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TEIS LUNDE LUMØ AND SIMEN AARDAL ULSAKER

PROMOTIONAL ALLOWANCES

UNIVERSITAS BERGENSIS

Department of Economics
UNIVERSITY OF BERGEN

Promotional allowances*

Teis Lunde Lømo† and Simen Aardal Ulsaker‡

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Abstract

We study a setting of repeated trade between an upstream manufacturer and two downstream retailers that can exert valuable but noncontractible sales effort. Our focus is the manufacturer's use of relational contracts with discretionary promotional allowances—payments that reward retailers for effort provision. We show that such contracts enable a sufficiently patient manufacturer to, in equilibrium, provide retailers with the correct incentives and extract the maximal industry profit in every period, and that this outcome cannot be replicated with formal two-part tariffs. These results have implications for the policy treatment of lump-sum payments from manufacturers to retailers, as well as for resale price maintenance.

1 Introduction

Lump-sum payments from upstream manufacturers to downstream retailers are widespread both in the EU and the U.S. (e.g., for groceries, apparel, computer software, etc.). This practice has received attention from policy makers for many years,[1] and there is by now a substantial literature that studies the rationale and effect of such payments; often

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†Department of Economics, University of Bergen, Teis.Lomo@uib.no.

‡Department of Economics, Norwegian School of Economics, Simen.Ulsaker@nhh.no.

[1] See, e.g., the UK Competition Commission's (2000, 2008) investigations of the grocery supply chain, and two reports by the U.S. Federal Trade Commission (FTC) (2001, 2003) on this topic.

called "slotting allowances" (for a survey, see Bloom et al., 2000). A central theme in this literature is that the payments are closely tied to the presence of large retailers, who, because of their "buyer power," can charge a fee simply for accepting to stock a manufacturer's product. However, according to the evidence, buyer power may not provide a complete explanation for the prevalence of lump-sum payments.[2]

A complementary perspective is that the payments are somehow linked to the retailers' provision of sales effort. Indeed, in many markets, retailers provide services that are valuable to final consumers—but impossible (or prohibitively costly) to directly contract upon. Examples of such services range from proper organization of shelves and inventories and local advertising campaigns to a salesperson's smile or enthusiasm for a certain product. Giving the retailers the right incentives when the level of sales effort cannot be specified explicitly in the contract can be challenging, especially when price restraints are unfeasible or prohibited by antitrust laws (as is currently the case in the EU).

The present paper illustrates how the manufacturer can incentivize the retailers through *promotional allowances*—payments made by the manufacturer to directly compensate and reward retailers for the provision of sales effort.[3] While promotional allowances are extensively used in real-world markets (e.g., within toys and tobacco) and have been subject to much discussion in policy circles (see, e.g., FTC, 2002, 2003) and the law-oriented part of the antitrust literature,[4] they have, to our knowledge, not been studied in a formal model. In this paper, we develop a theory of how firms use promotional allowances, and discuss the potential welfare effects and policy implications of such payment schemes.

A key feature of our model is that the firms (a manufacturer and two competing retailers) trade repeatedly. This captures the fact that, as many manufacturers and retailers spend a long time on product and brand development, retailers will typically stock goods from the same manufacturers year after year (think, e.g., about Nestlé and Unilever products sold at Carrefour and Tesco retail outlets). Another key feature of our model is that the promotional allowances are paid at the manufacturer's discretion. This allows the manufacturer to control behavior that is difficult or illegal to contract upon (such as

[2]For example, it is empirically unclear whether large manufacturers, relative to small manufacturers, make more payments (White et al., 2000; Bone et al., 2006) or less payments (Rao and Mahi, 2003). Furthermore, some of the largest retail chains, e.g., Costco and Whole Foods, do not ask for any lump-sum fees (e.g., FTC, 2001, p. 18), or, in the case of Walmart, has just recently started doing so.

[3]We take the term "sales effort" to include—or be synonymous to—"promotional activity" and "retail service," and use these terms interchangeably throughout the paper.

[4]See, for instance, Steiner (1991, 1997) and, more recently, Klein (2009) and Grimes (2010).

sales effort provision). In our model, the risk of disrupting the long-term relationships with the retailers ensures that the manufacturer pays the promotional allowances as long as the retailers provide the right level of effort, even though the manufacturer is free to withhold the payments in any period. This modeling feature also has a strong real-world motivation: indeed, we often observe that vertical supply relationships rely on informal and trust-based clauses and agreements (see, e.g., Kumar, 1996). For example, when investigating the British grocery sector, the UK Competition Commission (2008, p. 240) discovered that "Currently, not all agreements with suppliers are recorded in writing, [...] in many instances, [...] key terms of agreements are agreed orally."

In this framework, promotional allowances can arise as part of a relational contract (see Baker et al., 2002; Levin, 2002, 2003) between the manufacturer and the retailers. An important characteristic of a relational contract is the ability of self-enforcement; i.e., the agreement can be upheld due to the firms' mutual gain of cooperation, and not due to a threat of legal action. We show that the manufacturer can use relational contracts with discretionary promotional allowances to induce the retailers to choose the joint profit maximizing sales effort levels, and earn the maximum industry profit in every period. In addition to discretionary promotional allowances, the equilibrium contracts contain standard, court-enforceable two-part tariffs; i.e., per-unit wholesale prices and fixed fees (paid by the retailers). The manufacturer sets the wholesale prices to control price competition among the retailers (thereby inducing the joint profit maximizing retail prices), and extracts their flow profits through the fixed fees. Provided that the manufacturer is sufficiently patient, the contracts are self-enforced, and the first-best outcome can be sustained as a subgame perfect equilibrium of the repeated game.

Notably, in this equilibrium, lump-sum payments arise even though retailers have zero bargaining power, and are paid to reward retailers for providing a certain amount of sales effort rather than for simply accepting to stock the manufacturer's product. Because the rationale and effect of promotional allowances may be very different from that of pure slotting fees, it is far from obvious that the two types of payments should be subjected to the same legal treatment. This point is currently recognized in the UK, where the Groceries Supply Code of Practice from 2010 restricts the use of lump-sum payments in the grocery sector, except when such payments are tied to "promotions."[5] On the other hand, some European countries, e.g., Norway, have recently seen political pressure for a

[5]See point 12 and 13 of the UK Competition Commission's guidance paper to this code: https://www.gov.uk/government/publications/groceries-supply-code-of-practice

general ban on lump-sum payments in the grocery sector.[6] Our analysis suggests that lump-sum payments can be used to support the provision of retail services, even when they are not formally contingent on the provision of such services. Therefore, to the extent that the services provided by retailers are valuable, a general ban on lump-sum payments may be harmful to final consumers and society as a whole.

To see this more formally, consider the outcome in our model if the manufacturer is restricted to offering formal two-part tariffs alone. In this case, we show that the manufacturer must leave rents to the retailers in order to prevent deviations from the profit maximizing equilibrium. As a result, the manufacturer will prefer other equilibria in which retailers do not provide sales effort at the first-best level. In a sense, when promotional allowances are not available, the manufacturer has less incentive to strive for the effort levels and prices that maximize the firms' joint profit.

Intuitively, the key benefit of promotional allowances for the manufacturer is the ability to punish deviations (e.g., a retailer shirking on sales effort) in the same period as they occur. With this ability, retailers can be bribed into setting the optimal effort levels and prices in each period, even if their future discounted profits are zero—enabling the manufacturer to, at the same time, induce the profit maximizing outcome, and extract the entire industry profit in each period. An additional benefit of promotional allowances is therefore that they can render the retailers' patience level irrelevant for the sustainability of a first-best equilibrium.

By demonstrating how a manufacturer can use promotional allowances to convince retailers to provide sales effort, this paper also contributes to the active policy debate about resale price maintenance (RPM)—contract clauses through which manufacturers decide the prices charged by retailers. In 2007, the U.S. Supreme Court's ruling in *Leegin* revoked the per se ban on RPM due to *Dr. Miles* (1911) in favor of a more lenient, rule-of-reason approach.[7] The economic argument at heart of the Supreme Court's decision (and the procompetitive rationale for RPM in general) concerns noncontractible retail services:[8] "A single manufacturer's use of vertical price restraints [...] encourages

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[6]See p. 46 of the 2011 report delivered by a commission appointed by the Norwegian Government, available from: https://www.regjeringen.no/en/dokumenter/food-power-and-impotence/id641717/

[7]*Leegin Creative Leather Products, Inc. v. PSKS, Inc., 551 U.S. 877* (2007), overruling *Dr. Miles Medical Co. v. John D. Park & Sons Co., 220 U.S. 373* (1911).

[8]This classic idea was first introduced by Telser (1960) in a context with retailers that free-ride on each other's services, and then embraced in the central antitrust works of the Chicago School; Posner (1976, chapter 7) and Bork (1978, chapter 14).

retailers to invest in tangible or intangible services or promotional effort," and: "Absent vertical price restraints, the retail services [...] might be underprovided." (p. 11). The present paper illustrates that the Court's second concern may be less relevant as long as the manufacturer has the ability to use an alternative contract clause—promotional allowances—to support the provision of services. Thus, perhaps especially in markets in which the same firms trade year after year, the service argument in favor of a lenient legal treatment of RPM appears less convincing. This point is potentially relevant for policy design in the EU, where the vertical restraints regulations[9] that currently classify RPM as a "hardcore restriction" (i.e., a contract type that is highly unlikely to receive legal exemptions) are scheduled for revision in 2022.[10]

This paper is related to several strands of literature within industrial organization. The core of our formal model is a version of the sales effort framework developed by Mathewson and Winter (1984), Winter (1993) and Krishnan and Winter (2007). These authors study how the manufacturer can impose formal vertical restraints, e.g., RPM and exclusive territories, in addition to two-part tariffs in order to achieve the first-best outcome in a static game. We use their set-up as our stage game, but focus on how formal two-part tariffs and discretionary promotional allowances can resolve the manufacturer's vertical control problem in a repeated setting. In that sense, our paper is related to a burgeoning literature that applies, in particular, Levin's (2002, 2003) relational contracting framework to study topics from vertically related markets. To name a few examples, Buehler and Gärtner (2013) show that an informal, recommended retail price can transfer cost and demand information from a manufacturer to a retailer, whereas Itoh and Morita (2015) study how relational and formal contracts can be combined to reduce a hold-up problem in upstream investment. Moreover, our formal analysis shares some similarities with research on the evaluation of team performance under moral hazard (e.g., Rayo, 2007), which is natural given our focus on a setting with multiple, competing "agents" that exert effort. In our context, the bonus payments in Levin's framework correspond to the promotional allowances.

Our study also ties in with a small literature that considers how a combination of formal and informal agreements can incentivize retailers to exert sales effort. Seminal

[9]See the 2010 Vertical Restraints Block Exemption Regulation (i.e., Article 4(a), European Commission Regulation No 330/2010 on the application of Article101(3) of the TFEU to categories of vertical agreements and concerted practices), and the 2010 Guidelines on Vertical Restraints, available at: http://ec.europa.eu/competition/antitrust/legislation/guidelines_vertical_en.pdf

[10]Point 10 at the Commission's website: http://europa.eu/rapid/press-release_MEMO-10-138_en.htm

work by Klein and Murphy (1988) shows that manufacturers can use formal vertical restraints to create streams of quasi-rents to retailers, and then elicit effort through an informal agreement that threatens to eliminate these rents if monitoring reveals that retailers perform inadequately. In other words, Klein and Murphy look at how court-enforceable vertical restraints and relational contracts can be complements, whereas, in our model, they are rather substitutes. Klein and Wright (2007) argue that informal agreements about slotting allowances can induce retailers to provide promotional shelf space. However, their modeling approach is very different from ours, and it is difficult to conduct a direct comparison of the two results. For example, Klein and Wright consider a static setting with several manufacturers, linear formal contracts and no effort spillovers between the retailers. In contrast, we consider a single manufacturer in an infinitely repeated setting, and allow for both nonlinear contracts and positive and negative effort spillovers. Finally, an interesting paper by Zanarone (2009) provides some rare empirical evidence on these matters. He finds that Italian car dealers responded to a 2002 ban on exclusive territories by imposing price ceilings, service standards and quantity floors in the years to follow.[11] However, such tools may not be feasible or even efficient in other markets. Our analysis shows that relational contracts can be powerful coordination instruments even without such formal side-restrictions.

The paper now proceeds as follows. Section 2 describes our basic modeling set-up, and discusses the manufacturer's vertical control problem. In Section 3, we outline the relational contracting framework and state our main result about promotional allowances, before revisiting two-part tariffs in the repeated game. This section closes with a discussion of our modeling framework. Section 4 offers a few concluding remarks.

2 Framework

We study a vertically related market with an upstream manufacturer (female), and two symmetric and differentiated retailers $i = 1, 2$ (male). The manufacturer can produce any amount of her product at constant marginal cost $c \geq 0$. The product is sold to final consumers by the retailers, who set (noncontractible) retail prices $\mathbf{p} = (p_1, p_2)$ and sales effort levels $\mathbf{e} = (e_1, e_2)$. The cost of exerting effort is $\phi(e_i)$, and we assume that the function ϕ is twice continuously differentiable, increasing and convex. The direct demand for the manufacturer's product at retailer i is given by $q_i(\mathbf{p}, \mathbf{e})$. We assume that also the

[11] The working paper version, Zanarone (2007), provides a supporting theoretical model.

function q_i is twice continuously differentiable in all arguments, and furthermore that it is decreasing and concave in p_i, increasing and concave in e_i, increasing in p_j and either constant (no spillovers), increasing (positive spillovers) or decreasing (negative spillovers) in e_j. The total industry profit is

$$\Pi(\mathbf{p}, \mathbf{e}) = \sum_{i=1,2} \left[(p_i - c)\, q_i(\mathbf{p}, \mathbf{e}) - \phi(e_i) \right].$$

Given our assumptions about demand and the cost of effort, the function Π is concave. Let $\mathbf{p}^m = (p_1^m, p_2^m)$ and $\mathbf{e}^m = (e_1^m, e_2^m)$ denote, respectively, the vectors of retail prices and sales effort levels for which the industry profit reaches its maximal value $\Pi^m := \Pi(\mathbf{p}^m, \mathbf{e}^m)$.

To achieve full vertical control in this industry, the manufacturer must offer a set of supply contracts that incentivize the retailers to choose $\mathbf{p}^m$ and $\mathbf{e}^m$ when competing in the downstream market. We shall start by explaining why the manufacturer may fail to do this in a static setting. Suppose that the firms play a one-shot game in which 1) the manufacturer offers two-part tariffs (w_1, F_1) and (w_2, F_2) to the retailers who can accept or reject, and 2) the retailers choose prices and effort levels. The manufacturer needs the fixed fees (F_1, F_2) to extract the retailers' flow profits, and must rely on the wholesale prices (w_1, w_2) to provide incentives. But with two targets (price and effort) and only one instrument (the wholesale price), the manufacturer faces a trade-off. For example, in the classic "free-riding" case with positive effort spillovers, she should give the retailers fat margins (i.e., low wholesale prices) to induce $\mathbf{e}^m$, whereas restricting retail price competition and inducing $\mathbf{p}^m$ calls for relatively high wholesale prices. In general, this incentive conflict prevents the manufacturer from earning Π^m when she uses two-part tariffs in the one-shot game.[12] In Section 3.3, we show that the insufficiency of two-part tariffs, quite surprisingly, carries over to an infinitely repeated game (in that setting, however, the intuition is very different). These results motivate our focus on promotional allowances as an additional instrument.

We will use the equilibrium of the one-shot game with two-part tariffs—in which the manufacturer must trade off effort provision and price competition—as the "reversion point" in our analysis of the repeated game. Suppose that for any vector of wholesale prices, $\mathbf{w} = (w_1, w_2)$, there exists a unique continuation equilibrium with prices

[12] In contrast, had retailers not engaged in price competition (e.g., because they served separate markets), or had effort been fully and formally contractible (e.g., through service standards), then this incentive conflict would disappear. Except in these special cases, however, two-part tariffs fail to implement the first-best. See Winter (1993) for an extensive treatment of this vertical control problem.

$\mathbf{p}^s(\mathbf{w}) = (p_1^s(\mathbf{w}), p_2^s(\mathbf{w}))$ and effort levels $\mathbf{e}^s(\mathbf{w}) = (e_1^s(\mathbf{w}), e_2^s(\mathbf{w}))$. We denote the contract terms of the manufacturer's second-best two-part tariffs by $\mathbf{w}^s = (w_1^s, w_2^s)$ and $\mathbf{F}^s = (F_1^s, F_2^s)$, and the resulting industry profit in the equilibrium of the static game by $\Pi^s := \max_{\mathbf{w}} \Pi(\mathbf{p}^s(\mathbf{w}), \mathbf{e}^s(\mathbf{w})) < \Pi^m$.

3 Repeated play

We proceed in four steps. First, we outline our framework of relational contracts. Second, we analyze the equilibrium and state our main result about promotional allowances. Third, we analyze the case in which the manufacturer is restricted to formal two-part tariffs. Fourth, we discuss several aspects of our model.

3.1 Relational contracts

In the following, we assume that firms trade repeatedly in an infinite sequence of periods $t = 0, 1, 2...$, and that they discount future profits at a common rate $\delta \in (0, 1)$. When talking about prices, effort levels, contract terms etc. in any period t, we will drop the t-subscript to simplify notation.

We focus on payment schemes of the form (w_i, F_i, A_i). The wholesale price w_i and the fixed fee F_i are the same as in Section 2. As was tacitly assumed there, these terms are fully enforceable in court. In contrast, the *promotional allowance* A_i is paid at the manufacturer's discretion, and thus constitutes the "informal" part of the payment scheme. It will be useful to define the manufacturer's per-period flow profit (i.e., profit less fixed fees and promotional allowances) as

$$\pi_M(\mathbf{w}, \mathbf{p}, \mathbf{e}) = \sum_{i=1,2} (w_i - c)\, q_i(\mathbf{p}, \mathbf{e}),$$

and retailer i's per-period flow profit as

$$\pi_i(w_i, \mathbf{p}, \mathbf{e}) = (p_i - w_i)\, q_i(\mathbf{p}, \mathbf{e}) - \phi(e_i).$$

We also make the following definition:

$$\pi_i^d(w_i, p_j, e_j) := \max_{p_i, e_i} \left[(p_i - w_i)\, q_i(p_i, p_j, e_i, e_j) - \phi(e_i)\right].$$

Thus, $\pi_i^d(w_i, p_j, e_j)$ is retailer i's deviation profit; i.e., the maximal flow profit he can achieve by picking his best responses to (p_j, e_j) and his received contract terms (w_i, F_i).

In each period, the firms play the following three-stage game:

1. The manufacturer offers a payment scheme (w_i, F_i, A_i) to each retailer. After observing the rival's offer, each retailer can accept (and pay F_i) or reject.

2. Retailers choose prices and effort levels.

3. The manufacturer can pay promotional allowances.[13]

In the terminology of Levin (2002, 2003), a *relational contract* describes a complete plan for the full repeated game; i.e., all payments, prices and effort levels in every period, as well as firms' actions following any history of play. A relational contract is *self-enforced* if it constitutes a subgame perfect equilibrium of the repeated game. We focus on stationary contracts, i.e., contracts with the same payment scheme in all periods. This assumption is without loss of generality because our stage game has complete information (Levin 2003). Furthermore, we follow Levin (2002) by considering a multilateral relational contract, in which a deviation by one player is punished by all other players. In our context, this means, e.g., that if the manufacturer withholds a promotional allowance to one retailer, then *both* retailers will respond with reduced cooperation.[14] For simplicity, we focus on punishment strategies of the Nash-reversion type,[15] with the Nash equilibrium of the static game with two-part tariffs from Section 2 as the benchmark. More specifically, letting (w_i^*, F_i^*, A_i^*) denote the payment scheme offered to retailer i on the equilibrium path, we consider the following strategies.

Strategy of the manufacturer

[13] Of course, if this stage game was played only once, the manufacturer would set $A_1 = A_2 = 0$ at Stage 3, and her equilibrium profit would be Π^s.

[14] A natural justification for this assumption is that retailers view a deviation from the manufacturer in any period t as evidence that she cannot be trusted to live up to any relational agreements in future periods. One may also think of other circumstances that can facilitate multilateral punishment from retailers more directly, e.g., buyer groups and purchasing alliances such as the European Marketing Distribution and the U.S Independent Grocer's Association.

[15] This restriction is common in the literature on repeated vertical contracting (e.g., Nocke and White, 2007; Piccolo and Reisinger, 2011). In general, it is challenging to define optimal punishment strategies in vertical models because each period contains an extensive-form game.

- In $t = 0$, and any period t such that the manufacturer has offered $(\mathbf{w}^*, \mathbf{F}^*, \mathbf{A}^*)$ and retailers have chosen $(\mathbf{p}^m, \mathbf{e}^m)$ in all previous periods, the manufacturer offers (w_i^*, F_i^*, A_i^*) to retailer $i = 1, 2$. In such a period, the manufacturer pays A_i^* to retailer i if and only if the retailers chose $\mathbf{e}^m$. If any $\mathbf{e} \neq \mathbf{e}^m$ is chosen by the retailers, the manufacturer withholds the promotional allowances, and offers the static equilibrium contracts $(\mathbf{w}, \mathbf{F}, \mathbf{A}) = (\mathbf{w}^s, \mathbf{F}^s, \mathbf{0})$ in all future periods.[16]

Strategies of the retailers

- In $t = 0$ and any period t such that the manufacturer has offered (w_i^*, F_i^*, A_i^*) and retailers have chosen $(\mathbf{p}^m, \mathbf{e}^m)$ in all previous periods, retailer i accepts (w_i^*, F_i^*, A_i^*) if the manufacturer offers $(\mathbf{w}^*, \mathbf{F}^*, \mathbf{A}^*)$. If any other set of payment schemes are offered, retailer i accepts (w_i, F_i, A_i) if and only if $\pi_i (w_i, \mathbf{p}^s(\mathbf{w}), \mathbf{e}^s(\mathbf{w})) \geq F_i$. If the retailers are offered and accept $(\mathbf{w}^*, \mathbf{F}^*, \mathbf{A}^*)$, retailer i chooses (p_i^m, e_i^m). Otherwise, retailer i chooses the price and effort levels that correspond to the static continuation equilibrium, given the accepted payment schemes.

- In any period t in which the history of play has involved payment schemes other than $(\mathbf{w}^*, \mathbf{F}^*, \mathbf{A}^*)$ and/or choices other than $(\mathbf{p}^m, \mathbf{e}^m)$, retailer i accepts its offer (w_i, F_i, A_i) if and only if $\pi_i (w_i, \mathbf{p}^s(\mathbf{w}), \mathbf{e}^s(\mathbf{w})) \geq F_i$. The retailers then choose prices and effort levels that correspond to the static continuation equilibrium, given the accepted payment schemes.

The strategies specify that the firms are willing to cooperate at $t = 0$. The retailers are willing to accept payment schemes that will give them negative profits if the rival retailer chooses its price or effort level non-cooperatively, or if the manufacturer withholds the promotional allowance. The manufacturer will pay the promotional allowance, hoping that the retailers will reward her by behaving cooperatively in future periods. Any deviation is however punished by reversion to statically optimizing behavior. This means that if a firm deviates from the specified strategy in period t, the static equilibrium will be repeated in all future periods.

[16] As there is no uncertainty in our model, the manufacturer can infer the retailers' effort levels from observing their prices and quantity orders. We assume, however, that these inferences cannot be verified in court, so that effort-contingent contract clauses are infeasible. One could, in principle, also assume directly observable (but non-verifiable) effort levels, but these two assumptions would not be equivalent in the presence of demand uncertainty. We will discuss effort observability and uncertainty further in Section 3.4.

3.2 Equilibrium analysis

We now consider possible deviations in any period t to obtain the conditions under which the payment schemes $(\mathbf{w}^*, \mathbf{F}^*, \mathbf{A}^*)$ can support the profit maximizing outcome.

Starting at Stage 3, the manufacturer's strategy specifies that if effort levels have differed from $\mathbf{e}^m$ in period t she does not pay promotional allowances. If instead $\mathbf{e}^m$ has been set, her strategy is to uphold the contract by paying the allowances. However, for a payment scheme $(\mathbf{w}^*, \mathbf{F}^*, \mathbf{A}^*)$ to be part of a subgame perfect equilibrium, we need that the sum of the promotional allowances (i.e., the manufacturer's immediate gain from reneging on the relational contract) is smaller than the discounted value of her future gains from honoring the contract (i.e., her future loss from reneging):

$$\underbrace{\sum_{i=1,2} A_i^*}_{\text{Immediate gain from deviation}} \leq \underbrace{\frac{\delta}{1-\delta}\left[\pi_M\left(\mathbf{w}^*, \mathbf{p}^m, \mathbf{e}^m\right) + \sum_{i=1,2}\left(F_i^* - A_i^*\right) - \Pi^s\right]}_{\text{Future loss from deviation}}.$$

The above inequality thus gives an upper bound on the promotional allowances that can be part of a self-enforcing relational contract. By rearranging it, we get the manufacturer's participation constraint (or individual rationality constraint), which must be satisfied in any subgame perfect equilibrium with $(\mathbf{w}^*, \mathbf{F}^*, \mathbf{A}^*)$:

$$\sum_{i=1,2} A_i^* \leq \delta\left[\pi_M\left(\mathbf{w}^*, \mathbf{p}^m, \mathbf{e}^m\right) + \sum_{i=1,2} F_i^* - \Pi^s\right]. \qquad (IR_M)$$

Let us now consider Stage 2. The way we have specified the strategy of the manufacturer, the payment of the promotional allowance to retailer i is contingent on the effort level but not on the price level.[17] To prevent deviations in which retailer $i = 1, 2$ chooses e_i^m but a price $p_i \neq p_i^m$, let w_i^* be implicitly defined by the following equation:

$$\arg\max_{p_i}\left[\left(p_i - w_i^*\right) q_i\left(p_i, p_j^m, e_i^m, e_j^m\right) - \phi\left(e_i^m\right)\right] = p_i^m. \qquad (1)$$

[17] Of course, the promotional allowance could in principle be contingent on both price and effort levels. It should however be noted that this could be interpreted as an instance of RPM, and thereby possibly illegal. The 2010 EU Guidelines on Vertical Restraints state that RPM need not imply a direct contractual specification of the resale price, but may for example be achieved by "making the grant of rebates or reimbursement of promotional costs by the supplier subject to the observance of a given price level" (paragraph 48). Further, the Guidelines suggest that RPM may be upheld by "informal" means such as "threats, intimidation, warnings, penalties, delay or suspension of deliveries or contract terminations in relation to observance of a given price level" (paragraph 48).

These wholesale prices give the retailers incentives to maximize the industry profit when choosing retail prices, *when sales effort is fixed at the level that maximizes the industry profit.* This corresponds to the wholesale prices the manufacturer would choose in a static setting if she could specify the effort level directly in the contracts, and the sole purpose of the wholesale prices was to dampen the price competition among the retailers. We still have to rule out deviations where retailer i chooses an effort level different from e_i^m. Such a deviation would lead to a loss of the promotional allowance A_i^* in the current period, and will not be profitable as long as the following holds:

$$\underbrace{\pi_i^d\left(w_i^*, p_j^m, e_j^m\right) - \pi_i\left(w_i^*, \mathbf{p}^m, \mathbf{e}^m\right) - A_i^*}_{\text{Immediate gain from deviation}} \leq \underbrace{\frac{\delta}{1-\delta}\left[\pi_i\left(w_i^*, \mathbf{p}^m, \mathbf{e}^m\right) - F_i^* + A_i^*\right]}_{\text{Future loss from deviation}}.$$

By rearranging, we find that retailer i's participation constraint is

$$A_i^* \geq \left[\pi_i^d\left(w_i^*, p_j^m, e_j^m\right) - \pi_i\left(w_i^*, \mathbf{p}^m, \mathbf{e}^m\right)\right] + \delta\left[F_i^* - \pi_i^d\left(w_i^*, p_j^m, e_j^m\right)\right], \qquad (IR_i)$$

which gives a lower bound on the allowances. Now, for there to be scope for sustaining the payment schemes $(\mathbf{w}^*, \mathbf{F}^*, \mathbf{A}^*)$ in equilibrium, the constraints (IR_M) and (IR_i) must, when combined, specify a non-empty interval of promotional allowance payments. Whether this is the case depends on the firms' patience level and profits, as reported by the following lemma:

Lemma 1. *A self-enforcing, relational contract with payment scheme* $(\mathbf{w}^*, \mathbf{F}^*, \mathbf{A}^*)$ *that supports the maximal profit* Π^m *in every period can exist if and only if*

$$\sum_{i=1,2}\left[\pi_i^d\left(w_i^*, p_j^m, e_j^m\right) - \pi_i\left(w_i^*, \mathbf{p}^m, \mathbf{e}^m\right)\right] \leq \frac{\delta}{1-\delta}\left(\Pi^m - \Pi^s\right). \qquad (2)$$

Condition (2) gives the critical δ-value needed for Π^m to be sustainable in an equilibrium with payment scheme $(\mathbf{w}^*, \mathbf{F}^*, \mathbf{A}^*)$. This threshold is a function of the firms' joint gain from honoring the contract, $\Pi^m - \Pi^s$, as well as each retailer's individual gain from deviation, $\pi_i^d\left(w_i^*, p_j^m, e_j^m\right) - \pi_i\left(w_i^*, \mathbf{p}^m, \mathbf{e}^m\right)$. These profit levels depend on the horizontal externalities of the model, i.e., the degree of retail substitutability and the strength of effort spillovers. For instance, when retailers are close substitutes there is a strong trade-off between restricting price competition and enhancing effort provision, meaning that the difference $\Pi^m - \Pi^s$ is large. This implies that the firms have a strong collective interest in sticking with the relational contract, which, in isolation, makes the first-best equilibrium easier to sustain. On the other hand, a high degree of substitutability also means that each retailer can steal much of the rival's sales by deviating, e.g., to a lower price. This effect increases each retailer's gain from deviation, which, in isolation, makes the first-best equilibrium harder to sustain. Two similar effects apply for the strength of effort spillovers. Hence, in general, the effect of stronger horizontal externalities on the critical discount factor is ambiguous. To get a sense of which effects that are likely to dominate, we have calculated the profit levels in Condition (2) using linear demands à la Shubik and Levitan (1980).[18] In that example, the critical discount rate increases with the degree of retail substitutability and, usually, the strength of effort spillovers, meaning that the effect through the deviation profit outweighs the effect through $\Pi^m - \Pi^s$.[19]

Finally, let us consider possible deviations at Stage 1. For the manufacturer, a deviation to a payment scheme different than $(\mathbf{w}^*, \mathbf{F}^*, \mathbf{A}^*)$ will give a per-period profit of at most Π^s, which yields the following condition:

$$\pi_M(\mathbf{w}^*, \mathbf{p}^m, \mathbf{e}^m) + \sum_{i=1,2} F_i^* - \sum_{i=1,2} A_i^* \geq \Pi^s. \tag{3}$$

Furthermore, retailer i will only have an incentive to deviate (by rejecting the offered contract) if he gets a strictly negative profit from accepting (w_i^*, F_i^*, A_i^*), which means that the following condition must hold:

$$\pi_i(w_i^*, \mathbf{p}^m, \mathbf{e}^m) + A_i^* \geq F_i^*. \tag{4}$$

Clearly, there may exist many payment schemes that can satisfy Conditions (3) and (4) simultaneously. Our objective is to study the manufacturer's potential benefit from using discretionary promotional allowances, and, accordingly, we will focus on a payment

[18] More specifically, the demand system is

$$q_i(\mathbf{p}, \mathbf{e}) = \frac{1}{2}\left(v + e_i + be_j - (1+k)p_i + \frac{k}{2}(p_1 + p_2)\right), \; i \neq j = 1, 2,$$

in which $k \in (0,1)$ measures substitutability and $b \in (-1,1)$ measures spillover strength.

[19] The critical discount factor also depends on the firms' punishment strategies. Notably, Mailath et al. (forthcoming) show that in repeated games in which each period contains an extensive form game, an optimal punishment strategy may stipulate different punishments for different types of deviations. Although we do not formally analyze other punishment strategies than Nash-reversion, we may note that more sophisticated strategies should reduce the critical discount factor at which a first-best equilibrium can be sustained, but otherwise not affect our results.

scheme that is favorable for the manufacturer. As noted above, the wholesale prices chosen by the manufacturer ensure that the retailers will have incentives to maximize profit when choosing prices, as long as effort levels are fixed at the profit maximizing level. Now, let the equilibrium promotional allowance be given by

$$A_i^* = \pi_i^d \left(w_i^*, p_j^m, e_j^m \right) - \pi_i \left(w_i^*, \mathbf{p}^m, \mathbf{e}^m \right).$$

Observe that A_i^* eliminates the current period gain from choosing an effort level different from e_i^m, since it exactly corresponds to the flow profit gain such a deviation could bring about. This means that, in combination, $\mathbf{w}^*$ and $\mathbf{A}^*$ prevent deviations from the retailers when they choose prices and sales effort in Stage 2. Finally, by choosing the fixed fee as follows, the manufacturer can extract the entire flow profit of retailer i in each period:

$$F_i^* = \pi_i^d \left(w_i^*, p_j^m, e_j^m \right).$$

Note that $\mathbf{A}^*$ and $\mathbf{F}^*$ are chosen so that (4) binds for each retailer, since the promotional allowance exactly corresponds to the difference between the fixed fee and the flow profit of the retailer. When (4) binds for each retailer, the manufacturer earns the full industry profit, which, because the retailers set $(\mathbf{p}^m, \mathbf{e}^m)$, equals Π^m. Thus, Condition (3) will hold. Further, it is easily confirmed that as long as Condition (2) is satisfied, (IR_M) will also hold. We can now state the following result:

Proposition 1. *Suppose that δ is large enough to satisfy Condition* (2) *when $\mathbf{w}^*$ is given by Equation* (1). *Then, there exists a subgame perfect equilibrium of the repeated game in which the manufacturer uses promotional allowances, and earns Π^m in every period.*

How do the informal promotional allowances help the manufacturer in persuading the retailers to choose the profit maximizing prices and effort levels in each period, even though their per-period profit is zero, and even though each retailer could increase his flow profit in a given period by choosing different levels of sales effort and prices? The intuition is that the retailers lose the end-of-period promotional allowance if they deviate, and this alone makes deviations unprofitable. The retailers are thus convinced to stick to their equilibrium strategies because deviations will be punished by the manufacturer in the current period. Since there is no current period gain from deviating, the manufacturer is not forced to leave the retailers with positive profit on the equilibrium path in order to prevent deviations.

An interesting consequence of the last point is that, with promotional allowances, the retailers' patience level can be rendered irrelevant for the sustainability of a profit maximizing equilibrium. In other words, the equilibrium specified above will exist if and only if the manufacturer is sufficiently patient. Note here that a firm's patience is often thought to be closely and positively related to its bargaining power. For example, in Rubinstein's (1982) classic bargaining model, a player's bargaining weight in the Nash bargaining solution increases with his discount factor. In our set-up, the manufacturer has all of the bargaining power in the sense that she can make take-it-or-leave-it offers to the retailers at Stage 1. A natural interpretation of our model is therefore that the manufacturer will, in fact, be quite patient, which would help to prevent deviations from the equilibrium path.

Proposition 1 illustrates how promotional allowances can be used to support an equilibrium in which the industry profit is maximized in each period, and in which the manufacturer extracts the entire profit, leaving no rents for the retailers. Still, the retailers behave "cooperatively" in each period: they accept the formal two-part tariff and choose the profit maximizing effort levels and prices, even when a deviation from the equilibrium path by either the rival retailer (when setting effort and price) or the manufacturer (when paying the promotional allowance) could leave them with a strictly negative profit. This may seem counterintuitive, since a retailer could always secure himself a profit of zero by rejecting the offer from the manufacturer in each period.[20] It should however be noted that as long as the Condition (2) holds, promotional allowances can also be used to support equilibria in which the industry profit is maximized and the retailers get strictly positive profits in each period. The per-period industry gain from keeping sales effort levels and prices at the profit maximizing level (rather than reverting to the static equilibrium) is $\Pi^m - \Pi^s$. With the help of promotional allowances, *any* division of this gain is achievable in an equilibrium supported by Nash-reversion strategies. Consequently, if the firms use Nash-reversion strategies to support an equilibrium where industry profit is not maximized, this equilibrium will be Pareto-dominated by a profit maximizing equilibrium supported by promotional allowances.

[20] For example, if the retailers believed that in each period there was a small probability that the manufacturer would make a "mistake" and depart from its equilibrium strategy by withholding the promotional allowance, they would not want to sign the formal two-part tariff.

3.3 Two-part tariffs revisited

Repeated interaction often enables players to improve on suboptimal outcomes from static games. In Section 2, we saw that when the manufacturer is restricted to simple two-part tariffs in a one-shot setting, she earns a maximal profit of $\Pi^s < \Pi^m$ because wholesale prices are insufficient to give retailers the optimal incentives. This section considers the conditions under which a profit maximizing equilibrium can be supported in a repeated setting by two-part tariffs alone. As in Section 3.1, we restrict attention to punishment strategies of the Nash-reversion type, where the manufacturer offers the payment scheme $(\mathbf{w}^*, \mathbf{F}^*)$ on the equilibrium path, and where the retailers choose the profit maximizing vectors $(\mathbf{p}^m, \mathbf{e}^m)$ as long as there are no deviations. Any deviation in period t leads to reversion to statically optimal behavior in the rest of period t and in all future periods.

Suppose now that there exist an equilibrium in which, in each period, the manufacturer offers $(\mathbf{w}^*, \mathbf{F}^*)$, and the retailers choose $\mathbf{p}^m$ and $\mathbf{e}^m$. In order for this to be a subgame perfect equilibrium, the manufacturer needs to get a per-period payoff of at least Π^s, since in any period t, this is what she could get in this and all future periods by deviating and offering a different set of contracts. We thus need the following to hold:

$$\pi_M (\mathbf{w}^*, \mathbf{p}^m, \mathbf{e}^m) + \sum_{i=1,2} F_i^* \geq \Pi^s. \tag{5}$$

In any period t, retailer i will have an incentive to stick to the equilibrium strategy and choose p^m and e^m if and only if

$$\pi_i^d(w_i^*, p_j^m, e_j^m) - \pi_i (w_i^*, \mathbf{p}^m, \mathbf{e}^m) \leq \frac{\delta}{1-\delta} \left[\pi_i (w_i^*, \mathbf{p}^m, \mathbf{e}^m) - F_i^*\right]. \tag{6}$$

Combining condition (5) and (6) gives us the following result:

Lemma 2. *A payment scheme* $(\mathbf{w}^*, \mathbf{F}^*)$ *that supports the maximal profit* Π^m *in every period can exist if and only if*

$$\sum_{i=1,2} \left[\pi_i^d(w_i^*, p_j^m, e_j^m) - \pi_i (w_i^*, \mathbf{p}^m, \mathbf{e}^m)\right] \leq \frac{\delta}{1-\delta} (\Pi^m - \Pi^s). \tag{7}$$

When comparing Lemma 2 with Lemma 1, we see that condition (7) is identical to condition (2). As long as the sum of the retailers' gains from deviation is smaller than the discounted industry profit loss from a switch to the static outcome, there will always exist an equilibrium in which the industry profit is maximized, even when the firms use simple two-part tariffs.

However, there are also several important differences between the two cases. The combination of promotional allowances and formal two-part tariffs can be used to support the profit maximizing outcome, and at the same time give the firms the flexibility to divide the gain from cooperation in any desired way. When the firms are restricted to use two-part tariffs only, that flexibility is reduced. In fact, the manufacturer must leave the retailers with positive profits in any equilibrium in which the industry profit is maximized. To see this, observe that condition (6) can be written as

$$\begin{aligned} F_i^* &\leq \pi_i\left(w_i^*, \mathbf{p}^m, \mathbf{e}^m\right) - \frac{1-\delta}{\delta}[\pi_i^d(w_i^*, p_j^m, e_j^m) - \pi_i\left(w_i^*, \mathbf{p}^m, \mathbf{e}^m\right)] \\ &< \pi_i\left(w_i^*, \mathbf{p}^m, \mathbf{e}^m\right). \end{aligned}$$

The last inequality holds because $\pi_i^d(w_i^*, p_j^m, e_j^m) > \pi_i\left(w_i^*, \mathbf{p}^m, \mathbf{e}^m\right)$, which is a direct consequence of the fact that the maximal industry profit is not attainable through simple two-part tariffs in a static setting. If there existed a wholesale price w_i that would make (p_i^m, e_i^m) a best response to $\left(p_j^m, e_j^m\right)$, two-part tariffs would be sufficient to make $(\mathbf{p}^s, \mathbf{e}^s) = (\mathbf{p}^m, \mathbf{e}^m)$. Because this is not the case, retailer i will instead maximize his flow profit by choosing a pair $(p_i, e_i) \neq (p_i^m, e_i^m)$ when the rival chooses $\left(p_j^m, e_j^m\right)$, implying that $\pi_i^d(w_i^*, p_j^m, e_j^m) > \pi_i\left(w_i^*, \mathbf{p}^m, \mathbf{e}^m\right)$. Since $F_i^* < \pi_i\left(w_i^*, \mathbf{p}^m, \mathbf{e}^m\right)$, retailer i earns a strictly positive profit in each period. We get the following proposition:

Proposition 2. *If the manufacturer is restricted to two-part tariffs in the repeated game, her maximal, per-period equilibrium profit is strictly smaller than* Π^m.

This result establishes that two-part tariffs are not sufficient to solve the manufacturer's control problem, even when the firms trade repeatedly. A corollary of the proposition is that other equilibria—where prices and effort levels are not at their first-best levels—may give the manufacturer a higher profit than what she can get in a profit maximizing equilibrium. In any stationary equilibrium in which the two-part tariff is given by $(\mathbf{w}, \mathbf{F})$ and the prices and effort levels by $(\mathbf{p}, \mathbf{e})$, the per-period rent of retailer i is

$$\pi_i\left(w_i, \mathbf{p}, \mathbf{e}\right) - F_i \geq \frac{1-\delta}{\delta}[\pi_i^d(w_i, p_j, e_j) - \pi_i\left(w_i, \mathbf{p}, \mathbf{e}\right)].$$

The expression in the parentheses on the right hand side is not only a function of wholesale prices, but also of the prices and effort levels chosen by the retailers in equilibrium. When $(\mathbf{p}, \mathbf{e}) = (\mathbf{p}^m, \mathbf{e}^m)$, a slight change in, e.g., the effort level will only have a second order effect on the industry profit, but will generally have a first order effect on the rent the manufacturer has to leave the retailers. Whenever this is the case, there will exist equilibria in which $(\mathbf{p}, \mathbf{e}) \neq (\mathbf{p}^m, \mathbf{e}^m)$ that gives the manufacturer a higher profit than any profit maximizing equilibrium supported by Nash-reversion and two-part tariffs.

When the firms can use promotional allowances, they have a joint incentive of coordinating on equilibria that maximize the industry profit whenever such equilibria are attainable (since the gain from cooperation can always be distributed as the firms want). With two-part tariffs this is no longer the case. Consequently, there is less reason to believe that sales effort levels and prices are set at the profit maximizing level when the firms are restricted to use two-part tariffs. Further, if the firms use simple two-part tariffs to support an equilibrium in which the industry profit is not maximized, a Pareto improvement is achievable by the use of promotional allowances (i.e., by setting $A_1 = A_2 > 0$), even when no such improvement is available through the use of two-part tariffs alone. Since promotional allowances, in such situations, will be in the manufacturer and the retailers' joint interest, our model suggests that allowances should not necessarily be thought of as restraints that are "imposed" by firms at a certain level in the vertical chain.

3.4 Discussion of the framework

Several aspects of our modeling framework may be worth further discussion. In contrast to other formal studies of three-part tariffs, e.g., Marx and Shaffer (2007) and Miklós-Thal et al. (2011), the transfers from the manufacturer to the retailers are in our model paid at the end of a period rather than upfront. However, in a repeated setting the distinction between ex post and upfront is blurred, since the end of period t can be interpreted as the beginning of period $t + 1$ (and the other way around). Whether or not payments from manufacturers to retailers tend to occur at the beginning or end of the year or the trading season, is therefore not necessarily evidence against a particular theory of lump-sum payments, because it is still not obvious whether they "set up" trade in the next period or "settle up" trade in the last period.

Furthermore, our promotional allowances are discretionary payments made in the context of repeated interaction, whereas the slotting allowances in Marx and Shaffer (2007) and Miklós-Thal et al. (2011) are part of the formal contract governing trade in a static setting. It should be stressed that the use of promotional allowances in our model is intrinsically tied to the repeated nature of the relationship between the manufacturer and the retailers. In a static setting, the manufacturer would never have an incentive to make the discretionary payments to the retailers, and our three-part tariff would in effect reduce to the standard two-part tariff that constitutes the formal part of the relational contract. The discretionary nature of the promotional allowances is also important. Precisely because the manufacturer can choose to withhold the promotional allowance payments, the retailers can be incentivized to choose the profit maximizing effort and price levels in each period, even if they expect to get zero in profit in future periods. As we have seen, this not only allows the manufacturer to support an equilibrium in which she extracts the entire industry profit, it also means that the retailers' patience can be made irrelevant for the manufacturer's ability to support profit maximizing equilibria.

In our model, a sufficiently patient manufacturer can achieve the exact same results with promotional allowances, as she would be able to achieve with RPM. Of course, this strict equivalence may be broken if we relax some of our assumptions or add new features to the model. Of particular interest is demand uncertainty, which may affect the efficiency of both contract types. To illustrate this, let us assume that RPM is feasible and legal, and that a series of uncorrelated demand shocks hits the market throughout the game. The value of the shock in each period is unknown to all firms at Stage 1, but observable to all firms at the beginning of Stage 2. In such an environment, the manufacturer cannot achieve the first-best outcome by contractually fixing the retail prices. The reason is that the available industry profit will be reduced if the retailers cannot tailor their prices to the realized demand conditions at Stage 2. In contrast, because the manufacturer is able to infer the retailers' effort levels at the end of Stage 2, she can still provide the correct pricing incentives with promotional allowances at Stage 3, by making the allowances contingent on both prices and sales effort. This is true also if the demand shock remains unobservable to the manufacturer, but she can observe the effort levels directly. In these cases, the manufacturer strictly prefers promotional allowances to explicit price restrictions.

On the other hand, if both effort levels and the exact demand conditions remain imperfectly observable to the manufacturer, then she cannot tell, e.g., whether a low quantity order is the result of a negative demand shock or a retailer's shirking. To calculate the correct promotional allowances under such circumstances, it seems reasonable that the manufacturer must actively monitor the retailers' behavior. Such monitoring is likely to be costly and will present a drawback of promotional allowances. Whether the manufacturer would instead prefer to use RPM will depend on the level of monitoring costs relative to the cost of foregone profits from restricting retailers' pricing flexibility. (One should perhaps expect that both of these costs will increase with the level of demand volatility.) This means that in markets where effort monitoring is relatively easy, promotional allowances should, due to their discretionary nature and high level of flexibility, be more effective than price restrictions for incentivizing retailers.

Our analysis has illustrated how promotional allowances help to give retailers the incentives to choose profit maximizing levels of retail services. In so far as such services would otherwise be underprovided from a social welfare perspective, promotional allowances may, in the same way as RPM, have pro-competitive effects. A caveat should however be noted. While promotional allowances (and RPM) may be helpful in providing incentives for the provision of valuable retail services, they also provide incentives for prices to be kept at the monopoly level. Thus, from a consumer welfare perspective, there may be a trade-off between the cost of high prices and the benefit of high-quality services.

4 Concluding remarks

Firms often maintain long-term business relationships in which their mutual trust and goodwill makes it possible to sustain informal agreements about, e.g., terms of trade and market behavior (Ganesan, 1994; Kumar, 1996). In vertically related markets, we know that supply contracts between manufacturers and retailers frequently include a variety of clauses and requirements, but the exact details of these contracts are rarely made public. The present paper has illustrated how a manufacturer can use discretionary promotional allowances to give two competing retailers the correct incentives for providing sales effort in a repeated setting. The promotional allowances may be paired with formal two-part tariffs to form a self-enforcing, relational contract provided that the manufacturer is sufficiently patient. In the subgame perfect equilibrium sustained by the optimal contract, the manufacturer earns the maximal industry profit in every period. In contrast, the manufacturer cannot achieve this outcome with formal two-part tariffs alone.

Our analysis has provided the following suggestions for competition policy on vertical restraints. Because promotional allowances can be as effective as RPM in sustaining retail sales effort, the classic service argument in favor of RPM may carry less weight—perhaps especially in markets where the same firms trade year after year. On the other hand, the evidence of the possible anticompetitive effects of RPM is abundant.[21] Consequently, an adequate rule-of-reason to RPM approach should stress that defendants in RPM-cases from such markets ought to provide alternative, procompetitive arguments for their use of price restrictions. Relatedly, the analysis has illustrated that restricting retailers' freedom to receive lump-sum payments may harm consumers, since such payments may be used to support retail services that otherwise could be underprovided.

[21] Jullien and Rey (2007) consider repeated interaction between two manufacturers selling through exclusive retailers, and show how RPM can help the manufacturers to collude. Rey and Vergé (2010) study a setting where two manufacturers sell their products through common, competing retailers. In their model, RPM can be used to elevate retail prices to the monopoly level. O'Brien and Shaffer (1992) consider a manufacturer that secretly contracts with several retailers and find that RPM can help to alleviate the "opportunism" problem that otherwise pushes retail prices below the profit maximizing level. In addition, recent empirical evidence suggests that RPM has caused a reduction of consumer welfare in those U.S. states that have most actively embraced the rule-of-reason approach after *Leegin* (MacKay and Smith, 2014).

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Institutt for økonomi
Universitetet i Bergen
Postboks 7800
5020 Bergen
Besøksadresse: Fosswinckels gate 14
Telefon: +47 5558 9200
Fax: +47 5558 9210
www.uib.no/econ/