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Working Paper

Exclusive Dealing and Common Agency in International Markets

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Exclusive Dealing and Common Agency in International Markets[1]

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This version: December 2004

Abstract

This paper investigates the contractual choice between exclusive dealing and common agency in a simple international oligopoly model where products are sold through intermediaries. We find that when trade barriers are high domestic firms tend to adopt exclusive dealing contracts, whereas trade liberalization may lead firms to choose common agency. Social welfare can be raised be prohibiting exclusive dealing (common agency) when trade barriers are high (low) and products are close substitutes.

JEL classification: F12, F13, L42

Keywords: exclusive dealing, common agency, international trade, competition policy

1 Introduction

This paper examines the contractual relations between manufacturers and intermediaries and their effects on international trade. Specifically, we investigate the contention that some contracts between manufacturers and distributors represent an important obstacle to international trade [see, for instance, OECD (1999), U.S. Department of Justice (2000)].

Exclusive dealing (ED) contracts, by which distributors agree not to carry brands from competing manufacturers, have attracted particular attention. For instance, ED has been at the heart of several trade disputes between the United States and Japan [Nagaoka and Goto (1997)]. In 1995, Eastman Kodak filed a complaint under U.S. trade law against anti-competitive practices by its Japanese competitor, Fuji, in the market for photographic film and paper. Kodak's main complaint was that the ED contracts between Fuji and a number of Japanese wholesalers represented a severe obstacle in reaching Japanese consumers. The U.S. government took this case to the World Trade Organization (WTO) in 1996, where it was subsequently struck down with the argument that Kodak's complaint not be addressed to the WTO but rather to the Japanese antitrust authority, the Japanese Fair Trade Commission [WTO (1998)]. The markets for automobiles, flat glass and paper provide other examples, where ED contracts between Japanese manufacturers and their distributors have been blamed for the failure of U.S. producers to gain significant market share. Similar complaints have been made concerning exclusive dealing arrangements in a wide range of other industries and countries, including telecommunication in Europe, Hong Kong and Korea, fertilizer in Norway, ice cream in Germany, heart disease drugs in France, automobiles in the United Kingdom, bottle and biscuit manufacturing in Colombia, high-fructose corn syrup in Mexico, and artificial teeth in the United States [U.S. Department of Justice (2000)].

In many member countries of the European Union, automobiles are usually sold through networks of exclusive dealers. But recently the European Commission has proposed new rules on distribution arrangements for automobiles that restrict the use of ED and favor dealers selling competing brands. The main reason given by the Commission is that ED contributes to restricting intra-EU trade in automobiles and prevents a convergence in pre-tax prices [see, for instance, Monti (2000)]. An arrangement whereby competing brands are sold through the same agents is referred to as a common agency (CA).

In modeling manufacturers' choices between ED and CA we follow Besanko and Perry (1993) who suggest the following basic trade-off: CA reduces manufacturers' incentive to invest in their dealer network, because they benefit from spillovers from their rivals' investment. ED leads to higher investment but also tougher interbrand competition among manufacturers. Examples of such investments are training for retailers' employees, support for local advertising and promotion, and financing for retail outlets.[1] Both the size of the spillover and the degree of interbrand competition should be affected by the level of trade costs. As these costs change, the trade-off between these two aspects changes as well, which in turn affects the choice of contracts. We examine games between domestic and foreign manufacturers competing in the domestic market. Each manufacturer chooses between ED and CA and then selects how much to invest in his retailers and what wholesale price to charge. We start with the simplest possible case: one domestic and one foreign manufacturer and then extend the analysis to the three-manufacturer case with either two domestic or two foreign manufacturers.

We show two main points. First, the domestic manufacturer has an incentive to use ED when the trade barrier is high, because this contract can prevent imports whereas CA would not eliminate imports. This result is very robust, since it exists whatever the characteristics of the products (i.e., the degree of substitution), whatever the size of the spillover, and no matter whether there are two or three manufacturers (and thus one or two domestic manufacturers). Although the use of ED does not necessarily decrease welfare, it does so when the products are good substitutes. Second, the manufacturers have an incentive to use CA when the barrier to trade is low to mitigate interbrand competition. This incentive exists especially when the products are good substitutes and the spillovers are not very strong. The use of CA in this case decreases domestic welfare. Since, in both instances, the choice of contracts reduces or prevents imports, our results show that contractual arrangements can constitute barriers to trade and act as substitutes for standard trade barriers. Hence trade liberalization will not necessarily improve welfare unless it is accompanied by competition policy.

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[1]The presence of spillovers as a reason for ED was also discussed by Marvel (1982). Another reasons for choosing ED arises when manufacturers are incompletely informed about the retail cost. Gal-Or (1991) and Martimort (1996) show that ED may be preferred by manufacturers to CA as this may make it easier to extract information rents from retailers. Specifically, the manufacturer may use the observed behavior of competing agents to learn about the cost of their own agent, provided these costs are correlated.

As far as competition policy is concerned, the results of this paper suggest two main conclusions. First, one cannot assume that, from a domestic welfare point of view, CA and ED are systematically 'good' or 'bad'. Their effect depends very much on the market environment (level of trade barriers, degree of substitution among products, the size of spillovers, etc.). Second, competition policy needs to be especially active when products are good substitutes. It is in this particular case that the use of ED (when barriers to trade are high) and the use of CA (when they are low) reduce welfare.

This paper belongs to the emerging literature on the organization of firms and industries in an international environment. Recent papers on this broad topic include Grossman and Helpman (2001) who use an incomplete contract approach to understand in-house and outsourcing activities in an integrated world, and Spencer and Qiu (2001) who consider whether informal procurement within Japanese keiretsu acts as a barrier to trade. Articles more specifically aimed at the links between manufacturers and distribution in international markets include those by Fargeix and Perloff (1989), who, to our knowledge, provide the first theoretical treatment of this issue, Raff and Schmitt (2004) on exclusive territory contracts, and Richardson (2002) who uses a spatial approach to look at the interaction between trade policy and market access.

The paper is organized as follows. In the next section, we present the model. In Sections 3 and 4, we investigate the equilibrium choices of two manufacturers, one domestic and one foreign. In Section 5, we consider the welfare implications in the two manufacturer case. Section 6 deals with the three-manufacturers case. Section 7 provides further extensions, and Section 8 concludes.

2   The Model

Consider an industry composed of domestic manufacturers and foreign manufacturers who produce imperfectly substitutable goods for sale in the domestic market. We consider two main cases: the case with two manufacturers (one domestic and one foreign), and the case with three manufacturers (one domestic and two foreign, and two domestic and one foreign). The production technology exhibits constant marginal cost, which we normalize to zero.

The representative domestic consumer has a quasi-linear utility function:

$$U(x_1, \ldots, x_n, y) = \sum_{i=1}^{n} x_i - \frac{1}{2} \sum_{i=1}^{n} x_i^2 - b \sum_{i=1}^{n} \sum_{j \neq i}^{n} x_i x_j + y, \qquad (1)$$

where x_i denotes the consumption of manufacturer i's product, y the consumption of the numeraire good, and n is either 2 or 3. Parameter b ($b \in [0, 1]$) reflects the degree of product substitutability between any pair of products. If $b = 0$, the products are not substitutable and each manufacturer acts as a monopolist; if $b = 1$, the goods are perfect substitutes. Denoting income by M and the retail price of product i by p_i, the consumer's budget constraint is

$$\sum_i p_i x_i + y = M. \qquad (2)$$

Maximizing (1) subject to (2) and inverting the resulting first-order conditions yields a demand function for each product. The exact specification of these demands depends on the total number of products on the market. We therefore postpone the derivation of these demands.

To distribute their products to consumers, manufacturers require the services of retailers. We assume that there are many *ex ante* identical retailers, each of whom can provide a retail service at marginal cost $c < 1$. Retailers carrying a foreign product also incur a trade cost t per unit, which may reflect both transportation costs and trade barriers and is treated here as a resource cost. Each manufacturer may impose an ED contract on its retailers. The alternative is CA, where retailers carry at least two competing brands.

Manufacturer i sets a wholesale price w_i. In addition, he must choose how much to invest in his distribution chain. We follow Besanko and Perry (1993) in treating this investment as lowering the marginal cost of the retailers carrying his product. The manufacturer's investment is not specific to a particular retailer, but rather benefits all of his retailers. However, if a retailer is a common agent, the investment may be less effective in reducing the selling cost of one's own brand and it may also benefit the rival brands sold by the common agent.[2] In particular, by investing an amount I_i at a cost of $(k/2) I_i^2$,

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[2] For instance, the investment may be in providing assistance for the retailers' advertising and promotional activities, or in increasing the efficiency of the retailers' personnel or management. Under CA one would expect the return to this investment to be lower than under ED, since part of the retailers' time and resources are devoted to selling com-

manufacturer i lowers the marginal cost of selling his own brand by $\hat{I}_i$, where

$$\hat{I}_i = \begin{cases} I_i, & \text{if the retailer is an exclusive dealer of brand } i \\ \lambda I_i + (1-\lambda)(\frac{\sum_{j \neq i}^{m} I_j}{m}), & \text{if the retailer carriers } m \text{ additional brands,} \end{cases}$$

where $\lambda \in (0,1]$. The parameter λ shows how much manufacturer i's brand benefits from his own investment and how large the spillover is from the investments of other manufacturers selling their brands through the same retailer. The key however is the spillover effect.[3] If $\lambda = 1$, there are no externalities between the manufacturers. This corresponds to the case of ED. CA is hence characterized by $\lambda < 1$. The lower is λ, the greater is the incentive to freeride on the investments of the other manufacturers.

The strategic interactions between the manufacturers and between them and their retailers can be summarized by the following three-stage game. In the first stage, each manufacturer chooses whether to impose an ED contract on its retailers or to allow CA with other manufacturers. In the second stage, manufacturers choose their wholesale prices and investment levels. In the third stage, retailers choose retail prices and consumers then make their purchase decisions.

In the next two sections we solve this game for pure-strategy subgame-perfect equilibria for the simplest case with one domestic and one foreign manufacturer. It is an interesting case, not only because it allows us to derive results in a straightforward way but also because it gives us strong results that are shown to hold in the more complex cases. With two manufacturers, a key part of the game becomes very simple. Specifically, if at least one manufacturer chooses to offer ED contracts to his retailers, then both manufacturers necessarily offer ED contracts in equilibrium whether or not the other manufacturer wishes to do so.

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peting brands. Alternatively, one could model the investment as boosting demand for the manufacturer's product, for instance by informing potential customers about the existence of the product or the location of retailers. Here the investment would be rendered less effective by CA, if some of the potential customers visiting a retailer end up buying a competing product. Whether the investment lowers marginal cost or raises demand does not matter for the results.

[3]An alternative formulation of the externality, reminiscent of the way R&D spillovers are often modelled, would be to set $\hat{I}_i = I_i + (1-\lambda)\sum_{j \neq i}^{m} I_j/m$. Our computations show that this formulation would yield qualitatively the same results as the one we chose.

3 Equilibrium Prices and Investment

Since there is just one domestic and one foreign product in this simple environment, we use a single index i to denote whether a product (or a firm) is domestic or foreign ($i = h, f$). Price competition among retailers ensures that the equilibrium retail price of brand i is equal to

$$\tilde{p}_i = w_i + \delta_i t + c - \hat{I}_i, \quad i = h, f, \quad \text{where } \delta_h = 0,\ \delta_f = 1. \tag{3}$$

Manufacturer i's profit maximization problem can then be stated as follow:

$$\max_{w_i, I_i} w_i D_i(\tilde{p}_i, \tilde{p}_j) - \frac{k}{2} I_i^2, \tag{4}$$

where the demand for product i in the two product environment is given by

$$D_i(\widetilde{p}_i, \widetilde{p}_j) = \frac{1 - b - \widetilde{p}_i + b\widetilde{p}_j}{1 - b^2}, \quad i, j = h, f; \quad i \neq j. \tag{5}$$

The first-order conditions for this problem are

$$w_i \ : \ D_i + w_i \frac{\partial D_i}{\partial p_i} = 0, \tag{6}$$

$$I_i \ : \ -w_i \left[\lambda \frac{\partial D_i}{\partial p_i} + (1 - \lambda) \frac{\partial D_i}{\partial p_j} \right] - k I_i = 0. \tag{7}$$

The first condition states that a manufacturer's optimal wholesale price equates his residual marginal revenue with the marginal production cost. The second condition shows that the optimal investment balances the marginal benefit with the marginal cost of investment. The marginal benefit of investment is the sum of two effects: (1) a direct effect that arises because investment reduces the retail price of the firm's own product, which in turn raises residual demand; (2) a strategic effect that occurs because the investment also reduces the retail price of the rival product, which lowers residual demand. The difference between ED and CA is that under ED ($\lambda = 1$) the strategic effect disappears and the direct effect becomes stronger, thus ceteris paribus raising investment.

To ensure that the marginal benefit of investment is positive and that second-order conditions in the two-firm case are satisfied we assume that $\lambda > b/(1 + b)$ and $k > 1/(2 + b)(1 - b)$. For later reference we also assume

that $k > (\lambda(1+b) - b)(1-\lambda)/b$. With these assumptions in place we can use (5) in (7) to express the profit-maximizing investment level as a linear and increasing function of the wholesale price

$$I_i = w_i \frac{[\lambda(1+b) - b]}{k(1-b^2)}. \tag{8}$$

We can also rewrite (6) as

$$A_i - 2w_i + bw_j + [\lambda(1+b) - b]I_i - [\lambda(1+b) - 1]I_j = 0, \tag{9}$$

where $A_h = (1-b)(1-c) + bt$ and $A_f = (1-b)(1-c) - t$. Substituting for I_i and I_j from (8), we can turn (9) into a system of equations in wholesale prices:

$$\begin{aligned} w_i &= \frac{k(1-b^2)A_i}{2k(1-b^2) - (\lambda(1+b) - b)^2} \\ &+ \left(\frac{bk(1-b^2) + (\lambda(1+b) - b)(1-\lambda(1+b))}{2k(1-b^2) - (\lambda(1+b) - b)^2} \right) w_j. \end{aligned} \tag{10}$$

Solving this system, we get as equilibrium wholesale prices

$$\tilde{w}_i = \frac{k(1-b^2)}{\beta_1^2 - \beta_2^2} \{\beta_1 A_i + \beta_2 A_j\}, \tag{11}$$

where $\beta_1 = 2k(1-b^2) - (\lambda(1+b) - b)^2$ and $\beta_2 = bk(1-b^2) + (\lambda(1+b) - b)(1-\lambda(1+b))$. We can then compute the equilibrium sales volume

$$\tilde{x}_i = \frac{\tilde{w}_i}{1-b^2}, \tag{12}$$

and equilibrium profit

$$\tilde{\pi}_i = \frac{\tilde{w}_i^2}{1-b^2} \left[1 - \frac{(\lambda(1+b) - b)^2}{2k(1-b^2)} \right]. \tag{13}$$

If the barrier to trade is high enough, the foreign manufacturer cannot sell in this market and the domestic manufacturer is the only seller. In this case, the demand faced by the domestic product is simply $p_h = 1 - x_h$, and it is easy to derive that in equilibrium $\tilde{w}_h^m = \tilde{x}_h^m = \frac{k(1-c)}{2k-1}$, $\tilde{I}_h^m = \frac{(1-c)}{2k-1}$, $\tilde{\pi}_i^m = \frac{(1-c)^2 k}{2(2k-1)}$.

Consider first how the duopoly equilibrium changes with the trade cost taking as given the contract between the producers and the retailers.

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Lemma 1 *(i) The equilibrium investment levels, wholesale prices and sales volumes are linear in the trade cost. (ii) As the trade cost increases, the equilibrium investment level, wholesale price and sales volume increase for the domestic firm and decrease for the foreign firm whether the products are sold under exclusive dealing or under common agency contracts.*

Proof: See Appendix

The linearity of demand and perfect competition at the retail level explain why investment, wholesale prices and sales volumes are linear in t. The domestic wholesale price changes in the opposite direction from the foreign wholesale price when t changes, because a higher trade cost increases (decreases) the residual demand faced by the domestic (foreign) manufacturer.

Since profit is a quadratic function of the wholesale price, we may state:

Lemma 2 *As the trade cost changes, the equilibrium profit for each manufacturer changes in the same direction as its wholesale price. Specifically, the domestic manufacturer's profit increases at an increasing rate ($\partial\tilde{\pi}_h/\partial t > 0$, $\partial\tilde{\pi}_h^2/\partial t^2 > 0$) and the foreign manufacturer's profit decreases at a decreasing rate ($\partial\tilde{\pi}_f/\partial t < 0$, $\partial\tilde{\pi}_f^2/\partial t^2 > 0$) with t.*

Proof: See Appendix.

Lemma 2 describes a standard result in the literature, since it says that the increased competition brought by trade liberalization decreases the domestic manufacturer's profit and increases the foreign manufacturer's profit. The value added of the Lemma is to confirm this is the case for both types of contract. The interesting issue is to identify the forces that determine the choice of contract given a particular level of t and to derive the equilibrium contracts. This is what we do in the next section.

4 Equilibrium Contracts

In order to examine how contracts are chosen in equilibrium, we have to compare profit levels under the two contract arrangements knowing that CA can only emerge in equilibrium if both manufacturers prefer it over ED. Proposition 1 summarizes the results in free trade (see also Besanko and Perry (1993)).

Proposition 1 *In free trade, both manufacturers adopt a common agent unless the investment spillover is sufficiently strong and/or the degree of substitution between products is sufficiently low in which case both manufacturers adopt an exclusive dealing contract. Specifically, there exists a critical value $\lambda_0(b)$ such that $\tilde{\pi}_i^{CA}(\lambda, b) > \tilde{\pi}_i^{ED}(1, b)$ for $\lambda_0(b) < \lambda < 1$ and $\tilde{\pi}_i^{CA}(\lambda, b) < \tilde{\pi}_i^{ED}(1, b)$ for $b/(1+b) \leq \lambda < \lambda_0(b)$.*

Proof: See Appendix.

The reason that CA raises profit for high λ is that it acts as a commitment to keep investment low and thus raise retail prices above the level achievable under ED. But for a low enough λ (and hence a strong enough externality) investment under CA becomes too small and manufacturers are hence better off with ED.

Since CA tends to reduce investment and thus output as compared to ED, the market tends to be more competitive under ED than under CA. When the barrier to trade is high, ED is particularly detrimental to the foreign manufacturer which then faces a particularly low residual demand. This implies that the trade cost at which the profit of the foreign manufacturer is zero is lower under ED than under CA. Denoting the prohibitive levels of the trade cost under ED and CA by t_p^{ED} and t_p^{CA}, respectively, the implication of the competitive effect of ED is confirmed by Proposition 2.

Proposition 2 *In equilibrium, the prohibitive level of the trade cost is lower under exclusive dealing than under common agency $(t_p^{ED} < t_p^{CA})$.*

Proof: See Appendix

This is a strong result which holds irrespective of the degree of substitution between products and irrespective of the size of the spillover associated with the manufacturer's investment. The implication is clear: ED constitutes an additional barrier to trade when associated with significant trade costs. We will come back to this point.

Before proceeding further, it is useful to have a better understanding of why these two propositions hold. We can gain some useful insights by considering how marginal changes of the parameter λ affect equilibrium profits. Taking into consideration that the equilibrium retail prices can be written as $p_i(\tilde{w}_i, \lambda, \tilde{I}_i, \tilde{I}_j)$ and applying the envelope theorem, we obtain three distinct

effects:

$$sign\left\{\frac{d\tilde{\pi}_i}{d\lambda}\right\} = sign\{\frac{\partial D_i}{\partial p_j}\left(\frac{\partial p_j}{\partial w_j}\frac{\partial \tilde{w}_j}{\partial \lambda} + \frac{\partial p_j}{\partial I_j}\frac{\partial \tilde{I}_j}{\partial \lambda}\right)$$
$$+ \left(\frac{\partial D_i}{\partial p_i}\frac{\partial p_i}{\partial I_j}\frac{\partial \tilde{I}_j}{\partial \lambda}\right) + \left(\frac{\partial D_i}{\partial p_i}\frac{\partial p_i}{\partial \lambda} + \frac{\partial D_i}{\partial p_j}\frac{\partial p_j}{\partial \lambda}\right)\} \quad (14)$$

The first expression on the right-hand side is the *strategic effect*. A change in λ affects manufacturer i's residual demand D_i indirectly, because it changes both the level of investment and the wholesale price of manufacturer j and hence j's retail price. From (8) we know that $\partial \tilde{I}_j/\partial \lambda$ has the same sign as $\partial \tilde{w}_j/\partial \lambda$. Assume then that $\partial \tilde{w}_j/\partial \lambda > 0$. When this is the case, a decrease in λ reduces $\tilde{w}_j$, thus decreasing p_j and hence also D_i. This effect would tend to decrease manufacturer i's profit when λ is reduced. However, since $\partial \tilde{I}_j/\partial \lambda > 0$, the decrease in λ also decreases j's incentive to invest which raises p_j and hence D_i. If the effect on $\tilde{I}_j$ is stronger than the effect on $\tilde{w}_j$ then the strategic effect associated with a decrease in λ increases i's profit by mitigating the rivalry between the two manufacturers.

The second term can be described as a *free-rider effect*. A decrease in λ lowers manufacturer j's incentive to invest, since it benefits from a stronger spillover from i. This effect must increase i's retail price and thus decrease the demand for product i. Hence, with the free-rider effect, a decrease in λ is detrimental to manufacturer i's profit.

The third effect is a *rent-shifting effect*. This effect occurs only if the two firms have different levels of investment. Suppose then that i is the domestic manufacturer and t is positive (but not prohibitive) so that $\tilde{I}_i > \tilde{I}_j$. A reduction in λ reduces the effectiveness of investment and increases the spillover from the rival's investment, changing retail prices and hence demand. But these effects act differently on the two manufacturers. In particular, i's big investment becomes less effective while he benefits only relatively little from the greater spillover from j's small investment. The opposite is true for j: while his small investment becomes less effective, he benefits from an increased spillover from i's big investment. Hence a lower λ raises p_i relative to p_j, shifting market share and rent from the domestic to the foreign manufacturer.

As must be apparent, a decrease in λ has contradictory effects and several of them tend to decrease manufacturer i's profit, at least when it is a domestic

manufacturer. Using (5), we can rewrite (14) as

$$sign\left\{\frac{d\tilde{\pi}_i}{d\lambda}\right\} = sign\left\{b\left[\frac{\partial\tilde{w}_j}{\partial\lambda} - \lambda\frac{\partial\tilde{I}_j}{\partial\lambda}\right] + \left[(1-\lambda)\frac{\partial\tilde{I}_j}{\partial\lambda}\right] + \left[(1+b)(\tilde{I}_i - \tilde{I}_j)\right]\right\},$$
(15)

where the terms in square brackets represent the three effects identified above.

Suppose we have free trade so that investments are symmetric and the last term, representing the rent-shifting effect, is zero. If $\lambda = 1$, the second term (corresponding to the free-rider effect) is also equal to zero. The effect of a marginal decrease in λ then depends on the sign of the first term (the strategic effect). Using (11), it is easy to show that $\partial\tilde{w}_j/\partial\lambda > 0$, which implies that $\partial\tilde{I}_j/\partial\lambda$ is also positive.[4] It can also be shown that in free trade the strategic effect is unambiguously negative for $\lambda = 1$, so that at that point a marginal decrease in λ must increase profit. If we lower λ, the free-rider effect becomes positive and the strategic effect less clearly negative and eventually positive; hence a reduction in λ ultimately lowers profit. Also note that lowering b has a similar effect as reducing λ, since it decreases the weight of the strategic effect. This discussion provides intuition for Proposition 1.

Suppose now that t is positive. This means that in (15) the rent-shifting effect becomes relevant. Its sign is positive for the domestic manufacturer and negative for the foreign manufacturer. By itself this effect means that as λ falls, rent is shifted from the domestic to the foreign manufacturer. Since the magnitude of this effect depends on $(\tilde{I}_i - \tilde{I}_j)$, this shift in rent becomes stronger as t increases. In turn this suggests that for high t the foreign manufacturer may have higher profits under CA than under ED and vice versa for the domestic manufacturer. If this is the case, the level of the trade cost at which the foreign manufacturer makes no profit under ED (t_p^{ED}) must generate positive profit under CA. This not only provides an intuition for Proposition 2 but it also suggests that the domestic manufacturer systematically prefers ED to CA around the prohibitive barrier to trade.

The above analysis can be conveniently summarized by Figures 1 and 2. In Figure 1, we have assumed that the investment spillover is sufficiently low (λ near 1) and that the degree of substitution between products is relatively high (b near 1) so that, in free trade $\tilde{\pi}_i^{CA} > \tilde{\pi}_i^{ED}$. Figure 2 illustrates the opposite case: one where the spillover is high (λ is low) and the degree of

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[4]Using (11) and assuming free trade, $\tilde{w}_i = \frac{k(1-b^2)(1-b)(1-c)}{k(1-b^2)(2-b)-(1-b)(\lambda(1+b)-b)}$. Hence $\partial\tilde{w}_i/\partial\lambda > 0$.

substitution between the two products is low (b is low). These figures are useful to state two important results, summarized in Propositions 3 and 4.

Proposition 3 *(i) If the degree of substitution is high and/or the degree of investment spillover is low, there exists $\hat{t} < t_p^{ED}$ such that, as t decreases below $\hat{t}$, equilibrium contracts switch from exclusive dealing to common agency. (ii) If the degree of substitution is sufficiently low and/or the degree of investment spillover is sufficiently high, the equilibrium contracts exhibit exclusive dealing for all $t < t_p^{ED}$.*

Proof: See Appendix

The first result can be easily seen from Figure 1. When t is close to t_p^{ED}, the domestic manufacturer prefers ED to CA. In a two-manufacturer, two-product case, this ensures that ED is the equilibrium contractual arrangement even if the other manufacturer always prefers CA (in Figure 1, the foreign manufacturer prefers CA for all $t < t_p^{ED}$). A common agency contract can therefore emerge only if the domestic manufacturer also prefers it to ED. This occurs for $t < \hat{t}$. In Figure 2, the domestic manufacturer always prefers ED irrespective of t. This is sufficient to ensure that ED is the only equilibrium contract in a two-manufacturer environment irrespective of the foreign manufacturer's preferences.

If these results depend on the degree of investment spillover, they also depend on the degree of substitution between products. In particular, when products are strongly differentiated (as in Figure 2), ED is always preferred. If products are not strongly differentiated (as in Figure 1), trade liberalization by fostering interbrand competition induces the domestic manufacturer to switch contract to CA as the latter contract is more helpful than ED at mitigating the competitive impacts of trade liberalization. We have here a case where one manufacturer substitutes private contracting for traditional trade barriers in order to minimize the economic impact of trade liberalization.[5]

The model also has interesting results when the trade cost is high. In particular,

Proposition 4 *In the range of trade costs $t_p^{ED} \leq t \leq t_p^{CA}$, the domestic manufacturer adopts exclusive dealing and the foreign manufacturer cannot trade; the foreign manufacturer would trade under a common agency contract. This range is big, if λ, c and k are relatively small.*

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[5] See Raff and Schmitt (2004) for similar results with exclusive territory contracts.

Proof: See Appendix

This result is interesting because ED acts here as a barrier to trade above and beyond the effect of t itself. How wide the range of trade costs is over which this happens depends on the size of the spillover as well as on production and investment costs. In particular, the foreign firm will still be able to produce profitably under CA as opposed to ED, if it can benefit from a substantial spillover from the domestic firm and if its production and investment costs are relatively small.

Readers familiar with the industrial organization literature on ED might think that this result is nothing else than the foreclosure result that arises with ED when wholesale prices are restricted to be linear (see Bernheim and Whinston, 1998) and there is a large cost asymmetry among manufacturers (see Comanor and Frech, 1985; Mathewson and Winter, 1987). In part this is indeed the case, since the foreign manufacturer faces a barrier to trade that the domestic firm does not. However, the standard foreclosure result comes from the fact that a manufacturer with a cost advantage signs exclusive dealing contracts with all retailers so that a rival *cannot* sell. This feature does not exist in the present model, since we have a large number of perfectly competitive retailers. Perfect competition at the retail level has two implications. First, a manufacturer can only set linear wholesale prices. Second, it is not that the foreign manufacturer cannot find independent retailers to sign a retailing contract with when the domestic manufacturer has ED. Simply, the foreign manufacturer *chooses* not to sell in the domestic market with ED, because he cannot make a profit.

5   Welfare

In this section we want to identify the implications of different contracts for trade and competition policy. There are two issues we are particularly interested in: (i) Suppose that $t < t_p^{ED}$ and manufacturers choose CA. Would welfare be higher if the law mandated the use of ED? (ii) Suppose that $t_p^{ED} \leq t \leq t_p^{CA}$ so that the domestic manufacturer monopolizes the market through ED. Could welfare be raised by prohibiting the use of ED?

First, consider the case where $t < t_p^{ED}$ and the manufacturers adopt CA in equilibrium. Note that CA will be selected only if it yields both manufacturers a higher profit than ED. Hence CA must lead to lower domestic social welfare than ED if it reduces consumer surplus. Given the quasi-linear

utility function, the consumer surplus associated with consuming quantities x_h and x_f is

$$CS = x_h + x_f - \frac{1}{2}(x_h^2 + x_f^2) - bx_hx_f - p_hx_h - p_fx_f \qquad (16)$$

Defining the average quantity sold on the market as $\overline{x} \equiv (x_h + x_f)/2$, the difference between the domestic and the foreign sales as $\Delta \equiv x_h - x_f$, and substituting for p_f from the demand function, consumer surplus can be rewritten as

$$CS(\overline{x}, \Delta) = 2\overline{x} - (1+b)\overline{x}^2 - 2p_h\overline{x} - \frac{1}{4}(1-b)\Delta^2 - (1-b)x_f\Delta. \qquad (17)$$

Hence consumer surplus is essentially a function of the average quantity sold on the market and of the difference in the two manufacturers' market shares. Not surprisingly, consumer surplus is decreasing in the difference in market shares and increasing in the average quantity sold. We can gain some useful insights by considering how consumer surplus is affected by marginal changes in λ:

$$\frac{dCS}{d\lambda} = \left[(1-b)(x_h - x_f) - 2\overline{x}\frac{\partial p_h}{\partial \overline{x}}\right]\frac{d\overline{x}}{d\lambda} - \frac{(1-b)}{2}\left[3x_f - x_h\right]\frac{d\Delta}{d\lambda}. \qquad (18)$$

The first expression in square brackets is unambiguously positive, since $x_h \geq x_f$ and $\partial p_h/\partial \overline{x} < 0$. The second expression in square brackets is positive for low values of t but negative for high values of t. The total effect on consumer surplus of a marginal change in λ can then be viewed as a weighted sum of the impact of this change on the average quantity sold and on the difference in market shares. We show below that $\frac{dCS}{d\lambda} > 0$ so that consumer surplus and hence welfare unambiguously fall with a lower λ if b and λ are sufficiently close to 1, or if t is not too large. This implies that domestic social welfare is lower under CA than under ED under these conditions.

Second, suppose $t_p^{ED} \leq t \leq t_p^{CA}$ so that the domestic manufacturer chooses ED and there is no trade. The welfare effect of having ED rather than CA in this case is generally ambiguous. Domestic consumers are hurt, since they face a domestic monopoly instead of a duopoly, thus paying a higher price and facing less product variety. On the other hand, under CA rent would be shifted to the foreign manufacturer. When the products are good substitutes, however, it is straightforward to predict how having ED instead of CA will affect welfare: competition among products under CA must yield

higher domestic welfare as there is necessarily a strong pro-competitive effect, consumers benefit from greater product variety, and the rent being shifted to the foreign manufacturer is small. On the other hand, if the products are poor substitutes it is easy to provide examples in which social welfare is higher under ED and domestic monopoly. Proposition 5 summarizes the results:

Proposition 5 *(i) Common agency yields lower domestic social welfare than exclusive dealing around free trade. More generally if $t < t_p^{ED}$, common agency leads to lower domestic social welfare than exclusive dealing when the externality is not too large and the products are sufficiently close substitutes. (ii) If $t_p^{ED} \leq t \leq t_p^{CA}$, exclusive dealing leads to lower domestic social welfare when products are sufficiently close substitutes.*

Proof: See Appendix.

Recall from the previous section that when t is low CA occurs in equilibrium if b and λ are high. But these are exactly the conditions under which welfare tends to be lower under CA than under ED. These conditions are not very surprising. In particular, a high degree of substitution ensures that a change in relative market shares has little impact on consumers. Hence, the main effect takes place through the average quantity sold on the market, and CA tends to be associated with a lower average quantity compared with ED.[6]

What policy implications emerge from this analysis? Clearly whether the trade barrier is high or low, a high degree of substitution between products is a key indicator that the manufacturers' choice of contract is bad for domestic welfare, precisely because it is in this case that manufacturers have most to gain from anti-competitive behavior. Competition policy should therefore be active *whether ED or CA is chosen.* The specific recommendations for how competition policy should deal with ED and CA when products are close substitutes differ dramatically depending on the level of trade barriers. If trade barriers are high, competition policy should prohibit ED. If trade barriers are low, competition policy should not be concerned with ED, but rather—perhaps surprisingly—with CA. The implications for trade policy are

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[6]If t were a tariff, Proposition 5 would still hold around free trade and for $t_p^{ED} \leq t \leq t_p^{CA}$. For intermediate values of t, the welfare consequences are ambiguous because tariff revenue under CA may be higher or lower than under ED. The reason is that CA tends to lower average output but to raise the foreign manufacturer's market share.

also clear. Trade liberalization will not necessarily improve welfare unless it is accompanied by competition policy when products are good substitutes.

6   The Three-Manufacturer Case

There are two possible cases: one domestic manufacturer and two foreign ones, or two domestic manufacturers and a single foreign one. In each of these two environments, CA may involve the three products together or just two of them and it may involve products from the same or from different origins. It is useful to investigate these cases for two reasons. First, the three-manufacturer case opens new interesting questions. For instance, are there circumstances where the foreign manufacturers distribute their products through CA? Does this help them penetrate the domestic market? Second, we would like to know whether the results found in the two-manufacturer case extend to the three-manufacturer case. As the nature of the three-manufacturer problem is very close to the two-manufacturer case just derived, we do not provide a complete derivation of the equilibria but only highlight two main points.[7]

First,

Proposition 6 *Common agencies selling only foreign products do not improve foreign manufacturers' market access.*

Proof: See Appendix

This result comes from the fact that, like in the two manufacturer case, the prohibitive level of the trade cost is solely determined by the domestic manufacturer's choice of contract.[8] Hence, as long as the domestic manufacturer sells its product through exclusive retailers, *the prohibitive level is the same whether the two foreign manufacturers sell through common agents or not.* If the domestic manufacturer agreed to form a three product CA, then trade would occur for a wider range of trade costs (up to t_p^{CA}). However, this is not a profitable strategy for the domestic manufacturer and as a result, for $t \geq t_p^{ED}$, he remains a monopolist. This implies that, even

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[7]A detailed solution is available from the authors upon request.

[8]One way to see this is to suppose that $t = t_p^{ED}$ so that both foreign manufacturers choose zero investment under ED. Even if both had CA, it cannot be a best response for one of them to make a positive investment, since the marginal benefit of investment cannot be larger than under ED.

in a three-manufacturer environment, a single domestic manufacturer has a strong influence on foreign manufacturers' market access provided that the trade cost is high.

Second, we want to verify that the three-manufacturer case produces similar results as the two-manufacturer case. We need simulations to identify the equilibrium choice of contracts. We therefore impose specific values on the degree of substitution between products (b), the unit retail cost (c) and the investment cost parameter (k). We then ask what the subgame-perfect Nash equilibria of the game are for different values of the externality (λ) and the trade cost (t).

Figure 3 illustrates the case of two domestic manufacturers and one foreign manufacturer in (t, λ) space. Consistent with our previous analysis, it shows that the prohibitive level of the trade cost is lower under ED: $t_p^{ED} \leq t_p^{CA}$. All the curves for t below t_p^{ED} are indifference curves such that one manufacturer is indifferent between CA and ED given the other manufacturers' contracts. The two upward sloping curves characterize a domestic manufacturer's choice between having CA with the foreign manufacturer or with the two other manufacturers. The reason they are upward sloping is that, in response to a rise in t, a domestic manufacturer invests more in retailing cost-reducing activities while the foreign manufacturer does the opposite. Hence, as t rises, rent is being shifted from the domestic to the foreign manufacturer with whom it is engaged in a CA. To remain indifferent between CA and ED when t rises, the domestic manufacturer needs a higher λ. Exactly the opposite occurs with the foreign manufacturer when it is engaged in a CA with a domestic manufacturer. Therefore the foreign manufacturer's indifference curves are downward sloping. We show only the curve that matters for the equilibrium, which in this case is the one where the foreign manufacturer is indifferent between ED and having CA with both domestic manufacturers. Finally, the horizontal line shows the case where one domestic manufacturer is indifferent between ED and CA with another domestic manufacturer.[9] In every case, the manufacturer prefers CA for (t, λ) above the curve and ED for (t, λ) below the curve.

Figure 3 shows the equilibrium contracts for each of the regions defined by

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[9]When a common agency involves products from the same origin only, the equilibrium wholesale price takes the form $w(\lambda, t) = \frac{n(t)}{d(\lambda)}$. Since $\pi = w^2(\lambda, t)R(\lambda)$, a manufacturer is indifferent between keeping CA and switching to ED when $n^2(t)\left\{\frac{R(\lambda=1)}{d^2(\lambda=1)} - \frac{R(\lambda)}{d^2(\lambda)}\right\} = 0$. This implies that the roots in λ are independent of t.

the above curves. To understand how these equilibria are obtained, consider two of them: (CA,CA,CA) and (ED,ED,ED). CA between all three manufacturers is an equilibrium, because above the uppermost upward sloping curve a domestic manufacturer does not want to deviate from a three-product CA and, above the downward sloping curve, the same is true for a foreign manufacturer.[10] Consider now the north-east region denoted (ED,ED,ED). Below the lower upward sloping curve, a domestic manufacturer wants to deviate from a CA with a foreign manufacturer or from a CA with the two other manufacturers. A domestic manufacturer would not want to deviate from a CA with another domestic manufacturer (since we are above the horizontal line). The foreign manufacturer would like to form a CA with one or with both domestic manufacturers. There is no equilibrium (in pure strategies) with CA, since none of the domestic manufacturers wishes to have CA with the foreign manufacturer. The only possible equilibrium is thus ED for the three manufacturers. Similar reasoning can be applied to the other region. Note that Figure 3 has one region with two equilibria involving CA: one between a domestic and a foreign manufacturer and the other between the two domestic manufacturers. Finally consider the region to the right of t_p^{ED}. Both domestic manufacturers choose ED because if they do not, the foreign manufacturer enters at least as long as t is less than t_p^{CA}.

Figure 3 shows that trade liberalization, when it brings switches in contracts, leads to switches toward CA, not toward ED. Moreover, like in the two-manufacturer case, ED is the domestic manufacturers' contract of choice when the trade barrier is high. In short, the main result found in the two-manufacturer case extends to the case of two domestic manufacturers and one foreign manufacturer.

Consider now the case of two foreign and one domestic manufacturer. Its interesting feature is that the foreign manufacturers may form a CA, whether or not the domestic manufacturer participates. Figure 4 illustrates this case. The interpretation of the curves is similar to that in Figure 3. The striking feature of Figure 4 is that, although trade liberalization brings more CA, equilibria with CA are far more prevalent than in the previous case. Indeed all the regions in Figure 4 except the one where the externality is so strong that no one wants to be involved in a CA (below the horizontal line) are consistent with CA between the two foreign manufacturers. The fact that foreign

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[10]Note that in this region, like in all other ones, (ED,ED,ED) is always an equilibrium contract combination, since one manufacturer alone cannot form a CA.

manufacturers have a stronger incentive to sell their product through CA is not surprising. When the trade barrier is high, the competitive environment is intense for the foreign products and CA helps mitigate it. However, the domestic manufacturer cannot avoid the presence of the foreign products, but does not want to sell its product through CA, because significant rents would then be shifted to the foreign manufacturers.

7 Extensions

In this Section, we discuss two extensions: one concerning the behavior of manufacturers and the other concerning retailers. Consider first the behavior of manufacturers. One might wonder whether our results are robust to a game in which they select quantity instead of price. Under Cournot competition, manufacturers have an incentive to make commitments that raise output because rivals respond by lowering their output. Clearly ED is such a commitment and, hence, it might be tempting to conclude that CA may not survive under Cournot competition. In the two manufacturer case, however, CA does survive, simply because both manufacturers know that one manufacturer adopting ED means that the other necessarily has ED as well. ED hence raises investment and output of both manufacturers and reduces their profit. In the three firm case, there is clearly an incentive for one manufacturer to adopt ED if the others have CA. However a situation where one firm has ED and two have CA will still survive for the reasons explained in the two-manufacturer case. Hence, CA survives under Cournot competition. Moreover the choice between ED and CA under Cournot competition again systematically depends on the size of the spillover, the degree of product substitutability and the level of trade barriers.

Consider now the retailers. There are two ways or relaxing our assumptions about retailing: by introducing imperfect competition and by allowing for additional cost considerations. Market power at the retail level implies that the collusive aspect of CA is enhanced by retailers' ability to internalize price competition. For instance, suppose that the two manufacturers offer a two-part tariff contract to a common (monopoly) retailer and delegate the retail price decision to this retailer. In this case, the retailer selects the collusive retail prices, and the manufacturers set wholesale prices equal to their marginal costs and extract the retailer's monopoly profit through a fixed fee. In other words, the presence of a monopoly retailer leads to the same out-

come that would obtain if the manufacturers sold directly to consumers and maximized their joint profit (see Motta, 2004). In the context of our model, this suggests that the scope for CA is enhanced, not diminished, by the presence of imperfectly competitive retailers, at least when the trade barrier is low. When the trade barrier is high, it would seem that the domestic manufacturer would have an incentive to prevent entry by signing up exclusive contracts with all or at least with the most efficient retailers. Thus the scope for ED would be enhanced when the trade barrier is high. Bernheim and Whinston (1998)'s main message, however, is that, even in the presence of a single retailer, foreclosure is generally not optimal from the manufacturer's point of view. In other words, even when the barrier is high and there is a single retailer, ED is chosen not because of foreclosure opportunities but because of the presence of externalities associated with CA (such as investment spillovers). We conclude therefore that the presence of imperfectly competitive retailers does not generally affect our (positive and normative) results and, to the extent that it does, it is to enhance the scope for CA when the trade barrier is low.

Another factor which may increase the use for CA is the presence of economies of scope in retailing due, for instance, to the existence of fixed costs at the retailing level. In this case, the welfare effect associated with CA becomes ambiguous. CA brings cost savings and efficiency gains but acts at the same time as a commitment to reduce investment and, with imperfectly competitive retailers, to obtain more collusive prices. The trade-off here is similar to the one existing with mergers. Clearly, competition policy should still accompany trade policy and adopt a 'rule of reason' approach to the evaluation of CA.

8   Conclusions

In this paper, we examine domestic and foreign manufacturers' choices between exclusive dealing and common agency. We show three main points. First, domestic manufacturers use exclusive dealing when trade barriers are high so as to prevent rents from being shifted to foreign manufacturers. Rents would be shifted under common agency, because foreign manufacturers can benefit much more from domestic manufacturers' investments in their distribution chain than vice versa. Exclusive dealing is adopted whatever the characteristics of the products (i.e., the degree of substitution), whatever

the degree of interbrand externality, and no matter whether there are two or three manufacturers. Second, manufacturers tend to use common agency when trade barriers are low.[11] This incentive exists especially when the products are good substitutes and the interbrand externality is not very strong. Since the manufacturers want to mitigate interbrand competition, our results show that contracts can act as barriers to trade and, when switches in contracts occur, they are substitutes for standard trade barriers. This confirms the view held by antitrust authorities that private anti-competitive contractual arrangements may gain greater importance as traditional trade barriers are removed and that competition authorities may therefore have to be tough in a free-trade environment. Third, our analysis implies that competition authorities should be active especially when products are close substitutes, but that the policy they should pursue depends on the level of trade barriers. When trade barriers are high, authorities should be especially concerned with exclusive dealing arrangements by domestic manufacturers. However, when trade barriers are low their attention should turn to common agency arrangements. There is some evidence that competition authorities do worry about the anti-competitive effects of common agency. For instance, Kali und Salz, a German producer of potassium salt, and its French competitor, SCPA, have been found to infringe Art. 85 of the EEC (now Art. 81) for having (among other things) used the same common intermediary in Italy and in the Netherlands to distribute their products (European Commission, 1973). More generally, joint ventures set up for distribution infringe Art 81 if the parent firms are competitors. This is also true for joint distribution by non-EC competitors (Ritter et al. 2000).

These findings are helpful to interpret some of the examples mentioned in the introduction. In the European automobile market, the fact that exclusive dealing agreements have continued to be prevalent despite significant economic integration suggests that the degree of spillover is high and/or the degree of substitution between products is relatively low. A policy aimed at

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[11]There is some anecdotal evidence that this is indeed the case. In the European car market, for instance, the use of common agency increased between 1998 and 2002 in all EU member countries except Italy (HWB International). The same observation seems to be valid for other consumer durable markets where international competition is increasing. For instance, the Vice president of the Northamerican Heating, Refrigeration and Aiconditioning Wholesalers has observed that while the business is becoming 'North Americanized', the distribution channels are changing with common agency becoming more commonplace (Liegl, 2000).

discouraging exclusive dealing would then unambiguously lower the profits of the automobile producers. However, this outcome would be achieved by decreasing competition, not by increasing it. In other words, profits would be reduced by decreasing investments and sales, and increasing retail prices. Such a policy would unambiguously reduce social welfare at least if the market was at or near free trade. There is, however, another interpretation that would more strongly justify the recent EU policy. The use of exclusive dealing in the automobile industry varies a lot across European countries with at least 85% of the dealers under exclusive contracts in countries like Germany, Italy and in the UK, and with rates below 71% in countries like Austria, Denmark, Finland, Ireland and Sweden (HWB International).[12] Since it is doubtful that the degree of spillover or the degree of substitution differs significantly across Europe, it is tempting to conclude that these differences are due to differences in implicit barriers to trade and that it is those barriers that facilitate the extensive use of exclusive contractual arrangements in the large (automobile producing) countries. In other words, thanks to the bloc exemption granted by the EU Commission, European market integration would have largely by-passed the automobile market.

The paper also sheds light on the response of the WTO to Kodak's complaint about Fuji's use of exclusive dealing in the Japanese film market. In particular, our results suggest that the WTO's ruling that this was a domestic issue would have been essentially correct, if it were true that Japanese trade barriers in this market were low. If impediments to trade were significant, however, our analysis suggests that the WTO should have been pro-active not only with respect to the trade barriers themselves but also with respect to the contractual arrangement they induce.

9   Appendix

Proof of Lemma 1:

Since $\lambda > b/1 + b$ and $b < 1$, then from (8), $\frac{\partial \tilde{I}_i}{\partial t}$ has the same sign as $\frac{\partial \tilde{w}_i}{\partial t}$. Using (12), $\frac{\partial \tilde{x}_i}{\partial t}$ has also the same sign as $\frac{\partial \tilde{w}_i}{\partial t}$. Note that t can be found only in A_h and in A_f and that both A_h and A_f are linear in t. This implies that $\frac{\partial \tilde{w}_i}{\partial t}$ and thus $\frac{\partial \tilde{x}_i}{\partial t}$ and $\frac{\partial \tilde{I}_i}{\partial t}$ are independent of t. This establishes part (i). To

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[12] By contrast, ED is less common in the US automobile industry, where in 1989 about 30% of dealers held multiple franchises selling competing brands.

show part (ii), we only need to show that $\frac{\partial \tilde{w}_h}{\partial t} > 0$ and $\frac{\partial \tilde{w}_f}{\partial t} < 0$. Using $\tilde{w}_h$ as given by (11),

$$\frac{\partial \widetilde{w}_h}{\partial t} = \frac{k(1 - b^2)}{\beta_1^2 - \beta_2^2} \left\{ b\beta_1 - \beta_2 \right\}.$$

Hence, $\frac{\partial \tilde{w}_h}{\partial t} > 0$ if and only if $\beta_1^2 - \beta_2^2 > 0$ and $b\beta_1 > \beta_2$. This second inequality holds if and only if $bk > (\lambda(1 + b) - b)(1 - \lambda)$, which is true by assumption. Observe that, since $b < 1$, then the condition to have $b\beta_1 > \beta_2$ also implies $\beta_1^2 - \beta_2^2 > 0$. Finally,

$$\frac{\partial \widetilde{w}_f}{\partial t} = \frac{k(1 - b^2)}{\beta_1^2 - \beta_2^2} \left\{ b\beta_2 - \beta_1 \right\} < 0,$$

since $b\beta_1 > \beta_2$, then $\beta_1 > b\beta_2$ when $b < 1$. Hence, $\frac{\partial \tilde{w}_h}{\partial t} > 0$ and $\frac{\partial \tilde{w}_f}{\partial t} < 0$ whenever $bk > (\lambda(1 + b) - b)(1 - \lambda)$.

Proof of Lemma 2:

Since (13) is quadratic in w_i, $sign\left\{ \frac{\partial \tilde{\pi}_i}{\partial t} \right\} = sign\{w_i \frac{\partial \tilde{w}_i}{\partial t}\}$ and $sign\left\{ \frac{\partial^2 \tilde{\pi}_i}{\partial t^2} \right\} = sign\left\{ \frac{\partial \tilde{w}_i}{\partial t} \right\} sign\left\{ \frac{\partial \tilde{w}_i}{\partial t} \right\}$. Since $\frac{\partial \tilde{w}_h}{\partial t} > 0$, then $\tilde{\pi}_h$ is increasing at an increasing rate with respect to t ($sign\left\{ \frac{\partial \tilde{\pi}_h}{\partial t} \right\} > 0$, $sign\left\{ \frac{\partial^2 \tilde{\pi}_h}{\partial t^2} \right\} > 0$). Since $\frac{\partial \tilde{w}_f}{\partial t} < 0$, then $\tilde{\pi}_f$ is decreasing at a decreasing rate with respect to t ($sign\left\{ \frac{\partial \tilde{\pi}_f}{\partial t} \right\} < 0$, $sign\left\{ \frac{\partial^2 \tilde{\pi}_i}{\partial t^2} \right\} > 0$).

Proof of Proposition 1:

Using the equilibrium wholesale price, the manufacturer's equilibrium profit in free trade ($t = 0$) can be re-written as

$$\widetilde{\pi}_i|_{t=0} = \frac{k\beta_1 A^2}{2(\beta_1 - \beta_2)^2}, \tag{19}$$

where $A = A_h = A_f$. This function is continuous and twice differentiable in λ for $\lambda \in [\frac{b}{1+b}, 1]$. Differentiating this expression with respect to λ, we get

$$\frac{d\widetilde{\pi}_i|_{t=0}}{d\lambda} = \frac{kA^2}{2(\beta_1 - \beta_2)^3} \left[-2\beta_1 \left(\frac{d\beta_1}{d\lambda} - \frac{d\beta_2}{d\lambda} \right) + (\beta_1 - \beta_2)\frac{d\beta_1}{d\lambda} \right].$$

Since $\beta_1 > \beta_2$, $\frac{d\beta_1}{d\lambda} = -2(1 + b)(\lambda(1 + b) - b)$ and $\frac{d\beta_2}{d\lambda} = (1 + b)^2(1 - 2\lambda)$ then $\frac{d\beta_1}{d\lambda} - \frac{d\beta_2}{d\lambda} = -(1 - b^2)$. It follows that

$$sign\frac{d\widetilde{\pi}_i|_{t=0}}{d\lambda} = sign\left\{ \beta_1(1 - b) - (\beta_1 - \beta_2)(\lambda(1 + b) - b) \right\}.$$

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Note that $sign\left\{\left.\frac{d\tilde{\pi}_i|_{t=0}}{d\lambda}\right|_{\lambda=1}\right\} = sign\left\{-b\beta_1 + \beta_2\right\} < 0$ (which holds by assumption) and $sign\left\{\left.\frac{d\tilde{\pi}_i|_{t=0}}{d\lambda}\right|_{\lambda=b/(1+b)}\right\} = sign\left\{\beta_1(1-b)\right\} > 0$. We can further show that $\tilde{\pi}_i$ reaches a maximum at $\overline{\lambda} = \frac{2-b^2}{(1+b)(2-b)}$, where $\overline{\lambda} \in (\frac{b}{1+b}, 1)$. It follows that if $\tilde{\pi}_i|_{t=0,\lambda=b/1+b} > \tilde{\pi}_i|_{t=0,\lambda=1}$, CA is preferred for all $\frac{b}{1+b} \leq \lambda < 1$. If, however, $\tilde{\pi}_i|_{t=0,\lambda=b/1+b} < \tilde{\pi}_i|_{t=0,\lambda=1}$, the manufacturer's profit is higher with ED when $\frac{b}{1+b} \leq \lambda < \lambda_0$ and with CA when $\lambda_0 < \lambda < 1$ (where λ_0 is such that $\tilde{\pi}_i|_{t=0,\lambda=\lambda_0} = \tilde{\pi}_i|_{t=0,\lambda=1}$). Accordingly, we must simply show that values of b exists such that $\tilde{\pi}_i|_{t=0,\lambda=b/1+b} < \tilde{\pi}_i|_{t=0,\lambda=1}$. Using (19), it is easy to show that $\tilde{\pi}_i|_{t=0,\lambda=b/1+b} < \tilde{\pi}_i|_{t=0,\lambda=1}$ around $b = 0$ (but not for $b = 1$).

Proof of Proposition 2:

The prohibitive level of the trade barrier is determined by $x_f = 0$. Using (12) and (11), the prohibitive barrier is

$$t_p(b, \lambda) = \frac{(1-c)[k(1-b)(2+b) - (\lambda(1+b) - b)(2\lambda - 1)]}{k(2-b^2) + \lambda(b - \lambda(1+b))}.$$

This function is continuous and differentiable in λ for $\lambda \in [\frac{b}{1+b}, 1]$. Taking the derivative with respect to λ, we find that

$$sign\left\{\frac{\partial t_p}{\partial \lambda}\right\} = \{-[4\lambda(1+b) - 1 - 3b][k(2-b^2) + \lambda(b - \lambda(1+b))]$$
$$+ [2\lambda(1+b) - b][k(1-b)(2-b) - (2\lambda - 1)(\lambda(1+b) - b)]\}.$$

We have $sign\left\{\left.\frac{\partial t_p}{\partial \lambda}\right|_{\lambda=1}\right\} = sign\{-2(1+b)k + 1\} < 0$, since we require $k > \frac{1}{2(1-b^2)}$. Hence, lowering λ increases t_p in the neighborhood of $\lambda = 1$. Furthermore, $sign\left\{\left.\frac{\partial t_p}{\partial \lambda}\right|_{\lambda=b/(1+b)}\right\} = 2k(1-b^2) > 0$, so that raising λ starting at $b/(1+b)$ raises t_p. In the interval $\frac{b}{1+b} < \lambda < 1$, t_p reaches a maximum at

$$\lambda = \frac{b + kb + 2k - kb^2 - \sqrt{(b+1)}\sqrt{k}\sqrt{(kb^3 - 3kb^2 + 2b + 4k - 2)}}{1+b}.$$

Hence to make sure that $t_p^{ED} < t_p^{CA}$ we need to show that t_p is higher at $\lambda = b/(1+b)$ than at $\lambda = 1$. With ED ($\lambda = 1$), the level of prohibitive trade cost is

$$t_p^{ED} = \frac{(1-c)[k(1-b)(2+b) - 1]}{k(2-b^2) - 1},$$

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and under CA at $\lambda = b/1 + b$, the level of the prohibitive trade cost is

$$t_p^{CA}|_{\lambda=\frac{b}{1+b}} = \frac{(1-c)k(1-b)(2+b)}{k(2-b^2)}.$$

Comparing the two we find

$$t_p^{CA}|_{\lambda=\frac{b}{1+b}} - t_p^{ED} = \frac{(1-c)b}{(2-b^2)\left[k(2-b^2)-1\right]} > 0 \text{ for all } b \in (0,1). \quad (20)$$

Hence $t_p^{ED} < t_p^{CA}$ for $\frac{b}{1+b} \leq \lambda < 1$.

Proof of Proposition 3:

i) When b and/or λ are high and t is sufficiently low, both the domestic and the foreign manufacturer choose CA (Proposition 1). When t is sufficiently high, the domestic manufacturer selects ED, and we hence observe ED in equilibrium without trade (Proposition 2). By continuity, the domestic manufacturer still selects ED for $t < t_p^{ED}$ but high enough. Hence, there must exist a sufficiently low $t = \widetilde{t}$ such that $0 < \widetilde{t} < t_p^{ED}$ below which the equilibrium contracts exhibit CA.

ii) In free trade, the domestic manufacturer always selects ED when λ is sufficiently low, since CA is dominated by ED (Proposition 1). When $t > 0$, (15) indicates that the rent-shifting effect associated with positive trade barriers is an additional force inducing the domestic manufacturer to select ED over CA. Hence, if ED is selected when $t = 0$ because λ is sufficiently low, ED is selected for all t. When b is sufficiently low, CA is dominated by ED because the strategic effect of CA is sufficiently weak to leave only the cost of CA in the form of a less effective own investment. When $t > 0$, the strategic effect is even weaker for the domestic manufacturer. Hence if ED is selected when $t = 0$ because b is sufficiently low, it is also selected for all t.

Proof of Proposition 4:

The rate t_p^k is defined such that $x_f^k = 0$ $(k = CA, ED)$. Since, by Proposition 2, $t_p^{ED} \leq t_p^{CA}$, $x_f^{CA}(t = t_p^{ED}) \geq x_f^{ED}(t = t_p^{ED}) = 0$. The foreign manufacturer would have a positive share of the market under CA. Hence, $\pi_d^{ED}(t = t_p^{ED}) \geq \pi_d^{CA}(t = t_p^{ED})$ since the domestic manufacturer is a monopoly under ED and shares the market with the foreign manufacturer under CA. This implies that the domestic manufacturer selects ED when $t = t_p^{ED}$. The same reasoning holds for any t within the range $t_p^{ED} \leq t \leq t_p^{CA}$.

Note from the proof of Proposition 2 that a reduction in λ, starting at $\lambda = 1$, first increases the difference between t_p^{ED} and t_p^{CA} and then decreases

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it. At $\lambda = b/(1+b)$ we know from (20) that the difference is decreasing in c and k.

Proof of Proposition 5:

The sign of $dCS/d\lambda$ depends on $d\overline{x}/d\lambda$ and $d\Delta/d\lambda$ (see (18)). Using the equilibrium quantities, we have $\Delta = \frac{tk}{D}$, where $D = (1-b)(2+b)k - (2\lambda - 1)(\lambda(1+b) - b)$, so that

$$\frac{d\Delta}{d\lambda} = \frac{tk[4\lambda(1+b) - (3b+1)]}{D^2}.$$

The sign of $\frac{d\Delta}{d\lambda}$ depends on λ, at least as long as $t \neq 0$. A sufficient condition for $\frac{d\Delta}{d\lambda} > 0$ is $\lambda > \frac{3b+1}{4(1+b)}$. Similarly, $\overline{x} = \frac{k[2(1-c)-t]}{2E}$, where $E = 2[k(1+b)(2-b) - (\lambda(1+b) - b)]$, so that

$$\frac{d\overline{x}}{d\lambda} = \frac{k(1+b)[2(1-c) - t]}{2E^2},$$

where $\frac{d\overline{x}}{d\lambda} > 0$ for $t < 2(1-c)$ and $\frac{d\overline{x}}{d\lambda} < 0$ for $2(1-c) < t < t_p^{CA}$.

In free trade, (18) reduces to

$$\frac{dCS}{d\lambda} = -2\overline{x}\frac{\partial p_h}{\partial \overline{x}}\frac{d\overline{x}}{d\lambda}.$$

This expression is unambiguously positive since $\frac{\partial p_h}{\partial \overline{x}} < 0$ and $\frac{d\overline{x}}{d\lambda} > 0$ for $t < 2(1-c)$.

Consider now $0 < t < t_p^{ED}$. Since $\frac{d\overline{x}}{d\lambda} > 0$ when $t < 2(1-c)$, $\frac{d\overline{x}}{d\lambda} > 0$ when $0 < t < t_p^{ED}$ provided that $t_p^{ED} < 2(1-c)$. This is the case whenever $\lambda > [b + (\frac{2(1-b)^2}{2+b(1-b)})^{1/2}]\frac{1}{1+b}$ and thus whenever the externality is not too strong. If this condition holds, $\frac{dCS}{d\lambda} > 0$ for $0 < t < t_p^{ED}$ unless $\frac{d\Delta}{d\lambda} > 0$ is positive and strong. The presence of highly differentiated products makes sure the second part of (18) does not affect the sign of $\frac{dCS}{d\lambda}$.

Proof of Proposition 6:

To show this proposition, we must show that, when the domestic manufacturer has ED, the prohibitive trade cost is the same whether the two foreign manufacturers have CA or ED.

Consider the profit of a foreign manufacturer when it sells its product through common agencies with the other foreign manufacturer. Its profit takes the form

$$\pi_f^{ED,CA,CA} = \frac{n^2(t)R(\lambda)}{d^2(\lambda)},$$

where $n(t) = t[(1+b)(1-2k)+2kb^2] + (1-c)(-1-b+2k+kb-3kb^2)$, $R(\lambda) = k[2k(1-b^2)(1+2b)+(1+2b)(2b\lambda-\lambda^2(1+2b))-b^2]$ and $d(\lambda) = k^2(12b^3 + 2b^2 - 10b - 4) + k(-4b^3\lambda + b^3 + 2b^2\lambda + 6b\lambda + 3b + 2\lambda + 2) + b^2 - 2\lambda b^2 + b - 3\lambda b - \lambda$.

When all the manufacturers have ED, the foreign manufacturer's profit takes the form

$$\pi_f^{ED,ED,ED} = \frac{n^2(t)R(\lambda=1)}{d^2(\lambda=1)}.$$

It follows that t such that $\pi_f^{ED,ED,ED} = 0$ and $\pi_f^{ED,CA,CA} = 0$ takes the same value that we denote t_p^{ED}.

When the domestic manufacturer shares common retailers with one or with both foreign manufacturers, the volume of trade and the wholesale price can no longer be written as a function of $n(t)/d(\lambda)$. In these cases, the prohibitive rate depends on λ and is higher than when the domestic manufacturer selects ED.

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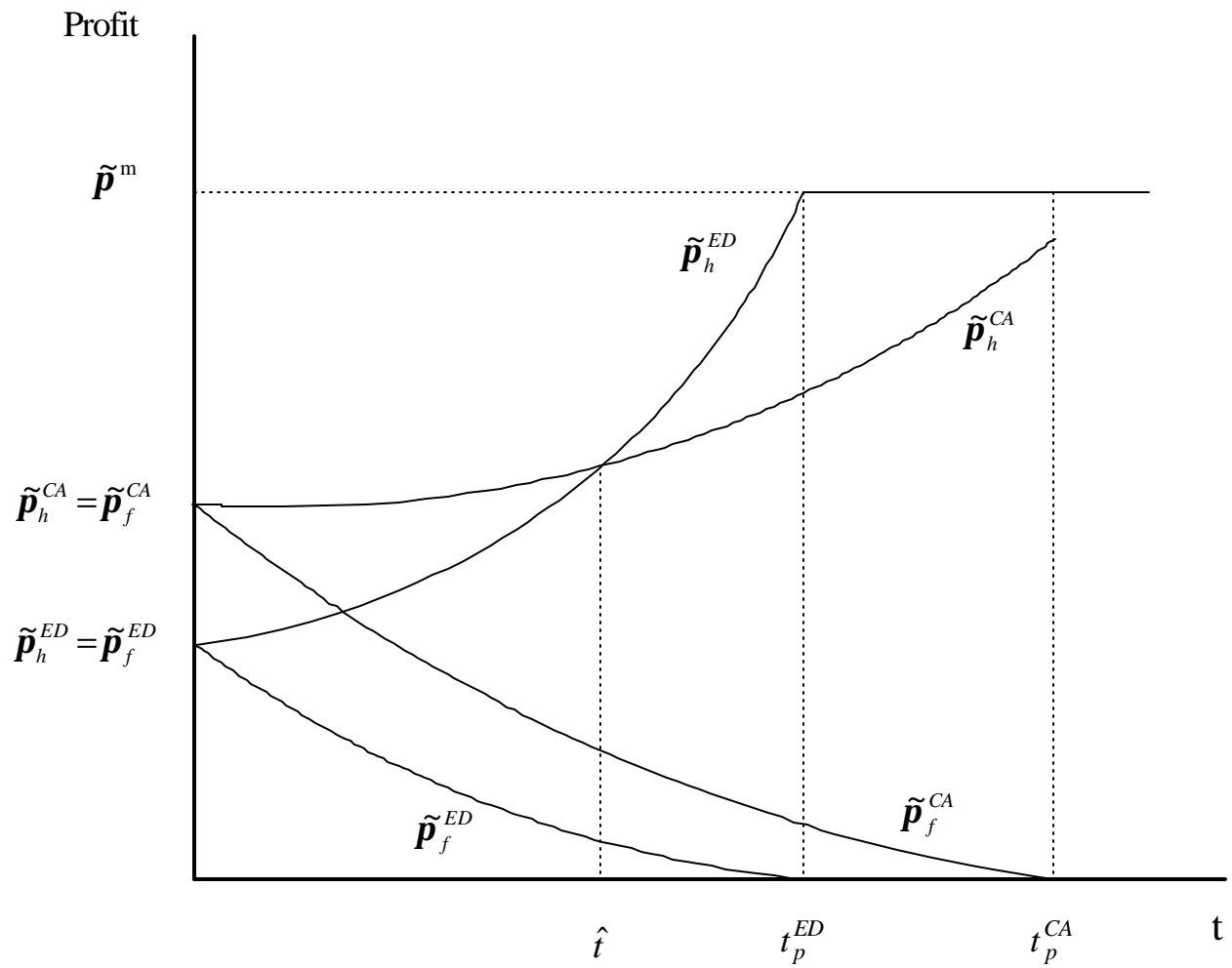
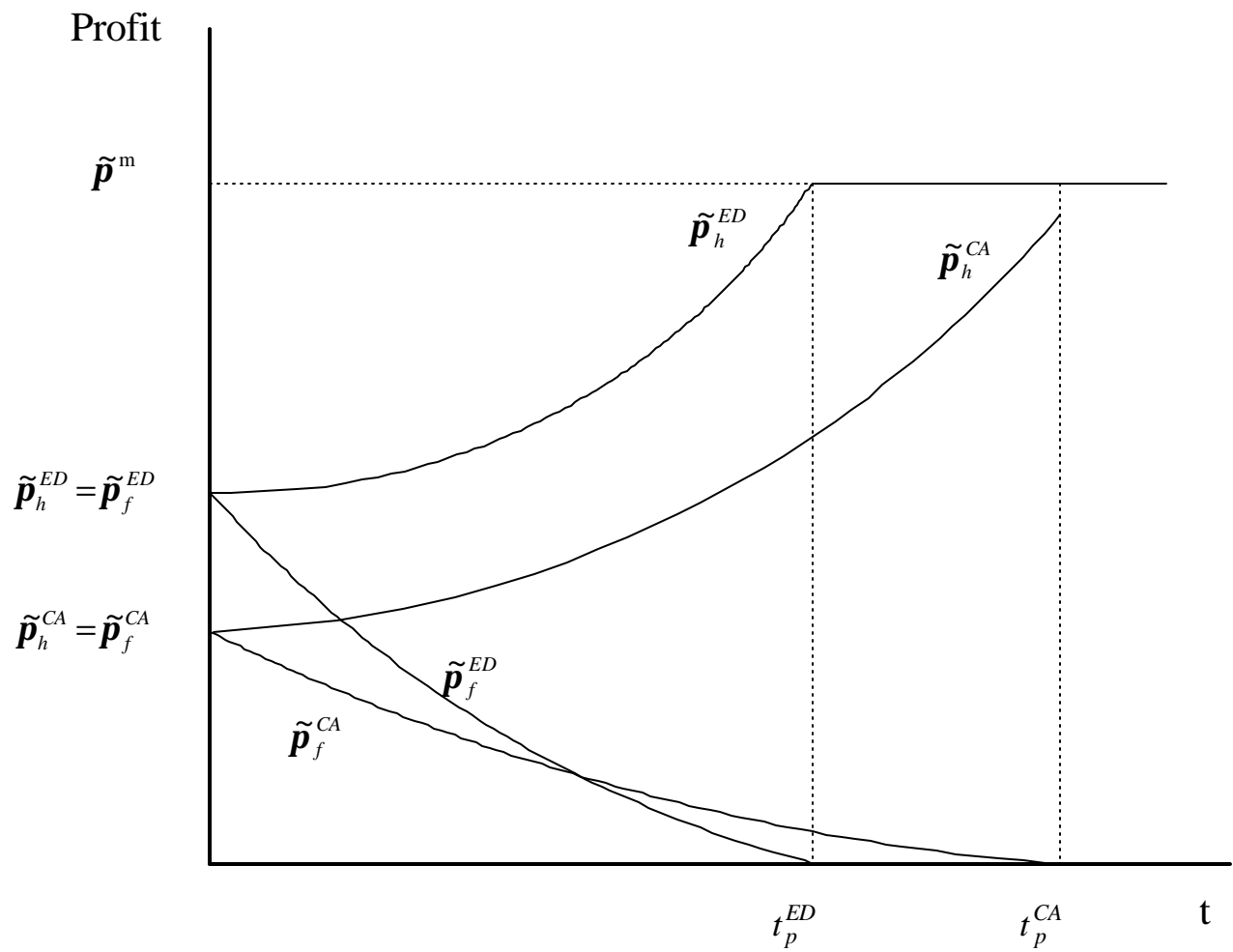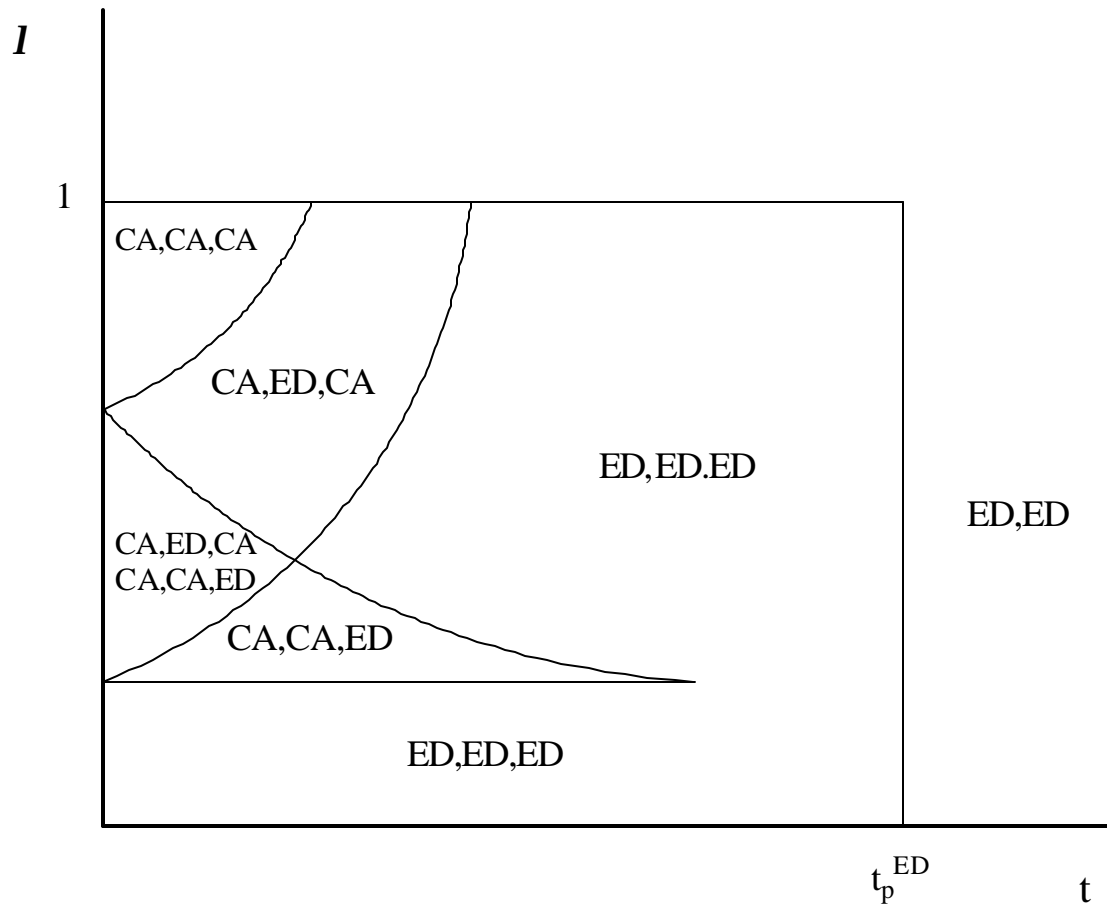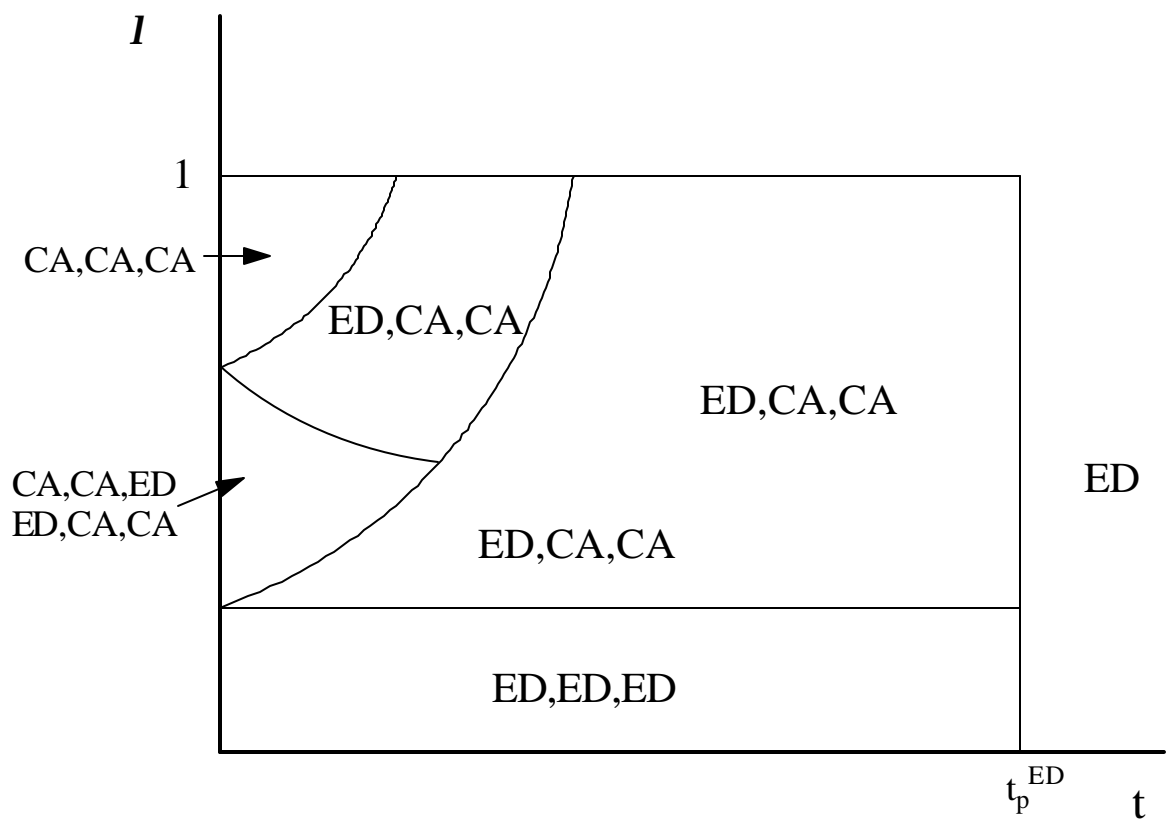Figure 1: Exclusive Dealing vs Common Agency (low externality)

Profit

$\tilde{p}^{\mathrm{m}}$

$\tilde{p}_h^{ED}$

$\tilde{p}_h^{CA}$

$\tilde{p}_h^{ED} = \tilde{p}_f^{ED}$

$\tilde{p}_h^{CA} = \tilde{p}_f^{CA}$

$\tilde{p}_f^{ED}$

$\tilde{p}_f^{CA}$

t_p^{ED}

t_p^{CA}

t

Figure 2: Exclusive Dealing vs Common Agency (high externality)

Figure 3: One Foreign and Two Domestic Manufacturers

1

1

CA,CA,CA →

ED,CA,CA

ED,CA,CA

ED

CA,CA,ED
ED,CA,CA →

ED,CA,CA

ED,CA,CA

ED,ED,ED

t_p^{ED}

t

1,2,3=D,F,F

<u>Figure 4</u>: One Domestic and Two Foreign Manufacturers