Exclusive Territories and Manufacturers’ Collusion*

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May 20, 2011

Abstract

This paper highlights the rationale for exclusive territories in a model of repeated interaction between competing supply chains. We show that with observable contracts exclusive territories have two countervailing effects on manufacturers’ incentives to sustain tacit collusion. First, granting local monopolies to retailers softens competition in a one-shot game. Hence, punishment profits are larger, thereby rendering deviation more profitable. Second, exclusive territories stifle deviation profits because retailers of competing brands adjust their prices to the wholesale contract offered by a deviant manufacturer, whereas intrabrand competition prevents such ‘instantaneous reaction’. We show that the latter effect tends to dominate, thereby making exclusive territories a more suitable organizational mode to cooperate. These insights are robust to endogenous communication between manufacturers. We also consider retailers’ service investments. Here, a novel effect emerges that softens the procollusive value of exclusive territories: Retailers of a deviant manufacturer increase investments, which renders deviation more profitable.

Keywords: exclusive territories, supply chains, tacit collusion, information sharing, vertical restraints.

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*The authors thank Preyas Desai (the department editor), an associate editor, and two anonymous referees for many very helpful comments and suggestions that greatly improved this paper. They are very grateful to Bruno Jullien and Patrick Rey for many discussions on this topic. They also thank Philippe Bontems, Volker Nocke, Hans-Theo Normann, and seminar participants at the University of Munich and the conference on Vertical Market Structures at Deutsches Institut für Wirtschaftsforschung Berlin. Part of this work was done while the authors visited the Institut d’Économie Industrielle at the University of Toulouse. They are very grateful for their hospitality.

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1 Introduction

Distribution networks organized through exclusive territories are widespread in many markets. In industries such as lodging, computer services or maintenance services, upstream firms use franchise contracts that predominantly grant the franchisee an exclusive territorial area in which the franchisor commits to not adding competing outlets.\(^1\) Car distribution in the United States as well as in Europe, distribution of beverages, and many other retail industries feature the same pattern.\(^2\) Several existing models rationalize the extensive use of exclusive territories by arguing that they provide retailers with the right incentives to invest in services that would otherwise be eroded by intrabrand competition—see, e.g., Mathewson and Winter (1984, 1994). However, exclusive territories not only affect the way manufacturers and retailers behave within a single supply chain, they also induce strategic effects on competing brands. As pointed out by Rey and Stiglitz (1995), softening intrabrand competition via exclusive territories also mitigates competition coming from substitute brands through a ‘strategic effect’: absent intrabrand competition, distributors of a given product can increase their retail prices if competing brands sell at higher wholesale prices. This spurs downstream profits and, therefore, the surplus that manufacturers can extract via franchise fees. Although these effects are crucial to judge the impact of exclusive territories on manufacturers’ profits as well as on retail prices, they are relatively unexplored. In particular, to the best of our knowledge, besides Rey and Stiglitz (1995) there is no other paper analyzing the role of exclusive territories in a model of competing supply chains.\(^3\)

In addition, the existing literature has mainly taken a static approach and has thus neglected the effects that limits on intrabrand competition have on repeated interactions between competing manufacturers. However, exclusive territories appear to be common in industries where few large producers compete for a long time. For example, Coca-Cola Company and PepsiCo, the two leading producers of nonalcoholic beverages, control a very large market share in this segment.\(^4\) Both these producers grant exclusive territories to their bottling companies, who sell and distribute the bottled beverages to final retailers. Another example is the hotel business in which only few big players like InterContinental Hotels Group, Wyndham Hotel Group and Marriott International (the three biggest companies) control a large share of the market in many cities or districts and grant exclusive territories to their franchisees.

Arguably, all these companies do not compete on a purely static perspective, but likely base their pricing behavior on dynamic considerations, that is, lowering their prices today may trigger

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\(^1\) For example, Azoulay and Shane (2001) document that more than 80% of franchisors among many different industries adopt exclusive territories.


\(^3\) As we will mention in the literature review, Iyer (1998) considers a model of competition between manufacturers but he focuses on pure interbrand competition, i.e., the case where each retailer has an exclusive territory. Thus, his model does not allow for a comparison of exclusive versus nonexclusive territories.

\(^4\) As reported by Fosfuri and Giarratana (2009), between 1999 and 2003 the two firms controlled more than 75% of the carbonated soft drink market in the United States.
a price reduction by competitors in the future. For example, Fosfuri and Giarratana (2009) point out that Coca-Cola and Pepsi have often avoided direct price competition and that price adjustments by one brand are usually followed immediately by the other. Taken together, these are telltale things that tacit collusion is relevant in markets with these features.

Building on these considerations, the objective of this paper is to identify the link between restrictions on intra- and interbrand competition and the incentives to achieve cooperative outcomes in a repeated game where manufacturers control the organizational strategies of the supply chain. We are interested in understanding what new trade-offs exclusive territories bring about in a dynamic game. What is the role that the strategic effect plays in a framework where tacit collusion can be enforced through repeated interactions? Do exclusive territories facilitate tacit collusion between upstream firms? What is the role of information-sharing agreements among competing vertical chains in such a dynamic setting? How does the interplay between retailers’ service provision and strategic price considerations influence collusion incentives?

To address these issues we first set up a simple repeated game extending the static analysis of Rey and Stiglitz (1995): two infinitely lived manufacturers, each producing a single brand, compete by offering observable two-part tariffs and choose whether to grant exclusive territories or allow for intrabrand competition. Within this framework, we show that exclusive territories have two opposing effects on upstream collusion. On the one hand, the static analysis suggests that cooperative outcomes between manufacturers should be harder to sustain under arrangements that remove intrabrand competition. This is because exclusive territories increase profits along the punishment phase when manufacturers punish deviations with grim-trigger strategies. On the other hand, we demonstrate that a new countervailing effect kicks in with repeated interaction. When both manufacturers impose exclusive territories, retailers of a given brand can react to the deviation of a deviant manufacturer directly in the time period of deviation. They do so by optimally changing their retail price decisions, thereby reducing the spot gain from deviation. This instantaneous ‘punishment’ mechanism is no longer at work without exclusive territories: retailers cannot tailor their pricing decisions to the wholesale contract offered by the competing manufacturer when facing intrabrand competition. Hence, exclusive territories reduce deviation profits relative to arrangements allowing for intrabrand competition.

Understanding which of these forces dominates is not obvious. One might argue that the effect of exclusive territories on the deviation profit is only of second order relative to the impact that these arrangements have on the punishment profit. Whereas the strength of the former effect relies solely on the retailers’ reaction to a deviation along the best-reply function, the latter also

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5Public contracts are a somewhat compelling assumption in industries where manufacturers can easily engage in information sharing agreements. For instance, in business-format franchising franchisors must give a ‘franchise disclosure document’ that includes, among other things, the franchise fee and the royalty rate to a potential franchisee 10 business days before signing any contract (see Federal Trade Commission, Title 16, Chapter 1, Subchapter D, Part 436). Of course, there are industries where this is not enough to perfectly disclose a franchisee’s costs since there are other deals between a franchisor and a franchisee that are not observable to outsiders, e.g., franchisors often sell ingredients and supplies to their franchisees at prices unknown to outsiders. However, even in these cases royalty rates are usually a key determinant of franchisees’ costs.
entails a reaction by the rival manufacturer. Our analysis suggests that this conjecture is incorrect and that the net effect is usually unclear. Moreover, in the standard linear demand model—and more generally when the second-order derivatives of the demand function are small—we show that the deviation effect is invariably stronger than the punishment effect, thereby making collusion easier to sustain when both manufacturers impose exclusive territories.

This result adds to the existing literature on collusion and vertical restraints. In particular, although both effects described above are also present in Nocke and White’s (2007) model of collusion and vertical integration, our analysis delivers different predictions relative to theirs. Whereas Nocke and White (2007) find that a single vertical merger suffices to facilitate collusion, in our model the procollusive effect of exclusive territories emerges if and only if all manufacturers impose this distribution mode. Moreover, we show that in our supply chain setup, vertical integration does not facilitate collusion over and above intrabrand competition. The same consideration applies to resale price maintenance.

The results of the baseline model extend to several more complex scenarios. First, the introduction of imperfect intrabrand competition brings in a novel effect of exclusive territories. When retailers dealing with the same manufacturers are differentiated, a deviant manufacturer who distributes by way of exclusive territories gains via larger sales of only one retailer and not many as would be the case if the manufacturer allowed for intrabrand competition. Thus, distributing via exclusive territories reduces a manufacturer’s temptation to deviate from a collusive outcome. Essentially, under imperfect intrabrand competition exclusive territories provide a commitment device for manufacturers to keep the deviation profit low. As a consequence, our result that exclusive territories facilitate collusion gets strengthened.

Next, to emphasize the key role of communication in supply chains, we study the incentives for manufacturers to disclose their wholesale contracts. To do so we consider an extended model where manufacturers at each stage of the repeated game decide whether to disclose information about wholesale contracts. It turns out that it is in the manufacturers’ best interest to exchange information about wholesale contracts: even in the deviation phase upstream firms prefer to make their contracts observable. The reason is that if contracts were not observable, the strategic effect that is beneficial to manufacturers would be absent. This result shows quite clearly the potential benefits of communication systems among competing supply chains, a feature that seems widespread in many markets. Indeed, consistently with our model, information-sharing agreements between competing supply chains, often enforced through suppliers’ trade associations, are common in several industries (see, e.g., Briley et al., 1994, Stern et al., 1996, and the references therein).

To further extend the model and sharpen its predictive value, we also introduce lack of commitment by considering the case where manufacturers can change their distribution and communication strategies at each period of the game. We find that also in this case exclusive

\[ A \text{ prominent example of a company changing its distribution regime is McDonald’s, who moved from exclusive to nonexclusive territories in 1969.} \]
territories and communication between producers make cooperative outcomes easier to sustain. In addition, if producers can change their distribution regime, they can threaten to distribute via nonexclusive territories after a deviation, thereby lowering the profit in the punishment phase and render such a deviation even less profitable than under commitment.

Finally, to build a bridge between the literature on retailers’ service provision and our repeated game approach to competition between supply chains, we consider a model where, besides setting final prices, retailers also invest into demand-enhancing services. This enriched model allows us to identify another novel effect of exclusive territories: when a manufacturer deviates by cutting its wholesale price, his retailer complements this better deal with a higher service level. This renders deviation more profitable because the deviant manufactures enjoys larger sales overall.

As a consequence, we find that collusion is now easier to sustain when manufacturers allow for intrabrand competition if problems of service provision are important enough. Otherwise, the pro-collusive effect of exclusive territories carries over. Therefore, we find that two features—competition between supply chains and service provision by retailers—that favor the use of exclusive territories in a static framework lead to novel effects in a dynamic framework that favor intrabrand competition.

The remainder of the paper is organized in the following way. Section 2 relates our contribution to the earlier literature. Section 3 sets up the baseline model. In Section 4 we characterize the equilibrium of the baseline model. Section 5 extends the baseline model to the case of endogenous disclosure of contracts, lack of commitment of the organizational mode, and imperfect intrabrand competition. In Section 6 we analyze investments in service provision by retailers, and Section 7 concludes.

2 Related Literature

The existing literature on exclusive territories, with the exception of Rey and Stiglitz (1995), focussed exclusively on the case of a monopolistic manufacturer. Mathewson and Winter (1984, 1994) were the first to show that exclusive territories can create an incentive for retailers to supply desired services—e.g., product demonstrations or non observable investments in quality. With intrabrand competition, each retailer free rides on the services provided by competitors, thereby eroding the equilibrium service level. Granting exclusive territories overcomes this free-riding problem. Drawing on Mathewson and Winter (1984, 1994), Klein and Murphy (1988) and Alexander and Reiffen (1995) give precise conditions under which a manufacturer can implement his desired service level. Iyer (1998) explores under which conditions a manufacturer optimally offers heterogeneous contracts to retailers to provide them with the right incentives to (i) invest in services and (ii) target different consumer groups. In an extension, he considers competition between manufacturers and shows, with pure interbrand competition, how this affects the
coordination between price and non-price downstream competition.\textsuperscript{7}

There are several other interesting issues that have been explored in the framework with a single manufacturer. For example, Dutta et al. (1994) compare exclusive and non-exclusive territories when bootlegging is allowed; i.e., even under exclusive territories a retailer can sell into a different geographical area. They show that the optimal intensity of bootlegging is positive and becomes stronger the more important retail services are and the longer the vertical relationship lasts.\textsuperscript{8} Desiraju (2004) analyzes the case where retailers are subject to limited liability and demand is stochastic. Therefore, the manufacturer must adapt the fixed fee to extract surplus. In this case, nonexclusive territories may be optimal despite of the free-riding problem. Chiang et al. (2003) demonstrate under which conditions it is beneficial for a manufacturer to open an own retail store in competition to the existing retailer although this may involve self-cannibalization. They show that this can even benefit the retailer if wholesale prices decrease.\textsuperscript{9}

The issue of competition between manufacturers has been analyzed in the literature dealing with strategic decentralization in supply chains. The seminal paper by McGuire and Staelin (1983) considers a model with competition between two manufacturers that charge linear wholesale prices and can distribute their products either via an independent retailer or via an integrated structure. They show that the equilibrium distribution outcome depends on the level of substitutability between the goods. In particular, both manufacturers choosing to be vertically integrated is always an equilibrium, and both choosing decentralization is also an equilibrium if products are close enough substitutes. Coughlan (1985) extends the analysis of McGuire and Staelin (1983) by allowing for general demand functions and provides evidence for the results from the semiconductor industry. Moorthy (1988) explains the intuitions for the results of McGuire and Staelin (1983) in more detail and extends the analysis to non-constant marginal costs and complementarity between products. Bonanno and Vickers (1988) consider two-part tariff wholesale contracts and show that decentralization is the unique equilibrium in this case. In contrast to our paper, these models take a static perspective and do not allow for repeated interaction.

On the empirical side, several studies have documented the main effects of exclusive territories. Using data from manufacturers of industrial machinery and electronic equipment in the United States, Dutta et al. (1999) demonstrate that the free-riding problem and the degree of upstream competition are highly significant explanatory variables of why manufacturers grant territorial exclusivity in these industries.\textsuperscript{10} Kalnins (2004) used data from the hotel industry in

\begin{itemize}
  \item Re却 and Tirole (1986) suggest a different rationale for exclusive territories, namely, that distributors may be better informed about local market conditions. If distributors compete with each other, they have no market power and therefore any superior information is lost because the uninformed manufacturer sets the retail price. With exclusivity the informed distributor sets the price, which allows for future segmentation of consumers.
  \item Nault and Tyagi (2001) consider the problem when customers in one geographical area may buy in another area but firms’ investments only affect the demand of their local consumers. They show under which conditions the optimal agreement between firms involves transfers or shared ownership.
  \item For a model that analyzes exclusive territories without the free-riding problem and compares price versus quantity competition between retailers, see Matsumura (2003).
  \item Frazier and Lassar (1996) also find for products used in business-to-business markets that distributing via exclusive territories is positively correlated to the degree of competition at the upstream level.
\end{itemize}
Texas from 1990 to 1999 to quantify the effects of exclusive territories. He found that for hotel chains that do not grant exclusive territories, adding a new hotel within the 10 closest hotels is associated with a $66 loss per room and has highly negative effects on the franchisee’s profit. Culbertson and Bradford (1991), Jordan and Jaffe (1987) and Sass and Saurman (1993, 1996) examine the effects of exclusive territories on beer prices in the United States. They find that this use leads to an increase in the wholesale and retail price of beer. In addition, they show that if manufacturers can choose between exclusive or nonexclusive territories, they predominantly use exclusive territories. Finally, Brenkers and Verboven (2006) evaluate the effects of enhanced competition between car dealers due to the removal of exclusive territories and exclusive distribution agreements in the European car market and find that car prices fall. However, they also demonstrate that after the removal, almost all car manufacturers chose a distribution system that limits the number of dealers to retain some market power with each of them in the respective geographical area. In sum, the empirical studies overwhelmingly demonstrate that exclusive territories have a large impact on retail prices and that competing manufacturers are more likely to choose this distribution system than an upstream monopolistic.

Given its dynamic perspective, our analysis also adds to the recent and growing literature on tacit collusion in vertical relationships. Nocke and White (2007) and Normann (2009) analyze whether vertical integration facilitates tacit collusion by comparing an industry with no integration to one in which one pair of firms is vertically integrated. Both these papers consider perfect Bertrand competition upstream. Nocke and White (2007) show that vertical integration facilitates tacit collusion when upstream firms compete by setting two-part tariffs. Normann (2009), instead, considers linear prices in the upstream market. He shows that even in this case similar results obtain, although collusion and deviation profits are different because of double marginalization.\footnote{For an experimental investigation of the effects of vertical mergers on final good prices when upstream firms compete for a long but finite time period, see Normann (2007).} The main effects that drive our results in the baseline model are similar to theirs. However, differently from these papers, we are concerned with exclusive territories instead of vertical integration and show that this practice facilitates collusion if and only if both manufacturers distribute via exclusive territories and not just one. In addition, in our supply chain framework, were manufacturers allowed to vertically integrate to sustain collusion, they have no incentive to do so but would prefer to distribute via exclusive territories if this is possible.

Jullien and Rey (2007) study the effects of resale price maintenance (RPM) on tacit collusion in a model with stochastic demand. They find that because of demand uncertainty, manufacturers never opt for RPM in a static context, but they do so to facilitate collusion. The reason is that RPM reduces the punishment profit and in addition, it also allows for an easier detection of deviations. Hence, the main difference between our paper and Jullien and Rey (2007) is that although the anticompetitive role of exclusive territories works through the deviation profit, in their framework RPM renders collusion easier to sustain mainly because it makes detection and punishments more effective. As for vertical integration, we show also that RPM does not improve
manufacturers ability to collude over and above nonexclusive territories in our framework.

Finally, in a model without exclusive territories but with public contracts, Schinkel et al. (2008) show that upstream collusion requires low wholesale prices and possibly negative franchise fees when the bargaining power is in the suppliers’ hand. By focusing on the polar case of buyer power, Piccolo (2010) finds similar results. There is one key difference between these two papers and ours. Whereas we are interested in the interplay between organizational and contractual strategies to sustain cooperative outcomes, they focus mainly on the optimal contracting aspect.

3 The Baseline Model

3.1 Players and Environment

Consider a game where two manufacturers, each denoted by $M_i$, $i = 1, 2$, compete by selling imperfect substitute goods (brands) through independent retailers. The downstream technology is one to one, and brand $i$’s final demand is $D_i(p_i, p_j)$, which depends on the retail price $p_i$ as well as on the retail price of the competing brand $p_j$. Manufacturers and retailers have linear cost functions with marginal costs normalized to zero. As in Rey and Stiglitz (1995), each manufacturer can organize his distribution network in two alternative manners. He can impose exclusive territories, i.e., grant his retailers exclusivity in the geographical area in which potential consumers reside. Alternatively, the manufacturer can allow for intrabrand competition by letting his retailers compete. Because in this regime dealers of one manufacturer distribute the same brand in a territory, they are in perfect Bertrand competition to each other.

3.2 Contracts and Observability

Manufacturers make take-it-or-leave-it offers to their retailers and compete by offering two-part tariffs. A contract $C_i = (w_i, T_i)$ specifies a wholesale price $w_i$ charged to all retailers distributing brand $i$ and a franchise fee $T_i$ that these must pay to $M_i$.\footnote{Two-part tariffs are the established praxis in most industries. For example, Lafontaine (1992) and Kalnins (2004) report that around 90% of business format franchising contracts consist of an up-front payment and a royalty rate on sales.} We assume that contracts are uniform within the same brand, that is, all retailers dealing with $M_i$ get the same contract. This symmetry hypothesis is without loss of generality and is imposed for arbitrage reasons as in Rey and Stiglitz (1995). It reflects the implicit assumption that resale on the downstream market prevents manufacturers from offering different wholesale trade rules to identical retailers. It also rules out non constant per-unit wholesale prices, thereby justifying our focus on two-part tariffs.

In the baseline model we assume that contracts are observable before the retail competition stage, as is done by, e.g., Rey and Stiglitz (1995) and Iyer (1998). This can be the case, for instance, because of mandatory disclosure rules.\footnote{As mentioned, these rules may help manufacturers to draw some inference on the contracts offered by rivals. Also, as Lafontaine and Shaw (1999) report, the prices in franchising contracts appear to be very stable over time.} Nevertheless, there are other industries
where producers have discretion about disclosing their contracts, like in automobile distribution. In these instances, manufacturers can make wholesale contracts public, for example, via information-sharing agreements and/or strategic alliances. In practice, syndicates and suppliers’ trade associations may facilitate the dissemination of information among competing supply chains, see, e.g. Stern et al. (1996). To capture this feature, in Section 5.1 we extend the baseline model to encompass the case where information sharing among competing supply chains is voluntary and taken at every stage of the game.

It is important to note that our results will not hinge on the assumption that franchise fees are observable, but they also hold when only wholesale prices are observable. We explain this in more detail in the next section. For consistency with the earlier literature, in the following we assume that contract observability refers to both wholesale prices and franchise fees.

3.3 Timing

Consider an infinitely repeated game with discrete time, \( \tau = 0, \ldots, +\infty \). Following Nocke and White (2007) and Jullien and Rey (2007), assume that manufacturers are infinitely lived and discount future profits at the same rate \( \delta \in (0, 1) \), whereas retailers are short-lived and thus maximize their spot profits. Our analysis extends to the arguably more realistic situation where manufacturers are not able to make long-term commitments, and retailers are too short sighted to collude at their level.

The sequence of events within the stage game unfolds as follows:

- \( T=1 \) (Contracting): Manufacturers simultaneously offer wholesale contracts. Offers are secret at this stage.
- \( T=2 \) (Acceptance): Retailers (simultaneously) decide whether to accept the received offers without knowing what offer has been made to rival retailers. In case of rejection they enjoy an outside option, which we normalize to zero for simplicity.
- \( T=3 \) (Contract disclosure): Wholesale contracts become common knowledge.
- \( T=4 \) (Competition): Retailers set prices and the market clears—i.e., final demands materialize and input orders are placed. Contract obligations are executed.

This particular timing is standard in the literature—see, e.g., Bonanno and Vickers (1988) or Rey and Stiglitz (1995). It captures those instances where information about actual contracts
can be credibly disseminated only after these offers are accepted. In practice, this communication protocol is carried out by external agencies such as trade associations through which firms usually share information about demand and costs (wholesale prices in our model).

### 3.4 Tacit Collusion

We look for stationary equilibria such that manufacturers maximize their discounted joint profits. For simplicity, we assume that manufacturers sustain tacit collusion through infinite Nash reversion, i.e., a deviation by a manufacturer is followed by an infinitely repeated play of the equilibrium of the stage game. In contrast, deviations by retailers do not trigger punishments.

As is common in the literature, we will say that exclusive territories facilitate collusion as long as they reduce the critical discount factor above which collusion can be sustained. In particular, the comparison of the different distribution regimes will be based on identifying the regime for which the largest range of discount factors are compatible with the collusive outcome.

### 3.5 Assumptions and Equilibrium Concept

The analysis will be developed under the following simplifying assumptions:

**Assumption 1** The inverse demand function for good \( i \) is 
\[
P^i(q_i, q_j) = \alpha - \beta q_i - \gamma q_j
\]
for \( i = 1, 2 \), where \( q_i \) is good \( i \)'s total output.\(^{17}\) We assume \( \alpha > 0 \) and \( \beta > \gamma \geq 0 \), so that inverting the system of inverse demand functions yields well behaved (symmetric) direct demand functions
\[
D^i(p_i, p_j) = \frac{\alpha(\beta - \gamma) - \beta p_i + \gamma p_j}{\beta^2 - \gamma^2} \quad \text{for } i = 1, 2.
\]

Linearity is often imposed in models that study repeated interaction between upstream and downstream firms; see, e.g., Schinkel et al. (2008) and Vives (2000). It helps us to make our point in the simplest possible way.

The next assumption allows us to focus on equilibria with positive sales.

**Assumption 2** Whenever indifferent between accepting a wholesale contract and opting out, retailers accept the contract and secure input supply.

The equilibrium concept that we use in solving the repeated game is subgame-perfect Nash equilibrium.\(^{17}\) This demand function can be derived from a representative consumer (or a unit mass of identical consumers) with utility function
\[
U(q_1, q_2) = \sum_{i=1}^{2} \left( \alpha q_i - \frac{1}{2} \beta q_i^2 - \gamma q_1 q_2 - \sum_{i=1}^{2} p_i q_i + M \right),
\]
where \( M \) is the utility from income. Differentiating this utility function with respect to \( q_i, i = 1, 2 \), yields the inverse demand function 
\[
P^i(q_i, q_j) = \alpha - \beta q_i - \gamma q_j.
\]
4 Equilibrium Characterization

There are three cases to analyze: (i) both manufacturers impose exclusive territories, (ii) both allow for intrabrand competition, and (iii) one manufacturer imposes exclusive territories while the other one does not. We will analyze each case in turn.

4.1 Exclusive Territories

When both manufacturers impose exclusive territories, only interbrand competition matters. Hence, the profit of a retailer distributing brand $i$ is

$$\pi_i(p_i, p_j) = D_i(p_i, p_j)(p_i - w_i) - T_i.$$  

Maximizing this function with respect to $p_i$ yields the system of first-order conditions

$$\frac{\partial D_i(p_i, p_j)}{\partial p_i}(p_i - w_i) + D_i(p_i, p_j) = 0, \quad i = 1, 2. \quad (1)$$

The solution of these equations yields the equilibrium of the retail game, i.e., the price functions $p_i(w_i, w_j)$ ($i = 1, 2$). It is evident that this equilibrium is unaffected if fixed fees are not observable to retailers because the optimal retail price depends only on own and rival wholesale prices.

We can now solve the upstream game. Using backward induction, $M_i$ maximizes the profit

$$\Pi_i(w_i, w_j) = D_i(p_i(w_i, w_j), p_j(w_j, w_i)) w_i + T_i,$$

subject to the retailer’s participation constraint

$$D_i(p_i(w_i, w_j), p_j(w_j, w_i))(p_i(w_i, w_j) - w_i) - T_i \geq 0. \quad (2)$$

Clearly, (2) is satisfied as equality at equilibrium. Hence, $M_i$ ’s optimization program is

$$\max_{w_i} D_i(p_i(w_i, w_j), p_j(w_j, w_i)) p_i(w_j, w_i).$$

The symmetric Nash equilibrium of the upstream game, $w_{ET}^N$, is then defined by the following system of first-order conditions:

$$\left(\frac{\partial D_i(.)}{\partial p_i} p_i(.) + D_i(.)\right) \frac{\partial p_i(.)}{\partial w_i} + \frac{\partial D_i(.)}{\partial p_j} \frac{\partial p_j(.)}{\partial w_i} p_i(.) = 0, \quad i = 1, 2. \quad (3)$$

The first term in (3) is the standard marginal revenue expression, i.e., each manufacturer internalizes the effect that a change in his wholesale price has on the final demand through the retail

\[18\]It is straightforward to verify that these conditions are also sufficient for an optimum with linear demands.
price, and thus on the sales profit. The second term reflects a \textit{strategic effect}: when choosing the wholesale price, each manufacturer anticipates the competing retailers’ reaction in the retail market and the resulting effect on his own product’s demand (see Rey and Stiglitz, 1995). Because prices are strategic complements, the strategic effect of an increase in $w_i$ on $M_i$’s profits is positive.

With linear demand, the equilibrium wholesale price with exclusive territories is

$$w^N_{ET} = \frac{\alpha \gamma^2 (\beta - \gamma)}{\beta (4 \beta^2 - \gamma^2 - 2 \beta \gamma)}, \quad (4)$$

which yields the manufacturer’s profit

$$\Pi^N_{ET} = \frac{\alpha^2 \beta (\beta - \gamma)(2 \beta^2 - \gamma^2)}{(\beta + \gamma)(4 \beta^2 - \gamma^2 - 2 \beta \gamma)^2}. \quad (5)$$

When the degree of differentiation between the two brands is minimal, i.e., $\gamma = \beta$, both manufacturers price at marginal costs ($w^N_{ET} = 0$) and make zero profits.

Consider now collusion. Recall that retailers always set prices according to (1) for given wholesale prices $w_i$ and $w_j$. Hence, colluding manufacturers maximize joint profits, that is,

$$\max_{(w_1, w_2)} \sum_{i=1,2, j \neq i} D^i \left( p_i (w_i, w_j), p_j (w_j, w_i) \right) p_i (w_i, w_j).$$

The wholesale prices solving this program are determined by the following system of first-order conditions:

$$\sum_{i=1,2, j \neq i} \frac{\partial D^i (.)}{\partial p_i} \frac{\partial p_i (.)}{\partial w_i} + \sum_{i=1,2, j \neq i} \frac{\partial D^i (.)}{\partial p_j} \frac{\partial p_j (.)}{\partial w_i} + \sum_{i=1,2, j \neq i} D^i (.) \frac{\partial p_i (.)}{\partial w_i} = 0, \quad i = 1, 2.$$  

With linear demands, this yields the collusive wholesale price

$$w^C_{ET} = \frac{\alpha \gamma}{2 \beta}.$$  

When the degree of differentiation between the two brands is maximal, i.e., $\gamma = 0$, the collusive wholesale price is equal to zero: each manufacturer behaves as a monopolist and extracts the whole downstream surplus by way of the fixed fee. If instead $\gamma > 0$, to induce retailers to set the monopoly price, manufacturers optimally set their wholesale prices above marginal costs because of the strategic effect. Because manufacturers are symmetric, in collusion each receives an equal share of the aggregate profit. Hence,

$$\Pi^C_{ET} = \frac{\alpha^2}{4(\beta + \gamma)}. \quad (6)$$

Finally, consider deviation. Suppose that $M_i$ is the deviant manufacturer, i.e., he offers a
wholesale price different than $w^C_{ET}$, whereas $M_j$ sticks to $w^C_{ET}$. The deviant’s maximization program is then

$$\max_{w_i} D^i (p_i (w_i, w^C_{ET}), p_j (w^C_{ET}, w_i)) p_i (w_i, w^C_{ET}),$$

which immediately yields the first-order condition

$$\left( \frac{\partial D^i \left( \cdot \right)}{\partial p_i \left( \cdot \right)} + D^i \left( \cdot \right) \right) \frac{\partial p_i \left( \cdot \right)}{\partial w_i} + \frac{\partial D^i \left( \cdot \right)}{\partial p_j \left( \cdot \right)} \frac{\partial p_j \left( \cdot \right)}{\partial w_i} = 0,$$

where the arguments of $D^i \left( \cdot \right)$, $p_i \left( \cdot \right)$ and $p_j \left( \cdot \right)$ are the same as in (7). Because contracts are observable before the retail competition stage, $M_t$ anticipates that the retailers distributing the competing brand will react immediately to his deviation, i.e., when observing an unexpected wholesale price $w_i < w^C_{ET}$, they charge a retail price $p_j (w_j, w_i)$ that is lower than $p_j (w_j, w^C_{ET})$. With linear demands, this leads to a deviation wholesale price of

$$w^D_{ET} = \frac{\alpha \gamma^2 (4\beta^2 - 2\beta \gamma - \gamma^2)}{8\beta^2 (2\beta^2 - \gamma^2)}.$$

It is straightforward to show that $w^D_{ET}$ falls short of the collusive wholesale price, i.e., $w^D_{ET} < w^C_{ET}$. This is because the deviant manufacturer gains from undercutting his competitor to maximize his sales profit. In addition, the deviant’s wholesale price exceeds the static Nash price level, $w^D_{ET} > w^N_{ET}$. This is because the wholesale price in collusion is larger than the equilibrium wholesale price of the static game, and wholesale prices are strategic complements. The deviant manufacturer gets the profit

$$\Pi^D_{ET} = \frac{\alpha^2 (4\beta^2 - 2\beta \gamma - \gamma^2)^2}{32\beta (\beta + \gamma)(\beta - \gamma)(2\beta^2 - \gamma^2)}.$$

Equipped with this characterization, we can now determine the critical discount factor $\delta_{ET}$ above which manufacturers can sustain collusion with exclusive territories. The condition that identifies this discount factor is standard: the stream of profits earned by a manufacturer in collusion must exceed the sum of profits in the deviation and punishment phase. Formally,

$$\frac{\Pi^C_{ET}}{1 - \delta} \geq \Pi^D_{ET} + \frac{\delta}{1 - \delta} \Pi^N_{ET}.$$

The value of $\delta$ that solves this self-enforceability constraint as an equality identifies the lowest critical discount factor above which manufacturers can collude with exclusive territories. Using (5), (6) and (8) we obtain

$$\delta_{ET} = \frac{(4\beta^2 - 2\beta \gamma - \gamma^2)^2}{(32\beta^3 - 12\gamma^2 \beta)(\beta - \gamma) + \gamma^4}.$$

It is easy to show that this discount factor is increasing in $\gamma$, i.e., collusion becomes more dif-
ficult to sustain when competition gets more intense (products are closer substitutes). Moreover, \( \delta_{ET} \) is also decreasing in \( \beta \), i.e., demands that are less sensible to own price variations facilitate cooperation.

4.2 Nonexclusive Territories

Suppose now that both manufacturers distribute by way of nonexclusive territories, i.e., both allow for intrabrand competition. In this case, retailers distributing the same brand are in Bertrand competition. Retail prices are equal to wholesale prices, i.e., \( p_i = w_i \) for \( i = 1, 2 \), and retailers make zero profits irrespective of the contract offered by the rival manufacturer. As a consequence, franchise fees must be zero at equilibrium, and manufacturers can make profits only by increasing wholesale prices above their marginal costs, which are assumed to be zero.

As before, we first look at the stage game that determines manufacturers’ profits along the punishment phase. \( M_i \)'s objective function is

\[
\Pi_i(w_i, w_j) = D_i(w_i, w_j) w_i, \quad i = 1, 2. \tag{10}
\]

Optimizing with respect to \( w_i \) we get

\[
\frac{\partial D_i(w_i, w_j)}{\partial w_i} w_i + D_i(w_i, w_j) = 0, \quad i = 1, 2. \tag{11}
\]

Note that, in contrast to the case where both manufacturers impose exclusive territories, with intrabrand competition there is no strategic effect. Essentially, allowing for intrabrand competition precludes retailers from adjusting their final prices to the competitors’ marginal costs. Looking for a symmetric equilibrium in wholesale prices we obtain

\[
w_{NE} = \frac{\alpha(\beta - \gamma)}{2\beta - \gamma}.
\]

As before, when brands’ differentiation is minimal (\( \gamma = \beta \)), manufacturers price at marginal costs. Inserting the equilibrium wholesale price \( w_{NE}^N \) into the profit function (10) yields the punishment profit

\[
\Pi_{NE}^N = \frac{\alpha^2\beta(\beta - \gamma)}{(\beta + \gamma)(2\beta - \gamma)^2}, \tag{12}
\]

where, of course, \( \Pi_{NE}^N = 0 \) for \( \gamma = \beta \).

Consider now collusion. It is straightforward to show that the collusive wholesale price is now \( w_{NE}^C = \alpha/2 \). Manufacturers’ collusive profit is then

\[
\Pi_{NE}^C = \frac{\alpha^2}{4(\beta + \gamma)}.
\]

Note that collusive profits are the same with exclusive and nonexclusive territories, although
wholesale prices differ between the two regimes. This is because when both manufacturers allow for intrabrand competition, they choose the retail price directly. Differently, when both impose exclusive territories, the wholesale prices are set in such a way to induce retailers to charge the same equilibrium retail price as with nonexclusive territories. Hence, the total ‘pie’ that manufacturers split does not change.

Turning to the deviation profits, the same logic developed above allows us to calculate the deviation wholesale price and profit. Suppose that $M_i$ is the deviant manufacturer. His optimization program then writes as

$$\max_{w_i} D_i^d(w_i, w^C_{NE}) w_i,$$

whose first-order condition is

$$\frac{\partial D_i^d(w_i, w^C_{NE})}{\partial w_i} w_i + D_i^d(w_i, w^C_{NE}) = 0.$$

With linear demands, we then get

$$w^D_{NE} = \frac{\alpha(2\beta - \gamma)}{4\beta}$$

and

$$\Pi^D_{NE} = \frac{\alpha^2(2\beta - \gamma)^2}{16\beta(\beta - \gamma)(\beta + \gamma)}.$$ (13)

The lowest discount factor above which manufacturers collude $\delta_{NE}$ is identified by the indifference condition

$$\frac{\Pi^C_{NE}}{1 - \delta} = \Pi^D_{NE} + \delta \Pi^N_{NE},$$

whose solution is

$$\delta_{NE} = \frac{(2\beta - \gamma)^2}{8\beta(\beta - \gamma) + \gamma^2}.$$

As before, also this critical value increases when competition becomes more intense, as reflected by a larger $\gamma$, and decreases when demand becomes less sensible to own prices, as implied by a larger $\beta$.

### 4.3 Asymmetric Distribution Channels

Suppose now that manufacturers have different distribution modes; e.g., $M_i$ imposes exclusive territories, whereas $M_j$ allows for intrabrand competition. In this case, the retailers dealing with $M_j$ set retail prices equal to marginal costs as they face intrabrand competition, i.e., $p_j = w_j$. Differently, those distributing brand $i$ face only interbrand competition and adjust their final prices to the rivals’ marginal costs. With linear demands, it is immediate to check that this yields a best-reply function of

$$p_i(w_i, w_j) = \frac{\alpha(\beta - \gamma) + \beta w_i + \gamma w_j}{2\beta}.$$
A simple backward induction argument allows us to show that the manufacturer imposing exclusive territories sets a wholesale price equal to his marginal costs \((w_i = 0)\) to maximize his retailers’ profits and then fully extract this surplus through the fixed fee \(T_i\). Differently, the manufacturer distributing via nonexclusive territories must charge a wholesale price above his marginal costs to make profits. His optimal wholesale price is given by

\[
w_j = \frac{\alpha(2\beta^2 - \beta\gamma - \gamma^2)}{2(2\beta^2 - \gamma^2)}.\]

Upstream profits are then

\[
\Pi_i = \Pi_{ET,NE}^{N} = \frac{\alpha^2(2\beta + \gamma)^2(\beta - \gamma)}{8\beta(\beta + \gamma)(2\beta^2 + \gamma^2)},
\]

and

\[
\Pi_j = \Pi_{NE,ET}^{N} = \frac{\alpha^2(\beta - \gamma)(4\beta^2 - 2\beta\gamma - \gamma^2)^2}{16\beta(\beta + \gamma)(2\beta^2 + \gamma^2)},
\]

with \(\Pi_{ET,NE}^{N} = \Pi_{NE,ET}^{N} = 0\) for \(\gamma = \beta\).

Next, consider collusion. Because the distribution networks are asymmetric, we assume that manufacturers share the ‘collusive pie’ to minimize the incentives to deviate. Let \(x\) be \(M_i\)’s share of the manufacturers’ joint profits. It is straightforward to verify that the collusive wholesale prices are \(w_i^C = \alpha\gamma/(2\beta)\) and \(w_j^C = \alpha/2\). Hence, manufacturers’ profits in collusion are

\[
\Pi_i^C = \Pi_{ET,NE}^{C} (x) = \frac{x\alpha^2}{2(\beta + \gamma)} \quad \text{and} \quad \Pi_j^C = \Pi_{NE,ET}^{C} (x) = \frac{(1-x)\alpha^2}{2(\beta + \gamma)}.
\]

Finally, consider deviation. Following the logic developed above, the deviation wholesale prices are given by

\[
w_i = w_{ET,NE}^{D} = 0 \quad \text{and} \quad w_j = w_{NE,ET}^{D} = \frac{\alpha(4\beta^2 - 2\beta\gamma - \gamma^2)}{4(2\beta^2 - \gamma^2)},
\]

which yields that manufacturers’ profits in deviation are

\[
\Pi_{ET,NE}^{D} = \max_{w_i} D'(p_i(w_i, w_j^C), w_j^C)p_i(w_i, w_j^C) = \frac{\alpha^2(2\beta - \gamma)^2}{16\beta(\beta - \gamma)(\beta + \gamma)},
\]

and

\[
\Pi_{NE,ET}^{D} = \max_{w_j} D'(w_j, p_i(w_i^C, w_j))w_j = \frac{\alpha^2(4\beta^2 - 2\beta\gamma - \gamma^2)^2}{32\beta(\beta - \gamma)(\beta + \gamma)(2\beta^2 - \gamma^2)}.
\]

In the asymmetric case under consideration there are two different self-enforceability constraints, one for each manufacturer depending on the share \(x\). This asymmetry leads to two critical discount factors, which can be determined with the standard procedure described above. Because manufacturers share the collusive pie potentially unevenly, these discount factors will
be functions of the sharing rule \( x \). Formally, 
\[
\delta \geq \hat{\delta}_i(x) \equiv \frac{\Pi^D_{\text{ET,NE}} - \Pi^C_{\text{ET,NE}}(x)}{\Pi^D_{\text{ET,NE}} - \Pi^N_{\text{ET,NE}}}
\]
and
\[
\delta \geq \hat{\delta}_j(x) \equiv \frac{\Pi^D_{\text{NE,ET}} - \Pi^C_{\text{NE,ET}}(x)}{\Pi^D_{\text{NE,ET}} - \Pi^N_{\text{NE,ET}}}.
\]

Because our objective is to determine the largest range of discount factors compatible with collusion, it is natural to pick \( x \) so as to minimize the maximum between these discount factors, i.e.,
\[
x \in \arg \min_{x' \in [0,1]} \left\{ \max \{ \hat{\delta}_i(x'), \hat{\delta}_j(x') \} \right\}.
\]
The unique solution of this program is obtained by equalizing \( \hat{\delta}_i(x) \) and \( \hat{\delta}_j(x) \), which gives us
\[
\hat{\delta}_{AS} = \frac{(2\beta^2 - \gamma^2)(8\beta^2 - 4\beta\gamma - \gamma^2)}{32\beta^4 - 16\beta^3\gamma - 24\beta^2\gamma^2 + 8\gamma^3\beta + 3\gamma^4}.
\]

For every discount factor above this threshold, collusion is viable with asymmetric distribution networks.

4.4 The Collusive Effect of Exclusive Territories

We can now provide the first result of this paper by ranking the critical discount factors obtained above.

**Proposition 1** Exclusive territories facilitate collusion if and only if both manufacturers distribute via this organizational mode; i.e., \( \hat{\delta}_{\text{ET}} < \hat{\delta}_{\text{NE}} < \hat{\delta}_{\text{AS}} \).

**Proof:** See the Appendix.

Distributing via exclusive territories has two opposing effects on collusion. On the one hand, the stage-game profit is larger when both manufacturers impose exclusive territories. This effect hinges on the genuine incentive of manufacturers to raise wholesale prices above marginal costs in the stage game with exclusive territories. This strategic effect was emphasized in the first-order condition (3). Combining (1) with (3), the strategic effect can be written as
\[
- \frac{\partial D}{\partial p_i} \left( p_i(w^N_{\text{ET}}, w^N_{\text{ET}}), p_j(w^N_{\text{ET}}, w^N_{\text{ET}}) \right) \frac{\partial p_i}{\partial w_i} (w^N_{\text{ET}}, w^N_{\text{ET}}) w^N_{\text{ET}}.
\]
(14)
The larger is this term, the less harsh is the punishment with exclusive territories.

On the other hand—because contracts are observable—when both manufacturers distribute via exclusive territories, retailers can spot and react to a deviation in the very same time period in which such an unexpected offer is made. When a manufacturer undercuts his rival by charging
a wholesale price that is lower than expected, the retailers distributing the rival’s brand reduce their final prices, thereby stifling the deviation gain of the former manufacturer. The extent of this reaction on the deviant’s profits also rests on the strategic effect, i.e.,

\[- \frac{\partial D_i(p_i(w_{ET}^D, w_{ET}^C), p_j(w_{ET}^C, w_{ET}^D))}{\partial p_i} \frac{\partial p_i(w_{ET}^D, w_{ET}^C)}{\partial w_i} w_{ET}^D.\] (15)

Once again, the larger this term, the smaller the profit that a manufacturer can earn by undercutting his rival when both impose exclusive territories and the latter charges the collusive wholesale price $w_{ET}^C$.

Which of these two countervailing forces dominates? In general, it is not clear whether (15) is larger than (14). However, with linear demands—and more generally when the second-order derivatives of the demand function are small—it turns out that the latter effect is invariably stronger than the former. This is because, due to strategic complementarity, the deviation wholesale price exceeds the Nash level, i.e., $w_{ET}^D > w_{ET}^N$. Because with linear demand the slope of the demand function is constant, (15) is larger than (14).

An important prediction of our model is that exclusive territories facilitate collusion if and only if both manufacturers distribute in this manner. As long as only one manufacturer, say $M_i$, imposes exclusive territories, collusion is harder to sustain, i.e., $\delta_{AS} > \delta_{NE}$. This is because intrabrand competition prevents the retailers dealing with $M_j$ to react on $M_i$’s deviation. Hence, because only the effect of reduced punishment survives in this case, $M_i$’s incentive to undercut his competitor is stronger than in the case where both manufacturers allow for intrabrand competition. This result differs from the ones obtained in the vertical restraints literature. For instance, in Nocke and White (2007), a single vertical merger suffices to facilitate collusion because its main procollusive force is to reduce the deviation profits of non integrated firms. However, as Nocke and White (2007) show, multiple mergers do not necessarily do so.

4.5 Endogenous Distribution Modes

So far we have treated each manufacturer’s distribution mode as an exogenous feature of the environment. In this subsection we extend the analysis by allowing each manufacturer to make this choice. Suppose that at the outset of the game, manufacturers simultaneously and independently choose their distribution channels. And, for the sake of crispness, assume for the moment that these decisions are made once and for all. This feature reflects the idea that distribution systems are not easy to change in practice. For example, Azoulay and Shane (2001) note that in the franchising industry transaction costs of changing the contracts are very large because of mandatory registration and material change laws.

Denote by $\mathcal{G}$ the extended game with the commitment stage. The next proposition shows that manufacturers indeed choose exclusive territories to sustain collusion whenever possible.

**Proposition 2** With public contracts, game $\mathcal{G}$ has the following properties:
• For $\delta < \delta_{ET}$, there exists a unique equilibrium where both manufacturers impose exclusive territories but do not collude.

• For $\delta_{ET} \leq \delta < \delta_{NE}$, there exists a unique equilibrium where both manufacturers impose exclusive territories and collude.

• For $\delta_{NE} \leq \delta < \delta_{AS}$, there are two payoff-equivalent symmetric equilibria, one where both manufacturers impose exclusive territories and another where they both allow for intrabrand competition. In each equilibrium, collusion is sustained.

• For $\delta \geq \delta_{AS}$, there exists a unique equilibrium where both manufacturers impose exclusive territories and collude.

**Proof:** See the Appendix.

It should be noted that for $\delta \geq \delta_{AS}$ there is a unique equilibrium where both manufacturers impose exclusive territories and collude even if, in this region of parameters, cooperation would be viable with one or both manufacturers allowing for intrabrand competition. This is because, when one manufacturer imposes exclusive territories but the other does not, the former receives a larger fraction of the collusive profit because he has a larger incentive to deviate. Hence, for each manufacturer it is strictly dominant to impose exclusive territories. This result is in line with Nocke and White (2007), who note that the distribution of the collusive profit is often asymmetric if upstream firms are asymmetric as well.

As a consequence, a distinctive feature of our model, which we show by going through the entire normal form of the game, is that in equilibrium indeed both manufacturers choose to distribute via exclusive territories for collusive purposes. This prediction appears to fit with the empirical evidence provided by Kalnins (2004), who found that in 1998 in Texas several hotel chains began to grant territorial exclusivity to its franchisees at the same time.

### 4.6 Other Vertical Restraints

As mentioned above, previous papers showed that other vertical restraints, like vertical integration or RPM, can foster collusion in different setups (for vertical integration, see Nocke and White, 2007, and Normann, 2009, for RPM, see Jullien and Rey, 2007). It is therefore important to note, that in our supply chains framework, neither of these two restraints facilitates collusion relative to intrabrand competition. The intuition is as follows: under vertical integration, the retail unit of a supply chain belongs to the manufacturer. Therefore, manufacturers compete directly in the retail market, which implies that a cheating manufacturer deviates by lowering the final consumer price. But this means that the rival manufacturer cannot react on this deviation in the very same period. Hence, the deviation profit cannot be diminished compared to

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19 For a more detailed analysis, see the supplementary appendix of the working paper version of this paper (Piccolo and Reisinger 2011).
the case of nonexclusive territories. In addition, because there is only one layer of competition, there is no strategic effect whatsoever, implying that also the punishment profit is the same with vertical integration and with nonexclusive territories.\textsuperscript{20} In contrast to vertical integration, RPM eliminates competition not at the wholesale but at the retail level. However, the consequence is that again an instantaneous reaction to a deviation is not feasible which implies that vertical price fixing cannot help making collusion easier to sustain relative to nonexclusive territories.

5 Extensions of the Baseline Model

Up until now, the baseline model has been developed under the hypotheses that (i) contracts are observable, (ii) manufacturers are committed to the distribution mode, and (iii) intrabrand competition is perfect. In this section we extend the model to allow for these possibilities. The objective is to show that the main insights do not change, first, when manufacturers voluntarily decide whether to share information about wholesale contracts and, second, when, in addition, they can change the distribution mode every period. Moreover, we also demonstrate that our results are reinforced when intrabrand competition is not perfect.

5.1 Endogenous Contract Disclosure

We first study the case of endogenous contract disclosure, that is, the management of a supply chain decides whether to make wholesale contracts observable to third parties, e.g., by joining a trade association (see Briley et al. 1994). To account for this possibility, we extend the baseline model by allowing manufacturers to choose at each stage of the game between making contracts observable or keeping them secret. If a manufacturer decides to keep his contract secret, the contract cannot be observed by the retailers distributing the competing brand. In this case we assume, in line with the earlier literature (e.g., Hart and Tirole 1990, Katz 1991, McAfee and Schwartz 1994, White 2007), that the equilibrium concept is perfect Bayesian Equilibrium (PBE) with the added passive beliefs refinement: when a retailer is offered a contract different from the one he expects in a candidate equilibrium, he does not revise his beliefs about the contract offered to the rival retailers. It should be noted that although contracts are not observable, a manufacturer can infer if his rival deviated from collusion because he observes the input order of his retailers in each period.

For obvious reasons, we assume that when manufacturers decide to communicate, it must be feasible for them to credibly disclose their contracts to rivals—i.e., if disclosed, contracts are hard information.\textsuperscript{21} This assumption has been made in the information-sharing literature,\textsuperscript{22} and it

\textsuperscript{20}The absence of the strategic effect was also demonstrated by Bonanno and Vickers (1998) in a static model. They show that because of this effect firms have an incentive to stay unintegrated.

\textsuperscript{21}Hard information is quantitative and easy to store and transmit in impersonal ways, and its content is independent of the collection process. In this sense, a legal contract indicating the wholesale price and franchise fee can be interpreted as hard information.

\textsuperscript{22}See, e.g., Gal-Or (1985) and Raith (1996) for information sharing in oligopoly or Jappelli and Pagano (1993)
seems reasonable in all circumstances where, to be legally binding, contracts need to be recorded in a ‘public registry’ or require legal certifications. The following result then obtains:

**Proposition 3** With endogenous contract disclosure, manufacturers make their contracts observable to third parties in equilibrium, and the critical discount factors are the same as those characterized in Proposition 1. Hence, exclusive territories facilitate collusion.

A manufacturer always gains by making his contract observable if he distributes via exclusive territories. If he decides not to disclose, downstream prices of rival retailers are unaffected by unobserved changes in his input prices. Hence, the manufacturer acts as if he was integrated with his retailers and faces a given residual downstream demand. Profit maximization then involves setting the input price equal to the manufacturers’ marginal cost. As a consequence, the strategic effect that allows a manufacturer to influence the behavior of rival retailers is only at work with observable contracts. Differently, when manufacturers allow for intrabrand competition, they are indifferent between disclosing or not because retailers always price at wholesale prices. Summing up, if manufacturers have the choice between information sharing or not, they decide to make their contracts observable under exclusive territories to be able to sustain cooperative outcomes for a larger range of parameters.

5.2 Lack of Commitment

So far, we assumed that the distribution mode of each supply chain is chosen once and for all at the outset of the game. This hypothesis seems natural when the transaction costs associated with changes in the form of distribution networks are very large. However, when such costs are relatively small, the distribution channel of each manufacturer is endogenous and results as the equilibrium outcome of a game where upstream firms decide their organizational strategies along with their wholesale contracts at each stage of the game. To account for this possibility, we now extend the game by allowing manufacturers to decide about their distribution modes each period.

Manufacturers’ actions have three components at each stage, i.e., (i) a distribution mode (exclusive versus nonexclusive territories), (ii) a disclosure decision (public versus private contracting), and (iii) a wholesale contract. We obtain the following result:

**Proposition 4** If manufacturers can change their mode of distribution in every period, manufacturers collude via exclusive territories, and the range of discount factors for which collusion is viable is larger than in case of commitment to the distribution mode.

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23The proofs of this and all following results can be found in the supplementary appendix of the working paper version of this paper (Piccolo and Reisinger 2011).

24As observed by McAfee and Schwartz (1994), this result is quite general: it does not hinge on the nature of downstream production (fixed versus variable proportions) or of downstream competition (strategic substitutes or strategic complements).
The intuition is as follows. By imposing exclusive territories, a manufacturer enables his retailers to react to an unexpected offer by the rival manufacturer in the period where such an offer is observed. Hence, with exclusive territories, the deviation profit is the lowest among all distribution modes. Thus, manufacturers choose to sustain tacit collusion via exclusive territories.

In addition, with lack of commitment, the stage game has two symmetric equilibria. The first type of equilibrium is such that both manufacturers choose exclusive territories and make their contracts observable to third parties. The second type of equilibrium is such that both manufacturers choose nonexclusive territories and either disclose or not disclose their contracts. Clearly, in the latter type of equilibrium manufacturers obtain lower profits than in the former. However, the latter combination is an equilibrium, because, given that \( M_j \) chooses nonexclusive territories, the profit of \( M_i \) is the same independent of his regime choice. This is because, due to intrabrand competition, retailers dealing with \( M_j \) have no discretion in setting prices and always set \( p_j = w_j \). Thus, \( M_i \) is indifferent between the distribution regimes and finds it optimal to distribute via non-exclusive territories, thereby rendering the choice of \( M_j \) to also distribute via nonexclusive territories optimal. The implication for the infinitely repeated game is then that the critical discount factor is minimized if this equilibrium is played as a punishment in the periods after a deviation.

As a consequence, we obtain that exclusive territories facilitate collusion in the extreme cases when manufacturers are committed to the organizational mode and when they can change it at no cost. But this implies that even in less extreme cases, i.e., when changing the organizational mode involves finite costs or it can only be changed every \( t > 1 \) periods, the result also applies.

5.3 Imperfect Intrabrand Competition

In this section we show that the qualitative insights of the baseline model survive, and are even strengthened, in the case of imperfect intrabrand competition. To this purpose, we consider the simplest case in which each manufacturer can either allow for intrabrand competition between two retailers selling differentiated products or grant territorial exclusivity to only one of them. So whereas under exclusivity a manufacturer is selling only one product, under nonexclusivity he sells two different products via his retailers. Hence, ceteris paribus, the total demand of a manufacturer’s good expands under nonexclusive territories relative to the exclusivity regime.\(^{25}\)

Naturally, the products of the two retailers distributing the same brand are less differentiated than the products of the competing brand. This can expressed in the following way. If both manufacturers distribute by way of nonexclusive territories, the inverse demand function of

\(^{25}\)For example, this is meant to capture a situation in which retailers of the same brand are located at different geographical points in the market. To see this, consider the market for soft drinks or hotels. In the first case, a soft drink producer sells more bottles via two retailers located at different points of a street than with only one, whereas in the second case a hotel franchisor gets more customers with two hotels in a neighborhood than with only one.
retailer 1 distributing manufacturer $i$’s product is

$$D^{i1}(q_{i1}, q_{i2}, q_{j1}, q_{j2}) = \alpha - \beta q_{i1} - \sigma \beta q_{i2} - \gamma (q_{j1} + q_{j2}),$$

with $\sigma \in [\gamma/\beta, 1]$. Here $q_{i1}$ and $q_{i2}$ are the quantities of the two retailers of manufacturer $i$, whereas $q_{j1}$ and $q_{j2}$ are those of the retailers of manufacturer $j$. The parameter $\sigma$ measures the degree of differentiation between two retailers distributing the same brand. If $\sigma = 1$, we are back to the previous analysis with perfect intrabrand competition. Assuming $\sigma \geq \gamma/\beta$ ensures that the products of retailers of the same brands are closer substitutes than those of competing brands. Again we will look for the distribution mode that allows manufacturers to sustain collusion for the largest range of discount factors.

There is one main difference between this framework and the one analyzed above. Of course, under exclusive territories nothing changes because each brand is sold by only one retailer. However, with imperfect intrabrand competition, the profits of manufacturers in collusion, deviation and punishment under nonexclusive territories scale up relative to the case of perfect competition between retailers of the same brand. This is because allowing for intrabrand competition now has a demand-enhancing effect. Hence, whereas the critical discount factor does not change with exclusive territories and is still equal to $\delta_{ET}$, the one with nonexclusive territories, denote it by $\hat{\delta}_{NE}$, is different to the one obtained under perfect intrabrand competition. In principle, the effect of this difference on collusion is not obvious. However, the next proposition shows that in the linear setup at hand the result is clear-cut.

**Proposition 5** Exclusive territories facilitate collusion even with imperfect intrabrand competition, i.e., $\delta_{ET} < \hat{\delta}_{NE}$. Moreover, the procollusive effect of exclusive territories becomes larger the less intense intrabrand competition is; i.e., the difference $\hat{\delta}_{NE} - \delta_{ET}$ expands as $\sigma$ becomes smaller.\(^{26}\)

The economic intuition for why the procollusive effect of exclusive territories becomes larger when intrabrand competition becomes less intense hinges on the effect that a change in $\sigma$ has on $\hat{\delta}_{NE}$ and is as follows. Collusion, deviation, and punishment profits are higher for lower values of $\sigma$. However, the gain from deviation is particularly large because a deviating manufacturer can now gain on two products. As a consequence, the sum of the increase in the deviation and punishment profit overturns the increase in the collusive profit in our linear framework.

This also explains why exclusive territories facilitate collusion even with imperfect intrabrand competition. In addition to the instantaneous reaction effect described above, distributing via exclusive territories now also reduces the temptation of a manufacturer to deviate simply because by cutting his wholesale price he can gain via larger sales of only one retailer and not of both as under intrabrand competition. In summary, exclusive territories provide a commitment device for manufacturers to keep the deviation profit low enough to render collusion sustainable.

\(^{26}\)For the sake of simplicity we do not consider the case of asymmetric distribution regimes. However, it is possible to show that $\hat{\delta}_{ET}$ is also smaller than the discount factor obtained with an asymmetric distribution regime.
Finally, it should be noted that with imperfect intrabrand competition collusive profits under nonexclusive territories are higher than under exclusivity. Hence, the comparison of discount factors is not made for equal profits. For simplicity, we do not address the issue of endogenous distribution modes here—an analysis that would be cumbersome because of the multiplicity of cases to analyze (see Normann 2009 for a similar approach). In summary, the prediction of our result is that there exists a range of discount factor in which manufacturers imposing exclusive territories are in collusion, whereas those who allow for intrabrand competition are not.

6 Service Incentives

So far we neglected investment problems on the retailers’ side. However, the provision of the right incentives to invest into promotional services or spend advertising effort is an important issue in several markets. In the existing literature the standard explanation for territorial exclusivity is indeed to avoid the well-known free-riding problem between retailers whose investment into services would be eroded under intrabrand competition. The goal of this section is to analyze the interplay between these incentives and the economic forces highlighted in the previous analysis. To the best of our knowledge, this analysis is the first to combine both upstream competition and downstream service investment in a model of exclusive territories.

We incorporate service provision by retailers in a natural way. In the last stage of our game, retailers now not only set final prices but also provide costly demand-enhancing effort. In particular, denote the sum of efforts of manufacturer $i$’s retailers by $e_i$. Then, the inverse demand function can be written as $P^i(q_i, q_j, e_i) = \alpha + e_i - \beta q_i - \gamma q_j$, $i, j = 1, 2$, $i \neq j$. Inverting this system one obtains the following direct demand functions

$$D^i(q_i, q_j, e_i, e_j) = \frac{\alpha(\beta - \gamma) + \beta e_i - \gamma e_j - \beta p_i + \gamma p_j}{\beta^2 - \gamma^2} \text{ for } i = 1, 2.$$  

Effort costs of a retailer $\ell$ dealing with manufacturer $i$ who sets an effort level of $e_{\ell i}$ are $C(e_{\ell i}) = (k/2)e_{\ell i}^2$. Such a quadratic cost function is common in previous research (see, e.g., Mussa and Rosen 1978, Iyer 1998). Nevertheless, the insights of the analysis are valid for any increasing and strictly convex cost function. Here, $k$ measures how costly it is to provide effort relative to the demand expansion, and it can be interpreted as the importance of service provision. For example, if $k \to \infty$, effort provision plays no role, which implies that $e_i = 0$. We are then back in our baseline model. Thus, this new analysis includes our baseline model as a special case.

Finally, to guarantee interior solutions, we impose that the cost function is convex enough so that a finite level of effort is optimal for retailers:

$$k \geq \frac{4\beta^2 - \gamma^2 + \sqrt{\gamma^2(8\beta^2 + \gamma^2)}}{8\beta(\beta^2 - \gamma^2)} \equiv \bar{k} > 0. \quad (16)$$

This guarantees that second-order conditions of the retailers’ and manufacturers’ maximization
problems are satisfied.

Two main effects will drive our results. One effect is straightforward and it implies that collusive profits are higher with exclusive territories simply because in this regime retailers provide positive effort. This clearly goes in the direction of making collusion easier to sustain when preventing intrabrand competition. On the other hand, in this enriched framework the instantaneous reaction effect becomes more complex because retailers not only change their pricing decisions as a response to a deviation, but they also change their effort levels. In particular, following a price cut the retailer of a deviant manufacturer increases its effort, thereby raising the gain from deviation under exclusive territories. The following result shows that the parameter $k$ shapes the trade-off between these effects:

**Proposition 6** There exists a threshold $k_1 > \bar{k}$, such that

- for $k > k_1$, collusion is easiest to sustain if both manufacturers distribute by way of exclusive territories, that is, $\tilde{\delta}_{ET}$ is smaller than $\tilde{\delta}_{NE}$ and $\tilde{\delta}_{AS}$;
- for $k < k_1$, collusion is easiest to sustain if both manufacturers distribute by way of nonexclusive territories, that is, $\tilde{\delta}_{NE}$ is smaller than $\tilde{\delta}_{ET}$ and $\tilde{\delta}_{AS}$.

The result shows that if service problems are important enough, i.e., $k < k_1$, collusion is easier to sustain if manufacturers allow for intrabrand competition. The reason is that, with exclusive territories, a deviation of one manufacturer makes it more profitable for his retailers to invest into services. This is the case because the retailers face a lower wholesale price and, therefore, benefit to a larger extent from an enhanced demand. But, because effort levels of competing retailers are strategic substitutes, the retailer of the nondeviating manufacturer optimally reduces its effort level. As a consequence, a deviation becomes very profitable if investment in services is important enough. By contrast, if manufacturers distribute through nonexclusive territories, retailers spend no effort because of the free-riding problem. Thus, the critical discount factor remains unchanged. So we find that if effort provision by retailers is very important, the effect that retailers of a deviating manufacturer provide higher effort dominates, thereby making nonexclusive territories a more suitable mode for collusion purposes.

In summary, combining the analysis of manufacturer competition with retailers’ service investments allows us to identify a novel effect that has not been identified in the literature so far: retailers of a deviating manufacturer have stronger incentives to provide demand-enhancing services, thereby making deviation more profitable. In this respect, our analysis demonstrates that whereas in a static context exclusive territories raise manufacturers’ profits both via the strategic effect and the removal of the free-riding problem, in a dynamic game the interplay between these two effects generates a novel force that favors nonexclusive territories.
7 Conclusion

We analyzed the use of exclusive territories in a model of repeated interaction between competing manufacturers. Our results show that there is a genuine tension between static and dynamic incentives that shapes manufacturers’ scope for limiting intrabrand competition. Although in the static analysis manufacturers unambiguously benefit from exclusive territories, because this allows retailers to price above marginal costs, in a repeated framework this effect makes collusion more difficult to sustain because it increases profits in the punishment phase. Nevertheless, with repeated interaction, a countervailing effect through deviation profits comes into play that tends to make cooperative outcomes easier to sustain with exclusive territories. When both manufacturers prevent intrabrand competition, retailers adapt their pricing decisions to the wholesale contract offered by the competing manufacturer. This ‘instantaneous reaction’ mechanism facilitates collusion with exclusive territories because it stifles manufacturers’ (spot) gains from deviation. With linear demands, it turns out that the latter effect completely offsets the former, thereby making exclusive territories the more suitable organizational mode to sustain cooperative outcomes. This result is robust to extensions concerning the disclosure and commitment rules. Moreover, it gets strengthened with imperfect intrabrand competition because manufacturers can commit to selling only through one retailer, and this attenuates their gains from deviation.

Finally, we extend the our analysis to allow for retailers’ investments into demand enhancing services. Here we show that a new effect emerges under exclusive territories which is that the retailers of a deviating manufacturer have higher investment incentives. As a result, we obtain that if service investments are important enough, this new effect can dominate the instantaneous reaction effect. Interestingly, this latter analysis shows that although manufacturer competition and retailer investments favor the use of exclusive territories in a static context, they bring about a novel force in a dynamic context that favors the use of intrabrand competition.

The paper provides novel implications on the benefits of vertical restraints in supply chains: First, the procollusive effect of exclusive territories emerges only if all manufacturers distribute via this mode. Second, vertical integration as well as vertical price control do not facilitate collusion over and above intrabrand competition. Finally, the procollusive effect of exclusive territories can be undermined in a model where retailers also invest into demand-enhancing services if the provision of these services is important enough.

Our results have implications both for supply chain managers and for policy makers. For supply chain managers, one of our most interesting results is that exclusive territories make it easier to sustain cooperative outcomes in competition between rival supply chains. This result applies because retailers have discretion over their final good prices, which gives them the power to react instantaneously to deviations by competing supply chains. Moreover, it is important for supply chain managers to note that other instruments like vertical integration or vertical price controls cannot achieve this goal and therefore have no bite in facilitating collusion. In addition, we show that the procollusive effect works only if rival supply chains also compete by way of

26
exclusive territories. Therefore, the implication for a supply chain manager is that it can be profitable to change the distribution system to exclusive territories if rival chains have done so as well to sustain cooperation, a result in line with the evidence found in Kalnins (2004).

It is also of importance for the manager of a supply chain to understand that the above-mentioned instantaneous reaction effect only works if there is some form of information sharing agreement with rivals. However, pure information-sharing alone is not beneficial to supply chains if they do not give retailers the freedom to select the downstream prices. Only contract disclosure coupled with territorial exclusivity helps to sustain cooperative outcomes between supply chains.

Finally, supply chain managers must be aware of the effect that service provision by retailers may undermine this procollusive force of exclusive territories. This is the case because retailers of a deviating manufacturer increase their service investments because of the lower wholesale price, thereby rendering a deviation more profitable. Thus, although exclusive territories lead to a larger investment level than intrabrand competition, they may hinder collusion if service provision is important enough.

Our results are also of interest from an antitrust perspective. As argued in the introduction, dynamic considerations are very likely to be of strong relevance in several industries in which manufacturers engage in exclusive territories. Therefore, it is of importance for antitrust authorities if exclusive territories are pro- or anticompetitive. In particular, this is the case because exclusive territories are treated differently in the United States and in Europe, and also the treatment in the United States had undergone several changes. For example, in the 1970s exclusive territories were illegal per se in the United States but in 1977 the Supreme Court overruled this decision and they are currently viewed under a rule-of-reason principle.27 To the contrary, the European Commission consistently opposed the praxis of exclusive territories. Our paper shows that because of the ‘instantaneous reaction’ mechanism, exclusive territories may facilitate tacit collusion between manufacturers and are therefore likely to be anticompetitive if manufacturers compete repeatedly. Our analysis also shows that from a collusive point of view, exclusive territories should be viewed more suspiciously than other vertical restraints, like RPM, that are also illegal in many countries.28

An assumption we made throughout the analysis is that cheated upstream firms punish deviations with infinite Nash reversion. This begs the question of whether the procollusive effect of exclusive territories would still hold when optimal punishment is in place.29 One can easily argue that this is the case in the context of our model, because were manufacturers able to punish

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28 For example, in Europe RPM is generally illegal. In the U.S. the Supreme Court has recently struck down a law that would prohibit RPM completely and instead concluded that RPM should be judged on a case-by-case basis.
29 Characterizing optimal penal codes is somewhat tricky in models with differentiated products—see, e.g., Wernerfelt (1989) or Håckner (1996)—because manufacturers receive positive profits even in the punishment phase since prices cannot be negative. Thus, determining the punishment profit involves the calculation of the optimal punishment length which is usually not possible in closed form.
deviations according to an optimal penal code, the difference between the punishment profits with and without exclusive territories would shrink because optimal punishment involves returning to collusion after some time. However, the instantaneous reaction of competing retailers after a deviation is still possible only under exclusive territories. So this effect becomes relatively stronger under optimal penal codes, thereby unambiguously increasing the procollusive value of exclusive territories.\textsuperscript{30} We also supposed that retailers are short-lived, i.e., they are basically passive in the repeated interaction not only with their competitors but also vis-à-vis manufacturers. This assumption is standard and has been made in the earlier literature dealing with related issues (see, e.g., Jullien and Rey 2007, Schinkel et al. 2008). In future research we hope to extend our analysis of collusion between competing supply chains so as to relax this hypothesis.

\textsuperscript{30}We thank Patrick Rey for pointing this out to us.
Appendix

Proof of Proposition 1. Using the expressions for the discount factors, we have

$$
\hat{\delta}_{ET} - \hat{\delta}_{NE} = -\frac{4\beta^3\gamma^4(\beta - \gamma)(4\beta - 3\gamma)}{(8\beta(\beta - \gamma) + \gamma^2)((32\beta - 12\beta^2\gamma^2)(\beta - \gamma) + \gamma^4)},
$$

and

$$
\hat{\delta}_{NE} - \hat{\delta}_{AS} = -\frac{2\gamma^3(\beta - \gamma)(4\beta^2 - \beta\gamma - \gamma^2)}{(8\beta(\beta - \gamma) + \gamma^2)(32\beta^4 - 16\beta^3\gamma - 24\beta^2\gamma^2 + 8\beta\gamma^3 + 3\gamma^4)}.
$$

It is immediate to verify that \( \hat{\delta}_{ET} < \hat{\delta}_{NE} < \hat{\delta}_{AS} \). Hence, there is a range of \( \delta \) in which collusion can be sustained if both manufacturers impose exclusive territories, but not if one or both allow for intrabrand competition.

Proof of Proposition 2. Consider first \( \delta < \hat{\delta}_{ET} \). In this range collusion can never be sustained. Hence, each manufacturer chooses the distribution mode that yields the largest stage-game profit (given the rival’s distribution mode). Because \( \Pi^N_{ET} > \Pi^N_{NE,ET} \) and \( \Pi^N_{ET,NE} > \Pi^N_{NE} \), it is a dominant action for each manufacturer to impose exclusive territories.

Next, suppose that \( \delta \in (\hat{\delta}_{ET}, \hat{\delta}_{NE}) \). In this range collusion can be sustained only when both manufacturers impose exclusive territories. No manufacturer wants to deviate from this strategy because \( \Pi^C_{ET} > \Pi^N_{NE,ET} \). Moreover, because \( \Pi^N_{ET,NE} > \Pi^N_{NE} \), imposing exclusive territories is again a dominant action for each manufacturer.

Suppose now that \( \delta \in (\hat{\delta}_{NE}, \hat{\delta}_{AS}) \). We know that \( \Pi^C_{ET} > \Pi^N_{NE,ET} \), hence there exists an equilibrium where both manufacturers impose exclusive territories. But, because in this range collusion can also be sustained if both manufacturers allow for intrabrand competition and \( \Pi^C_{NE} > \Pi^N_{ET,NE} \), there exists also an equilibrium where both manufacturers do not impose exclusive territories.

Finally, suppose that \( \delta \geq \hat{\delta}_{AS} \). In this range any pair of organizational modes sustains collusion. If both manufacturers choose the same distribution network, each one gets half of the collusive profit, whereas if \( M_i \) chooses exclusive territories and \( M_j \) chooses non-exclusive territories, \( M_i \) receives a share \( x \) of the collusive profit. Calculating \( x \) to minimize the discount factor in the asymmetric case yields

$$
x = \frac{256\beta^7 - 128\beta^6\gamma - 320\beta^5\gamma^2 + 160\beta^4\gamma^3 + 104\beta^3\gamma^4 - 56\beta^2\gamma^5 - 3\beta\gamma^6 + 3\gamma^7}{8\beta(2\beta^2 - \gamma^2)(32\beta^4 - 16\beta^3\gamma - 24\beta^2\gamma^2 + 8\beta\gamma^3 + 3\gamma^4)}.
$$

It is easy to check that

$$
x - \frac{1}{2} = \frac{\gamma^3(32\beta^4 - 16\beta^3\gamma - 24\beta^2\gamma^2 + 9\gamma^3\beta + 3\gamma^4)}{8\beta(2\beta^2 - \gamma^2)(32\beta^4 - 16\beta^3\gamma - 24\beta^2\gamma^2 + 8\gamma^3\beta + 3\gamma^4)} > 0.
$$

Therefore, \( M_i \) receives a larger fraction of the collusive profit than \( M_j \), and we have that \( \Pi^C_{ET,NE} > \Pi^C_{NE} \) and \( \Pi^C_{ET} > \Pi^C_{NE,ET} \). It then follows that for each manufacturer it is a dominant strategy to impose exclusive territories.
References


