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Exclusionary bundle discounts: A simple model with two applications

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Abstract

We develop a simple theoretical model of exclusionary bundle discounts. Based on the model, we develop a screening test for exclusionary bundle discounts. This test only requires knowledge of prices and an estimate of the coverage of the bundle discount. We apply this test to the Vodafone/Liberty Global merger in Germany and find bundle discounts in the German broadband Internet access market consistent with exclusion. We finally use the model to simulate the merger's price effects.

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1. Introduction

(1) Below-cost pricing by dominant firms is a recurrent theme in competition policy.[1] Bundle discounts refer to a firm selling two products together for less than the sum of the standalone prices. Possible exclusionary effects of bundle discounts are relevant for abuse of dominance cases but may also be relevant in merger cases.[2] Bundle discounts, like other theories of harm based on below-cost pricing, are typically assessed using price-cost tests, often relying on average variable costs.[3] Prices for a good sold in a bundle are computed by deducting the entire bundle discount from the good's standalone price. Absent an efficiency justification, a finding of pricing below cost is evidence of exclusionary pricing.

(2) Based on Fumagalli and Motta (2013), we develop a simple model of exclusionary bundle discounts. Based on the model, one can test whether prices in a bundle are consistent with exclusionary pricing. Unlike traditional price-cost tests, our test considers whether below-cost pricing could drive out competitors and whether recoupment can be expected.[4]

(3) We apply the test to the German fixed broadband Internet access market and find evidence of prices consistent with exclusionary bundle discounts being used. We then show how the model underlying our test can be used to simulate the effects of a recently proposed merger.

2. Model

2.1. Assumptions

(4) An incumbent, I, and an entrant, E, both sell a homogenous product to a unit mass of consumers with $n \in (0,1)$ denoting the share of early customers or the share of customers to whom the incumbent already sells another product.[5] The share of late customers is $1 - n$.

(5) Unit costs are $c_I > c_E = 0$. The entrant needs to pay a fixed cost of $f > 0$ to serve all customers, both early and late. The following conditions hold:

$$\boldsymbol{c_I > f > max(n, 1-n) \times c_I} \qquad \textbf{(A)}$$

(6) The first inequality means that the total cost of serving both early and late customers is lower for the entrant than for the incumbent. Otherwise, entry would not be efficient, and the incumbent could profitably block entry by charging a price equal to f to all customers. The second inequality means that the entrant serving only one of the two segments is not efficient. This is required as otherwise the entrant could never be excluded.

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[1] Cf. OECD (1989) and European Commission (2009), Guidance on its enforcement priorities in applying Article 82 of the EC Treaty to abusive exclusionary conduct by dominant undertakings. OJ C 45, 24.2.2009, p. 7-20.

[2] Cf. European Commission (2008), Guidelines on the assessment of non-horizontal mergers, OJ C 265/6, 18.10.2008.

[3] Cf. Areeda and Turner (1975), Fumagalli et al. (2018) and European Commission (2009).

[4] Another weakness of existing price-cost tests is that many leading theories of predatory pricing, such as financial frictions (cf. Bolton and Scharfstein (1990)), reputation building (cf. Milgrom and Roberts (1982)) or signal jamming (cf. Fudenberg and Tirole (1986)) do not require prices below costs for exclusion to occur.

[5] The other product is not modelled explicitly.

(7) Customers' value for the product is $v > {}^{f}/_{1-n}$. Customers buy from the firm offering the lowest price.

(8) There are two periods. In the first period, the incumbent and the entrant simultaneously set prices p_I^1 and p_E^1 for early customers. The early customers decide from whom to buy, the entrant decides whether to pay the entry cost and transactions take place. In the second period, firms simultaneously set prices p_I^2 and p_E^2 for late customers. The late customers decide from whom to buy, the entrant, if it has not already paid the entry cost f, decides whether to pay it or not and transactions take place.

2.2. Equilibrium

(9) The game is solved by backwards induction. In the second period, if entry took place in the first period, entrant and incumbent compete à la Bertrand so prices are given by $p_I^2 = p_E^2 = c_I$ and all $1-n$ late customers buy from the entrant. The entrant earns a profit of $(1-n)c_I$, while the incumbent earns nothing.

(10) If entry did not take place in the first period, the entrant would only produce in the second period if it expected to recover at least its fixed cost of entry on the late customers. By (A) the incumbent can always profitably undercut the entrant, who would need to earn at least f on the $1-n$ late customers, by setting:

$$\boldsymbol{p_I^2 = p_E^2 = {}^{f}/_{1-n} \equiv \overline{p}} \qquad \textbf{(RP)}$$

This is the recoupment price – RP - because it is the price that the incumbent can charge if the entrant has been excluded and which allows the incumbent to make a positive profit overall. If the entrant has not entered in period 1, all late consumers buy from the incumbent. The entrant would make a profit of zero if it sold to all late consumers at RP, not having sold to the early customers.

(11) In the first period, the incumbent ensures that entry does not take place by setting a price p such that $np - f + (1-n)c_I \leq 0$. If the entrant were to sell at price p, he would, even including profits on the late customers, at most cover its entry cost. Equation (EP) gives the highest price that ensures the incumbent excludes the entrant.

$$\boldsymbol{\underline{p} = \frac{f - (1-n)c_I}{n}} \qquad \textbf{(EP)}$$

This is the exclusionary price - EP - because it is the price that the incumbent needs to set in the first period to exclude the entrant. By the first inequality of (A), EP always lies below the incumbent's costs, c_I.

(12) The profit of the incumbent when setting the exclusionary price $\underline{p}$ is given by:

$$\boldsymbol{\left(\frac{f - (1-n)c_I}{n} - c_I\right)n + \left(\frac{f}{1-n} - c_I\right)(1-n)} \qquad \textbf{(Profit)}$$

(13) The incumbent earns nothing in both periods if the entrant enters in period one. The above expression therefore equals the incumbent's overall profit under exclusion. Rearranging

(Profit), the incumbent has an incentive to set a price $\underline{p}$ and exclude the entrant if the following condition holds.

$$\frac{f}{c_I} \geq 1 - \frac{n}{2} \qquad \textbf{(C)}$$

(14) Equation (C) is the key condition to assess predatory pricing based on the underlying parameters of the model. An increase in f makes it more likely, *ceteris paribus*, that predatory pricing is profitable for the incumbent. If the incumbent has a lower cost, c_I, bundle discounting is more likely to be profitable. Finally, the greater n, the more likely it is that predatory pricing is profitable for the incumbent.

3. Application 1: Screening test for exclusionary bundling

(15) Applying equation (C) to assess predatory pricing requires estimates of costs and the share of early customers. Cost estimates are unavailable in many cases. It is, however, possible to rearrange (C) as follows:

$$\frac{(1-n)^2\overline{p}}{(1-n)\overline{p} - n\underline{p}} \geq 1 - \frac{n}{2} \qquad \textbf{(C*)}$$

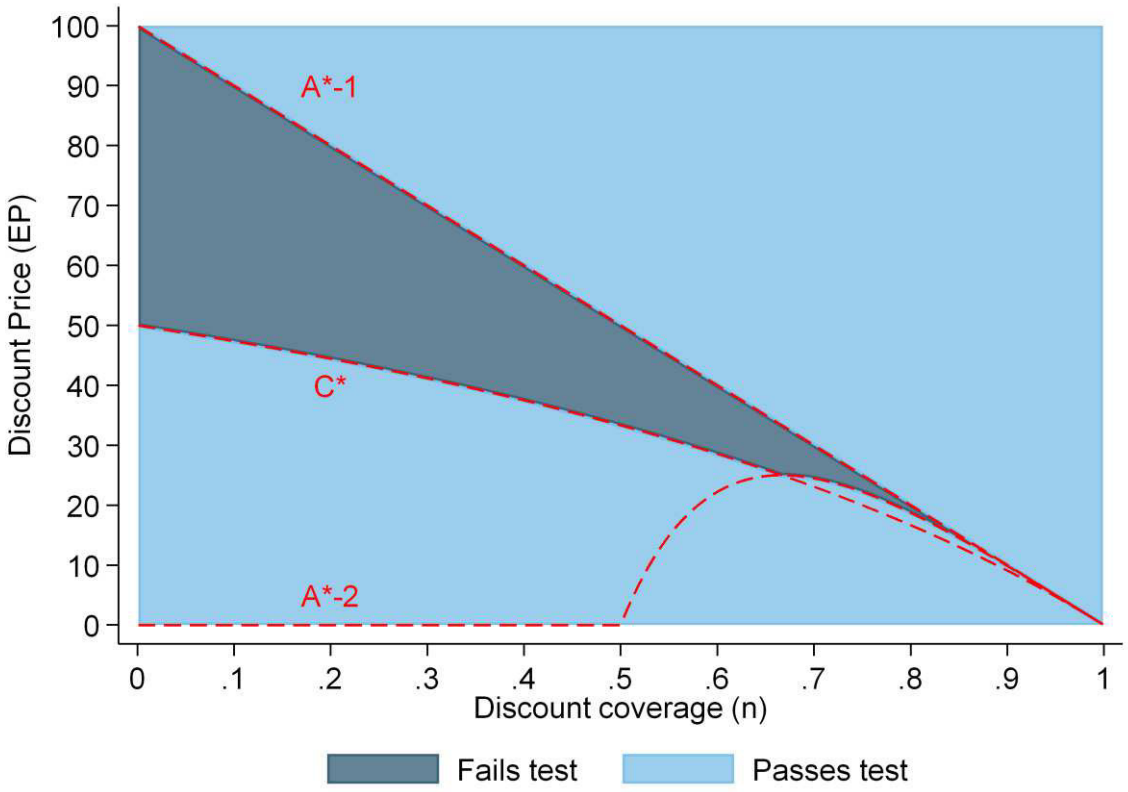
(16) Equation (C*) needs to hold for profitable exclusionary pricing by the incumbent. This condition, in contrast to condition (C), depends only on observables, namely the prices of the incumbent and the share of early customers. Information on prices can also be used to back out estimates of f and c_I by rearranging (EP) and (RP) appropriately. These estimates can be used to express (A) in terms of observed prices.

$$(1-n)\overline{p} \geq \underline{p} \geq \left({}^{(1-n)}/_{n}\right)\overline{p}(max\{2n-1, 0\}) \qquad \textbf{(A*)}$$

(17) Conditions (C*) and (A*) together constitute the test we propose for screening potentially exclusionary bundle discounts.[6] For a given standalone price of 100 the following figure 1 shows which combinations of implied prices for the good within the bundle and discount coverages, *n*, fail our test conditions, i.e. are consistent with exclusion.

[6] Low prices for the early customers constitute a bundle discount because we assumed the incumbent already sells them another product that is not explicitly modeled.

Figure 1: Permissible and exclusionary discount prices implied by the bundle price by discount coverage



Note: A*-1 is the first part of (A*). A*-2 is the second part of (A*).

4. Application 2: Merger simulation

(18) We apply our test to the German part of the Vodafone/Liberty Global merger.[7] Both Unitymedia, the Liberty Global Assets in Germany, and Vodafone are broadband Internet service providers using their own coaxial cable network infrastructure. Vodafone also provides Internet access by leasing lines from the legacy copper-based broadband Internet provider. Both Vodafone and Unitymedia are also active in the retail supply of Basic and Premium cable TV. Vodafone offers discounts for customers buying both its Premium cable TV and broadband Internet service.

(19) Several features of this industry fit the basic features of the model we set up. First, fixed costs play an important role in the provision of broadband Internet access. Large expenditures are necessary to lay the physical lines connecting a household to the backbone network of a provider. This corresponds to the model's assumptions regarding the importance of fixed costs for the incumbent and entrant.

(20) Second, in the coming years the roll-out of high-speed broadband is expected to increase. There are several firms in Germany, such as Deutsche Glasfaser or EWE Tel, that focus on rolling out fibre-based networks in the local loop, i. e. the connection of individual

[7] Cf. European Commission Case M.8864 Vodafone/Certain Liberty Global Assets, notified on 19.10.2018, OJ C 391/03 29.10.2018 and Financial Times, 9th May 2018, https://www.ft.com/content/eb6fbc86-534c-11e8-b24e-cad6aa67e23e, accessed 14.11.2018.

households to the rest of the network. While these fibre-based products will allow very high data transmission speeds, the existing legacy copper-based network and the legacy coaxial-cable network of Vodafone and Unitymedia require substantial updates to also reach high speeds. So as in the model, there is the threat of (efficient) entry in the future.

(21) Third, providers such as Vodafone have sufficient market power to be able to use price discrimination through bundle offers. This market power is set to increase following the merger due to some horizontal overlap and because Vodafone will add Unitymedia's Premium TV customers to its base.

(22) Fourth, there is scope for intertemporal price discrimination since broadband Internet access is neither storable nor tradable. If the product were storable, buyers of the bundled product could obtain further units of the subsidized product and sell it to the later buyers. This would prevent the incumbent (Vodafone) from gaining from the exclusion of the entrant.

(23) Fifth, individual households have very little buyer power and cannot coordinate their purchases or sponsor entry. This means that both types of buyers cannot cooperate to sponsor entry of a more efficient rival.

(24) Based on the model, we hypothesize that bundling allows Vodafone to reduce the profitability of independent roll-out of a fibre network that would in the future be able to compete with Vodafone's existing coaxial-cable network. Vodafone can do so by offering bundle discounts to households who also purchase its Premium TV. Following the merger, it is hypothesized that Vodafone has an incentive to extend this type of bundle discount to the area of Germany that is currently served by Unitymedia.

(25) One feature of the model that is hard to directly observe in the market is the timing assumption. There are two ways to think about this in the context of our application. First, since Vodafone already has some Premium TV customers, it can more quickly and directly advertise its offers to existing customers, who would therefore be the first to decide what type of high-speed broadband Internet access to obtain. In addition, customers who purchase Premium TV may also have a higher likelihood of a high willingness to pay for high-speed broadband Internet access than other customers, so that they would decide on purchasing this earlier. Second, one should not interpret the timing assumption of the game too literally, but rather as a metaphor for how exclusionary bundle prices can work in practice when there exist captive customers because of bundling. Whether this model applies would then be determined by whether it matches the data, rather than how realistic the assumptions appear *a priori*.

(26) We first apply the screening test. For this, we use public information regarding Vodafone's prices and its number of Premium TV customers. We take Vodafone's standalone list price for broadband Internet access with 50 Mbps, 34.99 €/month, to estimate RP. EP is estimated by subtracting the discount of 5 €/month for bundles including GigaTV and broadband Internet access, yielding 29.99 €/month.[8] In 2016, Vodafone had 1.8m Premium

[8] Cf. https://zuhauseplus.vodafone.de/kombi-pakete/, accessed on 26.10.2018.

TV customers. There are 24.2m households in Vodafone's cable area.[9] The coverage of Vodafone's bundle discounts is thus 7.5 %.

(27) We use these values to apply our simple screening test consisting of conditions (C*) and (A*) to test if Vodafone's prices and the discount coverage are consistent with exclusion of an entrant:

$$\frac{(1-7.5\%)^2 \times 34.99}{(1-7.5\%) \times 34.99 - 7.5\% \times 29.99} = 0.9945 \geq 0.962 = 1 - \frac{7.5\%}{2}$$

Hence, condition (C*) is satisfied. We next check if (A*) is satisfied.

$$(1-n)\overline{p} = (1-7.5\%) \times 34.99 = 32.35 \geq \underline{p} = 29.99$$

$$\underline{p} = 29.99 \geq 0 = \left({}^{(1-7.5\%)}/_{7.5\%}\right) \times 34.99 \times (max\{2 \times 7.5\% - 1,0\})$$
$$= \left({}^{(1-n)}/_{n}\right)\overline{p}(max\{2n-1,0\})$$

Hence, condition (A*) is also satisfied. We therefore conclude that Vodafone's pricing before the merger is consistent with exclusionary bundle discounts.

(28) We next analyze the effect of the merger on prices for standalone and bundled broadband Internet access. Unitymedia, in 2016, had 1.6m subscribers in an area containing 17.1m households. The Premium TV coverage in Germany, after the merger, therefore, is roughly 8.2%. We assume costs are unaffected by the merger, which from (EP) and (RP) can are estimated to be $\hat{f} = 32.83$ and $\hat{c}_I = 32.35$. Clearly, for $n = 8.2\%$, conditions (C) and (A) hold. Hence, the merged entity has an incentive to use exclusionary bundle discounts. (RP) and (EP) then yield the following predicted post-merger prices:

- $\overline{p}^{post} = 35.26\,€/\text{month}$
- $\underline{p}^{post} = 30.21\,€/\text{month}$

(29) The predicted post-merger prices are above Vodafone's respective pre-merger prices, though the increases are moderate. The reason is that with a greater coverage the per customer discount needed to ensure the entrant makes no profit is lower.

5. Conclusion

(30) Using only information on prices and quantities, we provide a method to test whether bundle discounts are consistent with exclusionary theories of harm. Future work should focus on relaxing restrictive assumptions of the model underlying our test, such as homogenous products and zero unit costs of the entrant.

[9] Cf. Statista, Number of pay TV and IPTV subscribers in Germany from 2006 to 2016, by provider (in 1,000) https://www.statista.com/statistics/388734/pay-tv-and-iptv-subscribers-germany/, accessed 8.11.2018. For household numbers, cf. https://www.destatis.de/DE/ZahlenFakten/GesellschaftStaat/Bevoelkerung/HaushalteFamilien/Tabellen/1_2_Privathaushalte_Bundeslaender.html, accessed 29.10.2018.

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