The Effects of
Cartel Damage Compensations

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Abstract

Damage compensation claims in case of cartels are supposed to increase deterrence, compensate losses and increase efficiency. I show that such claims can instead have adverse effects: If suppliers or buyers of cartelists are compensated in proportion to the profits lost due to the cartel, expected cartel profits can increase. Claims of downstream firms against upstream cartelists who do not monopolize the market increase consumer prices. Suppliers of cartelists can be worse off when eligible to compensation. These results apply also to abuses of dominance and call for a more careful approach towards the private enforcement of competition law.

1 Introduction

The European Court of Justice stated in Courage (2001) and Manfredi (2006) that everybody can claim compensation for the damages actually incurred due to competition law infringements.[1] Backed by these decisions, the European Commission (2005, 2008) has expressed its intention to facilitate private enforcement. The Commission aims at improving deterrence, efficiency, and corrective justice by enabling compensation of those who suffered losses. It has stressed that it aims at full compensation, taking into account lost profits and not only the overcharge that customers of cartelists have to pay. By showing that the overcharge is often a poor estimate of actual purchaser damages, Han, Schinkel and Tuinstra (2008) underline that accounting for quantity effects and pass on is important to calculate the appropriate compensation. Indeed, full compensation of actual damages is also put forward in the Proposal for a Directive of the European Parliament and of the Council of June 2013.[2]

With this paper, I add to the discussion by showing that facilitating the compensation of actual damages (Lost Profit Compensation, LPC) can instead increase consumer prices, increase the expected profits of cartelists and even decrease the expected profits of suppliers to cartelists. The main assumption underlying the model is that the cartelists and their trade partners rationally anticipate the compensation payments when trading. Informally speaking, this means that there needs to be at least some suspicion in the industry that there could be a cartel and that damage claims have a chance to succeed. Though framed in terms of horizontal cartels, the present analysis applies analogously to excessive pricing of dominant firms.

To derive the results, I use a simple vertical model where downstream firms sell to consumers and need homogenous inputs, which are offered by two upstream firms and a competitive fringe. The fringe should be understood broadly as any alternative source such as the world market or in-house production. I study the effects of the LPC in case of both upstream and downstream cartels. I begin with the case that the upstream firms form a cartel by fixing their sales prices and that the downstream firms can claim compensation for the profits lost due to the upstream cartel. The compensation payments are modeled as a probabilistic process which can, for example, be interpreted as follow-on lawsuits after a public detection. For the case in which sourcing from the competitive fringe is attractive (i.e., it is relatively efficient), I initially assume that claims are valid only if the claimants actually trade with the cartelists. This is plausible because when trade with a cartelist has not taken place, it appears very difficult to prove that trade would have taken place, were there no cartel.[3] There are two interesting effects of LPC claims in this case.

First, *consumer prices increase* when downstream firms are entitled to LPC claims

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[1]ECJ, Decision of 20th September 2001, C-453/99 Courage Ltd. v. Crehan and Cases C-295/04 to C-298/04 Vincenzo Manfredi v Lloyd Adriatico Assicurazioni SpA, 13 July 2006. See Wagner (2007) for a legal discussion. In line with this, the Federal Court of Justice of Germany (BGH) based a cartel damage decision on the norm that those who suffered losses should be compensated accordingly (Decision of 29th June 2011 – KZR 75/10).

[2]See http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2013:0404:FIN:EN:PDF.

[3]Note, however, that downstream firms sourcing from the efficient upstream firms in case of upstream competition is the right counter-factual.

against upstream cartelists. The reason is that once a downstream firm expects a positive LPC, it is willing to purchase from the cartelists at input prices above the competitive fringe cost. Hence the cartelists increase input prices and, in best response to that, consumer prices increase as well. This result is sustained with two-part tariffs as long as exclusivity clauses are not enforceable and there is sufficient price competition downstream.

Second, the *expected cartel profits can increase* when LPC claims are in place. The reason is that the claims relax the constraints of the contracting problem between the upstream cartelists and each downstream firm. Hence, the industry profits increase and the cartelists can appropriate part of that.

Without a competitive fringe, instead, purchaser claims against an upstream cartel reduce consumer prices, hurt the cartelists, and benefit the downstream firms – if upstream tariffs are linear. This is in line with common sense of how private enforcement should work. With two-part tariffs, however, consumer prices are not affected and claimants do not gain in expected value.[4]

In the second part of this paper I investigate the LPC in case of downstream cartels. This case is interesting because in principle everybody can claim compensation for the damages suffered from a competition law infringement. This includes suppliers of cartelists. Although there is not yet an established practice for these cases in Europe, they will potentially be more relevant once private enforcement becomes more common.[5] From both an academic and a policy perspective, it is therefore interesting to study the implications of facilitating supplier damage compensations with respect to social welfare goals. Towards this I consider the case that downstream firms jointly fix their sales prices (cartelize). For each downstream firm there is one efficient supplier. Suppliers compete and can claim compensation for damages due to the cartel.

A damage occurs to suppliers when the downstream cartelists order less quantity. Additionally, a downstream cartel tends to exert pressure on the upstream margins. The reason is that when jointly maximizing profits, the downstream firms tend to pass on cost increases for one product to a larger extent than it would be the case under imperfect competition. Hence, upstream firms have more individual incentives to lower their prices in case of a downstream cartel. The LPC accounts for these damages.

The LPC rule, however, adds another effect that is detrimental to suppliers, when compared to the situation with a cartel and no compensation rule. Upstream firms have to additionally lower their prices to compensate downstream cartelists for expected compensation payments when trading with them, as otherwise the cartelists source from the fringe. Yet the lower marginal input prices of the efficient upstream firms, the more attractive it is for the cartelists to source only one input from the fringe, by that save one expected damage obligation, and order more from the other upstream firm at the reduced price. Hence the upstream firms need to lower their prices even more, which benefits the cartelists, but hurts the suppliers. This yields a surprising finding: Entitling suppliers

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[4]This finding indicates that the assumption of linear tariffs, made in essentially all articles on cartel damages, is not innocuous and its consequences not yet fully investigated in this literature. See for instance Baker (1988); Besanko and Spulber (1990); Boone and Müller (2011); Han et al. (2008); Hellwig (2007); Salant (1987); Schinkel et al. (2008); Spiller (1986); Verboven and Dijk (2009).

[5]See Han et al. (2008) for a discussion of US cases.

of cartelists to claim damage compensations can actually decrease the expected profits of the claimants below the level that would result were there a cartel and no private enforcement. In other words, it may not even be desirable for suppliers to have the right to sue.

2 Related literature

This paper is most closely related to Salant (1987) and Baker (1988) who have pointed out that this Overcharge Compensation (OCC) may not be effective if the compensation payment is anticipated by cartelists and buyers when trading. The reason is that the OCC constitutes a discount paid by cartelists to buyers, which is perfectly compensated by an increase in the cartel price. Hence, expected prices as well as profits of cartelists and buyers are not affected by the presence of private enforcement.[6]

Baker suggests that an efficient compensation should rather be proportional to actual losses.[7] Indeed, compensating in proportion to actual losses is in line with results about efficient deterrence (Landes, 1983) and a common principle in civil law. The actual loss of a downstream firm due to excessive input prices equals the difference in downstream equilibrium profits as a result of different upstream prices. This encompasses pass-on of increased input prices, adjustments in quantities as well as competitive reactions, whereas the OCC is simply a multiple of the actual quantity purchased from at the excessive price times the price overcharge. As described in the Introduction, I show that compensating for actual losses (i.e. the Lost Profit Compensation, LPC) can instead have adverse effects on cartel profits, allocative efficiency, and effective compensation. In other words, I demonstrate that in cases where the OCC has at worst no effect, the LPC actually increases the undesired effects of an infringement. This result is obtained for typical industry structures with up- and downstream competition where contracting with externalities occurs (Segal, 1999). The LPC rule enables firms to write supply contracts that increase industry profits to the benefit of infringers, when compared to no compensation rule.

The main point which the present paper adds to the literature is that facilitating private compensation claims for profits lost due cartels or excessive pricing of dominant firms can have, surprisingly, distinctively undesirable effects because more profitable supply contracts become feasible. These effects include higher consumer prices, higher expected cartel profits and even a decrease in the expected profits of the damaged firms, when compared to no compensation rule.

Somewhat related is Harrington (2004, 2005) who investigates in a dynamic setting the pricing of cartelists when these fear to raise suspicion about the cartel's existence. Harrington shows that under specific conditions, higher cartel prices can result when public fines are higher (2004) and when the but-for-price price used for calculating damages is lower (2005). The reasoning for the first effect is that public fines can stabilize a cartel and thus allow for higher prices. The reasoning for the second effect is that a lower but-for-price increases the Overcharge Compensation to be paid, i.e., the quantity sold times the overcharge. To decrease that overcharge compensation, the cartelists may want

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[6]This neutrality result can fail for several reasons, see Section 6.

[7]See his Theorem 3.

to increase the cartel price to decrease the quantity sold. These mechanisms are clearly different from those analyzed in the static framework of this paper.

More generally, by investigating private damage compensation claims, the present paper adds to the literature on optimal private and public enforcement of competition law, see Segal and Whinston (2006) for an overview. One focus of that literature is on the use of private information for law enforcement. An advantage of private enforcement may arise if private parties are better informed about infringements than the authority. Yet the objectives of private agents to initiate lawsuits generally differ from social welfare objectives. For instance, with private enforcement there can be incentives for private claimants to delay actions that induce a cartel breakdown if additional compensation payments exceed additional losses (Spiller, 1986). In a related vein, Schinkel et al. (2008) show that cartelists can bribe direct purchasers to not whistle-blow the cartel, to the detriment of indirect purchasers. Another concern is that private parties can have incentives to initiate socially detrimental lawsuits. McAfee et al. (2008) show that remuneration of private agents for providing hints that help the authority to detect anti-competitive behavior may be better than establishing private damage claims. In a similar spirit, Polinsky and Che (1991) suggest that part of a damage payment should not be paid to the claimant, but to the treasury. Such a decoupling can achieve both a high deterrence and avoid excessive lawsuits. Moreover, Baker (1988) points out that the cartel profitability tends to be lower if damage payments are payable to the treasury. The reason is that the price adjustments, which counterbalance the implicit discounts that accrue to the cartelists' trade partners, disappear. I show that such a decoupling can hurt suppliers of cartelists who nevertheless need to reduce their prices to remain attractive.

3   Framework

Two upstream firms $U1$ and $U2$ supply homogenous products at constant marginal costs normalized to 0. Two symmetric downstream firms $D1$ and $D2$ can transform these upstream products one-to-one into final products.[8] Alternatively to sourcing inputs from $U1$ or $U2$, each downstream firm can source equivalent inputs from a competitive fringe at a marginal price $c > 0$.[9] The game is structured as follows:

1. Each supplier Ui, $i \in \{1, 2\}$, offers tariffs with unit prices w^i to both downstream firms.

2. Each downstream firm Di, $i \in \{1, 2\}$,

   (a) observes all input prices,

   (b) publicly accepts or rejects the tariff offers,

   (c) sets the sale price p_i,

   (d) sources inputs, produces and sells to consumers demanding $q_i(p_i, p_{-i})$ units.

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[8]Note that symmetry is not necessary for the analysis, but simplifies the exposition.

[9]The assumptions imply that the input is essential and correspond to a fixed proportions technology such as Leontief.

3. If there is a cartel, with probability $\alpha \in [0, 1)$ the cartelists have to pay compensation.

In Section 4, I study the case that upstream firms cartelize and downstream firms compete, and in Section 5 the reverse: upstream firms compete and downstream firms cartelize. All firms are risk neutral. Competitive prices maximize individual profits, whereas upstream (downstream) cartel prices maximize joint profits of $U1$ and $U2$ ($D1$ and $D2$). With this I abstract from the questions of how the cartel is stabilized – one may assume that cartelists are sufficiently patient to play trigger strategies – and why there is a cartel instead of implicit collusion. See Subsection 6.2 for a discussion on cartel stability. It is common knowledge whether there is a cartel. This assumption is not necessary in its strict form and relaxed in Subsection 6.1.

Similar to Baker (1988) and Salant (1987), the game structure reduces cartel detection and lawsuits to an exogenous process. This is done mainly for tractability, but also appears justifiable, as follow-on suits of public investigations play a major role for private damage compensation. The probability α with which the cartelists have to pay compensation is nevertheless allowed to increase in the cartel price for most of the analysis. For instance, a higher cartel price may ease the burden of proof in a lawsuit and thus increase its success rate. The probability α is common knowledge in the baseline model. Information asymmetries between cartelists and claimants about α are investigated in Subsection 6.1.

4   Upstream cartel

Assume for this section that upstream firms $U1$ and $U2$ cartelize to maximize joint profits, whereas $D1$ and $D2$ set prices non-cooperatively. I only analyze damage claims of the direct purchasers $D1$ and $D2$. This appears to be the by far most relevant case as indirect purchasers, in particular consumers, often lack both knowledge and damage volume to consider lawsuits. In the first three subsections I study linear tariffs. Two part tariffs follow in Subsection 4.4.

The profit of downstream firm i when sourcing at unit price w^i is given by $(p_i - w^i)\, q_i$, yielding the first order condition for p_i of

$$\left(p_i - w^i\right) \frac{\partial q_i}{\partial p_i} + q_i = 0, \ i \in \{1, 2\}. \tag{1}$$

Assume that for the relevant input costs $\{w^i, w^{-i}\}$ there are unique equilibrium downstream prices $p^*(w^i, w^{-i})$ for each firm i, characterized by (1). Let $p(w) \equiv p_i^*(w^i = w, w^{-i} = w)$ and $q(w) \equiv q_i(p(w), p(w))$. Denote the equilibrium downstream profits without any compensation payment by $\pi(w^i, w^{-i}) \equiv (p_i^* - w^i)q_i(p_i^*, p_{-i}^*)$ and $\pi(w) \equiv \pi(w^i = w, w^{-i} = w)$. To have a simple expression for the effect of an increase in the upstream price level, denote $\pi'(w) \equiv \left[\frac{\partial \pi(w^1, w^2)}{\partial w^1} + \frac{\partial \pi(w^1, w^2)}{\partial w^2}\right]_{w^1 = w^2 = w}$ and $p'(w) \equiv \left[\frac{\partial p^*(w^1, w^2)}{\partial w^1} + \frac{\partial p^*(w^1, w^2)}{\partial w^2}\right]_{w^1 = w^2 = w}$. Moreover, impose

Assumption 1. *The downstream profit $\pi(w)$ decreases and the downstream price level $p(w)$ increases in the upstream price level w: $\pi'(w) < 0$ and $p'(w) > 0$.*

That profits decrease in the input price level is generally the case for downstream monopolies and highly plausible for competition, though not necessary.[10] The price increase holds under standard regularity conditions, as does

Assumption 2. *If downstream products are substitutable ($\partial q_i/\partial p_{-i} > 0$), the profit of downstream firm i increases in the input price of firm $-i$: $\partial \pi(w^i, w^{-i})/\partial w^{-i} > 0$.*

Let w^N denote the competitive upstream price. A downstream firm's profit in case of upstream competition is given by $\pi(w^N)$. For instance, with Bertrand competition, the upstream equilibrium prices equal the marginal costs of 0 and downstream profits equal $\pi(0)$. Note that the assumption of Bertrand competition is not necessary: any non-cooperative price below the monopoly level yields the same qualitative results.

4.1 Lost profit compensation

The downstream profit lost due to an upstream cartel is the difference between the equilibrium downstream profits earned under upstream competition and upstream cartelization.[11] The counter-factual profit of a downstream firm in case of upstream competition, $\pi(w^N)$, is assumed to be common knowledge of the firms; the profit under the cartel is yet to be determined.

The LPC to downstream firm i when sourcing from the cartelists at a price w^i is given by

$$\text{LPC}_i \equiv \max\left\{0, \left[\pi(w^N) - \left(p_i - w^i\right) q_i\left(p_i, p_{-i}\right)\right]\right\}, \tag{2}$$

where $\pi(w^N)$ is the counter-factual profit absent a cartel and $(p_i - w^i)\, q_i$ the actual downstream profit in the presence of a cartel. The LPC is paid with probability α,[12] so the expected total profit of a downstream firm is

$$\Pi_i \equiv \left(p_i - w^i\right) q_i\left(p_i, p_{-i}\right) + \alpha\, \text{LPC}_i. \tag{3}$$

Note that $\alpha = 0$ is equivalent to no compensation rule, i.e. $\text{LPC}_i = 0 \,\forall\, i$. For $LPC_i > 0$, substituting from (2) yields

$$\Pi_i = \left[\left(p_i - w^i\right) q_i\left(p_i, p_{-i}\right)\right](1 - \alpha) + \pi(w^N)\alpha. \tag{4}$$

Note that the first term consists of the operational profit scaled down by $1 - \alpha$, as with a profit tax of α. Differentiation of (4) with respect to p_i yields the first order conditions stated in (1), independent of α. Hence the translation from upstream to downstream prices is unaffected by whether a LPC rule is in place ($\alpha > 0$) or not ($\alpha = 0$) and given by $p(w)$ for uniform upstream prices of w.

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[10]Downstream profits decrease in the uniform input price w in case of downstream substitutes if demand q_i does not become less own price sensitive when the price level increases, e.g., if demand is linear.

[11]One may generally ask whether comparing the equilibrium outcomes is the appropriate standard. Though logically sound, one can argue that a reduction in lost profits of a claimant resulting from the cartelists' increase of the claimant's competitors' input costs should not reduce the claim. For a further discussion along these lines see Hellwig (2007).

[12]The solution does not change if one scales the LPC by a positive factor μ, such as 3 for treble damages, as long as $\alpha\mu < 1$. Using the normalization $\mu = 1$ throughout reduces notation.

The two upstream firms fix a cartel price of w. The upstream cartel profit when both downstream firms source all inputs from the cartelists is given by

$$\Pi^U \equiv 2 w \, q(w) - \alpha \sum_{i \in \{1,2\}} \text{LPC}_i = 2 \left\{ w \, q(w) - \alpha \left[\pi(w^N) - \pi(w) \right] \right\}. \qquad (5)$$

For $\alpha > 0$ and a positive cartel overcharge $w - w^N$, the expected LPC is positive and reduces the cartel profit for all relevant w. The factual downstream profit $\pi(w)$ enters the cartel profits positively, so the cartelists partly internalize the downstream profits. This effect is the same as with forward integration. As downstream profits decrease in the cartel price (Assumption 1), the marginal cartel profit

$$\frac{\partial \Pi^U}{\partial w} = 2 \left\{ q(w) + w \, q'(w) - \left[\alpha'(w) \left(\pi(w^N) - \pi(w) \right) - \alpha(w) \, \pi'(w) \right] \right\} \qquad (6)$$

is lower with the compensation rule (equivalently: $\alpha > 0$) than without it ($\alpha = 0$). This is the case even if the probability of a compensation payment is exogenous ($\alpha'(w) = 0$) because $\frac{\partial^2 \Pi^U}{\partial w \partial \alpha} = \pi'(w) < 0$. If the probability increases in the cartel price ($\alpha'(w) > 0$), the marginal cartel profit is reduced further (see (6)). Overall, marginal cartel profits are lower with a compensation rule in place.

No competitive fringe.

A downstream firm only buys from the cartelists if its expected profit when sourcing from the cartelists is weakly higher than when it sources from the fringe at a price of c. For c sufficiently large and under the assumption that cartel profits are strictly concave, the FOC $\frac{\partial \Pi^U}{\partial w} = 0$ uniquely characterizes the optimal cartel price, denoted by w^K. If $\alpha > 0$, the cartelists fix a lower price w^K than if $\alpha = 0$.[13] As $p'(w) > 0$, also consumer prices $p(w^K)$ are lower for $\alpha > 0$. Analogously, expected downstream profits, $(1-\alpha)\pi(w^K) + \alpha\pi(w^N)$, are higher for $\alpha > 0$ than the downstream profits $\pi(w^K)$ that result for $\alpha = 0$. Hence

Proposition 1. *Without a competitive fringe (c sufficiently large) and with linear tariffs, when compared to no compensation rule, consumer prices and upstream cartel profits are strictly lower, whereas expected downstream profits are strictly higher under the LPC rule.*

See Figure 1 for an illustration (please disregard the dashed vertical lines for now). With the LPC, the cartel profit shifts down and to the left. Hence its maximizer also shifts to the left with the LPC and the expected cartel profit decreases.

Competitive fringe.

Consider now that there is an attractive competitive fringe, i.e., c is sufficiently small such that absent a compensation rule ($\alpha = 0$) the cartelists fix the maximal price of c. To make the problem interesting, assume that the competitive price w^N is strictly below c. For instance, with Bertrand competition, $w^N = 0$. Let us first focus on the case that single sourcing is necessary, either because suppliers offer exclusive contracts or for technological

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[13]The implicit function theorem yields $dw/d\alpha = -\frac{\partial^2 \Pi^U}{\partial w \partial \alpha} / \frac{\partial^2 \Pi^U}{\partial w \partial w}$. By assumption, $\frac{\partial^2 \Pi^U}{\partial w \partial w} < 0$ and $\frac{\partial^2 \Pi^U}{\partial w \partial \alpha} = \pi'(w) < 0$.

reasons. Without exclusivity, qualitatively equivalent results are obtained, see Subsection 4.3.

Recall the assumption that a downstream firm can only claim a LPC if it actually sources from the cartelists. If one downstream firm sources from a cartelist at a price of w, the expected profit of the other downstream firm from doing the same must be at least as high as the profit of sourcing from the fringe at a price of c:

$$\pi(w, w) + \alpha \left[\pi(w^N, w^N) - \pi(w, w) \right] \geq \pi(c, w). \tag{7}$$

For $\alpha > 0$ and $w = c$, the incentive compatibility constraint (7) reduces to $\pi(w^N, w^N) \geq \pi(c, c)$, which holds with strict inequality as $\pi'(w) < 0$ by Assumption 1. Hence the cartelists can raise w above c until (7) holds with equality. This implies an equilibrium cartel price $w^K > c$ and consumer prices exceeding the price level $p(c)$ which results without any compensation rule. Intuitively, the cartelists can demand a higher marginal price because in expectation the buyers receive a fixed fee. This is similar to the logic of slotting fees (Shaffer, 1991). Note that when compared to no compensation, the LPC rule reduces consumer surplus!

Total equilibrium downstream profits equal the value of sourcing from the fringe, i.e., the right hand side of (7) evaluated at $w = w^K$, i.e. $\pi(c, w^K)$. If downstream products are independent ($\partial q_i / \partial p_{-i} = 0$), this profit equals the profit without an LPC. With substitutes ($\partial q_i / \partial p_{-i} > 0$), this profit is strictly higher, so competing downstream firms benefit from the LPC rule.

What happens to cartel profits? Without the LPC, the cartel price equals c. The first order effect of introducing an LPC is a decrease in the expected cartel profits in (5). Yet, cartelists can charge a price above c once the LPC is in place. Indeed, in expectation the LPC works like an upfront payment that the upstream cartelists pay to downstream firms. In return, the cartelists can implement higher unit prices w which affect downstream prices and, in turn, industry profits.

Although expected downstream profits are never lower with the LPC than without it, upstream firms can nevertheless benefit in expectation through an increase in industry profits. For this to occur, there must be downstream competition and a relatively efficient fringe, so that without the LPC downstream prices are below the industry profit maximizing level. Using a linear demand specification, one can show that expected upstream cartel profits can indeed increase once downstream competition is sufficiently strong.[14]

Proposition 2. *Let the upstream cartel charge linear tariffs and c be sufficiently small. Compared to no compensation rule, with the LPC rule both input and consumer prices are strictly higher; downstream profits are higher for downstream substitutes, and unchanged for independent products; expected cartel profits can be higher.*

See again Figure 1 for an illustration. With the LPC, a higher cartel price is feasible as the fringe constraint shifts to the right. Although the profit function with the LPC is lower, the maximal expected cartel profits can thus be higher with the LPC than without it. This possibility is illustrated by point b being above point a.

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[14]Using the specification $q_i = 0.5 - (\beta + \gamma) p_i + \gamma p_{-i}$, $\beta, \gamma > 0$, for parameter values $\beta = 1$, $\alpha = 0.1$, $c = 0.05$, the cartelists are in expectation better off once γ exceeds approximately 1.9, i.e., downstream substitutability is sufficiently high.
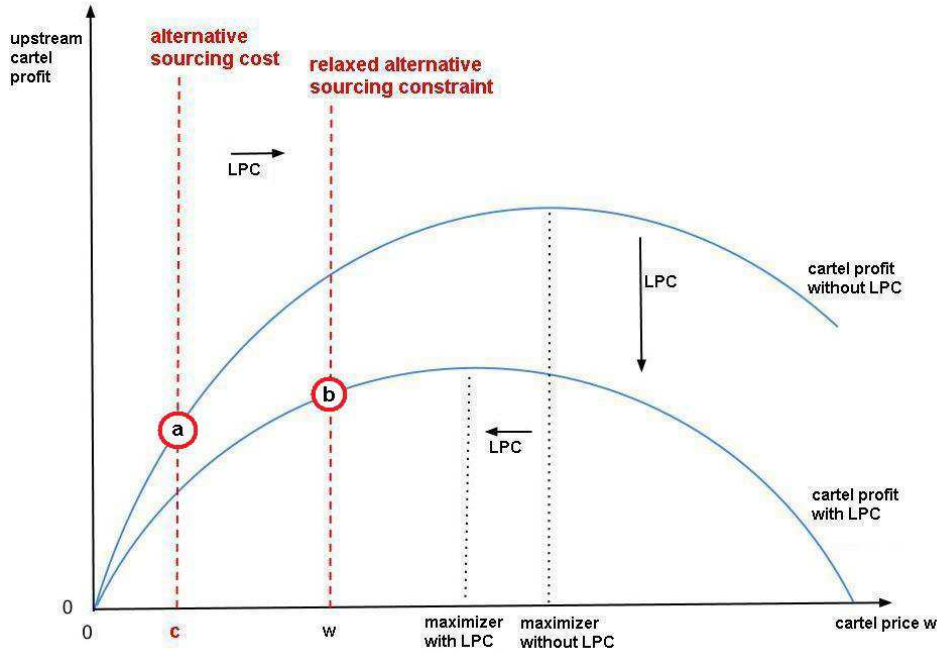
Figure 1: Upstream cartel profits. With a Lost Profit Compensation (LPC) of downstream firms, (marginal) cartel profits are lower, but the fringe constraint is relaxed.

Let us briefly summarize the findings. For the case that the upstream firms can monopolize the input market (c large), Proposition 1 states that the LPC rule decreases cartel prices, decreases expected cartel profits and benefits the downstream firms as well as consumers. This is in line with what common sense tells us. Instead, when the upstream cartel does not monopolize the input market, Proposition 2 states that essentially the opposite can happen: Cartel and consumer prices increase, expected cartel profits can increase and downstream firms may not benefit from the LPC rule. The reason is that the LPC works like a slotting fee: because in expectation the downstream firms receive a compensation payment, they are still willing to buy from the cartelists at an input price which is above the competitive fringe price of c.

4.2 Overcharge compensation

With the Overcharge Compensation (OCC), a downstream firm is only compensated for the overcharge on each unit bought. Formally, the OCC of downstream firm i is given by

$$OCC_i \equiv (w - w^N) \, q_i(p_i, p_{-i}), \tag{8}$$

with w denoting the uniform upstream cartel price and w^N the counter-factual competitive price, with $w^N \leq w$.[15]

Salant (1987) and Baker (1988) have shown that the OCC is neutral if there is no competitive fringe (c large). In case of the LPC, however, we have seen that the results crucially depend on whether there is a competitive fringe (c small vs. large). Let us

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[15]In principle, nothing changes when scaling the OCC by a factor such as 3 for triple damages; see footnote 16 for details.

therefore briefly study the OCC for both cases, so that we can compare it with the LPC. Using (8), the total expected profit of a downstream firm in case of the OCC reduces to

$$\Pi_i = (p_i - w(1 - \alpha)) q_i(p_i, p_{-i}).$$

Given w, the (expected) marginal costs of a downstream firm decrease as α increases. The FOC of downstream profits with respect to p_i is

$$q_i + (p_i - w(1 - \alpha)) \frac{\partial q_i}{\partial p_i} = 0. \tag{9}$$

The upstream cartelists anticipate the effect of w on p when maximizing the joint expected profits

$$\sum_i [w\, q_i - \alpha \, \mathrm{OCC}_i] = w\,(1 - \alpha) \sum_i q_i \tag{10}$$

with respect to w. Denote the effective input price by $\hat{w} \equiv w \cdot (1 - \alpha)$ and substitute it in (9) and (10) to observe that the expressions reduce to the ones without any compensation rule (obtained by setting $\alpha = 0$), only now with $\hat{w}$ instead of w.

No competitive fringe.

Without an attractive competitive fringe (i.e. with c sufficiently large), the effective input price that maximizes cartel profits is again given by $\hat{w} = w^M \equiv \arg\max_w w \cdot q(w)$. The resulting consumer prices are given by $p(w^M)$ and equal the equilibrium prices absent any compensation rule.[16] Hence the expected upstream and downstream profits, as well as consumer surplus, are the same under the OCC and no compensation rule.

This neutrality result holds also if α increases in w. An increased probability of a compensation payment lowers the expected input price of a purchaser and raises the cartelists' expected compensation obligations, but this change is perfectly compensated through an increase in the nominal cartel price.

Competitive fringe.

Let us now consider the case that there is an attractive competitive fringe (c sufficiently small). A downstream firm will simply source all inputs where the expected costs are lowest. With no compensation when sourcing from the fringe, the effective cartel price is lower than the alternative sourcing costs if $w(1 - \alpha(w)) \leq c$. Thus the cartelists will raise w until this condition holds with equality. In turn, the optimal nominal cartel price w^{OCC} is above c, but the effective marginal input costs of downstream firms equal c and consumer prices equal $p(c)$ as without any compensation rule. Hence the neutrality of the OCC is sustained.

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[16]The optimal "nominal" cartel price w^{OCC} is obtained by solving $w^{OCC} = w^M/(1 - \alpha(w^{OCC}))$. The condition has a solution if $\max_w \hat{w}(w) \geq w^M$, i.e., if it is possible to raise the effective input price to the monopoly level. This is clearly the case if $\alpha(w) < 1 \forall w \geq 0$. If $\alpha(w)$ reaches 1 before the previous condition holds, the optimal cartel price is lower and given by $\arg\max_w \hat{w}(w)$ (cf. Salant, 1987). This can in particular be the case if α is not just a probability, but includes a damage multiplier above 1, see footnote 12.

Proposition 3. *Let the upstream cartel charge linear tariffs. With the OCC rule, both expected input and consumer prices as well as expected up- and downstream profits are as with no compensation rule, i.e., the OCC is neutral, independent of the magnitude of c.*

Whereas the LPC has adverse effects when there is an attractive competitive fringe (c small), but beneficial effects otherwise (c large), the OCC is just neutral in both cases. This finding is interesting because the only difference is in how the damage compensation is calculated: the OCC accounts for the cartel overcharge on each unit bought, whereas the LPC accounts also for losses from foregone sales and pass on.

Towards an intuition, recall that with linear tariffs, up- and downstream firms can write contracts that perfectly counterbalance the OCC as it is linear in quantity. This results in neutrality. Instead, the LPC introduces a non-linearity similar to a slotting fee, which effectively changes the linear to particular non-linear tariffs. Allowing for two-part tariffs indeed neutralizes the effects of the LPC when the cartel monopolizes the input market. Interestingly, we will see in Subsection 4.4 that the adverse effects of the LPC persist with two-part tariffs if the competitive fringe is relatively efficient and contracts are non-exclusive.

4.3   Non-exclusive linear upstream tariffs

In Subsection 4.1 I assumed supply contracts to be exclusive: a buyer had to source all inputs from one supplier. In this subsection I show that Proposition 2 on the LPC also holds for non-exclusive linear contracts, with non-exclusive meaning that downstream firms are not restricted in sourcing (additional) inputs from the competitive fringe.

As before, I assume that there is no LPC when sourcing from the fringe (this assumption is relaxed in Subsection 4.5). This implies that a downstream firm which sources some inputs alternatively is not compensated for these expenses, although they are above the counter-factual expenses which would result with no upstream cartel. Consequently, the LPC is computed as if the inputs actually sourced from the fringe would have also been sourced from the fringe were there no cartel. Thus the counter-factual downstream profits equal $\pi(w^N) - c(1-\beta)q_i$, where $(1-\beta)$ denotes the fraction of inputs actually sourced from the fringe, and consequently β the fraction actually sourced from the cartelists.

The actual operational profit of a downstream firm is

$$\pi_i \equiv [p_i - \beta w - (1-\beta)c]\, q_i. \tag{11}$$

A downstream firm's expected profit for a positive LPC is[17]

$$\begin{aligned}
\Pi_i &= \pi_i + \alpha\left[\pi(w^N) - (1-\beta)c\,q_i - \pi_i\right] \\
&= (1-\alpha)\,\pi_i + \alpha\left[\pi(w^N) - (1-\beta)c\,q_i\right] \\
&= (1-\alpha)\,[p_i - \beta w - (1-\beta)c]\,q_i + \alpha\left[\pi(w^N) - (1-\beta)c\,q_i\right] \\
&= (1-\alpha)\left[p_i - \beta w - (1-\beta)c\frac{1}{1-\alpha}\right]q_i + \alpha\,\pi(w^N).
\end{aligned}$$

---

[17]The argument w of α is dropped here for brevity. The results do not depend on whether α' is zero or positive as long as $\alpha > 0$.

As can be easily seen when differentiating the last line with respect to β and setting $w = c$, downstream profits increase in the fraction β of inputs sourced from the cartelists at equal prices as this lowers expected damages. The cartelists can thus raise w up to $c/(1 - \alpha)$ without losing sales to the fringe. The cartelists also have to ensure that a downstream firm does not deviate to source all inputs from the fringe and earn a deviation profit of $\pi(c, w)$, as with exclusive tariffs.[18] Independent of which constraint is stricter, for c sufficiently small, the optimal cartel price is above c, yielding consumer prices above $p(c)$ also with non-exclusive contracts. As a downstream firm can assure itself a profit of $\pi(c, w^K)$ by sourcing all inputs from the fringe, it is better off under the LPC if downstream products are substitutes and not worse off otherwise, similar to the case with exclusive contracts in Subsection 4.1.

4.4   Two-part tariffs

Assume now that the suppliers $U1$ and $U2$ offer to each downstream firm a two-part tariff with a marginal price w as before and additionally a fixed fee F that needs to be paid upon acceptance of the contract. Maintain the assumption entertained so far that sourcing from the fringe yields no compensation claim.[19] When both downstream firms source inputs from the cartelists, each earns an expected profit of

$$\Pi_i(w, F) = \pi(w, w) - F + \alpha \left[\pi_N - (\pi(w, w) - F) \right], \tag{12}$$

with π_N denoting the counter-factual downstream profit without an upstream cartel.[20]

If Di accepts a (non-exclusive) contract and sources one more unit of input from the fringe instead of from a cartelist, it has a direct cost saving of $w - c$, but its expected compensation is reduced by αw due to the assumption of no compensation for sourcing from the fringe. This is the same logic as with linear tariffs in Subsection 4.3. Hence the downstream firm optimally sources all inputs from the cartelists if $w \leq c/(1 - \alpha)$. The cartelists' problem is to

$$\max_{F,w} \Pi^U = 2 \left[w \, q(w) + F \right] - \alpha \sum_i LPC_i \tag{13}$$

$$s.t. \quad \Pi_i(w, F) \geq \pi(c, w) \, \forall i, \tag{14}$$

$$w \leq c/(1 - \alpha). \tag{15}$$

The participation constraints in (14) clearly have to hold with equality as otherwise the cartelists could profitably raise F. The no arbitrage condition (15) is relevant in case contracts do not contain exclusivity clauses such that for $w > c/(1 - \alpha)$ and $F < 0$, purchasers could profitably cash F, but actually source from the fringe.

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[18]Intuitively, if a marginal deviation is not profitable, a discrete deviation, which additionally implies a discrete decrease of the non-linear compensation component, is not profitable either. This logic should be valid at least under strategic complementarity in downstream prices because then not accepting the supply contract of the cartelists and thereby committing to a lower perceived marginal input cost of c should be detrimental. For strategic substitutes, this may though favor the discrete deviation.

[19]The relaxation of this assumption is discussed for linear tariffs in Subsection 4.5. A similar logic applies for two-part tariffs.

[20]I do not use the notation $\pi(w^N)$ as the competitive upstream tariffs are potentially also non-linear and downstream profits may thus differ.

Substituting for Π_i from (12) in (14), imposing equality and solving for F yields

$$
\begin{aligned}
\pi(c, w) &= \pi(w, w) - F + \alpha \left[\pi_N - (\pi(w, w) - F) \right] \\
\Longrightarrow F &= \pi(w, w) + \frac{\alpha \, \pi_N - \pi(c, w)}{(1 - \alpha)}.
\end{aligned}
\tag{16}
$$

Substituting in (13) for LPC_i from the brackets in (12) and for F from (16) yields

$$
\Pi^U = 2 \left[p(w) \, q(w) - \pi(c, w) \right],
\tag{17}
$$

which is independent of α. If contracts are **exclusive,** the no-arbitrage condition (15) is irrelevant and the problem is thus independent of α. Hence for any c, the LPC has no effect on expected cartel profits and marginal equilibrium prices w^K and p^K.

Instead, if contracts are **non-exclusive**, the no-arbitrage condition (15) is relevant and downstream firms prefer to source from the fringe once $w > c / (1 - \alpha)$. Evaluating $\partial \Pi^U / \partial w$ at $w = c$ yields that it is positive for sufficiently small c and downstream substitutes.[21] For $\alpha = 0$, the optimal tariff is thus $\{F^K = 0, w^K = c\}$ and endogenously linear. For $\alpha > 0$, the no-arbitrage constraint is relaxed and a marginal price $w > c$ is feasible and also profitable for the cartelists if $\partial \Pi^U / \partial w > 0$ at $w = c$. Hence without exclusivity clauses, but with downstream price competition and sufficiently small c, marginal prices as well as cartel profits are above the levels which would result without am LPC. The equilibrium downstream profit equals the outside option value $\pi(c, w^K)$ on the right hand side of (14) and is higher under the LPC as $\partial \pi(c, w) / \partial w > 0$.

Proposition 4. *Assume that an upstream cartel uses two-part tariffs. Compared to no LPC rule,*

(i) if there is no competitive fringe or downstream products are not substitutable or input contracts are exclusive, the LPC is neutral with respect to marginal prices and expected profits.

(ii) If sourcing from the fringe is sufficiently attractive and input contracts are not exclusive and downstream products are substitutes, marginal prices and both expected upstream cartel and downstream profits increase.

The first part of Proposition 4 nicely relates the neutrality of the OCC with linear tariffs (Proposition 3): The OCC only imposes a discount that is linear in quantity. Hence linear tariffs are sufficient to neutralize this discount. Instead, the LPC implies a non-linear discount which essentially transforms the linear upstream tariffs into two-part tariffs. This yielded Propositions 1 and 2. With two-part tariffs, the non-linear discount implied by the LPC can be contracted around again, yielding Proposition 4 (i).

Yet, even with two-part tariffs the cartelists are constrained by the competitive fringe in their marginal price setting as the downstream firms' outside options are endogenous (see (17)). In cases where the cartelists want to set the highest feasible marginal price, the LPC helps them to sustain even higher prices. This is the same result as before with linear tariffs in Subsection 4.3 and yields Proposition 4 (ii).

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[21]See Proposition 4 in Hunold et al. (2012). That $\partial \Pi^U / \partial w > 0$ at $w = c$ depends on the assumption of downstream price competition.

4.5 Compensation when sourcing from the competitive fringe

Up to here, a firm was assumed to receive compensation with positive probability only if it actually traded with the cartelists. Note that compared to the regime with competitive upstream prices, a damage for a buyer also arises if the upstream cartel prices are so high that it is best for him to source from the less efficient competitive fringe. Although it appears difficult to successfully claim cartel damages without having traded with a cartelist, it is interesting to study the effects of relaxing this assumption. As we will see, the effectiveness of the compensation rule in reducing consumer prices and decreasing cartel profits is increased in this case. Facilitating such claims, if possible, is thus a desirable policy consideration.

Assume that a downstream firm can also claim a LPC if it does not source from the upstream cartelists. Clearly, relaxing the assumption on alternative compensation is only interesting if the competitive fringe is relevant (c sufficiently small), as otherwise sourcing alternatively is not a consideration.

When the linear contracts are exclusive,[22] downstream firm Di prefers to source from the cartelists, given the other firm does so, over sourcing from the fringe if[23]

$$\pi(w, w) + \alpha(w) LPC_i \geq \pi(c, w) + \alpha(w) LPC_i. \tag{18}$$

Condition (18) reduces to

$$\pi(w, w) \geq \pi(c, w), \tag{19}$$

if LPC_i on the right hand side of (18) is either conditioned on w or the actual alternative input price of c.[24] Raising w above c violates (19): each downstream firm then prefers to source from the fringe, so the equilibrium cartel price is $w^K = c$. In turn, downstream prices equal $p(c)$ as without a compensation rule.

As input prices do not counterbalance the LPC, the LPC rule clearly implies a redistribution from upstream cartelists to downstream firms, yielding

Proposition 5. *Assume that an upstream cartel charges linear tariffs, there is an attractive competitive fringe (c sufficiently small), and sourcing from the fringe yields the same LPC as sourcing from the cartelists. When compared to no compensation rule, input and consumer prices are unchanged, whereas expected downstream profits increase and cartel profits decrease.*

Excursion: Overcharge Compensation.

If a downstream firm receives the OCC also if it sources from the fringe, it buys from an upstream cartelist only if

$$w - \alpha(w)w \leq c - \alpha(w)w.$$

---

[22]The same results can easily be obtained for non-exclusive contracts.

[23]The assumption implicit in this statement is that the compensation probability α depends on the cartel price w independently of whether one or both firms actually source from the cartel.

[24]The reduction is straightforward if LPC_i is equal on both sides of (18). Explicitly conditioning on actual input prices yields $\pi(w, w) + \alpha(w)[\pi(0) - \pi(w, w)] \geq \pi(c, w) + \alpha(w)[\pi(0) - \pi(c, w)]$ which equivalently reduces to (19).

This implies $w \leq c$, yielding an optimal nominal cartel price of $w^K = c$.[25] Interestingly, the effective marginal costs of downstream firms now equal $c(1 - \alpha(c))$ and are strictly below c for $\alpha > 0$. Hence granting an OCC to downstream firms also when sourcing from the fringe yields lower consumer prices and decreases the upstream cartel profitability compared to no compensation rule.

5   Downstream cartel

Assume now that the downstream firms $D1$ and $D2$ fix sales prices to maximize joint profits. To make this meaningful, assume that the downstream products are substitutes: $\partial q_i / \partial p_{-i} > 0$, so downstream firms benefit from a cartel which allows them to internalize the price externalities. Moreover, assume that demand decreases when all prices increase: $\partial q_i / \partial p_i + \partial q_i / \partial p_{-i} < 0$. Maintain the assumption that each supplier can make take-it-or-leave-it offers in the first stage, so the downstream cartelists can still not directly influence input prices.

Upstream firms $U1$ and $U2$ set prices non-cooperatively and are eligible to claim compensation from the downstream cartelists, but no claims accrue to the competitive fringe.[26] To study the effects of a downstream cartel on supplier profits, it is necessary that $U1$ and $U2$ can make positive profits. Assume for simplicity that supplier $U1$ ($U2$) can serve $D1$ ($D2$) at zero marginal costs as before, but that serving the other downstream firm is prohibitively costly.

The joint downstream profits when sourcing all input from $U1$ and $U2$ at w^1 and w^2 are given by

$$\Pi_D(p_i, p_{-i}) \equiv \sum_{i \in \{1,2\}} \left\{ \left(p_i - w^i \right) q_i(p_i, p_{-i}) - \alpha \, LPC^i \right\}.$$

Let π^N denote the equilibrium profit of a supplier when both up- and downstream prices are set non-cooperatively. The LPC claim of supplier Ui if selling to Di is

$$LPC^i = \max \left[0, \pi^N - w^i \, q_i(p_i, p_{-i}) \right].$$

For $LPC^i > 0$, downstream profits are

$$\Pi_D(p_1, p_2) = \sum_{i \in \{1,2\}} \left\{ \left(p_i - w^i(1-\alpha) \right) q_i(p_i, p_{-i}) - \alpha \, \pi^N \right\}. \tag{20}$$

The profit of supplier Ui is

$$\Pi^i = (1 - \alpha) \, w^i \, q_i + \alpha \, \pi^N. \tag{21}$$

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[25]Note that also if the purchaser is compensated with c instead of w^K when sourcing from the fringe, the same results obtain.

[26]For example, because the fringe firms make zero profits or because the downstream firm's alternative is to produce in-house.

No competitive fringe.

Without a competitive fringe (c sufficiently large), each supplier is the monopolist of its downstream firm. The suppliers still influence each other indirectly through the effects of input prices on sales prices and thus input sales.

For now assume that the probability of a due payment is completely exogenous, i.e., α does not depend on the cartel prices.[27] Let $\tilde{w}^i \equiv w^i(1-\alpha)$ and substitute in (20) and (21) to observe that given $\tilde{w}^i$, the marginal profits with respect to the corresponding prices do not depend on α. Hence the effective equilibrium upstream price, denoted by $\tilde{w}^*$, is not a function of α, whereas the nominal price solves $w^* = \tilde{w}^*/(1-\alpha(w^*))$. The equilibrium downstream cartel price, denoted by p^K, is not affected by the LPC. A supplier's expected profit,

$$\Pi^i = \tilde{w}^* q_i(p^K, p^K) + \alpha\,\pi^N,$$

increases in α by the second term. As p^K is invariant in α, downstream cartel profits must decrease in α.

Proposition 6. *Assume that there is a downstream cartel, supplier Ui, $i \in \{1,2\}$, is a monopolist for firm Di using linear tariffs (c sufficiently large), and α is exogenous. Compared to no compensation rule, the LPC has no effect on consumer prices, benefits suppliers and decreases cartel profits.*

Competitive fringe.

Assume now that the fringe price c is sufficiently small such that absent any compensation rule, it is optimal for each supplier to charge c both in case of a downstream cartel and downstream competition.[28] At equal input prices, the downstream cartel markup is above the competitive markup. Hence the quantity sold is lower with a cartel and upstream profits are smaller.

With the LPC, the cartelists' choice between buying inputs for Di from the efficient supplier Ui and sourcing from the fringe depends not simply on whether input price w^i is below or above c, but also on the expected damage payments.

Recall the assumption that a LPC claim is valid only if trade with the cartelists takes place. If $w^i = c$ and $LPC^i > 0$, the cartelists prefer sourcing from the fringe as they pay the same input price and avoid the damage payment. Hence the upstream firms have to lower their prices below c to remain attractive.[29]

For $LPC^i > 0$, the cartel profit from sourcing all inputs from $U1$ and $U2$ at uniform prices of $w^1 = w^2 = w$ is defined by (20). The cartel profit from sourcing input for $D1$

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[27]This simplifies the exposition as otherwise one needs to explain how upstream firms account for how their input prices affect downstream cartel margins and in turn the detection probability. That distracts from the main point.

[28]This assumption is not completely innocuous. Intuitively, a downstream cartel puts additional pressure on input prices. In particular, with homogenous downstream products the equilibrium upstream prices equal 0 in case of joint downstream profit maximization because it does not matter which producer's product is sold more, except for the input price. Instead, upstream prices are positive in case of downstream competition a la Cournot.

[29]Note that this logic also applies if the LPC is not payable to the suppliers, but instead to the competition authority. This decoupling has been suggested by Polinsky and Che (1991) to avoid excessive lawsuits (recall the discussion in the Introduction).

from the fringe and input for $D2$ from $U2$ at w is

$$\Pi_D^{ALT}(p_1, p_2|w) \equiv (p_1 - c)\, q_1(p_1, p_2) + (p_2 - w\,(1 - \alpha))\, q_2(p_2, p_1) - \alpha\, \pi^N. \quad (22)$$

The value of sourcing from $U1$ depends on the input price for product $U2$. In equilibrium, it must be that

$$\max_{p_1,p_2} \Pi_D(p_1, p_2|w^1 = w^2 = w) = \max_{p_1,p_2} \Pi_D^{ALT}(p_1, p_2|w^2 = w), \quad (23)$$

i.e., for any price larger w charged by supplier Ui, the cartelists prefer to source the inputs for Di from the fringe at price c and adjust sales prices accordingly.

Recall that without compensation and c sufficiently small, the equilibrium input prices equal c. Hence there is no gain for the downstream cartelists from adjusting sales prices when turning to the competitive fringe for one product. Instead, with the LPC and input prices below c, the cartelists can profitably adjust prices:[30] When deviating to source inputs for $D1$ alternatively at price c, while continuing to source inputs for $D2$ at a price $w < c$, the downstream cartelists under standard conditions (as with linear demand) optimally raise the sales price on the high cost product of $D1$ and thus make a higher profit on the low cost product of $D2$. Hence the attractiveness of the cartelists' outside option is higher once $w < c$. Intuitively, the more substitutable the downstream products are, the more attractive this option becomes.

This logic yields a striking possibility: With the LPC in place, the expected profit of a supplier may be lower than that earned without a compensation rule. This intuition can be confirmed using the linear demand specification $q_i = 1/2 - (\beta + \gamma)\, p_i + \gamma\, p_{-i}$. For large parameter ranges with a sufficiently high substitution intensity γ, the optimal input prices without a compensation rule equal c and suppliers are worse off under the LPC, whereas cartelists are better off. See Table 1 for the parametric results.

γ	Upstream price (w)	$\Pi^{U1}(\alpha = 1/2)/\Pi^{U1}(\alpha = 0)$	$\Pi_D(\alpha = 1/2)/\Pi_D(\alpha = 0)$
0.5	0.04	104%	100%
1.65	0.02	100%	101%
4	0	83%	105%
5	−0.02	69%	108%

Table 1: Results for $\alpha = 0.5$, $\beta = 1$, $c = 0.05$ and increasing degrees of downstream competition (γ). Column 3 presents the supplier profit with the LPC relative to no LPC, Column 4 the ratio of downstream cartel profits.

Proposition 7. *Assume that there is a downstream cartel, each supplier Ui, $i \in \{1, 2\}$, can only supply downstream firm Di using linear tariffs, and the competitive fringe is attractive (c sufficiently small). Compared to no compensation rule, the LPC decreases consumer prices, but may increase cartel profits and hurt suppliers.*

Intuitively, with two-part tariffs a supplier can make its offer more attractive by lowering the fixed fee and at the same time still offer optimal marginal price. In consequence,

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[30]Even at prices of c and the LPC in place, in case of a deviation a price adjustment is profitable as the effective input price when sourcing from a supplier Ui is $c\,(1 - \alpha)$ instead of c.

the rent shift between supplier and customer that is imposed by the LPC is simply counteracted through the fixed fees and the LPC is neutral.

Proposition 8. *Assume that there is a downstream cartel and each supplier Ui, $i \in \{1,2\}$, can only supply downstream firm Di; two-part tariffs are feasible. If there is no competitive fringe or it yields no LPC and α is exogenous, the LPC does not affect consumer prices and expected profits, when compared to no compensation rule.*

Proof. See Appendix. □

5.1   Compensation when sourcing from the competitive fringe

Assume again that upstream tariffs are linear and, furthermore, that supplier Ui is compensated with

$$\max \left[0, \left(\pi^N - \beta \, w^i \, q_i \right) \right],$$

where β denotes the fraction of inputs for Di which the cartelists purchase from Ui, and $1 - \beta$ the fraction of inputs for Di which the cartelists purchase from the fringe. In case of a positive expected compensation (assumed henceforth), sourcing one unit from the fringe decreases cartel profits by c, whereas sourcing one unit from Ui decreases (expected) profits by $w^i - \alpha \, w^i$. The downstream cartelists are indifferent at $w^i = c/(1-\alpha)$, so supplier Ui can raise price above c, yielding equilibrium upstream prices of $w^* = c/(1-\alpha) > c$ for c sufficiently small. The expected supplier profit equals

$$w^* q_i + \alpha \left[\pi^N - w^* q_i \right] \;\; = c \, q_i + \alpha \, \pi^N.$$

For the cartelists, the effective input prices equal c as without any compensation rule. Downstream cartelists are worse off compared to no compensation rule because they additionally pay $\alpha \, \pi^N$ in expectation to the suppliers.

If α is independent of the cartel prices, i.e. $\alpha'(w) = 0$, the resulting downstream prices and quantities are as with no compensation rule. If α increases in the cartel markup, i.e. $\alpha'(w) > 0$, marginal cartel profits are lower, cartel prices lower and quantities higher.[31] This benefits both consumers and suppliers. As analyzed in Subsection 4.5 for upstream cartels, compensating for cartel damages even if no trade with the cartelists has taken place is beneficial for consumers.

Proposition 9. *Assume that there is a downstream cartel and each supplier Ui, $i \in \{1,2\}$, can only supply downstream firm Di using linear tariffs. If there is an attractive competitive fringe (c sufficiently small) and sourcing from also yields the LPC, the LPC benefits suppliers and hurts the cartelists. Consumer prices decrease only if α increases in the cartel mark-up and are unchanged otherwise.*

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[31]Note that the marginal profit of $\Pi_D(p_1, p_2) = \sum_{i \in \{1,2\}} \left\{ \left(p_i - w^i \right) q_i - \alpha \max \left[0, \left(\pi^N - \beta \, w^i \, q_i \right) \right] \right\}$ with respect to p_i is lower if $\partial \alpha / \partial p_i > 0$ and the supplier has a loss due to the cartel.

6 Extensions

6.1 Asymmetric information about the probability of compensation

So far I have assumed that all firms know the detection probability α and are aware of its public nature. This simplifies the exposition, but is not necessarily realistic. The opposite extreme case considered by Block et al. (1981) is that purchasers of upstream cartelists are agnostic about the possibility of a damage compensation, i.e., assess α with zero, and cartelists are aware of this. Block et al. have shown that this can be beneficial for the purchasers who than – incorrectly – take the nominal input price to be the effective one. Hence, the cartelists cannot increase prices to neutralize the rebate, and in turn the cartel profitability decreases also with the overcharge compensation, whereas purchasers benefit.

Besanko and Spulber (1990) have shown that the full neutrality of the overcharge compensation derived by Baker (1988) and Salant (1987) can fail if the cartelists' costs are private knowledge: the purchasers are no more sure about the effective input, i.e. whether it is due to high cost or a cartel overcharge. In turn cartelists have incentives to moderate the price.

Yet, the major results presented in the present paper can be obtained also in case of asymmetric information. To illustrate this, let us consider a simple example: The cartelists know the true probability α of a compensation payment when there is a cartel, whereas customers do not know whether collusion is implicit (read: legal, no compensation claims) or explicit (a cartel, compensation claims). Suppose that it is common knowledge that collusion is explicit with probability $\gamma > 0$. The customers thus expect a compensation payment with probability $\alpha\gamma$. Suppose further that the suppliers $U1$ and $U2$ collude and there is an attractive competitive fringe (c sufficiently small), but there is no compensation in case of alternative sourcing. If both $U1$ and $U2$ charge a (linear) input price of c, the customers strictly prefer to source from $U1$ or $U2$ over sourcing from the fringe: Only if they source from $U1$ or $U2$, they receive compensations with a positive probability. Hence, the (linear) equilibrium price charged by the colluding suppliers is above w, both in case of explicit and implicit collusion. Similarly, also the other adverse effects stated in Subsection 4.1 hold for γ sufficiently large. Note that the compensation rule consequently also has adverse effects in case that collusion is indeed implicit. The implicit colluders thus benefit from the umbrella of private enforcement of the cartel prohibition.

Overall, it appears plausible that the trade partners of cartelists have at least some knowledge (say, suspicion) of collusive behavior, and that the cartelists are aware of this. Moreover, recall that the results of this paper also apply for a dominant firm that charges excessive prices. For dominant firms it appears even more likely that their trade partners are aware of excessive pricing, though there may be common uncertainty about whether this can be proved in court (which is captured by α).

6.2 Cartel stability

Private enforcement may cause substantial damage obligations to accumulate over time. Eventually, the motive of avoiding discovery of evidence and by that avoiding paying the damage obligations may thus become the dominating objective of the cartelists. If the continuation of the cartel yields the highest discovery probability, there are thus incentives for a cartel breakdown. A cartel breakdown may, however, facilitate cartel detection because it causes price jumps which are suspicious for trade partners or the competition authorities. In this case private enforcement can even stabilize the cartel as defection from a cartel may become highly unprofitable. Yet, this logic also applies to public fines, see Harrington (2004).[32]

A further investigation of cartel stability in the context of private enforcement is out of the scope of this paper, but appears worthwhile for future research.

6.3 Endogenous detection

Recall that α denotes the probability of a damage compensation. This probability may increase in the cartel price for several reasons. For example, providing convincing evidence of a damage due a cartel may be easier when the markup is higher, so that lawsuits tend to be more successful and more frequent than in case of low markups.

Moreover, the detection probability may increase with the cartel price. In a dynamic setting, an increase in the cartel price today thus reduces expected future cartel profits. Purchasers of the cartelists may though not perceive that as a discount on their sales of today. Whinston (2006) shows that the neutrality result of Baker (1988) and Salant (1987) for the case of OCC and monopolistic suppliers fails in this case.

The alleviating effect of an increase in the detection probability generally also applies for the LPC studied in this paper, but the results are more robust than in the OCC case for at least two reasons. First, the LPC is not just neutral, but the LPC can strictly decrease allocative efficiency, benefit both upstream and downstream cartelists and hurt suppliers. Hence, endogenizing the detection probability in a dynamic setting may weaken, but does not necessarily overturn the result of strictly adverse effects. The second reason is slightly more technical: The aforementioned results (in particular Propositions 2 and 4) occur in case alternative sourcing is attractive. This involves corner solutions in the pricing problems which persist when the marginal profits are slightly perturbed.

7 Conclusion

By establishing private damage compensation claims, the EU-Commission aims at increasing the effectiveness of cartel deterrence, improving corrective justice by compensating those who suffered losses, and increasing efficiency. Forcing infringers to pay claimants the profit lost due to the infringement is the ex-post measure that achieves full compensation. Indeed, European courts have stated that compensating lost profits is the norm and

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[32]Straightforward is the argument that private damage compensation claims can reduce the incentives for leniency applications, in particular if the applicant's information is disclosed to private parties, making it an easy target.

also the EU-Commission has indicated to aim at full compensation. Moreover, Han et al. (2008) have shown by means of an oligopoly model that the Overcharge Compensation can be far away from actual losses due to a cartel. This favors the Lost Profit Compensation, although it is often harder to compute than the Overcharge Compensation.

Investigating ex-ante incentives, I show in this paper that Lost Profit Compensation claims of customers can have completely undesirable allocative effects: Expected cartel profits as well as consumer prices can increase and suppliers of cartelists can be worse off when entitled to compensation claims. The mechanism at work is that if anticipated, the compensation payments from the cartelists to their trade partners are counterbalanced through prices that are more favorable to the cartelists. The same logic applies to excessive pricing of dominant firms.

These effects arise if there is fringe competition upstream in spite of the cartel, e.g., due to imports or in-house production. If the cartel monopolizes the input market, instead, the Lost Profit Compensation tends to provide socially desirable incentives and tends to perform better than the Overcharge Compensation. The latter has already been studied by Baker (1988) and Salant (1987) in a less general framework and has been confirmed to be at worst neutral in terms of expected profits and consumer prices. As a policy implication, the Overcharge Compensation is likely to be more desirable than the Lost Profit Compensation in terms of ex-ante incentives if cartels and dominant firms are expected to be unable to fully monopolize the market in most cases.

In the US, suppliers have been recognized as antitrust victims in some, but were denied standing in other cases (Han et al., 2008). The legal treatment in the EU is still open. I have pointed out that facilitating supplier claims can also have undesirable effects. Most strikingly, in some cases it does not hurt, and in others it even benefits suppliers to *not* have standing. In other words: Facilitating supplier damage claims may be intended to benefit suppliers, but it may turn out to be a curse for them.

The arguments provided in this paper can be used to structure and stimulate the policy discussion about ex-ante incentives of private compensation claims in case of competition law infringements, in particular cartels and abuses of dominant positions. One should, however, bear in mind that the adverse results are derived under two central assumptions. The first is that damages can only be claimed if trade with the cartelists took place, so that sourcing from the competitive fringe does not trigger compensation. This appears to be realistic. Even if legally possible, it is highly likely that it is effectively much harder or even infeasible to claim a commercial damage if one did not actually trade with the cartelists. The second assumption is that the cartelists and their trade partners rationally anticipate the compensation payments when trading. Informally speaking, this means that there needs to be at least some suspicion in the industry that there could be a cartel or an abuse of a dominant position and that damage claims have a chance to succeed. This also appears plausible, and at the same time an interesting avenue for empirical research.

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Appendix

Proof of Proposition 9. Let π^N denote a supplier's profit in case of downstream competition. When sourcing from supplier Ui, the downstream cartelists face a damage claim of $LPC^i = \max\left\{0, \pi^N - [w^i q_i(p_i, p_{-i}) + F^i]\right\}$. For $LPC^i > 0$, the profit of supplier Ui is

$$\Pi^i = \left(w^i q_i + F^i\right)(1 - \alpha) + \alpha \pi^N. \tag{24}$$

Downstream cartel profits when sourcing from $U1$ and $U2$ become

$$\Pi_D(p_1, p_2) = \sum_{i \in \{1,2\}} \left\{\left(p_i - w^i(1 - \alpha)\right) q_i - F^i(1 - \alpha) - \alpha \pi^N\right\}. \tag{25}$$

The cartelists' profit when sourcing from Ui for Di and from the fringe for $D-i$ is

$$\Pi_D^{ALT}(p_i, p_{-i}) = \left(p_i - w^i(1 - \alpha)\right) q_i - F^i(1 - \alpha) - \alpha \pi^N + (p_{-i} - c) q_{-i}.$$

The cartelists are indifferent between the latter and sourcing both from $U1$ and $U2$ if

$$\max_{p_1, p_2} \Pi_D^{ALT}(p_1, p_2) = \max_{p_1, p_2} \Pi_D(p_1, p_2). \tag{26}$$

To simplify this exposition, assume that α is exogenous. Let $\{p_i^*, p_{-i}^*\} = \max_{p_1, p_2} \Pi_D$ to reduce (26) to

$$F^i(1 - \alpha) = (p_i^* - w^i(1 + \alpha)) q_i + (p_{-i}^* - w^{-i}(1 + \alpha)) q_{-i} - F^{-i}(1 - \alpha) - 2\alpha \pi^N - \max_{p_1, p_2} \Pi_D^{ALT}.$$

Substituting F^i in (24) yields

$$\Pi^i = p_i^* q_i + (p_{-i}^* - w^{-i}(1+\alpha)) q_{-i} - F^{-i}(1-\alpha) - \alpha \pi^N - \max_{p_1,p_2} \Pi_D^{ALT}. \qquad (27)$$

The profit is maximized when the downstream cartelists face the true input costs. Observe in (27) that for $w^{-i} = 0$, it is profit maximizing to set $w^i = 0$. Hence marginal upstream prices of 0 are mutually best responses, independent of the value of α. Under symmetric upstream tariffs with $w^1 = w^2 = 0$, the indifference condition (26) reduces to

$$F(1-\alpha) = \max_{p_1,p_2} \sum_{i \in \{1,2\}} \{p_i q_i\} - \max_{p_1,p_2} \{p_i q_i + (p_{-i} - c) q_{-i}\} - \alpha \pi^N$$

and

$$\Pi^i = \max_{p_1,p_2} \sum_{i \in \{1,2\}} \{p_i q_i\} - \max_{p_1,p_2} \{p_i q_i + (p_{-i} - c) q_{-i}\}, \qquad (28)$$

which is independent of α. Hence the LPC is neutral in terms of consumer prices and expected profits. □