capital labor ratio				0.320	
				[0.860]	
Labor productivity				0.167	
				[1.324]	
ln(Import from rest of the world)				0.119	
				[0.071]	
Constant	0.408***	0.458***	0.429***	-1.732**	1.370***
	[0.080]	[0.082]	[0.089]	[0.786]	[0.136]
Observations	3940	3729	4644	3729	3862
Adj R^2	0.1	0.12	0.06	0.19	0.05
Shea Partial R^2					0.442
Test of Excluded Instrument, p					0.000
Overidentification, Hansen J test, p					0.00

Robust standard errors in brackets. * significant at 10%; ** significant at 5%; *** significant at 1% Centered R^2 reported in case of IV regression.

CVD is an indicator that takes value one if a countervailing duty (CVD) has been imposed between 1995-2001 in that product by any of the four trading partners of China – Australia, Canada, EU and US against any existing WTO member, and zero otherwise. Positive tariffs is a dummy that takes the value one if the tariffs were positive (not zero) in year 1996 to begin with, and zero otherwise. All other regressors, except wage, are from year 1996. The wage data is for 2002.

1. Restricts sample to products belonging to industrial sector (mining and manufacturing industries).
2. Clustered at industry level as the political economy controls are available only at the aggregate industry level.
3. China's total exports to Australia, Canada, EU and US.

Instrumented variable: Pre-accession tariff (tariff in China for year 1996)

Instruments used: (a) avg_tariff - Average tariff in year 1996 of four developing countries with similar per capita income as of China - Brazil, India, Indonesia and South Africa - and (b) tariffTWN - tariff in 1996 for Taiwan.

The test of excluded instruments reports the test for relevance of the instruments in the corresponding first stage regression. The associated value of the $F_{(2, 3856)} = 399.64$. Additionally both the Anderson-canonical correlations likelihood-ratio test statistic and the Cragg-Donald statistics suggest that the equation is identified (p-val 0.00). The first stage centered R^2 is 0.46. Note that the Shea partial R^2 reported above is the same as the squared partial correlation between the excluded instruments and the endogenous regressor when there is a single endogenous regressor.

Table 3.7: Predicted Probability Model

Dependent Variable = (Tariff 2003 - Tariff 2000)	w/o Correcting for estimated regressor			Corrected using Gawande (97) method		
	(OLS)	(OLS)[1]	(IV)	(OLS)	(OLS)[1]	(IV)
Pr(Retaliation)[2]	-0.021	-0.052	-0.021	-0.019	-0.054	-0.026
	[0.061]	[0.053]	[0.051]	[0.098]	[0.094]	[0.087]
Pre-accession tariff	-0.357***	-0.386***	-0.334***	-0.357***	-0.386***	-0.334***
	[0.036]	[0.039]	[0.049]	[0.036]	[0.040]	[0.050]
Export to the world		-0.247***			-0.215***	
		[0.059]			[0.062]	
Pr(Retaliation) X Export to the world		0.130***			0.131**	
		[0.045]			[0.052]	
Export to Sample Partners[3]	-0.471***		-0.474***	-0.426***		-0.432***
	[0.106]		[0.108]	[0.106]		[0.108]
Pr(Retaliation) X Export to Sample Partners	0.171***		0.166***	0.170***		0.165***
	[0.052]		[0.051]	[0.061]		[0.060]
Constant	0.725	1.117	0.312	0.713	1.098	0.31
	[0.600]	[0.664]	[0.773]	[0.595]	[0.657]	[0.767]
Observations	3708	4228	3635	3708	4228	3635
Adj R[2]	0.43	0.48	0.43	0.43	0.48	0.43
Shea Partial R[2]			0.521			0.518
Test of Excluded Instrument, p			0			0
Overidentification, Hansen J test, p			0.405			0.405

Robust standard errors in brackets. * significant at 10%; ** significant at 5%; *** significant at 1% All regressions account for clustering at industry level as the probability of retaliation is predicted at the aggregate industry level. Centered R^2 reported in case of IV regression.

1. Restricts sample to products belonging to industrial sector (mining and manufacturing industries).

2. Pr(Retaliation) is the predicted coefficient on the industry dummies from the first stage regression - $CVD_{jict} = \pi_i + \varpi_c + \varpi_t + \theta W_{jict} + \varepsilon_{jict}$;

where

$\pi_i = \varpi_i * I_i$ where ϖ_i is the full set of industry dummies and I_i is an indicator that indicates whether that industry has been targeted by a CVD in the past.

The results from the first stage regression are given in Table A1. Table A2 shows simple correlation between coefficients from different specifications. Here we use the coefficients from the first stage regression using the Linear Probability model, where CVD is regressed on industry, country and time dummies.

3. China's total exports to Australia, Canada, EU and US.

Instrumented variable: Pre-accession tariff (tariff in China for year 1996) Instruments used: (a) avg_tariff - Average tariff in year 1996 of four developing countries with similar per capita income as of China - Brazil, India, Indonesia and South Africa - and (b) tariffTWN - tariff in 1996 for Taiwan.

The test of excluded instruments reports the test for relevance of the instruments in the corresponding first stage regression. The associated value of the F-statistics for the results without correction is $F(2, 35) = 49.58$ and the associated F-statistics for the set of results after correcting for the standard errors is $F(2, 35) = 49.60$. Additionally both the Anderson-canonical correlations likelihood-ratio test statistic and the Cragg-Donald statistics suggest that the equation is identified (p-val 0.00) for both sets of results. The first stage centered R^2 is 0.52 in both cases. Note that the Shea partial R^2 reported above is the same as the squared partial correlation between the excluded instruments and the endogenous regressor when there is a single endogenous regressor.

Table 3.8: Robustness Exercises for the Interaction Model

Dependent Variable = (Tariff 2003 - Tariff 2000)	Robustness to Sample			Robustness to outliers		
	(OLS)	(OLS)	(OLS)[4]	(OLS)	(OLS)	(OLS)
CVD	0.149	0.123	-0.723	-0.04	-0.743	-0.766
	[0.681]	[0.687]	[0.828]	[0.184]	[0.545]	[0.554]
Pre-accession tariff	-0.359***	-0.366***	-0.194***	-0.320***	-0.290***	-0.362***
	[0.036]	[0.037]	[0.033]	[0.006]	[0.024]	[0.034]
Export to Sample Partners[1]	-0.391***	-0.367***	-0.348	-0.348***	0.403	
	[0.099]	[0.096]	[0.255]	[0.070]	[0.956]	
CVD X Export to Sample Partners	0.663***	0.641***	0.991***	0.910***	6.192***	
	[0.225]	[0.227]	[0.292]	[0.140]	[1.384]	
Mid-Total-Export[2]						0.096
						[0.332]
Hi-Total-Export[3]						0.004
						[0.433]
CVD X Mid-Total-Export						0.528
						[0.682]
CVD X Hi-Total-Export						2.366***
						[0.651]
Constant	0.702	0.876	-0.789	0.057	-0.365	0.639
	[0.607]	[0.621]	[0.694]	[0.120]	[0.366]	[0.538]
Observations	3640	3448	3569	3708	3410	3708
Adj R[2]	0.42	0.43	0.29		0.42	0.43

Robust standard errors in brackets. * significant at 10%; ** significant at 5%; *** significant at 1%

The first column refers to the case where the sample is restricted to include products belonging to manufacturing industries only. The second column includes only those industries which were targeted by a countervailing duty imposed by Australia, Canada, EU or US in at least one of the products belonging to that industry. In the third column we use 1996 as the pre-accession year for data on tariffs as well as exports. The fourth column reports form median regression. In the fifth column we drop observations identified as being associated with an outlier based on the Hadi

criterion. Finally, the sixth regression includes dummy variables that indicate whether the export value falls between the 33rd and 66th percentile (Mid-Total-Exports), or above the 66th percentile (Hi-Total-Exports).

1. China's total exports to Australia, Canada, EU and US. 2. An indicator that takes the value one for those observations with the export values lying between 33rd and 66th percentile, and zero otherwise. 3. Indicator variable with value one if the exports lie above the 66th percentile and zero otherwise. 4. In all the specifications, except here where the relevant year is 1996, the data on pre-accession tariff and exports belong to year 1999.

Table 3.A1: Data Appendix - Source and Explanations

Variable	Year	Obs	Mean	Std. Dev.	Min	Max	Source/Description
Product level -							
CVD	---	5442	0.13	0.34	0	1	Own calculation using notifications to WTO and government publications
Tariff	1996	4989	23.73	16.79	0.00	121.60	Applied ad valorem tariffs in China from TRAINS
Tariff	1999	4989	17.18	12.20	0.00	121.60	"
Tariff	2000	4972	17.03	12.21	0.00	121.00	"
Tariff	2003	5027	11.33	8.03	0.00	68.00	"
Change in tariff[1]	---	4685	-5.70	7.07	-111.60	45.00	Calculated as Chinese Tariff in 2003 - Tariff in 2000
Export to the world	1996	4767	0.31	1.15	0.00	27.89	China's exports to the rest of the world from COMTRADE
Export to the world	1999	4801	0.40	1.58	0.00	47.99	in 100 million USD
Export to Sample Partners	1996	4038	0.12	0.58	0.00	15.15	China's exports to selected partner countries from COMTRADE
Export to Sample Partners	1999	4153	0.19	0.96	0.00	36.97	in 100 million USD
Industry level							
Total output	1999	4433	365.90	190.23	16.46	704.22	Various Issues of China Statistical Yearbook
Total output	1996	4655	322.25	181.04	0.72	570.32	in 100 million USD
Number of firms	1999	4433	7.31	3.81	0.08	14.37	Various Issues of China Statistical Yearbook
Number of firms	1996	4655	20.41	12.08	0.13	61.89	in 1000 units
Share of state owned enterprises	1999	4433	40.84	18.43	6.49	99.86	Calculated as (value added of total industry / value added of state owned enterprises)*100
Share of state owned enterprises	1996	4655	34.13	17.52	6.23	98.09	from China Statistical Yearbook (various issues)
Capital labor ratio	1999	4433	3.01	1.14	0.58	8.64	Calculated as (total assets / employment) in the industry
Capital labor ratio	1996	4655	1.59	0.63	0.26	5.40	from China Statistical Yearbook (various issues)
Labor productivity	1999	4433	2.16	0.82	0.19	5.79	Calculated as (total output / employment) in the industry
Labor productivity	1996	4655	1.24	0.44	0.19	4.40	from China Statistical Yearbook (various issues)
ln(Import from rest of the world)	1999	4883	-3.65	2.68	-15.05	3.84	log of China's exports from the rest of the world aggregated at Chinese two digit industry
ln(Import from rest of the world)	1996	4854	-3.82	2.70	-18.42	3.55	from COMTRADE
Wage	2002	4653	1257.06	303.14	592.27	2867.63	per annum in USD from China Labor Yearbook (2003)

1 In the counterfactual exercise we also use change in tariffs between 1997 and 2000 which is calculated in a similar way.

Table 3.A2: First Stage Regression to Get Predicted Probability

Dependent Variable = CVD	Linear Probability			Logit		
Food Processing	0.014***	0.019***	0.020***	0.014***	0.105***	3.436***
	[0.002]	[0.002]	[0.002]	[0.002]	[0.014]	[0.528]
Food Manufacturing	0.015***	0.021***	0.017***	0.016***	0.112***	2.315***
	[0.002]	[0.002]	[0.002]	[0.002]	[0.015]	[0.371]
Beverage Manufacturing	0.012***	0.018***	0.015***	0.012***	0.084***	3.715***
	[0.004]	[0.005]	[0.005]	[0.004]	[0.036]	[1.645]
Textile Industry	0.023***	0.029***	0.029***	0.024***	0.184***	4.185***
	[0.001]	[0.002]	[0.001]	[0.001]	[0.010]	[0.330]
Garments and Other Fiber Products	0.016***	0.022***	0.017***	0.017***	0.118***	1.822***
	[0.001]	[0.002]	[0.002]	[0.002]	[0.010]	[0.212]
Leather, Furs, Down and Related Products	0.038***	0.044***	0.040***	0.040***	0.328***	7.165***
	[0.005]	[0.005]	[0.005]	[0.005]	[0.046]	[1.083]
Furniture Manufacturing	0.001	0.007***	0.002	0.001***	0.006***	0.147*
	[0.001]	[0.001]	[0.001]	[0.001]	[0.006]	[0.148]
Papermaking and Paper Products	0.000	0.006***	0.006***	0.000***	0.002***	0.068***
	[0.000]	[0.001]	[0.001]	[0.000]	[0.002]	[0.068]
Raw Chemical Materials and Chemical Products	0.002***	0.008***	0.008***	0.002***	0.011***	0.314***
	[0.000]	[0.001]	[0.001]	[0.000]	[0.002]	[0.063]
Medical and Pharmaceutical Products	0.003**	0.009***	0.010***	0.003***	0.022***	0.797
	[0.001]	[0.002]	[0.002]	[0.001]	[0.009]	[0.348]
Chemical Fiber	0.005***	0.011***	0.011***	0.005***	0.036***	1.005
	[0.001]	[0.001]	[0.001]	[0.001]	[0.009]	[0.259]
Rubber Products	0.005***	0.011***	0.010***	0.005***	0.035***	0.703
	[0.002]	[0.002]	[0.002]	[0.002]	[0.013]	[0.260]
Plastic Products	0.006***	0.012***	0.009***	0.006***	0.042***	0.969
	[0.002]	[0.002]	[0.002]	[0.002]	[0.014]	[0.341]
Nonmetal Mineral Products	0.008***	0.014***	0.013***	0.008***	0.058***	1.445*
	[0.001]	[0.002]	[0.002]	[0.001]	[0.010]	[0.277]
Smelting and Pressing of Ferrous Metals	0.133***	0.136***	0.085***	0.153***	1.851***	19.428***
	[0.004]	[0.004]	[0.004]	[0.006]	[0.107]	[1.761]
Smelting and Pressing of Nonferrous Metals	0.010***	0.016***	0.016***	0.010***	0.068***	1.911***
	[0.002]	[0.002]	[0.002]	[0.002]	[0.011]	[0.343]
Metal Products	0.004***	0.010***	0.008***	0.004***	0.024***	0.476***
	[0.001]	[0.001]	[0.001]	[0.001]	[0.005]	[0.102]
Ordinary Machinery	0.003***	0.009***	0.008***	0.003***	0.022***	0.540***
	[0.001]	[0.001]	[0.001]	[0.001]	[0.004]	[0.108]
Special Purpose Equipment	0.004***	0.010***	0.009***	0.004***	0.027***	0.912
	[0.001]	[0.001]	[0.001]	[0.001]	[0.006]	[0.218]
Transport Equipment	0.002**	0.007***	0.006***	0.002***	0.011***	0.328***
	[0.001]	[0.001]	[0.001]	[0.001]	[0.004]	[0.136]
Electric Equipment and Machinery	0.002***	0.008***	0.004***	0.002***	0.012***	0.134***
	[0.001]	[0.001]	[0.001]	[0.001]	[0.005]	[0.068]
Instruments, Meters, Cultural and Office Machinery	0.001***	0.007***	0.005***	0.001***	0.008***	0.179***
	[0.000]	[0.001]	[0.001]	[0.000]	[0.003]	[0.070]
Other manufacturing	0.000	0.006***	0.004***	0.000***	0.001***	0.026***
	[0.000]	[0.001]	[0.000]	[0.000]	[0.001]	[0.026]
herfindahl - share of exporters using import values			0.003***			0.030***
			[0.001]			[0.003]
no of exporters for that hs category			0.000***			0.995**
			[0.000]			[0.002]
growth_import			0.000			1.044
			[0.001]			[0.097]
growth_import2			-0.003***			0.766***
			[0.000]			[0.050]
Year Fixed Effects	No	Yes	Yes	No	Yes	Yes
Country Fixed Effects	No	Yes	Yes	No	Yes	Yes
Observations	130988	130988	127196	130988	130988	127196
R-squared	0.07	0.11	0.07			
no of parameters	23	32	36	23	32	36

Robust standard errors in brackets. * significant at 10%; ** significant at 5%; *** significant at 1%
Only those industry dummies were included for which at least one product was hit by a CVD duty in the past. Odds ratios reported in the case of Logit.

$CVD_{jict} = \pi_i + \varpi_c + \varpi_t + \theta W_{jict} + \varepsilon_{jict}$; where, $\pi_i = \varpi_i * I_i$ where ϖ_i is the full set of industry dummies and I_i is an indicator that indicates whether that industry has been targeted by a CVD in the past.

Table 3.A3: Correlation between the Industry Coefficients from First Stage Regressions

	Eq 1	Eq 2	Eq 3	Eq 4	Eq 5	Eq 6	Eq 7	Eq 8	Eq 9	Eq 10
Eq 1	1									
Eq 2	0.9999	1								
Eq 3	0.9792	0.9802	1							
Eq 4	0.9999	1.0000	0.9802	1						
Eq 5	0.9790	0.9801	0.9998	0.9801	1					
Eq 6	0.9996	0.9993	0.9734	0.9993	0.9732	1				
Eq 7	0.9912	0.9902	0.9472	0.9901	0.9465	0.9946	1			
Eq 8	0.9896	0.9899	0.9885	0.9899	0.9889	0.9861	0.9693	1		
Eq 9	0.9919	0.9909	0.9487	0.9908	0.9480	0.9951	1.0000	0.9704	1	
Eq 10	0.9898	0.9901	0.9883	0.9902	0.9887	0.9864	0.9698	1.0000	0.9708	1

Simple correlation between the coefficients (odds ratio for Logit) from alternative first stage regressions.

Eq1-Eq5 = Coefficients from Linear Probability; Eq6-Eq10 = Odds Ratios from corresponding Logit Specifications. Dependent Variable = CVD (varies by product, time, country). Takes value 1 if one of the four countries imposed a countervailing duty for that product in that year. Regressors included: Eq1 = industry dummies only, Eq2 = Eq1+ country and year dummy, Eq3 = Eq2+ Number of exporters, Herfindahl index of exporters, growth of imports, square(growth of imports), Eq4 = Eq2+yr*ctry dummy, Eq5 = Eq3+year*country dummy.

Table 4.1: Average Tariff in Taiwan - Three Digit ISIC rev.2.

ISIC3	Tariff in 2000		Tariff in 2003		Change in Tariffs		Change in Tariffs[1]	
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
111	15.20	15.07	10.16	13.27	-5.60	8.58	-7.53	9.19
113	4.47	6.64	5.53	6.44	-0.42	0.91	-0.63	1.17
121	7.81	9.18	5.18	5.90	-2.49	3.92	-3.62	4.31
122	0.00	0.00	0.00	0.00	0.00	0.00	--	--
130	25.77	10.85	22.50	15.94	-5.15	10.41	-5.41	10.62
210	0.00	0.00	0.00	0.00	0.00	0.00	--	--
220	3.07	3.06	1.92	2.46	-1.67	2.66	-2.50	3.00
230	0.00	0.00	0.00	0.00	0.00	0.00	--	--
290	0.62	1.21	0.55	1.10	-0.07	0.26	-0.23	0.44
311	20.60	13.72	20.94	34.18	-0.34	29.93	-0.37	31.09
313	19.31	11.62	8.57	7.97	-10.42	11.55	-11.04	11.60
314	25.63	6.21	21.25	3.31	-4.38	3.96	-4.38	3.96
321	8.18	4.12	8.00	3.49	-0.09	1.20	-0.09	1.22
322	13.07	2.17	12.01	1.65	-1.08	0.94	-1.08	0.94
323	4.92	4.00	4.11	3.51	-0.53	0.95	-0.57	0.97
324	5.36	1.93	5.40	1.95	0.07	0.18	0.08	0.19
331	3.53	4.33	2.44	3.84	-1.10	1.02	-1.61	0.83
332	7.67	2.13	4.67	2.53	-3.00	1.82	-3.00	1.82
341	5.04	2.74	2.30	1.21	-2.77	1.61	-3.03	1.43
342	3.96	4.46	1.78	2.02	-2.19	2.45	-4.22	1.67
351	3.49	2.30	3.25	1.85	-0.25	0.98	-0.27	1.02
352	4.09	3.70	2.84	2.59	-1.25	2.02	-1.97	1.94
353	3.47	2.08	2.99	1.74	-0.38	0.61	-0.38	0.61
354	3.75	3.95	2.77	2.78	-0.98	1.26	-0.98	1.26
355	8.79	3.67	8.19	2.95	-0.61	1.04	-0.62	1.04
356	4.94	1.31	4.73	1.41	-0.20	0.57	-0.21	0.58
361	10.04	2.87	8.97	2.13	-1.06	0.81	-1.06	0.81
362	8.23	5.09	7.10	4.23	-1.14	1.82	-1.16	1.83
369	7.26	3.42	6.72	3.25	-0.53	0.90	-0.56	0.92
371	6.91	3.64	3.68	2.56	-2.85	1.95	-3.40	1.63
372	2.34	2.90	1.77	2.36	-0.62	0.72	-1.05	0.65
381	7.90	3.10	6.85	3.01	-1.03	1.38	-1.04	1.39
382	4.60	2.66	3.36	2.13	-1.23	1.27	-1.32	1.27
383	5.98	5.19	5.17	4.41	-0.75	1.18	-0.93	1.24
384	11.92	10.85	12.98	15.59	1.04	8.23	1.30	9.18
385	4.01	2.74	3.27	2.53	-0.72	1.09	-0.85	1.14
390	5.10	3.16	4.36	3.01	-0.65	1.18	-0.76	1.25
410	--	--	--	--	--	--	--	--
999	1.80	2.66	1.22	2.18	-0.29	0.56	-0.83	0.68
Total	7.70	8.08	6.66	11.22	-1.06	8.12	-1.22	8.68

Simple average of the six digit HS tariff data from TRAINS. Change in tariffs (Tariff2003-Tariff2000).
1. Data with zero tariffs in 2000 were dropped before taking averages.
Source: Authors calculation

Table 4.2: Effect of Probability of Retaliation on Change in Tariff

Dependent Variable = (Tariff 2003 - Tariff 2000)	(OLS)[1]	(OLS)	(OLS)	(OLS)[2]	(IV)[1,3]	(IV)[3,4]
CVD	0.902**	1.107***	1.111***	0.883*	1.171***	1.009***
	[0.354]	[0.328]	[0.333]	[0.526]	[0.380]	[0.381]
Pre-accession tariff	-0.121***	-0.168***	-0.167***	-0.197***	-0.132**	-0.089
	[0.043]	[0.029]	[0.031]	[0.028]	[0.063]	[0.058]
Positive tariffs			-0.045			
			[0.186]			
Constant	-0.172	0.076	0.111***	-2.382***	-0.153	-0.46
	[0.225]	[0.164]	[0.031]	[0.604]	[0.514]	[0.458]
Observations	4518	4461	4461	4461	4346	4513
Adj R^2	0.02	0.06	0.06	0.08	0.02	0.02
Shea Partial R^2					0.176	0.144
Test of Excluded Instrument, p					0.000	0.000

Robust standard errors in brackets. * significant at 10%; ** significant at 5%; *** significant at 1%

Centered R^2 reported in case of IV regression.

1. Uses the pre-accession tariff for 1999 for comparison with China case. All other regressions have 1992 tariffs as the

2. Includes Industry dummies (ISIC 3 digit)

3. Instrumented variable: pre-accession tariff (tariff in Taiwan for 1999). Instrument Used: Average tariff for the year of pre-accession tariff (1999) in four developing countries (Brazil, India, Indonesia and South Africa)

4. Instruments for 1996 tariff as pre-accession tariff.

The test of excluded instruments reports the test for relevance of the instruments in the corresponding first stage regression. The associated value for the first IV regression reported in the table is $F(1, 4343) = 586.19$ and that for the second IV regression is $F(1, 4510) = 788.09$. Additionally in both cases both the Anderson-canonical correlations likelihood-ratio test statistic and the Cragg-Donald statistics suggest that the equation is identified (p-val 0.00). The first stage centered R^2 is 0.18 and 0.15. Note that the Shea partial R^2 reported above is the same as the squared partial correlation between the excluded instruments and the endogenous regressor when there is a single endogenous regressor.

Table 4.3: Counterfactual 1 – Using Pre-Accession Sample

Dependent Variable = (Tariff 1999 - Tariff 1996)	(OLS)	(OLS)	(OLS)[1]	(IV)[2]
CVD	-0.003	0.005	0.011	0.005
	[0.054]	[0.055]	[0.076]	[0.052]
Pre-accession tariff	0.009	0.010	0.018**	0.012
	[0.006]	[0.006]	[0.007]	[0.011]
Positive tariffs		-0.086*		
		[0.046]		
Constant	-0.034	0.031*	0.007	-0.064
	[0.035]	[0.018]	[0.277]	[0.081]
Observations	4469	4469	4469	4300
Adj R2	0.00	0.00	0.00	0.00
Shea Partial R2				0.175
Test of Excluded Instrument, p				0.00

Robust standard errors in brackets. * significant at 10%; ** significant at 5%; *** significant at 1% Centered R^2 reported in case of IV regression.

1. Includes Industry dummies (ISIC 3 digit)

2. Instrumented variable: pre-accession tariff (tariff in Taiwan for 1996) Instrument Used: Average tariff for the year of tariff in four developing countries (Brazil, India, Indonesia and South Africa) for the year 1996.

The test of excluded instruments reports the test for relevance of the instruments in the corresponding first stage regression. The associated value for the IV regression reported in the table is $F(1, 4297) = 526.79$. Additionally both the Anderson-canonical correlations likelihood-ratio test statistic and the Cragg-Donald statistics suggest that the equation is identified (p-val 0.00). The first stage centered R^2 is 0.18. Note that the Shea partial R^2 reported above is the same as the squared partial correlation between the excluded instruments and the endogenous regressor when there is a single endogenous regressor.

Table 4.4: Counterfactual 2 – Using Average Change in Tariffs for Similar Countries during the Sample Period (2000-2003)

Dependent Variable = (Tariff 2003 - Tariff 2000)	(OLS)	(OLS)	(OLS)[1]	(OLS)[2]
CVD	1.107***	1.518***	-0.623***	0.012
	[0.328]	[0.529]	[0.087]	[0.049]
Pre-accession tariff	-0.168***	-0.166***	-0.020***	0.008*
	[0.029]	[0.034]	[0.005]	[0.004]
Change in Average tariffs of BRA,IDN,IND,ZAF		0.218		-0.001
		[0.337]		[0.008]
Constant	0.076	0.454	-1.667***	-0.030
	[0.164]	[0.497]	[0.040]	[0.024]
Observations	4461	4122	4294	4131
Adj R^2	0.06	0.06	0.03	0.00

Robust standard errors in brackets. * significant at 10%; ** significant at 5%; *** significant at 1%
1. For this column the dependent variable is Change in Average tariffs of Brazil, Indonesia, India and South Africa between 2000 and 2003 and the pre-accession tariff is the average tariff in 1999 for these countries
2. Here the dependent variable is change in tariff of Taiwan between 1996 and 1999 (for comparison with the pre-accession counterfactual)

Table 4.5a: Effect of Probability of Retaliation on Change in Tariff - Sample Restricted to Products for which the Tariffs did not Decline During the Sample Period (2000-2003)

Dependent Variable = (Tariff 2003 - Tariff 2000)	(Tobit)[1]	(Tobit)	(Tobit)[2]	(Tobit)
CVD	11.233***	8.410***	6.151***	8.998***
	[1.938]	[1.373]	[1.616]	[1.382]
Pre-accession tariff	1.546***	1.156***	0.984***	1.133***
	[0.107]	[0.081]	[0.096]	[0.082]
Change in Average tariffs of BRA,IDN,IND,ZAF				1.705***
				[0.365]
Constant	-33.441***	-24.007***	-24.324***	-20.464***
	[1.517]	[1.095]	[3.635]	[1.253]
Observations	2040	2010	2010	1861
Adj R[2]	0.05	0.05	0.10	0.05

Robust standard errors in brackets. * significant at 10%; ** significant at 5%; *** significant at 1%
Pseudo R^2 reported in case of tobit regression.
1. Uses the pre-accession tariff for 1999 for comparison with the China case. All other regressions have 1992 tariffs as pre-accession tariff.
2. Includes industry dummies (ISIC 3 digit)

Table 4.5b: Counterfactual for the Effect of Probability of Retaliation on Change in Tariff - Sample Restricted to Products for which the Tariffs did not Decline During the Sample Period (1999-1996)

Dependent Variable = (Tariff 1999 - Tariff 1996)	(Tobit)	(Tobit)[1]
CVD	-0.852	1.011
	[1.617]	[2.156]
Pre-accession tariff	0.269***	0.266***
	[0.051]	[0.077]
Constant	-28.222***	-25.714***
	[2.581]	[3.687]
Observations	4367	4367
Adj R[2]	0.02	0.09

Robust standard errors in brackets. * significant at 10%; ** significant at 5%; *** significant at 1% 1. Includes industry dummies (ISIC 3 digit). Pseudo R^2 reported in case of Tobit regression.

Table 4.6: Effect of Probability of Retaliation on Change in Tariff – Robustness Tests

Dependent Variable = (Tariff 2003 - Tariff 2000)	(OLS)	(OLS)[1]	(OLS)	(OLS)[2]	(OLS)[3]
CVD	1.194***	0.574**	1.101***	0.813**	1.129***
	[0.325]	[0.252]	[0.329]	[0.326]	[0.336]
Pre-accession tariff	-0.156***	-0.161***	-0.170***	-0.103***	-0.170***
	[0.030]	[0.029]	[0.029]	[0.038]	[0.031]
Bound_Accession_Document	0.921***				
	[0.189]				
Not_Bound_TRAINS			3.338***	-0.483***	
			[0.743]	[0.086]	
Constant	-0.411*	-0.109	0.141	-0.256	0.079
	[0.229]	[0.188]	[0.166]	[0.216]	[0.185]
Observations	4461	4461	4461	4114	3764
Adj R^2	0.06	0.07	0.06	0.02	0.05

Robust standard errors in brackets.

* significant at 10%; ** significant at 5%; *** significant at 1%

1. Includes Industry dummies (ISIC 3 digit)

2. Sample restricted to only products belonging to the Manufacturing Sector

3. Sample restricted to products belonging to only those ISIC-3 digit industries which had a CVD in at least one product

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