CESifo *Working Paper Series*

ENDOGENOUS VERTICAL RESTRAINTS IN INTERNATIONAL TRADE

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Working Paper No. 284

April 2000

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* We would like to thank seminar audiences at the Universities of Virginia, British Columbia, Kiel and Helsinki, Simon Fraser University, the Canadian Competition Bureau, the Norwegian School of Economics and Business Administration and participants at the Econometric Society Winter Meetings in Boston for helpful comments and suggestions. We started working on this paper while we were both visitors at the *Center for Economic Studies* in Munich. We are grateful to Hans-Werner Sinn and the *CES* staff for their great hospitality. Schmitt acknowledges financial support from the Social Sciences and Humanities Research Council of Canada.

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Abstract

This paper examines interbrand competition between a domestic and a foreign manufacturer who market their products through intermediaries. The contracts manufacturers offer these intermediaries are endogenous. In equilibrium contracts may specify exclusive territories (ET), depending on the degree of substitutability between products and the level and degree of transparency of trade barriers. Trade liberalization, through lower or more transparent barriers, may lead manufacturers to use ET, thereby substituting private anti-competitive arrangements for government-imposed barriers. This substitution may decrease competition and welfare, and thus create a role for competition policy in a freer trade environment.

JEL Classification: F13, L42

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1 Introduction

The trade literature typically assumes that exporters sell directly to consumers. Throughout history, however, intermediaries have played an important role in international exchange. Greif (1993), for instance, analyzes in detail the complex relations between merchants and their overseas agents in the 11th-century Mediterranean economy [see Peng (1998) for an account since 1600]. In his analysis of retail trade in England between 1550 and 1700, Berger (1980) notes that during that time retailers assumed an important role in the distribution of internationally traded goods.

Reliable data about the share of trade handled by intermediaries is hard to come by. In the early 1990s, Japan's trading companies handled 40% of Japanese exports according to the Economist (1995), while US export management companies handled about 10% of US manufactured exports according to Root (1994). However, these shares do not capture all the intermediaries operating in international markets. More broadly, Rauch (1999) estimates that in 1990 about 65% of international trade was in differentiated products for which there were no organized exchanges or reference prices (up from 55% in 1970). It is mainly with respect to these products that intermediaries can be expected to play an important role. Not only do intermediaries match international buyers and sellers, they typically also provide a variety of services ranging from providing information about markets and competing products to foreign manufacturers, to providing pre- or after-sale services to local consumers. The increasing role of intermediaries is also consistent with the general trend of export service outsourcing.

The relationship between manufacturers and intermediaries, however, is not without problems. For instance, it is well known that in imperfectly competitive markets successive markups by manufacturers and intermediaries (double marginalization) create inefficiencies within the vertical structure. The inability of manufacturers to observe their intermediaries' sales effort may create moral hazard problems. And the presence of market uncertainty may lead to a problem of allocating risk between parties with different degrees of risk aversion. To deal with such problems, manufacturers and intermediaries typically write contracts. Such

contracts are known as vertical restraints.

The potential use of these contracts raises interesting questions in the context of international trade. For instance, what contracts do foreign and domestic manufacturers offer their local intermediaries? Do they use different contracts? Do changes in protection encourage or discourage the use of certain vertical restraints by domestic or foreign firms? Does this increase or reduce competition? What are the effects on welfare? Since some vertical restraints are known to impede competition, is there a role for competition policy at the national or at the international level in restricting their use? This list of questions is, of course, not exhaustive. The point is that we know very little about contracting problems in international trade and about how the choice of contract interacts with trade policy. This paper represents an attempt at investigating some of these questions. The main message of the paper is that it is potentially important to consider contractual arrangements when assessing the effects of trade liberalization. In particular, we show that, as trade policy changes, the vertical contractual arrangements themselves may change with strong implications for trade volume, competition and welfare.

There has recently been considerable speculation in policy circles on both sides of the Atlantic about the role of vertical restraints in international trade. For instance, the European Commissioners in charge of trade and competition policy have asserted that: "*[..] the incentive for firms to engage in anti-competitive behavior impeding market access (such as [..] vertical restraints) increases with the reduction of tariffs and other barriers*" (Brittan and Van Miert (1996, p.4)). In a similar vein, Debra Valentine (1997), the Assistant Director of the International Antitrust Division at the U.S. Federal Trade Commission, has argued that: "*... as government barriers to market integration disappear, we can expect that private anticompetitive practices will assume increased importance. And vertical restrictions will be an important and complicated issue for competition enforcers.*" By endogenizing the use of vertical restraints, this paper is able to investigate whether there is any validity to these speculations.[1]

[1]In November 1997, the US Department of Justice established the International Competition Policy

The vertical restraint we focus on is an exclusive territory (ET) clause, which implies that a manufacturer uses an exclusive intermediary (hereafter called a retailer) in a given country or region. There are at least two reasons why ET is an interesting vertical restraint to examine in an international context. First, it is the area of ET where the United States and the European Union (EU) differ the most in their anti-trust policies. In the United States, vertical restraints—and especially ET—are viewed as essentially efficient and thus harmless; the main argument is that they alleviate free riding among retailers in the provision of customer services. The opposite is true in Europe. At least until recently, the EU saw ET as anti-competitive and as restricting trade, thereby undermining the forces of economic integration, especially when the exclusive territories correspond to member countries.[2] It is thus the role of international trade and economic integration that differentiates the United States and the EU as far as the treatment of ET is concerned.[3] Second, the enforcement of an ET clause, which requires a suppression of intrabrand competition across assigned territories, appears to be relatively easy at the international level. As Gallini and Hollis (1999) have pointed out, there exist a variety of legal tools, such as trademark and copyright laws, that help prevent this type of competition, e.g. by excluding parallel imports. So if manufacturers find it in their interest to use ET internationally, there would seem to be little that would stand in their way.

In our model the choice of ET is determined by the following trade-off. The benefit of adopting ET is that it helps reduce interbrand competition between domestic and foreign manufacturers. The cost of an ET contract is that it exposes risk-averse retailers to the

Advisory Committee (ICPAC) in large part to examine the "*interface of international trade and competition policy.*" The reason given for this mandate is that: "*As many formal barriers to trade have been reduced or eliminated around the world, international policy attention is focusing increasingly on the role of private anticompetitive practices of firms.*" (www.usdoj.gov/atr/icpac/icpac.htm).

[2]The recent EU Green Paper on Vertical Restraints in EC Competition Policy suggests a change in policy that would move the EU closer to the U.S. position [EU (1998)].

[3]This role, however, is still not very well understood. As Deacon (1995) acknowledges when he writes about Europe, the "partially complete nature of the internal market has never been satisfactorily analyzed in the economic literature (in particular with respect to territorial exclusivity provisions) [..]."

uncertainties associated with international trade. A key source of these uncertainties, apart from exchange-rate fluctuations, is the seemingly random nature of many trade barriers. By this we mean that many policies are sufficiently obscure in their interpretation, or arbitrary in their application so as to make the true cost of imports highly uncertain. Examples of such policies in Japan, Korea, the EU and the United States (listed in Appendix 1) show that these barriers are not simply trading costs easily captured by well-defined taxes. Rather they involve resource costs, and they have a high element of arbitrariness and uncertainty about them, because policies and regulations are purposely vague, ambiguous and left open to interpretation. In short, uncertainty is built in, whether through antidumping or countervailing duty investigations, changes in tariff classification, 'administrative punishment' for mistakes about custom procedures, or the design and application of industry or health standards, product certification, entry authorizations, advertising and labeling standards, especially when these standards are under the control of industry associations. In the case of Japan, their randomness is best exemplified by this quote: "[..] gaining access in Japan is an experience not unlike attaining justice in Franz Kafka's novel *The Trial*" (cited by Saxonhouse (1993)).

Trade policy is shown in this paper to have non-trivial effects on the trade-off between reducing price competition and insuring retailers, and hence on the equilibrium choice of ET. In particular, we identify conditions under which trade liberalization leads to an increased use of ET in equilibrium, and other conditions under which it induces manufacturers to stop using ET. In the former case, manufacturers counteract a reduction in government barriers to trade with a private anti-competitive arrangement. We also demonstrate that this private arrangement, namely ET, may have worse effects than the initial government barrier so that interbrand competition, trade volume and welfare may decrease with trade liberalization. The paper hence identifies circumstances under which competition policy, when it prohibits ET, may have a clear role to play in a freer trade environment.

This paper is linked to the literature in the following way. To the best of our knowledge, Fargeix and Perloff (1989) is the first trade paper in which a manufacturer (in their case only

the domestic one) sells through an agent. They are interested in how trade liberalization affects this agent's incentive to provide customer services, and hence treat contracts as exogenous.[4] Although there are many recent books and papers about the role of competition policy in international markets, most deal with mergers and cartels rather than with vertical restraints.[5] The present paper is, however, closely linked to the literature in Industrial Organization on vertical restraints. This is especially the case with respect to Rey and Tirole's (1986) classic paper on endogenous vertical restraints, and Rey and Stiglitz's (1995) paper on the anti-competitive effect of ET.

The rest of the paper is organized as follows. In the next section, we build a model with one domestic and one foreign manufacturer. In Section 3, we first derive the equilibrium prices, outputs and profits for each combination of contracts selected by the two manufacturers, and then show that interbrand competition generally decreases with the use of ET. In Section 4, we derive the equilibrium choice of contracts given the exogenous parameters of the model. In Section 5, we use simulations to investigate the effects of trade liberalization on the equilibrium choice of contracts, the volume of trade and on welfare. We also discuss the role of competition policy. Section 6 provides extensions, and Section 7 concludes.

2 The Model

Consider a domestic manufacturer (h) and a foreign manufacturer (f) who produce imperfectly substitutable goods for sale in the home market. Consumer demand for product i is given by

$$D^i = D^i(p_i, p_j), \quad i, j = h, f; \quad j \neq i, \tag{1}$$

[4] Another recent paper in which manufacturers use agents is Richardson (1999b). But in this paper, too, contracts are exogenous.

[5] Bhagwati and Hudec (1996) recently edited two volumes on a variety of issues linked to the harmonization of policies, including competition policy. Recent papers more specifically on international aspects of competition policy include Francois and Horn (1998), Head and Ries (1997), Horn and Levinsohn (1997), Levinsohn (1994), Motta and Onida (1997), Nagaoka (1998) and Richardson (1999a).

where p_i denotes the consumer price of product i. Defining D_i^i (and D_j^i) as the partial derivatives with respect to price p_i (respectively p_j), we make standard assumptions such as $D_i^i < 0$, $D_j^i > 0$, and $|D_i^i| > \left|D_j^i\right|$. Furthermore, we assume that $D_{ii}^i \leq 0$, $D_{ij}^i > 0$, and $|D_{ii}^i| > \left|D_{ij}^i\right|$. The assumptions on the second derivatives (as is shown in Appendix 2) assure strategic complementarity of prices.

The production technology exhibits constant marginal costs. We denote manufacturer i's marginal cost by c_i, $i = h, f$. To distribute their products to consumers both manufacturers require the services of intermediaries. In keeping with tradition, we refer to these intermediaries as retailers, even though their activities may also cover other distribution stages. We assume that there are many competitive retailers serving the home market and that the retail activity itself is costless. Under ET, a manufacturer picks one of these retailers to be his exclusive agent;[6] we refer to the home (foreign) manufacturer's exclusive retailer as retailer h (f). We assume that manufacturers can commit themselves to assign ET and that this choice, once made, is observed by all firms.

In addition to the wholesale price, retailers potentially face a cost arising from trade barriers. This cost is represented by a random variable t and measured in per-unit terms. We treat it as a resource cost incurred by the retailers.[7] It is common knowledge for all agents in the economy that t is distributed over the interval $[t^-, t^+]$ with mean t^e and variance σ_t^2. Both manufacturers and retailers face uncertainty about t at the contracting stage, but retailers later observe the realization of t before choosing what price to charge consumers. The variance σ_t^2 can be interpreted as the degree of uncertainty of the trade barrier.

In this paper, we limit the choice of contracts to 'ET' and 'no ET'. To make sure that manufacturers cannot discriminate among retailers or propose other contractual arrangements (e.g. retail price maintenance), we follow Rey and Tirole (1986) and Rey and Stiglitz

[6] Alternatively, we could assume that the home market is divided into a finite number of 'territories', such as federal states or metropolitan areas, and that each 'territory' has a large number of competitive retailers. This would have no effect on our results.

[7] Our welfare conclusions would not be affected in any qualitatively important way, if we were to treat t as a revenue-generating tariff.

(1995) in assuming that manufacturers observe only the amount supplied to retailers and whether a given retailer carries a product, but do not observe the quantity sold by the retailers, their profit and retail prices. Moreover, the manufacturers cannot refuse to deal *ex post*. They can, however, set a franchise fee, since manufacturers observe whether the product is carried by a retailer. Hence, a contract always specifies a wholesale price w_i and a franchise fee F^i $(i = h, f)$.[8] Complicating the choice of contract in this uncertain trade environment is the fact that, while manufacturers themselves are risk neutral, retailers are risk averse. For analytical tractability, we assume that retailers are extremely risk averse; what this implies will be discussed below.

The assumption that the realization of t is not observed by the manufacturers is important: it implies that manufacturers cannot specify contracts conditional on the realization of t. They hence have no direct (i.e. contractual) means of insuring retailers. The non-transparent barriers listed in Appendix 1 fit this assumption. These barriers are typically product-specific and, insofar as retailers (or wholesalers) act as importers of the foreign products they sell, manufacturers have no reason to know the realization of t before the products are actually sold.[9]

The strategic interactions between the manufacturers and between them and their retailers can be summarized by a three-stage game. In the first stage, each manufacturer chooses which contract to have with its retailer(s). Manufacturers have two options: assign ET to their retailers or, alternatively, sell to retailers without such a clause. In the second stage, manufacturers choose their wholesale prices and franchise fees given the option chosen in the first stage. In the third stage, retailers learn the realization of t and choose their retail

[8] Rey and Stiglitz (1995) show that ET, in itself, does not require a franchise fee. However, they demonstrate that it is a dominant strategy for the manufacturers to adopt such a franchise fee along with ET and thus we consider this case only.

[9] What is important for our results is that manufacturers cannot write complete insurance contracts. Exchange-rate movements, which otherwise act in a similar way as changes in trade barriers (see Feenstra (1989)), do not fit our interpretation of t, at least to the extent that it is possible to perfectly hedge against such movements.

prices accordingly. Consumers then make their purchase decisions. In the next two sections, we characterize the subgame-perfect equilibria of this game.

3 The Role of Rivalry and Uncertainty

3.1 The choice of retail prices

Consider first the economic choices at the retail stage. Retailers face two potential types of competition, intrabrand competition from other retailers representing the same manufacturer and interbrand competition from retailers selling the other manufacturer's product. The degree of inter- and intrabrand competition, as we shall see, depends on the manufacturers' choice of contract. If a manufacturer does not use ET, intrabrand competition among his retailers leads them to adopt marginal-cost pricing, and drives their profit to zero. The retail price of the product supplied by the manufacturer under no ET is simply $p_h = w_h$ or $p_f = w_f + t$, depending on whether the manufacturer is domestic or foreign.

If a retailer has been granted an exclusive territory, he faces the following maximization problem:

$$\max_{p_i}(p_i - w_i - t_i)D^i(p_i, p_j) - F^i, \tag{2}$$

where $t_f = t$ and $t_h = 0$. The first-order condition to this problem is

$$D^i(p_i, p_j) + (p_i - w_i - t_i)D^i_i(p_i, p_j) = 0. \tag{3}$$

This condition implicitly defines retailer i's best-response function, which we write as $p_i = R_i(p_j, w_i, t_i)$. Given our assumptions about the demand function, it is straightforward to verify that $\partial R_i/\partial p_j > 0$, $\partial R_i/\partial w_i > 0$ and $\partial R_i/\partial t_i > 0$. That is, the best-response function is upward sloping, and i's price response is increasing in his wholesale price and the trade barrier he faces.

There are four possible sets of equilibrium retail prices, depending on each manufacturer's choice of contract. As we have already seen, retailer i's price when manufacturer i does not impose ET is $p_i = w_i + t_i$ regardless of j's choice. If manufacturer i uses ET but j does

not, then retailer i's equilibrium price is obtained by using $p_j = w_j + t_j$ in (3). If both manufacturers have chosen ET, (3) defines a pair of best-response functions for retailers i and j, and the equilibrium retail prices are obtained by solving this system. Below, we will write retailer i's price as $p_i(w_i, w_j, t)$ for $i = h, f$, where it is implicitly understood that this price also depends on the contracts chosen by the two manufacturers.

The fact that retailers are risk averse has no effect on their choice of price, since this choice comes after they have observed the realization of t. But it may affect their decision of whether to represent a manufacturer, since this choice is made before they learn the value of t. We have to distinguish between two cases depending on whether the manufacturer uses ET. If he does not use it, then intrabrand competition guarantees that the retailers representing this manufacturer earn zero profits for every realization of t—they simply pass on any cost to the consumer. In order for the retailers to be willing to represent the manufacturer in this case the franchise fee must be zero.

If the manufacturer imposes ET, he exposes his exclusive retailer to risk. Ex post, the realization of t is only observed by the retailer. This means that the manufacturer cannot make the franchise fee and the wholesale price contingent on the realized value of t. The retailer's ex-post profit therefore varies with this value, and he must be compensated for taking on the associated risk if he is to accept the manufacturer's contract. The assumption of extreme risk aversion allows us to capture this compensation, or risk premium, in an analytically tractable way.[10] In particular, this assumption implies that the retailer only accepts the manufacturer's contract, if doing so leaves him with a non-negative profit under the "worst" realization of t.

Letting t_i^v denote the worst possible realization of t for retailer $i = h, f$, it is easily shown that $t_f^v = t^+$ and $t_h^v = t^-$.[11] Using (2), we then observe that under ET the highest franchise

[10] Our results only depend on the fact that under ET a manufacturer must pay his retailer a risk premium, and not on the specific form that this risk premium takes under the assumption of extreme risk aversion.

[11] To see this consider the worst realization of t for retailer f, assuming that wholesale prices and the franchise fee are given. If h does not have ET, an increase in t raises retailer f's cost but leaves p_h and the residual demand for f's product unchanged; so the higher is t, the lower is retailer f's profit. If h has

fee the manufacturer is able to charge (assuming that the retailer's payoff from his best outside alternative is normalized to zero) is

$$F^i(w_i, w_j, t_i^v) = (p_i(w_i, w_j, t_i^v) - w_i - I_i t_i^v) D^i\left(p_i(w_i, w_j, t_i^v), p_j(w_i, w_j, t_i^v)\right), \tag{4}$$

where $I_f = 1$ and $I_h = 0$.

3.2 The choice of wholesale prices

Consider now the manufacturers' choice of wholesale prices. We start with the case where both have chosen ET. Manufacturer i's problem is to find the w_i that maximizes his expected profit, which consists of his expected wholesale profit and the franchise fee. To simplify the analysis, we assume that expected demand satisfies $E_t D^i\left(p_i(w_i, w_j, t), p_j(w_i, w_j, t)\right) = D^i\left(p_i(w_i, w_j, t^e), p_j(w_i, w_j, t^e)\right)$, as would, for instance, be the case if demand were linear.[12] We can then write the maximization problem as follows:

$$\max_{w_i} (w_i - c_i)\, D^i\left(p_i(w_i, w_j, t^e), p_j(w_i, w_j, t^e)\right) + F^i(w_i, w_j, t_i^v). \tag{5}$$

Setting the derivative with respect to w_i equal to zero, we obtain

$$\left(D^i(t^e) + (w_i - c_i) D_i^i(t^e) \frac{\partial p_i(t^e)}{\partial w_i}\right) + (w_i - c_i) D_j^i(t^e) \frac{\partial p_j(t^e)}{\partial w_i} + \frac{\partial F^i(t_i^v)}{\partial w_i} = 0, \tag{6}$$

where we have simplified the notation by using $D^i(t^e) \equiv D^i\left(p_i(w_i, w_j, t^e), p_j(w_i, w_j, t^e)\right)$, $p_i(t^e) \equiv p_i(w_i, w_j, t^e)$, and $F^i(t_i^v) \equiv F^i(w_i, w_j, t_i^v)$. Applying the envelope theorem, we can

ET, any increase in p_f in response to a rise in t will be accompanied by an increase in p_h; this follows from the strategic complementarity of retail prices. However, since $dp_h/dp_f < 1$ (see Appendix 2), p_h will rise be less than p_f and so demand for good f must fall. In addition, note that when manufacturer f uses ET, $\partial p_f/\partial t < 1$ (see Appendix 2). This together with falling demand means that retailer f's profit is decreasing in t. A fall in t affects retailer h indirectly via a decrease in p_f. A lower p_f leads to lower residual demand for good h and a smaller profit for retailer h.

[12] More generally this holds whenever t enters expected demand with an exponent of one.

write the third term as follows:[13]

$$\frac{\partial F^i(t^v)}{\partial w_i} = -D^i(t_i^v) + (p_i(t_i^v) - w_i - I_i t_i^v)\, D_j^i \frac{\partial p_j(t_i^v)}{\partial w_i}. \tag{7}$$

Using (7) in (6) gives:

$$\begin{aligned} &(D^i(t^e) - D^i(t_i^v)) + (w_i - c_i)\, D_i^i(t^e) \tfrac{\partial p_i(t^e)}{\partial w_i} \\ &+ \left[(w_i - c_i) D_j^i(t^e) \tfrac{\partial p_j(t^e)}{\partial w_i} + (p_i(t_i^v) - w_i - I_i t_i^v)\, D_j^i(t_i^v) \tfrac{\partial p_j(t_i^v)}{\partial w_i}\right] = 0. \end{aligned} \tag{8}$$

This first-order condition illustrates three important effects of the choice of w_i, namely an insurance, a direct and a strategic effect. The first term (in parentheses) represents the insurance effect. An increase in w_i raises profit from wholesaling at rate $D^i(t^e)$. However, it also increases the cost of the retailer and thus decreases the manufacturer's profit from the franchise fee at rate $D^i(t_i^v)$, where $D^i(t_i^v) \leq D^i(t^e)$. Intuitively, raising w_i is beneficial since it helps transfer some of the risk from the risk-averse retailer to the risk-neutral manufacturer.[14] The second term is the standard direct effect of w_i on wholesale profit. The third term (in square brackets) is the total strategic effect: an increase in w_i raises p_j, since $\partial p_j/\partial w_i = (dp_j/dp_i)(\partial p_i/\partial w_i) > 0$, and hence indirectly the residual demand for good i by $D_j^i(\cdot)(\partial p_j(\cdot)/\partial w_i)$. A unit increase in residual demand raises the wholesale profit by $(w_i - c_i)$ and the franchise fee by $(p_i(t_i^v) - w_i - I_i t_i^v)$.

Best-reply function (8) together with its counterpart for manufacturer j defines the equilibrium wholesale prices when both manufacturers have chosen ET. If manufacturer i does not use ET but j does, i's retailers are fully insured through intrabrand competition, but he can no longer levy a franchise fee. His first-order condition is hence given by

$$\left(D^i(t^e) + (w_i - c_i) D_i^i(t^e) \frac{\partial p_i(t^e)}{\partial w_i}\right) + (w_i - c_i) D_j^i(t^e) \frac{\partial p_j(t^e)}{\partial w_i} = 0, \tag{9}$$

which is identical to (6) except that $\partial F^i/\partial w_i = 0$. Manufacturer j's first-order condition changes, too. He still levies a franchise fee, but no longer realizes a strategic effect since i's

[13] We can use the envelope theorem here, since in a subgame perfect Nash equilibrium a retailer's choice of price must be a best response in all subgames following the move of *nature*, which picks $t \in [t^-, t^+]$; t_i^v is one of nature's possible choices.

[14] If the retailer were risk neutral, $D^i(t_i^v)$ would be equal to $D^i(t^e)$.

retailers price at marginal cost and therefore $\partial p_i(\cdot)/\partial w_j = 0$. The new first-order condition for j reads

$$\left(D^j(t^e) - D^j(t_j^v)\right) + (w_j - c_j)\, D_j^j(t^e)\frac{\partial p_j(t^e)}{\partial w_j} = 0, \tag{10}$$

which is the same as (8), except that the strategic effect has disappeared (and i has been replaced with j). Hence when one manufacturer chooses ET and the other does not, equilibrium wholesale prices are defined by (9) and (10).

If both manufacturers choose 'no ET', the effect from the franchise fee and the strategic effect disappear from (8), leaving

$$D^i(t^e) + (w_i - c_i)D_i^i(t^e)\frac{\partial p_i(t^e)}{\partial w_i} = 0. \tag{11}$$

Equilibrium wholesale prices are then given by the system of equations (11).

Below it will prove convenient to denote a contract choice by a single letter: E for 'ET' and N for 'no ET'. A pair of contract choices can then be written as (E, E), (E, N), (N, E) or (N, N), where the first letter refers to the domestic manufacturer's contract. We denote the equilibrium wholesale prices and corresponding manufacturer profits in the four possible subgames following the manufacturers' choice of contracts by $w_i^{kl} \equiv w_i^{kl}(t^e, t_i^v, t_j^v)$, and $\Pi_i^{kl} \equiv \Pi_i^{kl}(w_i^{kl}, w_j^{kl}, t^e, t_i^v, t_j^v)$, where $i, j = h, f$ and $k, l = E, N$.

In the next section we ask how the choice of wholesale prices affects retail prices and thus the degree of interbrand competition across the different contract scenarios.

3.3 Contracts and interbrand competition

We know from Rey and Stiglitz (1995) that in the absence of uncertainty and with two symmetric manufacturers the simultaneous adoption of ET by both leads to higher retail prices. For the purpose of the current paper, however, it is important to generalize this result in three directions, namely by allowing for cost asymmetries between firms, uncertainty and risk-averse retailers, and asymmetries in the contract choice. The following proposition is proved formally in Appendix 3:

Proposition 1 *(a) The use of ET by one or both manufacturers leads to higher expected equilibrium retail prices than in the case where no one uses ET. (b) If* $|t^v - t^e|$ *is sufficiently small, moving from a situation where only one manufacturer uses ET to one where both use ET raises expected equilibrium retail prices.*

What is the intuition for these results? Consider first part (a). Suppose manufacturer j adopts ET. This frees up the link between his wholesale price and the price choice of his retailer. Manufacturer i (who does not have ET) now realizes that if he raises the wholesale price and hence the retail price of his product, j's retailer will respond by raising his price as well; this is the strategic effect given by the last term of (9). Hence for any wholesale price set by j, i chooses a *higher* wholesale price than before, leading to a higher retail price for both products.

When switching to ET, manufacturer j encounters a double-marginalization problem. He can alleviate this problem by *decreasing* w_j and using the franchise fee to capture the profit of his exclusive retailer. In particular, retail price p_j would be the same as in the absence of ET, if w_j were set equal to marginal cost c_j. However, j finds it optimal to set $w_j > c_j$, since a higher wholesale price provides at least some insurance for the retailer (this can be formally seen by noticing that the first term in (10) is positive). This effect implies that, ceteris paribus, j's exclusive retailer does increase his retail price when manufacturer j adopts ET. Together with the strategic effect for manufacturer i, this means that the equilibrium expected retail prices necessarily increase when one manufacturer adopts ET.

If both manufacturers switch from no ET to ET, then both can exploit the strategic effect and both must insure their retailer at least partially by keeping wholesale price above marginal cost. In other words, the above effects play for both manufacturers and, as a result, the equilibrium retail prices must unambiguously increase as well.

Part (b) of the proposition indicates that there is some possible ambiguity about the change in expected retail prices when one manufacturer already has ET and the other one switches from no ET to ET. This is the case at least with significant uncertainty about the barrier to trade. The ambiguity does not come from the retail price response for the

good produced by the manufacturer with ET. In effect, with the switch in contracts by his rival, this manufacturer can now exploit a strategic effect which, ceteris paribus, increases his wholesale and retail prices (compare (10) and (8)). Rather the ambiguity comes from the price response of the manufacturer who adopts ET. With uncertainty about t, the switch to ET introduces an insurance effect (which, ceteris paribus, would lead to a higher retail price), but it also decreases the strategic effect (which tends to reduce the retail price). This reduction in the strategic effect may or may not be offset by the insurance effect. If the retailers were risk-neutral, the strategic effect would not be affected by the change in contract. Hence a sufficient condition for the equilibrium retail prices to increase is that the degree of uncertainty is small.

4 The Equilibrium Choice of Contracts

Having characterized the equilibrium wholesale and retail prices for the four possible contract combinations, we now turn to the first stage of the game, namely the manufacturers' choice of contract. We can represent this decision problem by the following strategic-form game:

		Foreign Manufacturer	
		E	N
Domestic Manuf.	E	Π_h^{EE}, Π_f^{EE}	Π_h^{EN}, Π_f^{EN}
	N	Π_h^{NE}, Π_f^{NE}	Π_h^{NN}, Π_f^{NN}

The strategy combination (E, E) forms a Nash equilibrium of this stage game, if $\Pi_h^{EE} \geq \Pi_h^{NE}$ and $\Pi_f^{EE} \geq \Pi_f^{EN}$; (N, N) is a Nash equilibrium if $\Pi_h^{NN} \geq \Pi_h^{EN}$ and $\Pi_f^{NN} \geq \Pi_f^{NE}$, and so on.

4.1 Two polar cases

Whether a given contract constitutes a best response (or even a dominant strategy) depends on a trade-off between the insurance property of the contract and its effect on interbrand competition. As we have shown above, the use of ET tends to reduce competition (i.e. increase retail prices). However, since this contract has inferior insurance properties relative to

'no ET', a manufacturer uses ET only when the gain from decreased interbrand competition outweighs the risk premium that he has to 'pay' the risk-averse retailer. Before examining this trade-off in more detail it is useful to first look at two extreme situations, one in which there is no uncertainty about t, and another in which there is no interbrand competition.

Proposition 2 *If there is no uncertainty about trade barriers, barriers are non-prohibitive, and goods are substitutes, each manufacturer's dominant strategy is to choose ET.*

This result is a corollary of Proposition 3 in Rey and Stiglitz (1995) and easily proved using the arguments laid out in the previous section. By adopting ET a manufacturer frees up the retail price from his wholesale price thereby allowing his rival to exploit a strategic effect. In particular, the rival will choose a higher wholesale price, since he now realizes that the associated increase in his good's retail price will be accompanied by an increase in the other good's retail price. Hence adopting ET leads to more collusion and is desirable whether or not the rival himself has adopted ET.

Proposition 3 *If trade barriers are uncertain and the degree of product substitutability is sufficiently small, 'no ET' is a dominant strategy for each manufacturer. Moreover, independent of the degree of product substitutability, 'no ET' is a dominant strategy for the domestic manufacturer, if the expected barrier to trade is sufficiently close to the prohibitive level.*

The first part of this proposition is a corollary of Rey and Tirole (1986)'s Proposition 2, where the result is proved for the case where the degree of substitutability is zero. By continuity, the result also holds for a sufficiently small degree of substitutability. When products are poor substitutes, firms do not have to worry about rivalry but only about the insurance property of the contract. Under 'no ET', retailers are fully insured against risk since they earn zero profit in any state of nature. The second part of Proposition 3 follows from the first. When the expected level of the trade barrier is high, the domestic firm again faces little price competition, and thus chooses 'no ET' to insure its retailers.

The preceding arguments point to three factors that influence the trade-off between reducing competition and providing insurance, and hence determine the choice of contract.

They include the degree of product substitutability, the degree of uncertainty of trade barriers, and the expected level of these barriers. To identify the role of each of these factors we need to assign parameters to them.

4.2 A parameterized model

Assume that demand takes the following form:

$$D^i(p_i, p_j) = 1 - p_i + bp_j. \tag{12}$$

Parameter b reflects the degree of product substitutability. If $b = 0$, then the products are not substitutable and each producer acts as a monopolist; when $b = 1$, demand depends only on the price difference.

Further assume that $c_i = 0$ for $i = h, f$, and that t is distributed over the interval $[t^e - v, t^e + v]$. Parameter v then measures the 'degree of uncertainty' about t, whereas t^e allows us to track changes in the expected level of trade barriers, keeping the degree of uncertainty constant. To compute welfare, we make the additional assumption that t is uniformly distributed; in this case, the variance of t, σ_t^2, is equal to $\frac{v^2}{3}$.

From the discussion in the previous section it is clear that, given uncertain trade barriers, both manufacturers will adopt 'no ET' for sufficiently low values of b, and both will choose ET for values of b close enough to one, unless v and/or t^e are very high. Hence, the most interesting trade-offs in the choice of contract occur for intermediate values of b. This is the case we focus on below.

Figure 1 shows the equilibrium contracts that arise for different values of t^e and v for $b = 0.8$.[15] When v is small, the risk premium manufacturers have to pay their exclusive retailers is small and both adopt ET in order to reduce price competition. When v is large relative to t^e, the risk premium is big and both manufacturers choose 'no ET', despite

[15] All figures in this paper were generated with Maple using the parameterized model described above, and a grid of at least 95 values each for t^e and v. We consider only values such that $t^e \geq v$ to make sure that trade barriers are non-negative for all realizations of t.

substantial price competition. Finally when t^e and v are both substantial, the domestic manufacturer faces little price competition and hence chooses 'no ET' to insure his retailers. Interestingly, however, the foreign manufacturer's best response is to adopt ET: the high level of the trade barrier reduces the variation in his retailer's profit margin, thus helping to insure him. This allows the foreign manufacturer to adopt ET to limit price competition with the domestic rival.

[Insert Figure 1 about here]

Figure 1 confirms that changes in both the expected level of trade barriers (keeping v fixed and changing t^e) and the degree of transparency (holding t^e fixed and changing v) may lead to a shift in equilibrium manufacturer-retailer contracts. These shifts give rise to discrete changes in wholesale and retail prices, as stated in Proposition 1. Price changes, in turn, have consequences for the volume of trade, consumer surplus, profits and welfare. These consequences are explored in the next section.

5 The Effects of Trade Liberalization

We consider two trade liberalization scenarios, a cut in the level of the trade barrier and a decrease in the degree of uncertainty of the trade barrier, assuming that $b = 0.8$ so that the equilibrium contracts are given by Figure 1. Consider the effects of a decrease in the level first, that is, the effects of reducing t^e holding v constant. Holding contracts fixed, cutting t^e leads to increased price competition between the manufacturers; this is, of course, a standard result in the literature on imperfect competition in trade [see, for instance, Helpman and Krugman (1989)]. But as Figure 1 shows, a reduction in t^e eventually leads to a switch in contract by at least one manufacturer.[16]

When v (and hence the risk premium an exclusive agent would have to be paid) is small, the domestic manufacturer eventually reacts to the decrease in t^e by adopting ET

[16] In Figure 1 it is possible to have a switch from (N, E) to (E, E) and then to (N, N).

while the foreign manufacturer keeps ET. As we know from Proposition 1, this change in contract causes a jump in equilibrium retail prices when v is small. Hence, at this switch, manufacturers are replacing trade barriers with private anticompetitive arrangements. We have thus identified circumstances under which the suspicions of antitrust authorities we mentioned in the introduction prove to be correct. However, we can also identify a situation in which trade liberalization prompts manufacturers to abandon private anticompetitive arrangements. When v is high, it is the foreign manufacturer who moves from ET to 'no ET', whereas the domestic manufacturer retains 'no ET': as t^e falls, the retailer carrying the foreign product faces a greater variability in profit and, since v is high, has to be insured by changing the contract to 'no ET'. In this case, Proposition 1 tells us that equilibrium retail prices drop at the point where the switch occurs. Trade liberalization in this case boosts competition in two ways, namely by the traditional effect of forcing retailers to lower price, and by inducing manufacturers to stop using ET.

Similar switches in contracts can be generated by decreasing the degree of uncertainty of the trade barrier (i.e., by reducing v holding t^e constant). Since such a reduction directly reduces the need to insure retailers, both manufacturers eventually adopt ET.

Next, we turn to the impact of theses contract changes on expected domestic welfare. To examine this impact we must explicitly define the preferences of a representative domestic consumer that we had previously only characterized by his demand functions (12). Assume that they are given by the following quasi-linear utility function:

$$U(x_i, x_j, y) = \frac{1+b}{1-b^2}x_i - \frac{1}{2(1-b^2)}x_i^2 + \frac{1+b}{1-b^2}x_j - \frac{1}{2(1-b^2)}x_j^2 - \frac{b}{1-b^2}x_i x_j + y, \qquad (13)$$

where x_i denotes the consumption of manufacturer i's product, y the consumption of the numeraire good, and $b \geq 0$. Denoting income by m, the consumer's budget constraint is

$$p_i x_i + p_j x_j + y = m. \qquad (14)$$

It is easily verified that maximizing (13) subject to (14) and inverting the resulting first-order conditions yields the demand functions in (12).

We define domestic welfare in an ex-ante sense as the (risk-neutral) representative consumer's expected utility, assuming that his expected income, m, consists of the expected profits that he obtains from the domestic firms. When looking at ex-ante social welfare, it is important to make sure that the firms' participation constraints are satisfied [see, for instance, Mas-Colell, Whinston and Green (1995), ch. 23, for a discussion]. This means that ex ante the representative consumer is not able to collect more than the profits the firms themselves expect to receive. He therefore obtains the risk-neutral domestic manufacturer's total expected profit, but only zero profit from the risk-averse retailers.[17]

Trade liberalization affects expected welfare in two ways. First, holding contracts fixed, a decrease in t^e reduces equilibrium prices. This lowers the domestic manufacturer's expected profit but increases expected consumer surplus. Except when the trade barrier is close to the prohibitive level, the consumer-surplus effect dominates and a reduction in trade barriers raises expected domestic welfare. This is again a standard result in the literature on imperfect competition in trade [see, for instance, Helpman and Krugman (1989)], and we do not dwell on it. Second, reducing t^e even infinitesimally may lead to a switch in contract and hence to a discrete change in welfare. This change in welfare comes from two sources: the changes in equilibrium prices affecting both the domestic manufacturer's profit and consumer surplus, and from the change in the variance term in consumer surplus.[18]

The discrete jumps in expected domestic welfare that occur when the equilibrium contracts change are illustrated in Figure 2, which plots welfare as a function of t^e and v for $b = 0.8$. Figure 2 indicates that moving from (N, E) to (N, N) leads to a discrete improvement in expected welfare. When trade liberalization instead leads to (E, E), there is

[17] Under ET manufacturers set their franchise fees so as to extract the profits obtained by retailers under the 'worst' realization of t; so retailers expect to receive zero profits. However, since the probability that t takes on this value is infinitely small, retailers earn pure profits ex post. Our formulation of ex-ante social welfare is also in line with the Industrial Organization literature [see Rey and Tirole (1986)]. For further details on ex-ante and ex-post welfare see Holmstrom and Myerson (1983).

[18] Even though the representative consumer is risk neutral, expected consumer surplus depends on the variance of t, σ_t^2. With linear demands, consumer surplus is increasing in σ_t^2, but the coefficient associated with σ_t^2 is specific to each combination of contracts.

a discrete drop in expected welfare. The figure also indicates that the effects on expected domestic welfare of changes in contracts may be quite large compared to the effects of even significant trade liberalization; this is reflected by the fact that the surfaces for any given contract combination are relatively flat, whereas the discrete jumps when contract changes occur are relatively big.[19] For instance, it can be shown that for $v = 0.2$ the fall in expected welfare that occurs when the domestic firm switches from 'no ET' to ET is so large that even complete trade liberalization cannot offset the associated expected welfare loss.

[Insert Figure 2 about here]

Figures 3 and 4 plot expected world welfare (defined as expected domestic welfare plus the foreign manufacturer's expected profit) and the expected trade volume, respectively. In these two figures the surfaces for any given contract equilibrium are significantly steeper and the jumps where contract changes occur smaller than in Figure 2. Although, according to Figure 3, abandoning ET can still lead to sizeable gains in world welfare, big gains can now also be achieved through trade liberalization. The reason for this is evident in Figure 4. This figure indicates that, although the volume of trade decreases when one or both manufacturers switch to ET, the choice of contracts has comparatively small effects on the volume of trade compared to a reduction in t^e.

[Insert Figures 3 and 4 about here]

What does this imply for the potential role of competition policy? It is apparent that in the scenario illustrated in Figure 2 ($b = 0.8$) the biggest improvement in domestic welfare that can be achieved comes less from trade liberalization per se than from manufacturers abandoning ET. Trade liberalization induces them to do so when v is high, but not when v is low. In this last case, there is a clear role for a competition policy prohibiting ET. However, insofar as our simulations show world welfare to be much less sensitive to switches

[19] The shape and spacing of the iso-welfare contours indicate, for instance, that the region with (E, E) has a steeper gradient than the region with (N, E).

in contracts and much more sensitive to trade liberalization than domestic welfare, the need for competition policy is essentially a national one. Hence, in the scenario examined in this paper, there does not seem to be a need for global rules concerning the use of ET. However, at the national level, competition policy and trade liberalization may be complements especially in an environment where barriers to trade are relatively transparent.

6 Extensions

In this section, we examine how the results or our model would be affected by changes in the underlying assumptions. One of these assumptions is that there is no retailing cost. This made sure that manufacturers want to use a franchise fee along with ET. As shown by Gal-Or (1991), this is no longer the case in the presence of fixed retailing cost. In this case, linear pricing with ET may be the only equilibrium especially when products are close substitutes and retailing costs are high. The advantage of linear pricing is that it represents an even greater commitment to raise prices than using a franchise fee, and this is especially profitable when products are close substitutes. The disadvantage is that it is more difficult for manufacturers to capture the retailer's profit than when a franchise fee is used, but the foregone profit is low when the retailing cost is high. Of course, fixed retailing cost are not consistent with marginal-cost pricing under 'no ET'. Insofar as the same conclusion holds with variable retailing costs (as claimed by Gal-Or) or by a combination of both types of retailing costs giving rise to U-shaped average retailing cost curves, it indicates that ET and the anti-competitive effect it brings cannot be expected to be systematically associated with franchise fee payments between retailers and manufacturers.

It might be argued that the domestic manufacturer should have a better knowledge of the barrier to trade than the foreign manufacturer. Given the nature of the barrier, it is probably extreme to assume it would know about it at the same time as the retailers. Still, this constitutes a useful benchmark. In this case, the contract between a domestic manufacturer and its retailers can be made conditional on the realization of t. The domestic

manufacturer has little need for competition as it can now insure its retailers while granting them exclusive territory. In other words, ET becomes a dominant strategy for the domestic manufacturer. From Proposition 1 we know that the foreign manufacturer benefits from ET set by the domestic manufacturer, and he might therefore place more weight on the insurance motive. We can thus expect the foreign manufacturer to use 'no ET' for a wider set of parameters than when both manufacturers do not know t. An equilibrium with (E, N) should then also be observed for a larger parameter range. However, as t^e falls we should still observe a switch to (E, E) when v is small.

Finally, we have concentrated our attention on ET ignoring other forms of contractual arrangements between manufacturers and retailers. In particular, manufacturers may want to consider deeper vertical integration with retailers. It is clear, however, that merging with a retailer does not constitute a dominant strategy for the manufacturers when the alternatives are contractual arrangements with ET or with 'no ET'. The main benefit of 'no ET' is to insure retailers. With a merger, the risk is supported by the merging firm and thus in part by the risk-averse retailer. Unless specific contractual arrangements among merging parties are set to shift the risk toward the production unit of the merging entity, merging as a joint-profit maximization mechanism cannot completely insure the retailer. Similarly, ET helps decrease intrabrand competition precisely because the retailer plays a key role as an independent intermediary. A merger produces the opposite result: it eliminates the retailer as an intermediary and the merging firm simply sets a retail price. There is thus more competition among the two manufacturers once they have merged with their retailers than if they do not merge and use ET. This suggests that merger, as an alternative contractual arrangement, would not dominate the contracts analyzed in this paper.

7 Conclusions

In this paper, manufacturers pursue two objectives: they want to insure their risk-averse retailers against the effects of uncertain barriers to trade, and they want to minimize interbrand

competition. The first objective can be accomplished by creating intrabrand competition between retailers. The second objective can be achieved by the use of exclusive territories. This creates a trade-off: while exclusive territory clauses are very efficient at decreasing interbrand competition, they have poor insurance properties. Uncertain trade barriers directly affect the foreign manufacturer. But they also have an indirect effect on the domestic manufacturer via interbrand competition between retailers. Hence the domestic manufacturer, too, faces a trade-off in his use of exclusive territories.

In this setting, trade liberalization tends to make exclusive territories more attractive to manufacturers if domestic and foreign products are relatively good substitutes and the degree of trade uncertainty is not too high. The consequence is immediate: welfare, and even imports, may decrease with trade liberalization as the mechanism just described induces manufacturers to replace trade barriers with private anti-competitive arrangements. On the other hand, if domestic and foreign products are relatively poor substitutes and/or trade uncertainty is high, trade liberalization will tend to reduce the use of exclusive territories. In this case, the switch in contracts to retailer competition gives an additional boost to trade volume and welfare.

We conclude that, in this model, a concern expressed by anti-trust authorities in the United States and Europe is at least partly justified: trade liberalization may induce manufacturers to use private anti-competitive arrangements, such as exclusive territories. Hence, if anything, competition policy limiting the use of such a clause must be stronger, not weaker, with economic integration. However, the results of this paper also suggest that such a competition policy cannot be applied as a *per se* rule. Indeed, the effects of lower barriers to trade depend to a large extent on their initial level, on their degree of transparency, and on the degree of substitutability between foreign and domestic products. For instance, there is no need to be tougher on exclusive territory clauses when products are highly differentiated or when products are similar but barrier to trade are relatively uncertain. A tougher competition policy, however, becomes desirable when foreign and domestic products are similar and the initial barrier to trade is high and relatively transparent.

There are, of course, many possible channels through which firms might react to attenuate the effects of trade liberalization. In this paper, we have claimed that contractual arrangements should be considered as an important candidate. By inducing manufacturers to switch to an exclusive-territory clause when barriers to trade decrease or become more transparent, our approach may contribute to explaining why the effects of the EU's 1992 Single Market Initiative have been more modest than expected, or why official efforts to improve market access in Japan had somewhat disappointing results. Still, this paper represents only a first step and much further research, both at the theoretical and at the empirical level, is needed to gain a better understanding of the role of contractual arrangements in international trade.

8 Appendix 1: Examples of Uncertain Barriers to Trade

8.1 Japan:

Aluminum Baseball Bats (Prestowitz (1988), p96-99): To sell a baseball bat, the Japanese league required producers to have an official league seal imprinted on the bat. It took 3 years for two US producers, Rawlings and Easton, to obtain the seal. The league then required the use of an aluminum alloy not used in the United States. After a complaint to GATT, the requirement was dropped, but bats still had to satisfy a safety standard. To check whether the standard was met, MITI required inspection of the U.S. factory. However, the ministry did not have enough travel money to send inspectors abroad and Japan could not accept third-party inspection. It was then decided that each lot of bats shipped from the United States would have to be inspected before receiving the safety mark. Ultimately, Japan relaxed its law on safety standards. Four years later, the two US firms still had less than 1% of the market.

New varieties of horticultural products must undergo costly and time-consuming additional scientific and testing according to phytosanitary protocols. Fresh horticultural products must go through inspection at the exporting country production site by Japanese inspectors. Fumigation takes place as soon as a shipment is found to be infested with live

insects regardless of whether such pests are already present in Japan (USTR (1998)).

Import clearance procedures are slow by OECD standards. A new Additional Tax Law (1997) is slowing down custom processing and specifies administrative punishments for mistakes, clerical or otherwise (USTR (1998)).

The government delegates public policy functions, such as industry standards development, product certifications and entry authorizations, to industry associations and other business-related organizations. These organizations are under no obligation to conduct their operations in an open, transparent and non-discriminatory manner or to include foreign firms in their deliberations (USTR (1998)).

8.2 Korea: (all from USTR (1998))

Import clearance for non-perishable agricultural products typically takes two to four weeks and sometimes up to two months. There exist mandatory incubating testing for some products including Florida fruits. The law requires labels to include manufacturing process information and ingredient listed by percentage for all ingredients. It also requires labeling on imported products to show the import price in Korean Won, which has to be updated every three months to account for exchange rate fluctuations.

Arbitrary and sudden changes in custom classification and border treatment (i.e., the tariff level) are often reported. Custom clearance applications can be rejected on administrative grounds.

Korea requires pre-approval for cosmetics, food additives, pharmaceuticals, chemicals, electronics, and personal communication services. It requires annual testing of cosmetic products and batch testing for each shipment, including animal testing.

Pharmaceutical companies report that for products developed outside Korea final-step clinical trials cannot be started in Korea before they are completed in another country. There is then a 145 days delay in registration before those trials can begin, thus delaying introduction of new foreign products by two years.

In the auto industry, the reclassification of minivans has increased taxes (1995). There

is redundant vehicle testing beyond the initial type-approval certification process. Korea blends international certification standards making it impossible for importers to homologate vehicles without incurring cost to modify and test vehicles for export to Korea.

All radio and television advertising must be submitted in its final fully produced form for censorship. Given the unpredictability of the process, this adds considerable risk and cost of introducing new products.

8.3 United States:

In April 1999, Canada accused the US of illegally manipulating international customs rules to thwart Canadian lumber exports by reclassifying siding boards so that they fall under the quotas set in the 1996 Canada-US lumber agreement. Siding is the third major category of Canadian lumber to face reclassification in the past year. The US successfully reclassified pre-drilled studs and is proposing doing the same with notched studs (Globe and Mail (1999)).

On Jan 4, 1989, the Custom Service announced that jeeps and vans were re-classified as trucks increasing the tariff rate from 2.5% to 25% effective immediately. The Treasury Department then modified the change in classification by announcing that two-door vehicles were trucks but four-door sport vehicles and jeeps were automobiles (Bovard (1991)).

On Dec. 6, 1988, Customs announced that steel wire rope with beckets was re-classified from an uncontrolled tariff category to a tariff classification restricted by a Voluntary Restraint Agreements signed a few years earlier (Bovard (1991)).

On July 2, 1987, Customs announced a retroactive 2,500% tariff increase on computer parts (Bovard (1991)).

In 1988, Customs increased the tariff levied on a shipment of 33,000 girl's ski jackets from 10.6% to 35% because the jackets had small strips of corduroy on the sleeves amounting to 2% of the jacket's composition (Bovard (1991)).

In 1988, Customs prohibited the imports of a shipment of 30,000 tennis shoes from Indonesia, because the shoe boxes contained an extra pair of shoelaces (Bovard (1991)).

8.4 European Union:

In February 1988, the EC changed its requirement for a product to qualify as being 'European'. Concerning integrated circuits, the EC changed its rule of origin by redefining the term 'place of last substantial transformation' from 'place of assembly and testing' to 'place of diffusion' (i.e., the state at which circuits are placed on a semiconductor wafer) (USTR (1989)).

New standards for sterile medical devices and diagnostic products in Germany requires storage of pharmaceutical file samples at the importer's site rather than the exporting company (USTR (1989)).

In 1982, France decreed that all VCRs imported from Japan must pass through the (completely overworked) customs office in Poitiers (Krugman and Obstfeld, 1997).

9 Appendix 2

We first show that under ET retail prices are strategic complements, i.e., that retailers' best-reply functions are upward sloping. Retailer i's best-reply function is given by (3). Using the implicit function theorem to compute its slope, we have

$$\frac{dp_i}{dp_j} = -\frac{D^i_j + (p_i - w_i - t_i)D^i_{ij}}{2D^i_i + (p_i - w_i - t_i)D^i_{ii}}. \tag{15}$$

The denominator of (15) is negative and hence

$$\text{sign}\left(\frac{dp_i}{dp_j}\right) = \text{sign}\left(D^i_j + (p_i - w_i - t_i)D^i_{ij}\right) > 0.$$

Also note that $dp_i/dp_j < 1$.

Next we demonstrate that, under ET, $\partial p_i/\partial w_i < 1$, which means that retailer i absorbs part of any increase in the wholesale price (or t_i). Totally differentiating the system of first-order conditions in (3), we obtain

$$\begin{bmatrix} 2D^i_i + (p_i - w_i - t_i)D^i_{ii} & D^i_j + (p_i - w_i - t_i)D^i_{ij} \\ D^j_i + (p_j - w_j - t_j)D^j_{ji} & 2D^j_j + (p_j - w_j - t_j)D^j_{jj} \end{bmatrix} \begin{bmatrix} dp_i \\ dp_j \end{bmatrix} = \begin{bmatrix} D^i_i dw_i \\ D^j_j dw_j \end{bmatrix}.$$

Using Cramer's Rule, we can compute

$$\frac{\partial p_i}{\partial w_i} = D_i^i \frac{2D_j^j + (p_j - w_j - t_j)D_{jj}^j}{\Delta}, \tag{16}$$

where

$$\begin{aligned}\Delta &= \left(2D_i^i + (p_i - w_i - t_i)D_{ii}^i\right)\left(2D_j^j + (p_j - w_j - t_j)D_{jj}^j\right) \\ &\quad - \left(D_i^j + (p_j - w_j - t_j)D_{ji}^j\right)\left(D_j^i + (p_i - w_i - t_i)D_{ij}^i\right) > 0\end{aligned}$$

by the assumptions imposed on demand. Hence $\partial p_i/\partial w_i < 1$, if

$$\Delta > D_i^i \left(2D_j^j + (p_j - w_j - t_j)D_{jj}^j\right), \tag{17}$$

or

$$\begin{aligned}&\left(D_i^i + (p_i - w_i - t_i)D_{ii}^i\right)\left(2D_j^j + (p_j - w_j - t_j)D_{jj}^j\right) \\ &- \left(D_i^j + (p_j - w_j - t_j)D_{ji}^j\right)\left(D_j^i + (p_i - w_i - t_i)D_{ij}^i\right) > 0,\end{aligned} \tag{18}$$

which holds given the assumptions about demand.

10 Appendix 3: Proof of Proposition 1

(a) If manufacturers i and j have 'no ET', wholesale prices are given by (11). Note that under 'no ET' retailers price at marginal cost so that we can replace w_i in (11) by $p_i - t_i^e$ to obtain:

$$D^i(t^e) + (p_i - c_i - t_i^e)D_i^i(t^e)\frac{\partial p_i(t^e)}{\partial w_i} = 0. \tag{19}$$

Suppose that j switches to ET. Wholesale prices are then given by (9) and (10). Using $w_i = p_i - t_i^e$ in (9) we obtain i's first-order condition:

$$\left(D^i(t^e) + (p_i - c_i - t_i^e)D_i^i(t^e)\frac{\partial p_i(t^e)}{\partial w_i}\right) + (p_i - c_i - t_i^e)D_j^i(t^e)\frac{\partial p_j(t^e)}{\partial w_i} = 0. \tag{20}$$

Since the strategic effect in (20) is positive, j's switch to ET means that for any w_j manufacturer i chooses a higher w_i, thereby driving up p_i.

Now fix w_i and consider what w_j would have to be to keep p_j unchanged when j adopts ET. Under ET, p_j is determined by retailer j's first-order condition (3). Comparing (3) and

(19) we find that holding p_j fixed would require that $w_j = c_j$. However, manufacturer j's first-order condition under ET, (10), indicates that his best response to w_i involves $w_j > c_j$, since under risk aversion $D^j(t^e) - D^j(t_j^v) > 0$. Hence for any given w_i, j's choice of w_j implies that p_j is higher than under 'no ET'. We conclude from this and the argument in the previous paragraph that if j adopts ET both p_i and p_j go up.

Next consider what happens if i and j both introduce ET so that equation system (8) determines wholesale prices. Using the same reasoning as in the preceding paragraph, we can establish that the only way to keep retail prices unchanged when there is a switch from 'no ET' to ET is for both manufacturers to set wholesale price equal to marginal cost, $w_i = c_i$ for $i = h, f$. But since $D^i(t^e) - D^i(t_i^v) > 0$ and the strategic effect in (8) is positive, manufacturers will choose $w_i > c_i$, thereby raising retail prices. This establishes part (a).

(b) If j has ET but i does not, wholesale prices are given by (9) and (10). Consider what happens if i adopts ET so that wholesale prices are given by (8). To keep retail price p_j constant for a given w_i, j would have to continue setting w_j according to (10). But a comparison of (10) and (8) shows that j wants to raise w_j due to the positive strategic effect in (8), and hence p_j must rise for any given w_i. Since $dp_i/dp_j > 0$ under ET, this effect tends to raise p_i as well.

Next take w_j as given and consider how w_i would have to change to keep p_i constant when i adopts ET. Under 'no ET' $p_i(t_i^e) = w_i - t_i^e$ and $\partial p_i(t^e)/\partial w_i = 1$; using this in (9) we can write i's first-order condition under 'no ET' as:

$$\Big(D^i(t^e) + (p_i(t_i^e) - c_i - t_i^e)D_i^i(t^e)\Big) + (p_i(t_i^e) - c_i - t_i^e)D_j^i(t^e)\frac{\partial p_j(t^e)}{\partial w_i} = 0. \tag{21}$$

Under ET, i's retailer chooses p_i according to (3); and to achieve the same expected markup, $(p_i(t_i^e) - c_i - t_i^e)$, as in (21), i would have to set w_i so that

$$(w_i - c_i)\, D_i^i(t^e)\frac{\partial p_i(t^e)}{\partial w_i} + (p_i(t^e) - c_i - t_i^e)\, D_j^i(t^e)\frac{\partial p_j(t^e)}{\partial w_i} = 0. \tag{22}$$

This equation differs from (8) due to the fact that $t^e \neq t_i^v$. First, (8) contains the insurance effect, $D^i(t^e) - D^i(t_i^v)$, which is positive and hence suggests that p_i should be higher than

under no ET. Second, the strategic effect in (8) differs from that in (22); the former is bigger, if

$$(w_i - c_i)D_j^i(t^e)\frac{\partial p_j(t^e)}{\partial w_i} + (p_i(t_i^v) - w_i - I_i t_i^v)\, D_j^i(t_i^v)\frac{\partial p_j(t_i^v)}{\partial w_i} > (p_i(t^e) - c_i - t_i^e)\, D_j^i(t^e)\frac{\partial p_j(t^e)}{\partial w_i}, \tag{23}$$

or

$$(p_i(t_i^v) - w_i - I_i t_i^v)\, D_j^i(t_i^v)\frac{\partial p_j(t_i^v)}{\partial w_i} > (p_i(t^e) - w_i - t_i^e)\, D_j^i(t^e)\frac{\partial p_j(t^e)}{\partial w_i}. \tag{24}$$

This condition, however, is not always satisfied. Under linear demand, for instance, the derivatives in (24) do not depend on the level of t so that the condition reduces to

$$p_i(t_i^v) - I_i t_i^v > p_i(t^e) - t_i^e. \tag{25}$$

But we can verify that this inequality does not hold for either the domestic or the foreign firm. The domestic firm does not face any trade barrier, so (25) simplifies to $p_h(t^-) > p_h(t^e)$, which is a contradiction. For the foreign firm we note that, since $\partial p_f(\cdot)/\partial t = \partial p_f(\cdot)/\partial w_f < 1$ (see Appendix 2) and $t^+ > t^e$, $p_f(t^+) - t^+ > p_f(t^e) - t_f^e$ is also a contradiction.

Since all effects other than the change in the strategic effect imply an increase in retail prices as i shifts to ET, a sufficient condition for such an increase is that $|t_i^v - t_i^e|$ is small. This proves part (b).

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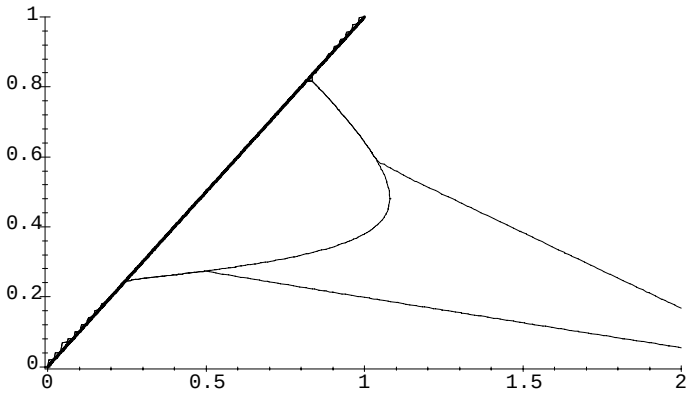

Figure 1:

Equilibrium Contracts in (**t**,**v**)-Space

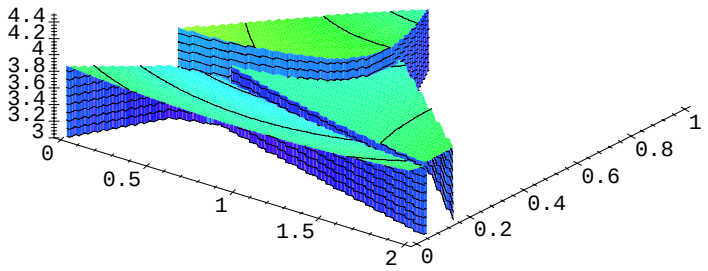

Figure 2:

Domestic Welfare

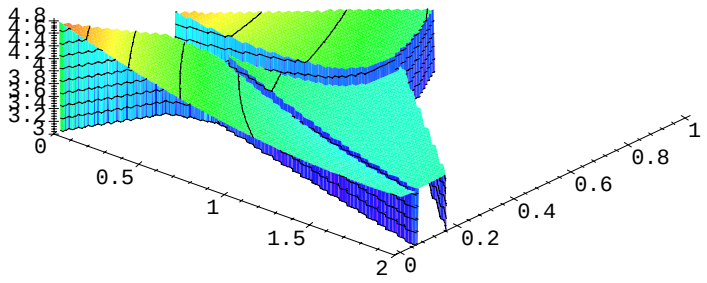

Figure 3:

World Welfare

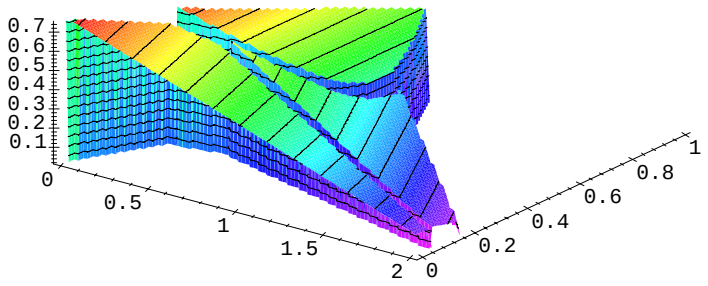

Figure 4:

Trade Volume