Optional fixed fees in multilateral vertical relations

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Abstract

We examine vertical contracting in a perfect information environment. In contrast to McAfee and Schwartz [McAfee, R.P., Schwartz, M., 1994. Opportunism in multilateral vertical contracting: Nondiscrimination, exclusivity and uniformity. American Economic Review. vol. 84, pp. 210–230.] we demonstrate that outcomes are efficient if an upstream monopolist has the choice of requiring upfront fixed fee payments or making them 'optional'.
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1. Introduction

The main result in the literature on vertical contracting has been to demonstrate how ex post opportunism constrains an upstream monopolist's ability to leverage its market power downstream. Starting from 'efficient' supply contracts consistent with an integrated monopoly outcome, an upstream monopolist has an incentive to act opportunistically by discounting to selected downstream firms.

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Anticipating this, other downstream firms will only sign agreements consistent with a more oligopolistically competitive outcome.

There have been several different statements of these results. Hart and Tirole (1990), O'Brien and Shaffer (1992), McAfee and Schwartz (1994), Segal (1990), Segal and Whinston (2003), and de Fontenay and Gans (2005) all demonstrate how private information may give rise to secret discounting. In contrast, one of the central results of McAfee and Schwartz (1994) [hereafter MS] was to demonstrate how a similar outcome could occur even with perfect information; a particularly strong challenge to Chicago School presumptions.

The result that arms-length vertical contracting may not maximise industry profits has, of course, motivated analyses of alternative practices that could achieve this. For instance, vertical integration allows the downstream externalities to be partially internalised by the upstream firm (Hart and Tirole, 1990) while exclusive dealing may directly reduce downstream competition (Rey and Tirole (2003)).

Here we demonstrate, however, that efficiency in the complete information variant explored by MS may be more easily achieved. We reconsider an implicit but, it turns out, far from innocuous assumption that downstream firms must pay fixed fees upfront (prior to learning information about the contract terms of others). We demonstrate that an upstream firm has an incentive to make such fees optional, thus, providing a means for downstream firms to back out of contracts if they have been the victim of opportunistic behaviour. This, in turn, removes the upstream firm's incentive to act opportunistically; restoring efficiency. The simplicity and the realistic nature of optional fees lead us to conclude that imperfect information or downstream bargaining power are necessary ingredients to motivate inefficiencies in vertical contracting.

2. Model set-up

We consider the environment of MS where an input monopolist faces n (>1) competing downstream firms that can use that input. The monopolist has no fixed costs and a constant marginal cost, $z > 0$. To firm i, the monopolist offers a two part tariff, $T_i(q) = f_i + r_i q_i$ where f_i is the fixed fee, and r_i is the unit price. Interestingly, McAfee and Schwartz (1994) impose a requirement that the fixed fee is upfront. That is, as soon as a downstream firm accepts a supply contract, it is liable for the fixed fee; that is $T_i(0) = f_i$.

Here we depart from MS's game by making it a choice for the monopolist whether this tariff is *upfront*—payable regardless of quantity chosen—or *optional*—paid only if $q_i > 0$; that is, $T_i(0) = f_i$ or $T_i(0) = 0$.[1] To be sure, the upstream firm will still be able to impose the upfront constraint in any offer; however, as we demonstrate, it will not want to.

As in MS, it is assumed that, for i, profits are $\pi_i(r_i, \boldsymbol{r}_{-i}) - f_i$ where $\boldsymbol{r}_{-i}$ is a vector of unit prices paid by i's downstream rivals. $\pi_i(.)$ is continuously differentiable, decreasing in r_i, increasing in $\boldsymbol{r}_{-i}$ and submodular in $(r_i, \boldsymbol{r}_{-i})$ (as per standard theories of oligopoly including differentiated goods Bertrand and Cournot competition).

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[1] In contrast, Marx and Shaffer (2004b) assume that the fixed fee is always optional but that the downstream firm incurs a relationship-specific sunk cost as soon as they accept a contract. This plays the same role as MS's upfront requirement. Our focus here is what happens when the monopolist is not constrained in its contract terms.

The timing of the game is as follows:

Stage 1   (*Offers/Acceptances*): The monopolist approaches firms 1, ..., n sequentially where an offer is a pair, (f_i, r_i) with either $T_i(0) = f_i$ or $T_i(0) = 0$. When approached, firm i, chooses whether to accept or reject that offer. The monopolist then moves on to the next firm in the sequence. All offers and acceptances are publicly observed.

Stage 2   (*Competition*): Firms simultaneously
             (i) set their downstream instruments, prices, or outputs; and
             (ii) purchase the necessary amounts of the monopolist's input.

As noted earlier, this game differs from that of MS only in terms of permitting the monopolist to make fixed fees optional.[2] Note, however, that the only contract terms that become publicly observed at Stage 2, are the marginal prices. Fixed fees and whether they are optional or not, are not communicated.

3. Upfront fees

To build intuition, we begin with the case of MS where the monopolist is constrained to set $T_i(0) = f_i$ for all i. In this case, they find that there is no equilibrium that achieves a payoff to the monopolist of $G^* \equiv \max_r \Pi(r)$ where r is the vector of all marginal prices and:

$$\Pi(r) = \sum_{i=1}^{n} (r_i - z)q_i(r) + \pi_i(r) \qquad (1)$$

The reason is simple: let r_i^* be the marginal price to i and r_{-i}^* the vector of marginal prices to firms other than i consistent with achieving G^*. Suppose that the monopolist had offered and had accepted r_i^* for $i = 1, ..., n - 1$. Suppose also that each of those downstream firms expected the monopolist to offer their rivals, r_i^*. Then, in Stage 1, the monopolist would have been able to set, $f_i^* = \pi_i(r_i^*, r_{-i}^*)$ for all i.

Will the monopolist continue with this conjectured offer for the nth firm? Observe that, for a given marginal price, r_n, the monopolist will offer a fixed fee, $f_n = \pi_n(r_n, r_{-n}^*)$. Thus, it will choose:

$$\hat{r}_n \equiv \mathrm{argmax}_{r_n} r_n q_n(r_n, r_{-n}^*) + \pi_n(r_n, r_{-n}^*) + \sum_{i=1}^{n-1} (r_i - z)q_i(r_n, r_{-n}^*) + \sum_{i=1}^{n-1} \pi_i(r_n^*, r_{-n}^*) \qquad (2)$$

The first order conditions to solve (1) as opposed to (2) differ by $\sum_{i=1}^{n-1} \partial \pi_i / \partial r_n$ (as the last term of (2) is given). *So long as one other downstream firm is required to be active to attain* G^*, this term is strictly positive. Therefore, $\hat{r}_n < r_n^*$, so the monopolist appears to attain more than the industry profit maximising outcome, G^*. However, this behaviour of the monopolist will be foreseen in any subgame perfect

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[2] While not discussing this assumption explicitly, McAfee and Schwartz (1994, p. 218–219) do claim that in franchise agreements upfront fixed fees are very common (citing Lafontaine, 1992) and hence, this assumption would be a good representation of reality. However, franchise arrangements do not necessarily involve franchisees in direct competition with one another and so it is unclear that there is a need for optional fees in this case.

equilibrium. Hence, the most another downstream firm, i, will accept is $f_i = \pi_i(r_i, \boldsymbol{r^*}_{-i})$ implying that G^* will not be attained.

4. Optional fees

Now consider the polar case where the monopolist cannot charge an upfront fee so that $T_i(0)=0$. In this case, when it comes to offering firm n a lower marginal price, this will at least be another downstream firm to make a loss if they choose $q_i > 0$. As such, assuming only one downstream firm 1 chooses to become inactive, the monopolist will earn (ignoring the possibility that $(r_n > r_n^*)$):

$$
\max_{r_n} r_n q_n\left(r_n, \infty, \{r_i^*\}_{i=2}^{n-1}\right) + \pi_n\left(r_n, \infty, \{r_i^*\}_{i=2}^{n-1}\right) + \sum_{i=2}^{n-1} \left(r_i^* q_i\left(r_i^*, \infty, \{r_j^*\}_{j \neq i, 1, n}, r_n\right) \right.
$$
$$
\left. + \pi_i\left(r_i^*, \boldsymbol{r}_{-i}^*\right)\right) \quad \text{if} \quad r_n < r_n^* \quad \text{otherwise} \quad G^* \tag{3}
$$

Clearly, by the definition of G^*, the monopolist will be better off offering the efficient contract to firm n. The reason for this is straightforward: if the monopolist acted opportunistically in its agreement with n against the other downstream firms, some would choose not to produce and would avoid paying the monopolist any fees. Unless it happened that industry profit maximisation only involved firm n, this would not be desirable for the monopolist. As such, optional fees give the monopolist an incentive not to act opportunistically.

The following proposition demonstrates that this logic carries over to the case where the monopolist can choose for each individual firm whether to impose upfront fees or not and where this contractual choice cannot be observed by rival downstream firms.

Proposition 1. *The unique subgame perfect equilibrium outcome of the sequential contracting game involves the monopolist earning G^*.*

Proof. We examine the case of $n=2$. As will be apparent the result easily generalises. First, we consider whether the efficient contract, $(r_i, f_i)=(r_i^*, \pi_i(r_i^*, r_2^*))$, with optional fees for all i, is a set of equilibrium offers and acceptances. Notice that if firm 1 has been offered the efficient contract and an optional fee, by our earlier logic, if the monopolist offers the efficient contract to firm 2 with an optional fee, it is accepted. However, if firm 1 is required to pay an upfront fee, the monopolist will offer an alternative contract to firm 2 that involves $r_2 < r_2^*$ and hence, causes firm 1 to earn less than $\pi_1(r_i^*, r_2^*)$. Given this, the monopolist is better off offering the efficient contract and an optional fee to firm 1. Finally, will the monopolist offer an optional fee to firm 2? As firm 2 can observe that firm 1 has been offered the efficient contract, it will accept the efficient contract regardless of whether it is offered an optional fee or not.

Is there another equilibrium outcome? Note first that, by subgame perfection, if firm 2 is offered a contract other than the efficient one this means that firm 1 has been offered a contract either without an optional fee or that is different from the efficient one. In either case, the monopolist would earn less than G^*. Nonetheless, it is a (weakly) dominant strategy for firm 2 to accept any contract offered to it with an optional fee. Hence, there is no incentive for the monopolist to not offer these contracts to either firm and in so doing it will have an incentive to offer the efficient contract to each.

Thus, the opportunism problem identified by MS is wholly an artifact of their restriction of fees to be upfront. There is no reason for this restriction and such terms will be a choice; open to negotiation by the upstream and downstream firms. With this flexibility, the opportunism problem is eliminated.

It is useful to note that the above outcome also emerges in the simultaneous variant of MS where offers are made simultaneously and secretly to all downstream firms as are acceptances and rejections but prior to Stage 2 each downstream firm learns the marginal cost of the others. As in the proof of Proposition 1, with optional fees (even if they are not publicly observed), the monopolist does not want to offer one or more downstream firms a contract other than the efficient one. If it does so, those who had accepted the efficient contract would not produce, leaving the monopolist less than G^*.

Note, however, that if unavoidable relationship-specific costs are incurred by a downstream firm as soon as it accepts a contract offer, the opportunism problem re-emerges (Marx and Shaffer (2004b)). However, as a general matter, it is not clear that these costs would of necessity be incurred prior to downstream firms learning the marginal costs of their rivals. Nonetheless, the existence of such costs would motivate the use of other mechanisms to achieve industry profit maximisation such as non-discrimination clauses (Marx and Shaffer, 2004a) or menus of contracts (Marx and Shaffer (2004b)).[3]

Finally, it is also apparent that Proposition 1 relies upon the assumption that the upstream monopolist has all of the bargaining power. If this were not the case, then a deviation from efficiency with one firm may not cause others to exercise their fixed fee option. It is an open issue, however, as to whether efficiency may hold for more equitable distributions of bargaining power once re-contracting opportunities are also considered.

5. Conclusion and future directions

Recent analyses of inefficiency in vertical contracting have involved models with imperfect and perfect information. The perfect information stream—where firms are assumed to learn each other's marginal costs prior to choosing production levels—has received additional attention as it is the natural setting to consider the role of facilitating practices such as non-discrimination clauses. The efficacy of such practices is an unresolved issue in the literature (Marx and Shaffer, 2004a).

This paper takes the perfect information assumption seriously and, in so doing, challenges the construction of existing models. We demonstrate that such models impose implicit contractual restrictions (namely, upfront fees) and that when the upstream firm is free to negotiate whether fees are upfront or not, an efficient outcome is the unique equilibrium. These results suggest that the explanation for inefficiencies in vertical relationships lies in information difficulties. For example, imperfect information appears to be a driver of potentially pro-competitive inefficiency and understanding environments in which secret discounting is likely to occur as a persistent phenomenon.

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[3] Those analyses assumed that downstream firms were symmetric; something we do not need for Proposition 1. However, when such alternative mechanisms are used, it is possible to model sequential contracting as permitting production prior to all downstream supply agreements being in place; that is, an agreement could be signed with one firm, production could take place and relationship-specific costs incurred then an agreement with another downstream firm could be signed with adjustments in behaviour taking place between the first firm and the monopolist (through the non-discrimination clause or menu choice). In this situation, relationship-specific costs might be more naturally applied (see Marx and Shaffer, 2001).

Acknowledgement

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