Market Share Exclusion

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4 May 2007

Abstract

A market share exclusion contract between a seller and a buyer prevents rival sellers from competing for a share of the buyer’s purchases. We show that because each acceptance of a market share exclusion contract decreases the surplus of all other buyers from their unrestricted purchases and the excluding seller captures some of this decrease in the buyers’ surplus, market share exclusion can be profitable unlike complete exclusion and decreases buyer surplus. The profitability is characterized in terms of straightforward economic concepts. Anti-competitive market share exclusion can be profitable also when the rival is present in the exclusionary contracting stage.

JEL Classification Codes: L42, K11, K21.

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1 Introduction

This paper examines the incentives for and the efficiency of market share exclusion contracts. A market share exclusion contract restricts a buyer’s purchases from the excluding seller’s competitors either by imposing explicit restrictions on the share of the buyer’s purchases from the competitors in exchange for an up-front payment from the excluding seller to the buyer, or by specifying rewards and discounts for the buyer if the share of the buyer’s purchases from the competitors do not exceed a certain share of the buyer’s total purchases. By inducing a buyer to accept a market share exclusion contract the excluding firm therefore either explicitly or in effect reduces its competitors’ potential market size.

The possible anti-competitive effects of market share exclusion contracts have played a part in many recent anti-trust cases. In *AMD v. Intel* (2005) the plaintiff contends that the discounts offered by the defendant to buyers were contingent on the share of each buyer’s purchases from the defendant and had an anti-competitive exclusionary effect.\(^1\) In *Masimo v. Tyco Health Care* (2004) the plaintiff argued that the defendant’s pricing was contingent on the buyer’s share of purchases from the defendant and that such pricing had an anti-competitive exclusionary effect.\(^2\) In *Concord Boat v. Brunswick* (2000) the plaintiffs argued that market share and volume discounts offered by the defendant to buyers had had an anti-competitive exclusionary effect.\(^3\) Market share exclusion contracts were also part of *United States v. Microsoft* (1998) as Microsoft’s contracts with AOL and other internet access providers restricted each internet access provider’s distribution of Microsoft’s competitors’ browsers to less than fifteen percent of each internet access provider’s subscribers.\(^4\)

We examine market share exclusion contracts in a model with an incumbent seller that offers buyers non-discriminatory market share exclusion contracts, a rival whose investments

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\(^3\) Concord Boat Corp. v. Brunswick Corp., 207 F.3d 1039, 1063 (8th Cir. 2000).

\(^4\) See the Findings of Fact at http://usvms.gpo.gov/ms-findings2.html (last accessed 1/31/2007).
are increasing in its potential market size, and buyers that coordinate on their most preferred equilibrium. We show that market share exclusion can be profitable unlike complete exclusion and always decreases buyer surplus. These results arise because each acceptance of a market share exclusion contract decreases the rival’s investments and thereby decreases every buyer’s expected surplus from its unrestricted purchases, and because the excluding seller captures part of this decrease in the buyers’ surplus. Importantly, whether market share exclusion is profitable in equilibrium is characterized in terms of straightforward and empirically malleable economic concepts.

Our analysis and results depart from much of the earlier literature on exclusionary contracting in several ways. The obvious difference is that we consider market share exclusion contracts instead of exclusive dealing contracts. An equally important difference is that we assume that the extent of entry is increasing in the rival’s potential market size instead of assuming that the rival’s entry is dependent upon whether the rival can achieve a known minimum efficient scale of production upon entry. This assumption is essential for our analysis and, we believe, is the more plausible depiction of the entry mechanism especially in innovative industries such as those exemplified by the aforementioned cases of market share exclusion. The results differ as well as we show that market share exclusion can be profitable (and anti-competitive) when complete exclusion through exclusive dealing is not.

The literature on exclusionary contracting traces back to the Chicago School argument (see e.g. Director and Levi (1958), Posner (1976), and Bork (1978)) according to which exclusive dealing cannot reduce buyer welfare because buyers would not accept exclusive dealing contracts that would make them worse off. Rasmusen, Ramseyer and Wiley (1991) and

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5 This difference arises because each acceptance of a market share exclusion contract has a negative externality both on buyers who accept the contract and on buyers who reject the contract (as both type of buyers purchase in expectation at least part of their purchases from the rival and any buyer who purchases from the rival captures some of the surplus created by the rival’s investments) whereas each acceptance of an exclusive dealing contract has a negative externality only on buyers who reject the contract (as only free buyers may purchase from the rival).

6 When there is no minimum efficient scale of production exclusive dealing is not profitable because the incumbent cannot compensate the buyers for the deadweight loss. See Rasmusen, Ramseyer and Wiley (1991)
Segal and Whinston (2000a) (hereafter "RRW-SW") find qualified support for the Chicago School view on exclusive dealing by showing that non-discriminatory exclusive dealing contracts are not profitable when buyers coordinate on their most preferred equilibrium. In contrast with these analyses of exclusive dealing we find that market share exclusion can be profitable and anti-competitive when the incumbent offers buyers non-discriminatory contracts and the buyers coordinate on their most preferred equilibrium.

Many analyses have also challenged the Chicago School argument on exclusive dealing and our analysis complements these contributions by further characterizing the set of conditions under which exclusionary contracting can be profitable and have anti-competitive effects. The RRW-SW analysis challenges the Chicago School conclusion by showing that if there is a minimum efficient scale for entry, anti-competitive exclusive dealing can be profitable either if buyers do not coordinate on their most preferred equilibrium or if the incumbent offers buyers discriminatory exclusive dealing contracts. Our analysis of market share exclusion complements the RRW-SW analysis by showing that exclusionary contracting can be profitable and anti-competitive even when discriminatory contracts are prohibited and buyers coordinate on their most preferred equilibrium.

Fumagalli and Motta (2005) complement the RRW-SW analysis by showing that if buyers are downstream competitors and the deviation of one buyer is enough to trigger entry, the incumbent cannot compensate the deviant buyer who buys from the more efficient entrant and, consequently, exclusive dealing cannot be profitable for the incumbent. Simpson and Wickelgren (2004) in turn complement the RRW-SW analysis by showing that even if the incumbent can offer discriminatory contracts, the incumbent cannot profitably exclude independent buyers if the buyers can breach the exclusive dealing contracts by paying extra for the formal triangle-loss argument. Posner (2001) notes that although the Chicago School argument was presented in Posner (1976) he did not conclude that exclusive dealing could never reduce consumer welfare, as many later contributions had asserted.

See also Stefanadis (1998) who finds that discriminatory exclusive dealing contracts can be profitable even if buyers are downstream competitors.
pectation damages. Simpson and Wickelgren (2004, 2005) also show that if the buyers are downstream competitors and exclusive dealing contracts can be breached by paying expectation damages, exclusive dealing can be profitable and reduce buyer welfare, thus challenging the conclusion of Fumagalli and Motta (2005) regarding exclusive dealing and downstream competition. As in the RRW-SW analysis, we assume that the buyers are not downstream competitors and that contracts cannot be breached.⁸

Aghion and Bolton (1987) show that an exclusive dealing contract with a buyout price enables the incumbent to extract rents from the potential entrant. Their analysis and the RRW-SW analysis assumed that the entrant cannot offer buyers exclusive dealing contracts.⁹ But, as Marvel (1982) suggested, the competitors too may be expected to offer exclusive dealing contracts. To this extent Mathewson and Winter (1987) showed that if both the incumbent and the entrant can offer exclusive dealing contracts and common representation contracts, and the firms are restricted to linear pricing, exclusive dealing can be profitable and either increase or decrease consumer welfare.¹⁰ Bernheim and Whinston (1998) and O’Brien and Shaffer (1997) extended this analysis to non-linear pricing and showed that as long as all buyers are present in the exclusive dealing contracting stage, exclusive dealing can lead to the exclusion of entrants but only if exclusion increases overall efficiency.¹¹ We initially follow the RRW-SW analysis and assume that the rival is not present in the exclusionary contracting stage.¹² In an extension we then show that anti-competitive market share exclusion can still

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⁸One rationale for why efficient breach may not feasible for a buyer is that if a buyer’s contract with a seller covers also goods which none of the seller’s competitors is able to provide and if the buyer’s ex-post valuation for those goods is higher than the buyer’s ex-ante valuation, breaching the contract would enable the seller to charge the buyer a higher price for those goods than the price specified in the original contract, thus making breach of the original contract prohibitively expensive for the buyer.

⁹Spector (2004) combines the RRW-SW approach with the assumption that also the entrant can offer buyers exclusive dealing contracts and finds that if there are multiple buyers and if sellers can offer discriminatory contracts, exclusive dealing can be profitable and decrease the buyers’ welfare.

¹⁰A common representation contract rewards a buyer for rejecting all exclusionary contracts.

¹¹Bernheim and Whinston (1998) further stress that in this setup exclusive dealing is superfluous in the sense that the same outcome can be always reached with or without explicit exclusive dealing contracts.

¹²This assumption has several potential justifications. First, the rival may be a smaller, financially constrained firm so that it may be prohibitively costly for the rival to make buyers up-front payments. Second, the entry threat may consist of several potential entrants that are unable to coordinate their payments to
be profitable if the rival too is present in the contracting stage and both firms can offer buyers market share exclusion contracts as well as common representation contracts.

A central feature of our analysis is the focus on the effect of exclusionary contracting on the rival’s marginal investment incentives, as opposed to the minimum efficient scale assumption in the RRW-SW analysis. Segal and Whinston (2000b), Gilbert and Shapiro (1998), and Gilbert (2000) consider the effects of exclusive dealing on marginal investment incentives, but these analyses do not consider multiple buyers whereas contractual externalities between the buyers are central to our analysis, and while their analyses examine the effect of exclusive dealing on entry and on overall efficiency our focus is on the effect of market share exclusion on buyer welfare.\textsuperscript{13} Stefanadis (1997) examines the effect of exclusive dealing on marginal innovation incentives of upstream firms and finds that exclusive dealing can be profitable and may reduce consumer welfare. In contrast with our approach, Stefanadis (1997) assumes that buyers are downstream competitors and focuses on exclusive dealing.

Several recent papers examine the role of market share and volume discounts explicitly while our analysis interprets such discounts as an indirect way to achieve market share exclusion. Kolay et. al. (2004) and Mills (2006) examine inducing buyer investments as a rationale for discounts. Marx and Shaffer (2004) characterize the ability of a seller and a buyer to use market share discounts to shift rents from second seller. Ordover and Shaffer (2007) examine an incumbent seller’s incentives to use discounts to exclude a financially

the buyers. Third, up-front payments may be prohibitively costly for either firm if there are many buyers who have a very low ex-ante valuation and this valuation is each buyer’s private information. In contrast, the incumbent may be able to induce buyers to accept exclusionary contracts in exchange for lower pricing on an existing version of the good with the intent to influence competition against a future version of the good. For example, in United States v. Microsoft (1994) it was alleged that Microsoft offered low prices for the existing version of the operating system in exchange for contracts that were effectively exclusionary for a much longer period than the expected lifetime of the operating system (see Stefanadis (1998)).

\textsuperscript{13} The general analyses of contracting with externalities of Segal (1999) and Segal (2003) mention exclusive dealing as an application and the probability of entry is assumed to be increasing in the entrant’s potential market size. The focus in these articles is on the case when an agent’s trade with the principal always makes other agents either more eager or less eager to trade with the principal. The methods therefore are not directly applicable to the analysis of market share exclusion because whether a buyer’s acceptance of a market share exclusion contract increases or decreases other buyers’ willingness to accept the contract may depend on the number of buyers that accept the contract.
constrained competitor in the presence of switching costs.

This paper is organized as follows. In the next section we present the model. In the third section we provide the equilibrium analysis and characterize the conditions under which anti-competitive market share exclusion is profitable. In the fourth section we consider the case when both firms can offer buyers market share exclusion contracts and common representation contracts. The fifth section concludes.

2 The Model

The model has an incumbent, a rival and $N$ ex-ante identical buyers. Ex-ante each buyer has an uncertain valuation for one unit of a divisible good. A buyer’s valuation for a fraction of a unit of the good equals the fraction of the valuation for one unit of the good. The cumulative distribution function of possible valuations (the demand function) is denoted by $q(\cdot)$. After buyers learn their valuations the valuations become each buyer’s private information.

The incumbent can manufacture the good at marginal cost is $\bar{c}$. The rival can manufacture the good at marginal cost $\bar{c} - \Delta c$ but only if its R&D investments are successful.\footnote{The analysis extends readily to the case in which the rival’s investments decrease its marginal cost with certainty instead of increasing its probability of success if the incumbent and the rival are differentiated Bertrand competitors. The only essential feature of the analysis is that the incumbent’s expected profit from the buyers’ non-restricted purchases is strictly positive and decreasing in the rival’s investments; market share exclusion is therefore not profitable if the incumbent and the rival are homogenous Bertrand competitors and the rival’s R&D investments are successful with certainty.} The rival can increase its probability of success by increasing its R&D investment. We adopt a reduced form approach to modelling the rival’s investment technology.\footnote{The reduced-form approach allows us to state the results in terms of the reward-elasticity of entry (see e.g. Acemoglu and Linn (2004) for a recent empirical estimation of reward-elasticity of entry). The reduced-form entry technology can be derived by assuming that the rival’s R&D cost is given by $C(\mu)$, where $\mu$ is the rival’s probability of success, and the R&D cost and the marginal R&D cost are both increasing in the rival’s probability of success, $C'(\mu) > 0$ and $C''(\mu) > 0$.} The rival’s probability of success, denoted by $\mu$, is an increasing function of the rival’s expected reward for success per buyer: $\mu = F(\Pi_R/N)$, where $\Pi_R$ denotes the rival’s expected profit from all buyers
in the event that its R&D investments are successful and $F(\cdot)$ is a continuous and almost everywhere differentiable function with $F'(\cdot) > 0$.\footnote{We assume that the rival’s probability of success $\mu$ is increasing in its average expected reward for success from buyers as opposed to its total reward for success from buyers in order to focus on the effect of increasing the number of buyers $N$ has on the rival’s investments through its effect on the buyers’ acceptance decisions. The assumption eliminates the effect that increasing the number of buyers $N$ would have on the rival’s probability of success when the proportion of buyers who accept the contract is held constant.} This reduced-form entry technology can depict both the case when the rival’s marginal cost of increasing its probability of success is increasing in the probability of success and the case when entry involves an uncertain fixed cost which is the rival’s private information. The responsiveness of the rival’s probability of success to any changes in its potential market size is captured by the reward-elasticity of the rival’s probability of success, defined by $\varepsilon_{\mu} \equiv F'(\Pi_{R}/N) \frac{\Pi_{R}/N}{F(\Pi_{R}/N)}$.\footnote{While the model is therefore one of explicit exclusion, the economic mechanism examined in this paper applies also to market share exclusion contracts are only exclusionary in their effect. Consider for example a situation in which the rival can potentially supply only a limited number of goods to the buyers. If the buyers’ ex-post valuations for these goods are higher than the buyers’ ex-ante valuations the incumbent can then use volume discounts instead of explicit market share exclusion contracts to effectively exclude any rival from competing for a share of the buyers’ purchases. See also Kaplow and Shapiro (2007) for a discussion on United States v. Dentsply (2005) and the lack of distinction between contracts that are explicitly exclusionary and contracts that are exclusionary only in their effect.}

The timing of actions is as follows. In stage 1 the incumbent offers the same market share exclusion contract to all buyers and the buyers then simultaneously and non-cooperatively accept or reject the contract. In stage 2 the rival invests in R&D, nature reveals the outcome of these R&D investments, and each buyer learns its valuation for the good. In stage 3 the incumbent sets the price for the good (if the rival’s R&D is unsuccessful) or the incumbent and the rival compete on price (if the rival’s R&D is successful) and the buyers subsequently make their purchase decisions.

As in RRW-SW, we assume that neither the incumbent nor the rival can commit to prices for the good before stage 3. The market share exclusion contract specifies a payment $t$ and a quantity $s \in [0, 1]$. A buyer who accepts the contract receives the payment $t$ in return for agreeing to purchase at most $(1 - s)$ units of the good from the rival.\footnote{The contract can alternatively specify that at least the share $s$ of the buyer’s actual purchases is from the incumbent. In this case the analysis is identical to that in the text if the buyers can satisfy the requirement that they buy the share $s$ from the incumbent either by buying $s$ units of the new good from the incumbent or by buying $(1 - s)$ units of an existing good.} A buyer’s
acceptance of the contract thereby decreases the rival’s potential market size as the rival is excluded from selling to the buyer the share $s$ of the buyer’s potential purchases.

The number of buyers who accept the market share exclusion contract is denoted by $n$. The size of the unrestricted potential purchases, which equals the rival’s potential market size, is therefore $(N - n) + n(1 - s)$, and the size of the restricted potential purchases is $ns$.

## 3 Equilibrium Analysis

We focus on perfectly coalition-proof subgame-perfect Nash equilibria and proceed by backward induction. We assume that if a buyer’s expected surplus is the same when the buyer accepts the contract and when the buyer rejects the contract the buyer will reject the contract. We also assume that there exists an arbitrarily small smallest possible increment for the payment $t$ so that an equilibrium in which buyers accept the contract may exist.

In stage 3 the firms set prices and buyers make their purchase decisions. Consider first the case when the rival’s R&D investments are not successful. In this event all active buyers purchase from the incumbent. The incumbent sets the price for a unit of the good equal to the monopoly price, defined by $p_M \equiv \arg \max_p (p - \bar{c})q(p)$, and the incumbent’s expected profit from each buyer is the monopoly profit $\pi_M \equiv (p_M - \bar{c})q(p_M)$.

Consider next the case when the rival’s R&D investments are successful. For the $n$ buyers who accepted the market share exclusion contract $(s,t)$ the incumbent offers $s$ units of the good at the monopoly price $sp_M$ and the incumbent’s expected profit from the restricted market share is $ns\pi_M$. The incumbent and the rival compete on price for the unrestricted market share which consists of all potential purchases of buyers who rejected the contract and the share $(1 - s)$ of the potential purchases of buyers who accepted the contract. Price

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by buying at zero price $s$ units of an older version of the good for which all buyers have zero valuation. This additional assumption in the alternative specification implies that when the rival’s investment is successful the incumbent sets the price of $s$ units of the good at $s \times p_M$ in stage 3, where $p_M$ is the monopoly price for one unit of the good, instead of setting the price of $s$ units of the good at $p_M$. This additional assumption in the alternative specification is not needed if there is no deadweight loss from monopoly pricing.
competition drives down the price of a unit of the good to the incumbent’s marginal cost $\bar{c}$ and the rival’s expected profit is $\Delta cq (\bar{c})$ from each buyer who rejected the contract. Similarly, price competition drives down the price of $(1 - s)$ units of the good to the incumbent’s marginal cost $(1 - s) \bar{c}$ and the rival’s expected profit is $(1 - s) \Delta cq (\bar{c})$ from each buyer who accepted the contract. When the rival is successful, its expected reward in stage 3 is therefore

$$\Pi_R = (N - n) \Delta cq (\bar{c}) + n (1 - s) \Delta cq (\bar{c}).$$  

In stage 2 the level of the rival’s investments $\mu$ is determined. The rival’s probability of success when $n$ buyers accept the contract is denoted by $\mu_n$ and is given by

$$\mu_n = F \left( \frac{(N - n) \Delta cq (\bar{c}) + n (1 - s) \Delta cq (\bar{c})}{N} \right)$$  

by the assumption $\mu = F (\Pi_R/N)$ and the expression (1).

In stage 1 the incumbent first offers the market share exclusion contract $(s, t)$ to all buyers and the buyers then decide simultaneously and non-cooperatively whether to accept or reject the contract offer. A buyer’s expected surplus depends both on its own acceptance decision and on the acceptance decisions of the $N - 1$ other buyers. Let $CS (p) \equiv \int_p^\infty q (p) \, dp$ denote the buyer’s expected surplus in stage 1 if the price of a unit of the good in stage 3 were $p$ with certainty. Let $k$ denote the number of buyers who accept the contract among the $N - 1$ other buyers. The expected surplus of a buyer who rejects the contract is denoted by $U_R (k, s)$ and is given by

$$U_R (k, s) = (1 - \mu_k) CS (p_M) + \mu_k CS (\bar{c}).$$  

(3)

The expected surplus of a buyer who accepts the contract is denoted by $U_A (k, s, t)$ and is

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19 The notation $\mu_n$ omits the dependence of the rival’s probability of success on $s$. 

http://law.bepress.com/alea/17th/art75
given by

$$U_A(k, s, t) = (1 - \mu_{k+1}) CS(p_M) + \mu_{k+1} [sCS(p_M) + (1 - s) CS(\bar{c})] + t$$  \hspace{1cm} (4)$$

as in this case $k + 1$ buyers in total accept the contract, the rival’s associated probability of success is $\mu_{k+1}$, and the buyer can purchase the share $1 - s$ of its potential purchases from the rival at the equilibrium price $\bar{c}$ when the rival is successful.

A buyer’s acceptance constraint for a market share exclusion contracts $(s, t)$ is $U_A(k, s, t) > U_R(k, s)$. The expression (3) for $U_R(k, s)$ and the expression (4) for $U_A(k, s, t)$ imply that when $k$ of the $N - 1$ other buyers accept the contract this acceptance constraint can be written as

$$t > s\mu_k (\pi_M + DL_M) + (1 - s) (\mu_k - \mu_{k+1}) (\pi_M + DL_M),$$  \hspace{1cm} (5)$$

where $DL_M \equiv CS(\bar{c}) - [CS(p_M) + \pi_M]$ denotes the expected deadweight loss from monopoly pricing. The first term on the right-hand side of the inequality (5) is the decrease in the expected surplus of the buyer if it accepts the contract that arises because the buyer then cannot purchase the share $s$ of its potential purchases from the rival at price $\bar{c}$ when the rival is successful. The second term on the right-hand side of the inequality (5) is the decrease in the expected surplus of the buyer if it accepts the contract that arises because of the effect that the buyer’s own acceptance has on the rival’s investments and consequently on the buyer’s expected surplus from the unrestricted share $(1 - s)$ of its potential purchases.

In general, other buyers’ acceptance of the contract may affect a buyer’s acceptance decision by changing the magnitude of the effect that the buyer’s own acceptance has on the rival’s probability of success. However, when the number of buyers $N$ is large the effect that an individual buyer’s acceptance of the contract has on the rival’s investments is negligible regardless of how many other buyers accept the contract, and consequently the aforementioned effect of other buyers’ acceptance of the contract on a buyer’s acceptance
decision is also negligible. As this aspect simplifies and focuses the exposition considerably we first examine the buyers’ behavior and the profitability of market share exclusion when the number of buyers $N$ is large. At the end of this section we then characterize the profitability and efficiency of market share exclusion for an arbitrary number of buyers.

Even when the number of buyers $N$ is large other buyer’s acceptances potentially influence a buyer’s acceptance decision through the effect that the acceptances have on the rival’s probability of success. However, the following result establishes that when the number of buyers $N$ is large a buyer’s willingness to accept a market share exclusion contract when all other buyers reject the contract is a sufficient condition for the buyer to accept the contract in equilibrium.

**Lemma 1** Suppose that the incumbent offers buyers a market share exclusion contract. Then: for a given demand function $q(\cdot)$ and entry technology $(\Delta c, F(\cdot))$, all buyers accept the market share exclusion contract in the perfectly coalition-proof equilibrium if the number of buyers $N$ is large enough and each buyer is willing to accept the contract when all other buyers reject the contract.

**Proof.** See the appendix.

The intuition for this result is the following. Because buyers who reject the contract have a larger share of unrestricted purchases than buyers who accept the contract the buyers who reject the contract benefit more from the rival’s success than buyers who accept the contract. A buyer’s decision to accept the contract thus has a larger negative externality on the expected surplus of another buyer if it rejects the contract than if it accepts the contract. As this is the only non-negligible effect that another buyer’s acceptance of the contract has on a buyer’s acceptance decision when the number of buyers $N$ is large, a buyer’s willingness to acceptance the contract can never be reversed by another buyer’s acceptance of the contract when the number of buyers $N$ is large enough. This in turn implies that if each buyer is
willing to accept a contract when all other buyers reject the contract then all buyers accepting
the contract is the only Nash equilibrium.

The following result establishes that the same condition a buyer’s willingness to accept
the contract when all other buyers reject the contract is also a necessary condition for the
buyer to accept the contract in equilibrium.

**Lemma 2** Suppose that the incumbent offers buyers a market share exclusion contract.
Then: a buyer accepts the market share exclusion contract in any perfectly coalition-proof
equilibrium only if the buyer is willing to accept the contract when all other buyers reject the
contract.

**Proof.** See the appendix. ■

The intuition for this result, which does not rely on the number of buyers $N$ being large,
is the following. A buyer’s acceptance has a negative externality both on other buyers who
accept the contract and on buyers who reject the contract. Therefore, if each buyer prefers
to reject the contract when all other buyers reject the contract all buyers are better off in the
Nash equilibrium in which all buyers reject the contract compared to any Nash equilibrium
in which a buyer accepts the contract. Hence, in any perfectly coalition-proof equilibrium a
buyer accepts the contract only if all buyers rejecting the contract is not a Nash equilibrium.

Lemma 1 and Lemma 2 together imply that given a demand function and entry technol-
ogy, when the number of buyers $N$ is large enough, in equilibrium either all buyers reject
the contract or all buyers accept the contract and the necessary and sufficient condition for
all buyers to accept the contract is that each buyer is willing to accept the contract when
all other buyers reject the contract. Using inequality (5) this condition can be written as

$$ t > s\mu_0 (\pi_M + DL_M) + (1 - s) (\mu_0 - \mu_1) (\pi_M + DL_M). $$

(6)

For a given $s$ the second term in this inequality (6) is arbitrarily small compared to the first
term when the number of buyers $N$ is large enough. In this case the optimal market share exclusion contract that the buyers accept therefore satisfies

$$t = s\mu_0 (\pi_M + DL_M) + \delta,$$  \hspace{1cm} (7)$$

where $\delta$ is arbitrarily small for a large enough number of buyers $N$.

Consider now the incumbent’s decision in stage 1. The incumbent’s expected profit is

$$\Pi_I = (N - n) (1 - \mu_n) \pi_M + n [(1 - s) (1 - \mu_n) \pi_M + s\pi_M - t].$$  \hspace{1cm} (8)$$

The difference in the incumbent’s expected profit between when all buyers accept the market share exclusion contract ($n = N$) and when all buyers reject the contract ($n = 0$) is denoted by $\Delta \Pi_I$ and is given by

$$\Delta \Pi_I = N (\mu_0 - \mu_N) \pi_M (1 - s) + N (\mu_0 s\pi_M - t).$$  \hspace{1cm} (9)$$

The market share exclusion contract compensates each buyer for the effect that its own acceptance has on the buyer’s expected surplus. The second term in the expression (9) represents the cost of inducing the buyers to accept the contract, holding the rival’s probability of success constant at $\mu_0$. By inequality (5) the effect is negative, and when the number of buyers $N$ is large this effect is approximately $-N\mu_0 sDL_M$ because $t$ is arbitrarily close to $s\mu_0 (\pi_M + DL_M)$ by equality (7).

By offering a market share exclusion contract the incumbent exploits the negative externalities between buyers as the contract does not compensate any buyer for the effect that other buyers’ acceptance of the contract has on the buyer’s expected surplus through its effect on the rival’s probability of success. Moreover, the incumbent captures part of the decrease in the buyers’ expected surplus. The first term in this expression (9) represents
this increase in the incumbent’s expected profit from the unrestricted share of the buyers’ potential purchases. The effect is positive because $\mu_0 - \mu_N > 0$ and $s \in (0, 1)$.

When the number of buyers $N$ is large, the profitability of market share exclusion therefore depends on whether the increase in the incumbent’s expected profit from the unrestricted share of the buyers’ potential purchases is sufficiently higher than the expected deadweight loss associated with the restricted share of the buyers’ potential purchases. The following result establishes the condition under which market share exclusion is profitable.

**Proposition 1** For a given demand function $q(\cdot)$ and entry technology $(\Delta c, F(\cdot))$, when the number of buyers $N$ is large enough market share exclusion occurs in the perfectly coalition-proof equilibrium if $\frac{DL_M}{\pi_M} < \varepsilon_{\mu|_{\mu=\mu_0}}$. For a given demand function $q(\cdot)$ and entry technology $(\Delta c, F(\cdot))$, when the number of buyers $N$ is large enough and the reward-elasticity of the rival’s probability of success is constant market share exclusion occurs in the perfectly coalition-proof equilibrium only if $\frac{DL_M}{\pi_M} < \varepsilon_{\mu|_{\mu=\mu_0}}$.

**Proof.** See the appendix. ■

The condition for the profitability in the first part of this proposition arises as follows. The buyers’ acceptance of the market share exclusion contract decreases the rival’s probability of success by approximately $\varepsilon_{\mu|_{\mu=\mu_0}} s \times 100$ percent when $s$ is small. The incumbent’s gain $N (\mu_0 - \mu_N) \pi_M (1 - s)$ from the buyers’ unrestricted purchases is therefore approximately $N \varepsilon_{\mu|_{\mu=\mu_0}} s \mu_0 \pi_M (1 - s)$ when $s$ is small. Holding the rival’s probability of success constant, the net cost of inducing buyers to accept the market share exclusion contract is $N \mu_0 s DL_M$.

The net benefit of inducing the buyers to accept the market share exclusion contract is therefore positive if $N \varepsilon_{\mu|_{\mu=\mu_0}} s \mu_0 \pi_M (1 - s) - N \mu_0 s DL_M > 0$. The second part of the
proposition follows from the observation that when the entry technology has constant reward-elasticity and the number of buyers $N$ is large enough, the incumbent’s profit is concave in $s$ for the optimal market share exclusion contract that the buyers accept.

Consider now the profitability of market share exclusion with an arbitrary number of buyers $N$. When the number of buyers is small, the effect that an individual buyer’s acceptance has on the rival’s probability of success is no longer negligible. The payment $t$ must therefore generally compensate each buyer also for this effect of the buyer’s acceptance on the buyer’s own expected surplus. The presence of this effect also implies that each buyer’s willingness to accept the contract is not necessarily increasing in the number of other buyers who accept the contract. The next proposition characterizes the profitability of market share exclusion with an arbitrary number of buyers $N$.

**Proposition 2** Market share exclusion occurs in any perfectly coalition-proof equilibrium if
\[
\frac{\varepsilon_\mu|_{\mu=\mu_0}}{N_{\pi_M+(\pi_M-DL_M)}} > \frac{N \times DL_M}{N_{\pi_M+(\pi_M-DL_M)}}.
\]
If the rival’s probability of success is linear in the reward for success, market share exclusion occurs in any perfectly coalition-proof equilibrium only if
\[
\frac{\varepsilon_\mu|_{\mu=\mu_0}}{N_{\pi_M+(\pi_M-DL_M)}} > \frac{N \times DL_M}{N_{\pi_M+(\pi_M-DL_M)}}.
\]

**Proof.** See the appendix. ■

The difference in the condition for the profitability of market share exclusion in this proposition compared to the condition derived in Proposition 1 for the case when the number of buyers $N$ is large arises as follows. By inequality (6) the part of the payment $t$ to the buyer that compensates the buyer for the effect that the buyer’s own acceptance has on the rival’s probability of success is $(1-s)(\mu_k - \mu_{k+1}) (\pi_M + DL_M)$ when $k$ other buyers reject the contract. When $s$ is small, $(\mu_k - \mu_{k+1})$ is approximately $\frac{s \pi M}{N}$ and $\mu_k$ is approximately to $\mu_0$. The part of the payment $t$ to the buyer that compensates the buyer for the decrease in the rival’s probability of success is therefore approximately $\frac{s \pi M}{N}$ when $s$ is small. The condition for the profitability of market share exclusion therefore becomes
\[
N \varepsilon_\mu|_{\mu=\mu_0} s \mu_0 \pi_M - N \mu_0 s DL_M + N \mu_0 \varepsilon_\mu|_{\mu=\mu_0} \frac{s \pi M}{N} + DL_M > 0.
\]
The finding that market share exclusion can be profitable contrasts sharply with the unprofitability of non-discriminatory exclusive dealing contracts which corresponds to the case $s = 1$ in the model. In this case the buyer’s acceptance condition (5) becomes $t > \mu_k (\pi_M + DL_M)$ when $k$ of the $N - 1$ other buyers accept the contract. Because $\mu_k$ is decreasing in $k$, a buyer’s acceptance of the contract therefore never reverses another buyer’s willingness to accept the contract. Hence, the condition $t > \mu_0 (\pi_M + DL_M)$ is a necessary and sufficient condition for all buyers to accept the contract in the perfectly coalition-proof equilibrium. Substituting $s = 1$ and $t = \mu_0 (\pi_M + DL_M) + \delta$, where $\delta$ is arbitrarily small, into the expression (9) then reveals that exclusive dealing is never profitable for the incumbent.$^{21}$

The reason for why market share exclusion can be profitable but exclusive dealing is never profitable is that whereas a buyer’s acceptance of a market share exclusion contract has a negative externality on all buyers a buyer’s acceptance of an exclusive dealing contract has a negative externality only on buyers who reject the contract. Consequently, whereas all buyers’ acceptance of an exclusive dealing contract can never increase the incumbent’s expected profit by more than what it costs to induce each buyer to accept the contract, all buyers’ acceptance of a market share exclusion contract can increase the incumbent’s profit by more than what it costs to induce each buyer to accept the contract by increasing the incumbent’s expected profit from the buyers’ unrestricted purchases.

We now consider the effect of market share exclusion on the buyers’ expected surplus. The next result states that market share exclusion is always anti-competitive in the model.$^{22}$

**Proposition 3** If market share exclusion occurs in any perfectly coalition-proof equilibrium the buyers’ expected surplus is less in the equilibrium compared to the buyers’ expected surplus

$^{21}$An exception is the case when there is no deadweight loss, $DL_M = 0$ and buyers accept an exclusive dealing contract when accepting and rejecting the contract yields the same expected surplus. In this case the incumbent can earn as much profit with exclusive dealing as the incumbent can earn when it does not offer any contract in stage 1, and market share exclusion is more profitable than exclusive dealing if $\xi_M > 0$.

$^{22}$While we consider the competitive effect of market share exclusion on the buyers’ welfare, this result extends directly to the the case when anti-competitive actions are defined as actions that decrease total welfare because the rival’s investment incentives are below the socially optimal investment incentives and the buyers’ welfare is increasing in the rival’s investment.
in equilibrium when market share exclusion contracts are prohibited.

**Proof.** See the appendix. ■

The intuition for this result, which applies regardless of the number of buyers, is the following. When market share exclusion is profitable, it increases the incumbent’s expected profit and decreases the rival’s probability of success. Successful entry by the rival increases each buyer’s expected surplus more than it decreases the expected surplus of the incumbent. The combined expected surplus of the incumbent and all buyers is therefore increasing in the rival’s probability of success. Market share exclusion must therefore decrease the buyers’ expected surplus.

4 **Extension: Rival is Present in the Contracting Stage**

In this section we consider the profitability and efficiency of market share exclusion when also the rival is present in the exclusionary contracting stage. Because the buyers’ acceptance of a market share exclusion contract offered by the incumbent decreases the rival’s expected profit, the rival has an incentive to induce buyers to reject the incumbent’s market share exclusion contract offer. However, as we show in this section, anti-competitive market share exclusion can be profitable for the incumbent in equilibrium even if both firms are present in the exclusionary contracting stage. While we focus on the effect of market share exclusion on the buyers’ welfare, our results imply that market share exclusion by the incumbent decreases overall efficiency as well because the total surplus is increasing in the rival’s investments and market share exclusion by the incumbent decreases the rival’s investments.

We retain all other aspects of the model introduced in section 2 but assume that in stage 1 both firms simultaneously offer buyers both a market share exclusion contract and a common representation contract. A common representation contract rewards a buyer for not accepting an exclusionary contract offer from either firm. In this extended model each
buyer potentially receives four contract offers in the exclusionary contracting stage: one exclusionary contract offer and one common representation contract offer from each firm. A buyer can accept at most one exclusionary contract offer, and a buyer cannot accept a common representation contract offer if it accepts either firm’s exclusionary contract offer. We assume that in the exclusionary contracting stage the incumbent cannot discriminate between buyers but the rival can.

The rival’s ability to induce buyers to reject the incumbent’s market share exclusion contract offer is potentially limited for two reasons. First, if the size of the rival’s improvement $\Delta c$ is small compared to the buyers’ valuation of the good, the rival’s reward for success is small compared to the incumbent’s gain from market share exclusion contracts. This limits the rival’s ability to induce buyers to reject the incumbent’s market share exclusion contract offer by offering buyers common representation contracts. Second, when the size of the rival’s improvement $\Delta c$ is small compared to the buyers’ valuation of the good a buyer’s acceptance of a market share exclusion contract from the rival decreases the buyer’s expected surplus from the restricted share of its purchases by more than what the acceptance increases the rival’s expected profit. When $\Delta c$ is small compared to this deadweight this limits the rival’s ability to induce buyers to reject the incumbent’s market share exclusion contract by offering buyers market share exclusion contracts.

Anti-competitive market share exclusion can therefore be profitable for the incumbent in equilibrium also when the rival is present in the exclusionary contracting stage as the following result shows.

**Proposition 4** Market share exclusion is profitable for the incumbent and decreases the buyers’ total expected surplus in any perfectly coalition-proof equilibrium in the extended model if $\varepsilon_{\mu}\big|_{\mu=\mu_0} > \frac{DLM}{M}, \Delta c$ is sufficiently small, and the number of buyers $N$ is large enough.

**Proof.** See the appendix.
5 Conclusion

Market share exclusion contracts between a buyer and a seller reduce the excluding seller’s competitors’ potential market size by limiting the buyer’s purchases from the competitors. We examine market share exclusion in a model in which an incumbent faces the threat of entry by a rival and offers non-discriminatory market share exclusion contracts to buyers who coordinate on their most preferred equilibrium. Instead of assuming that the rival makes a binary choice over whether to incur a known fixed cost of entry we assume that the extent of entry is increasing in the rival’s potential market size.

In contrast with the conclusions of the Chicago School and the RRW-SW analyses of exclusive dealing, according to which non-discriminatory exclusive dealing contracts can never be profitable for the incumbent when buyers coordinate on their most preferred equilibrium, we find that market share exclusion can be profitable for the incumbent and always decreases buyer surplus. Importantly, we characterize the condition for the profitability of market share exclusion in terms of straightforward economic concepts, namely the ratio of the deadweight loss and the monopoly profit and the reward-elasticity of the rival’s probability of entry. We also show that market share exclusion can be profitable even when the rival is present in the exclusionary contracting stage.

Our analysis of market share exclusion can be reinterpreted as an explanation for the profitability of exclusive dealing when the duration of the exclusive dealing contract is shorter than the lifetime of the excluding seller’s product. Analogous to a market share exclusion contract an exclusive dealing contract in this case decreases a successful entrant’s expected discounted future revenues and thereby increases the excluding seller’s expected profit from the buyers’ unrestricted purchases, which in this case consist of the buyers’ purchases after the exclusive dealing contract expires, provided that the extent of entry is again increasing in the reward for entry.
References


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Appendix: Proofs

Proof of Lemma 1. Suppose that the acceptance condition \( t > s \mu_k (\pi_M + DL_M) + (1 - s) (\mu_k - \mu_{k+1}) (\pi_M + DL_M) \) holds for some \( k \in \{0, ..., N - 1\} \) so that a buyer is willing to accept the market share exclusion contract if \( k \) other buyers accept the contract. The corresponding condition for a buyer to accept the contract when \( k + 1 \) other buyers accept the contract is \( t > s \mu_{k+1} (\pi_M + DL_M) + (1 - s) (\mu_{k+1} - \mu_{k+2}) (\pi_M + DL_M) \).

Subtracting the right-hand side of the latter inequality from the right-hand side of the former inequality yields \( (\mu_k - \mu_{k+1}) (\pi_M + DL_M) - (1 - s) (\mu_{k+1} - \mu_{k+2}) (\pi_M + DL_M) \). Hence, if \( \left[ \frac{(\mu_k - \mu_{k+1})}{(\mu_{k+1} - \mu_{k+2})} - (1 - s) \right] > 0 \) a buyer’s willingness to accept the contract when \( k \) other buyers accept the contract implies that the buyer is also willing to accept the contract when \( k + 1 \) other buyers accept the contract. Denoting \( r = \frac{k+1}{N} \), we have \( k + 1 = rN \), \( k = (r - \frac{1}{N}) N \), and \( k + 2 = (r + \frac{1}{N}) N \). The expression for the rival’s probability of success \( \mu_k \) can now be rewritten as \( \mu_{rN} = F \left( \frac{(N - rN) \Delta c \phi(c) + rN(1 - s) \Delta c \phi(0)}{N} \right) \) so that the rival’s probability of success is a function of \( r \). As \( N \) increases, both \( \left( \mu_{(r + \frac{1}{N})N} - \mu_{rN} \right) / \left( \frac{1}{N} \right) \) and \( (\mu_{rN} - \mu_{(r - \frac{1}{N})N}) / \left( \frac{1}{N} \right) \) approach \( \frac{d \mu_{rN}}{dr} \) for any \( r \). Hence, for a large enough \( N \) both \( (\mu_{k+1} - \mu_k) / \left( \frac{1}{N} \right) \) and \( (\mu_{k+2} - \mu_{k+1}) / \left( \frac{1}{N} \right) \) are arbitrarily close \( \frac{d \mu_{rN}}{dr} \bigg|_{r = k+1} \) for all \( k \in \{0, ..., N - 1\} \). As \( N \) increases the ratio \( \frac{(\mu_k - \mu_k + 1)}{(\mu_{k+1} - \mu_{k+2})} \) therefore approaches 1 for all \( k \in \{0, ..., N - 1\} \) and \( \left[ \frac{(\mu_k - \mu_{k+1})}{(\mu_{k+1} - \mu_{k+2})} - (1 - s) \right] \) becomes arbitrarily close to \( s \) for any \( k \in \{0, ..., N - 1\} \). Therefore, \( \left[ \frac{(\mu_k - \mu_{k+1})}{(\mu_{k+1} - \mu_{k+2})} - (1 - s) \right] > 0 \) for all \( s \in (\varepsilon, 1] \), where \( \varepsilon \) is arbitrarily small, when the number of buyers \( N \) is large enough. For a given \( s \), a buyer’s willingness to accept the contract when \( k \) other buyers accept the contract therefore implies that the buyer is also willing to accept the contract when \( k + 1 \) other buyers accept the contract if the number of buyers \( N \) is large enough. By recursion, if the number of buyers \( N \) is large enough, if a buyer’s acceptance condition holds when all other buyers reject the contract the buyer’s acceptance condition holds when \( k \) other buyers accept the contract for all \( k \in \{1, 2, ..., N - 1\} \). All
buyers accepting the contract is therefore the only Nash equilibrium if each buyer is willing
to accept the contract when all other buyers reject the contract. ■

**Proof of Lemma 2.** Suppose that the buyers are not willing to accept the contract when
all other buyers reject the contract. Consider first the case that in a Nash equilibrium \( k + 1 \)
buyers accept the contract with certainty for some \( k \in \{1, \ldots, N - 1\} \) and the \( N - k \) other
buyers reject the contract with certainty. The former condition requires that \( U_A(0, s) + t \leq U_R(0, s) \) and the latter condition requires that \( U_A(k, s, t) > U_R(k, s) \). Each acceptance
always decreases the expected surplus of a buyer who accepts the contract through the
effect that the acceptance has on the rival’s probability of success. Therefore, \( U_A(0, s, t) > U_A(k, s, t) \). Combining this inequality with the inequality \( U_A(0, s, t) \leq U_R(0, s) \) implies that
\( U_R(0, s) > U_A(k, s, t) \). Therefore, all \( k+1 \) buyers who accept the contract in the equilibrium
would be better off if the buyers would coordinate on the equilibrium in which all buyers
reject the contract compared to the equilibrium in which \( k + 1 \) buyers accept the contract.
And because \( U_R(0, s) > U_R(k, s) \) also those who reject the contract are better off if all
buyers reject the contract compared to the equilibrium in which \( k + 1 \) buyers accept the
contract. Furthermore, by the assumption \( U_A(0, s) + t \leq U_R(0, s) \) all buyers rejecting the
contract is a self-enforcing deviation from the proposed equilibrium in which \( k + 1 \) buyers
accept the contract with certainty. The equilibrium in which \( k + 1 \) buyers accept the contract
therefore cannot be a perfectly coalition-proof equilibrium if the buyers are not willing to
accept the contract when all other buyers reject the contract. Consider now the case that
in a Nash equilibrium \( k + 1 \) buyers accept the contract with a positive probability for some
\( k \in \{1, \ldots, N - 1\} \) and the \( N-k \) other buyers reject the contract with certainty. The expected
payoff of a buyer who plays a mixed strategy is the same for rejecting and accepting the
contract. Because each buyer’s acceptance has a negative externality on all other players, all
buyers who play a mixed strategy would increase their payoff from rejecting the contract if
rejected the contract with certainty. This would also benefit all other buyers. Furthermore,
those who in the proposed Nash equilibrium accept the contract with certainty would again
also benefit from rejecting the contract with certainty because again $U_R(0, s) > U_A(k, s, t)$,
and this change in the buyers’ strategy would again benefit all other buyers as well. Finally,
by the assumption $U_A(0, s) + t \leq U_R(0, s)$ all buyers rejecting the contract is a self-enforcing
deviation from the proposed equilibrium in which $k + 1$ buyers accept the contract with
a positive probability. The equilibrium in which $k + 1$ buyers accept the contract with a
positive probability therefore cannot be a perfectly coalition-proof equilibrium if the buyers
are not willing to accept the contract when all other buyers reject the contract. ■

Proof of Proposition 1. The first part of this Proposition is also a corollary of Props-
ition 2 and a separate proof is omitted. Consider now the second part of the proposi-
tion. The rival’s probability of success is $\mu = A(\Pi_R/N)^\varepsilon$ by assumption, where $\varepsilon > 0$
and $A > 0$. For a given $s$ the optimal market share exclusion contract satisfies $t =
\mu_0(\pi_M + DL_M) + \delta$, where $\delta$ is arbitrarily small when the number of buyers $N$
is large enough (see the equality (7)). Combining this with the effect of the buyers’ acceptance of
the market share exclusion contract on the incumbent’s expected profit (see the expression
(9)) when the number of buyers $N$ is large enough yields $\Delta \Pi_I = N(\mu_0 - \mu_N)\pi_M(1 - s) +
N(-\mu_0 s DL_M - \delta)$. Substituting $\mu_0 = A(N/N)^\varepsilon$ and $\mu_N = A(N(1 - s)/N)^\varepsilon$
this becomes $\Delta \Pi_I = NA(1 - (1 - s)\varepsilon)\pi_M(1 - s) + NA(-s DL_M - \delta)$ . Therefore, $\frac{d(\Delta \Pi_I)}{ds} =
NA((-1 + (\varepsilon + 1)(1 - s)\varepsilon)\pi_M - DL_M + \delta)$, where $\delta$ is arbitrarily small when the number of buyers $N$
is large enough, and $\frac{d^2(\Delta \Pi_I)}{ds^2} = NA(-\varepsilon(\varepsilon + 1)(1 - s)\varepsilon - 1\pi_M + \hat{\delta})$, where $\hat{\delta}$ is arbitrarily small
when the number of buyers $N$ is large enough. Because $\frac{d^2(\Delta \Pi_I)}{ds^2} < 0$ for all $s \in [0, 1 - \varepsilon]$,
where $\varepsilon$ is arbitrarily small, when the number of buyers $N$ is large enough, the condition
$\frac{d(\Delta \Pi_I)}{ds}\bigg|_{s=0} = NA\left(\varepsilon\pi_M - DL + \hat{\delta}\right) > 0$ is a necessary condition for market share exclusion
to be profitable when the number of buyers is large enough. Hence, because $\hat{\delta}$ is arbitrarily
small for all $s$ when the number of buyers $N$ is large enough, for a given reward-elasticity $\varepsilon$
and demand function $q(\cdot)$ market share exclusion is profitable for a large enough $N$ only if
επ_М - DL_М > 0. ■

Proof of Proposition 2. Suppose that the incumbent offers a market share exclusion contract that all buyers accept. Together with the expression (4) for a buyer’s expected surplus when the buyer accepts the contract and the expression (3) for a buyer’s surplus when the buyer rejects the contract this implies that for the optimal market share exclusion contract that all buyer accept the equality
\[ t = s\mu_k (\pi_М + DL_М) + (1 - s) (\mu_k - \mu_{k+1}) (\pi_М + DL_М) + \delta, \]
where \( \delta \) is arbitrarily small, holds for at least one \( k \in \{0, ..., N - 1\} \). For an arbitrarily small \( s \) the rival’s probability of success \( \mu_k \) is arbitrarily close to \( \mu_0 \) for all \( k \in \{0, ..., N - 1\} \), and \( \mu_k - \mu_{k+1} \) is arbitrarily close to \( \varepsilon|_{\mu=\mu_k} \) for all \( k \in \{0, ..., N - 1\} \). Therefore, for a sufficiently small \( s \) the payment \( t \) satisfies \( t = s\mu_0 (\pi_М + DL_М) + (1 - s) \varepsilon|_{\mu=\mu_0} \frac{s}{N}\mu_0 (\pi_М + DL_М) + \delta \), where the \( \delta \) is arbitrarily small. Combining this expression for the payment \( t \) as well as the aforementioned approximation for \( \mu_0 - \mu_N \) with the expression (9) for the change in the incumbent’s expected profit when all buyers accept the contract yields
\[ \Delta \Pi_I = N \varepsilon|_{\mu=\mu_0} s\mu_0 \pi_М (1 - s) + N (-s\mu_0 DL_М - (1 - s) \varepsilon|_{\mu=\mu_0} \frac{s}{N}\mu_0 (\pi_М + DL_М)) + \delta, \]
where \( \delta \) is arbitrarily small. Therefore
\[ \left. \frac{d(\Delta \Pi_I)}{ds} \right|_{s=0} > 0 \text{ if } \varepsilon|_{\mu=\mu_0} \pi_М - DL_М - \varepsilon|_{\mu=\mu_0} \frac{1}{N} (\pi_М + DL_М) > 0, \]
which can be rewritten as
\[ \varepsilon|_{\mu=\mu_0} > \frac{N \times DL_М}{N \pi_М + (\pi_М - DL_М)}. \]
While it may not be optimal for the incumbent to offer a market share exclusion contract that all buyers accept, when this condition holds it is profitable for the incumbent to offer a market share exclusion contract that at least some buyers accept.

Consider now the second part of the proposition. By assumption the rival’s probability of success is linear in the reward for success so that \( \mu_n = a + bR_n \), where \( b > 0 \) and \( R_n \) denotes the reward for success when \( n \) buyers accept the market share exclusion contract \((s, t)\). Because each acceptance of a market exclusion contract \((s, t)\) decreases the rival’s reward for success by an equal amount and the probability of success is linear in the reward for success, each acceptance of the contract also decreases the rival’s proba-
bility of success by an equal amount, \((\mu_0 - \mu_1) = (\mu_k - \mu_{k+1})\) for all \(k \in \{1, \ldots, N - 1\}\). Together with the assumption that the rival’s probability of success \(\mu_k\) is decreasing in \(k\) the result \(\mu_0 - \mu_1 = \mu_k - \mu_{k+1}\) for all \(k \in \{0, \ldots, N-1\}\) implies that if the acceptance condition \(t > s\mu_k (\pi_M + DL_M) + (1-s)(\mu_k - \mu_{k+1}) (\pi_M + DL_M)\) (see the inequality (5)) holds for \(k = 0\) this acceptance condition holds for all \(\{0, \ldots, N - 1\}\). The condition \(t > s\mu_0 (\pi_M + DL_M) + (1-s)(\mu_0 - \mu_1) (\pi_M + DL_M) + \delta\), where \(\delta > 0\) is arbitrarily small. Furthermore, because of the result that when the entry threat is linear all buyers accept a market share exclusion contract if any buyer accepts the contract, the change in the incumbent’s expected profit is (see the expression (9)) \(\Delta \Pi_I = N(\mu_0 - \mu_N) \pi_M (1-s) + N(\mu_0 s \pi_M - t)\). Combining this expression for the change in the incumbent’s expected profit and the expression for the payment \(t\) in the optimal market share exclusion contract that the buyers accept yields \(\Delta \Pi_I = N(\mu_0 - \mu_N) \pi_M (1-s) + N(\mu_0 s \pi_M - s \mu_0 (\pi_M + DL_M) - (1-s)(\mu_0 - \mu_1) (\pi_M + DL_M) - \delta)\), where \(\delta\) is arbitrarily small, and which can be rewritten as \(\Delta \Pi_I = N(\mu_0 - \mu_N) \pi_M (1-s) + N(-\mu_0 s DL_M - (1-s)(\mu_0 - \mu_1) (\pi_M + DL_M) - \delta)\). The assumption \(\mu_n = a + b R_n\) implies that \(\mu_0 - \mu_n = b (R_0 - R_n)\) and that \(\varepsilon_{\mu|\mu=\mu_0} = b \left( \frac{R_0}{\mu_0} \right)\). Combining these two expressions yields \(\mu_0 - \mu_n = \mu_0 \varepsilon_{\mu|\mu=\mu_0} \left( \frac{R_0 - R_n}{R_0} \right)\). Because \(R_n = \left( \frac{N-n s}{N} \right) R_0\) the expressions for \(\mu_0 - \mu_1\) and \(\mu_0 - \mu_N\) can be rewritten as \(\mu_0 - \mu_1 = \mu_0 \varepsilon_{\mu|\mu=\mu_0} \frac{s}{N}\) and \(\mu_0 - \mu_N = \mu_0 \varepsilon_{\mu|\mu=\mu_0} s\). Substituting these expressions for \(\mu_0 - \mu_1\) and \(\mu_0 - \mu_N\) in the previous expression for the change incumbent’s expected profit yields \(\Delta \Pi_I = N \mu_0 \varepsilon_{\mu|\mu=\mu_0} s \pi_M (1-s) + N(-\mu_0 s DL_M - (1-s) \mu_0 \varepsilon_{\mu|\mu=\mu_0} \frac{s}{N} (\pi_M + DL_M) - \delta)\), where \(\delta\) is arbitrarily small. Because \(\frac{d^2(\Delta \Pi_I)}{ds^2} < 0\), the sufficient condition for the profitability of market share exclusion when the entry technology
is linear is therefore \( \frac{d(\Delta H)}{ds} \bigg|_{s=0} = N \mu_0 \left[ \epsilon_{\mu=\mu_0} \pi_M - DL_M - \epsilon_{\mu=\mu_0} \frac{1}{N} (\pi_M + DL_M) \right] > 0 \), which can be rewritten as \( \epsilon_{\mu=\mu_0} > \frac{N \times DL_M}{N\pi_M + (\pi_M - DL_M)} \).

**Proof of Proposition 3.** The incumbent’s expected profit from a buyer who rejects the contract is \((1 - \mu_n) \pi_M\) and the buyer’s expected surplus is \(CS(\bar{c}) + \mu_n (\pi_M + DL_M)\). The combined expected surplus in this case is therefore \(CS(\bar{c}) + \pi_M + \mu_n DL_M\). The incumbent’s expected profit from a buyer who accepts the contract is \([ (1 - s) (1 - \mu_n) \pi_M + s \pi_M - t]\) and the buyer’s expected surplus is \(CS(\bar{c}) + \mu_n (1 - s) (\pi_M + DL_M) + t\). The combined expected surplus in this case is therefore \(CS(\bar{c}) + \pi_M + \mu_n (1 - s) DL_M\). In both cases the combined expected surplus is increasing in \(\mu_n\) and in the latter case the combined expected surplus is also decreasing in \(s\). The total combined surplus of the incumbent and all buyers must therefore also be decreasing in \(\mu_n\) and \(s\). Because \(\mu_n < \mu_0\) and \(s > 0\) for all market share exclusion contracts this total combined surplus is less when market share exclusion occurs in equilibrium compared to the case when market share exclusion is prohibited. If market share exclusion is profitable for the incumbent, it must therefore decrease the buyers’ total expected surplus.

**Proof of Proposition 4.** Consider first market share exclusion contracts offered by the rival. Let \((r_i, u_i)\) denote the market share exclusion contract offered by the rival to buyer \(i \in \{0, \ldots, N\}\), where \(r_i\) is the share of the potential purchases of the buyer that it cannot purchase from the incumbent if the it accepts the contract and \(u_i\) is the payment from the rival to the buyer if the buyer accepts the contract. For the buyer \(i\) to accept the market share exclusion contract \((r_i, u_i)\) the expected surplus of the buyer if it accepts the contract must be at least as high as the buyer’s expected surplus is if it rejects all contracts in stage 1. A necessary condition for the buyer \(i\) to accept the market share exclusion contract \((r_i, u_i)\) offered by the rival is therefore \((1 - r_i) [\mu'CS(0) + (1 - \mu') CS(p_M)] + r_i \mu' CS(p'_M) + u_i > \mu CS(0) + (1 - \mu) CS(p_M)\), where \(\mu'\) is the rival’s probability of success when the buyer accepts the contract, \(\mu\) is the rival’s probability of success when the buyer rejects the contract,
and \( p'_M \) is the rival’s optimal monopoly price for the restricted share of the buyer’s potential purchases, \( p'_M \equiv \arg \max_p (p - (\bar{c} - \Delta c)) q(p) \). For a small enough \( \Delta c \) the rival’s optimal monopoly price \( p'_M \) is arbitrarily close to the incumbent’s optimal monopoly price \( p_M \). For a high enough number of buyers \( N \) the rival’s probability of success when the buyer \( i \) accepts the contract, \( \mu' \), becomes arbitrarily close to the rival’s probability of success when the buyer \( i \) rejects the contract, \( \mu \). For a high enough number of buyers \( N \) and small enough \( \Delta c \) the acceptance condition therefore becomes \((1 - r_i) [\mu CS(0) + (1 - \mu) CS(p_M)] + r_i \mu CS(p_M) + u_i + \delta > \mu CS(0) + (1 - \mu) CS(p_M)\), where for any given \( u_i \) and \( r_i \) the constant \( \delta \) is arbitrarily small compared to \( u_i \) and \( r_i \) if the number of buyers \( N \) is large enough. The cost of inducing the buyer \( i \) to accept the market share exclusion contract is therefore arbitrarily close to \( r_i [\mu (CS(0) - CS(p_M)) + (1 - \mu) CS(p_M)] \) if \( \Delta c \) is small enough and the number of buyers \( N \) is large enough. The rival’s expected revenue from the restricted purchases of buyer \( i \) is \( r \mu_A \pi'_M \), where \( \pi'_M = (p'_M - (\bar{c} - \Delta c)) q(p'_M) \). For a small enough \( \Delta c \) the rival’s monopoly profit \( \pi'_M \) is arbitrarily close to \( \pi_M \) and the rival’s expected revenue from the restricted purchases of a buyer becomes arbitrarily close to \( r \mu \pi_M \). The rival’s expected surplus \( r \mu \pi_M \) from the restricted share \( r_i \) of the buyer’s potential purchases is less than the cost \( r_i [\mu (CS(0) - CS(p_M)) + (1 - \mu) CS(p_M)] \) of inducing the buyer to accept the market share exclusion contract. For a small enough \( \Delta c \) and high enough number of buyers \( N \) the rival’s expected revenue from a buyer is therefore less than the rival’s revenue from the unrestricted share \((1 - r_i)\) of the buyer’s potential purchases. The rival’s revenue from a buyer’s unrestricted purchases is in turn less than \( \Delta c \) and the rival’s total revenue from the buyers’ unrestricted purchases is thus less than \( N \Delta c \). Consequently, the payment \( u_i \) must satisfy \( u_i < r_i \mu \pi_M + N \Delta c \) and accepting a market share exclusion contract from the rival increases a buyer’s expected surplus by less than \( N \Delta c \) if the number of buyers \( N \) is high enough and \( \Delta c \) is small enough. As \( N \Delta c \) is arbitrarily small if \( \Delta c \) is small enough compared to the number of buyers \( N \), this implies that the incumbent can still induce buyers to accept...
a market share exclusion in equilibrium by increasing the payment \( t \) by the arbitrarily small amount \( N\Delta c \).

Consider now common representation contracts offered by the rival. Common representation contracts never increase a rival’s expected revenue from a buyer above \( \Delta c \) and if \( \Delta c \) is small enough and the number of buyers \( N \) is high enough by the first part of the proof offering market share exclusion contracts does not increase the rival’s expected revenue from a buyer above \( \Delta c \) either. When the number of buyers’ \( N \) is high enough and \( \Delta c \) is small enough the rival’s total expected revenue is therefore less than \( N\Delta c \). Hence, the payment \( N\Delta c \) that the rival can offer to a buyer is arbitrarily small for \( \Delta c \) is small enough and the number of buyers \( N \) is large enough. This implies that the incumbent can still induce buyers to accept a market share exclusion in equilibrium by increasing the payment \( t \) by the arbitrarily small amount \( N\Delta c \).