1

Predatory Pricing

1.1 Introduction

Predatory pricing is one of the most interesting and most controversial issues in antitrust. The term refers to a practice whereby an incumbent firm (the predator) sets prices very aggressively with the aim of excluding a rival from the market (that is, forcing the rival to leave the market or discouraging it from entering) or marginalising the rival and relegating it to a niche role. Predation – if successful – will therefore be associated with the existence of two periods: one, the predatory period, in which consumers will enjoy low prices and the incumbent will sacrifice profits; the other, the recoupment period, in which the incumbent will be able to increase its prices, and obtain higher profits, because the prey is no longer in the market (or has been marginalised). From the incumbent's point of view, this strategy is profitable if the earlier profit sacrifice is outweighed by the subsequent higher gains. From the point of view of consumers, and of social welfare, exactly the opposite happens. If the predatory strategy is successful, higher surplus during the predatory period will be outweighed by lower surplus in the recoupment phase.

Given that predatory episodes are associated with low prices, it should not come as a surprise that it is extremely difficult to distinguish low prices that are an expression of tough but fair competition from low prices that are an expression of an exclusionary strategy by the dominant firm. Suppose we observe that after the entry of a competitor, an incumbent firm reacts by starting to cut prices aggressively. Is this the sort of genuine competitive response that we should expect (after all, any theory in which firms do not collude would foresee that entry would lower equilibrium prices), or is it instead predation? In other words, are low prices good news for consumer welfare, or are they instead just a temporary consumer

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gain which anticipates the permanent consumer loss which will take place when the prey exits the market?[1] This is the first reason why predation is a controversial issue. A second reason is that, until the 1980s, economists had been unable to propose a convincing rationale for predation. As we shall explain in Section 1.2.1, Chicago scholars argued that predation is not a profitable and rational strategy for a dominant firm, and therefore that we should not expect predatory episodes to occur at all. This view was – and probably still is – quite influential and is reflected in the current status of the case-law in the US, where plaintiffs have not been successful in a predatory case for a long time (see Section 1.5). Since the 1980s, modern industrial organisation theory has been able to find rigorous explanations of why an incumbent firm may have an incentive to use predatory prices to exclude a more efficient rival.[2] These theories – which we shall call 'traditional theories'– are mostly based on the existence of imperfect information[3] and will be reviewed in Section 1.2. The focus of this chapter, however, will be on an alternative theory which does not rely on imperfect information, and which is based instead on the co-existence of scale economies, an incumbency advantage and sequential buyers (or markets) (see Sections 1.2.3 and 1.3). Note that this theory (based on Fumagalli and Motta, 2013) is new, in the sense that it rationalises predation in particular cases where traditional theories may not apply, but does not replace traditional theories. Indeed, the mechanism underpinning this new theory might well co-exist with other rationales for predation.

In Section 1.4, we will comment upon the implications of such theory for competition policy and the features that an industry must exhibit for such predation theory of harm to hold. This may provide a guide to distinguish unlawful predatory pricing from lawful price-cutting.

In Section 1.5, we will give an overview of landmark decisions by competition authorities and of key case-law in the US and in the EU, while

[1] Note, incidentally, that one would like to distinguish unlawful predation from lawful price-cutting when the predatory episode is still occurring, before the prey might be obliged to exit the market. However, even *ex post*, the identification of predatory pricing is not easy: observing that the incumbent increases its prices after exit is not sufficient to prove predation, because – once again – any model of competition would tell us that prices will increase when the number of competitors is reduced, all else equal.

[2] The discussion has moved to the extent to which these theories provide workable criteria to identify real cases of predation.

[3] We note that, in economic theory, the notion of imperfect information encompasses that of incomplete information and of asymmetric information. In this chapter, for simplicity, we will generally refer to 'imperfect information', although we note that some of the models we refer to considered specific instances of it.

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in Section 1.6 we will review a number of international cases on predation which can be read in the spirit of the economic models we present in this chapter.

1.2 Theories of Predation

In this section, we briefly describe how the economic literature has dealt with predation so far.[4] First, we report and discuss the Chicago School's skeptic views about predation, as expressed by McGee (1958). Next, we summarise the traditional economic models which offer a rationale of predation on the grounds of imperfect information. Finally, we discuss a theory of predation based, instead, on the existence of scale economies and an incumbency advantage (originally due to Fumagalli and Motta, 2013).

1.2.1 Predation: The Chicago School and the Search for a Theory

Although cases of predatory pricing were not rare in the US, at least until the *Brooke* ruling in 1993, theories which could formally (that is, using rigorous economic modelling) explain predation did not appear until the 1980s. For a long time, the main (informal) explanation for predation was probably the 'deep pocket' (also called 'long purse') story, which goes roughly as follows. A large firm might drive a small competitor out of the market by waging a price war that generates losses to both. But the small competitor has limited resources (a 'small pocket') and will therefore be unable to survive such losses for a long time. Sooner or later, it will have to give up and leave the industry, allowing the large firm to increase prices and recoup losses. Unfortunately, however, a solid theory to support this story has appeared only relatively recently (see below).

The idea that a firm could drive out competitors by using predatory pricing was criticised on four main grounds by McGee (1958), in a very influential article. First, due to its larger market share, a large firm will usually suffer greater losses from a price war than a small firm: other things being equal, the same unit loss will be multiplied by a larger number of units. Second, predation makes sense only if the large firm will increase prices when the prey leaves. But, McGee argues, the assets and plants of the small firm will not disappear, and as soon as prices rise the small firm can re-enter, or its assets might be bought and used by somebody else, reducing the profits the predator can expect to make. Third, the predation theory assumes that the predator has a deep pocket and the victim a small one,

[4] This section partly follows Motta (2004: Section 7.2).

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while this should rather be explained than assumed. In this perspective, one should wonder why a small firm, even if financially constrained, could not set out the situation (including the fact that the predator is making more losses than the small firm does, and cannot sustain them forever) to its creditors, thereby obtaining funds until predation ends. Fourth, for predation to be rational, it must be not only feasible but also more profitable than alternative instruments. If a large firm wanted to get rid of a competitor, this criticism goes, predation would be an inefficient tool because it destroys industry profits for the time it lasts. Taking over the rival would be a more profitable strategy, as it would allow the preservation of high profits in the industry.

The first two arguments above can be taken care of relatively easily. Indeed, the first point does not hold if the large firm could price discriminate and decrease prices selectively only in those markets or for those clients where the small firm is competing. This allows the predator to preserve high margins on most of the units it sells, therefore reducing the cost of the predation strategy.

As for the second point, it relies on the idea that entering and re-entering the industry does not entail sunk costs. But fixed sunk costs are pervasive, and a firm cannot typically close down its plants, fire its workers, cease to supply its product one day and return costlessly to its business soon after that.

Furthermore, the very fact that the incumbent has successfully preyed once may have an influence over other firms that are considering entry into the same market. A potential entrant will not rush into the industry after seeing the end of its predecessor. This is one of the important counter-objections made by Yamey (1972), who pointed out that predation will discourage further entry into the industry. If an incumbent develops a reputation for reacting toughly and aggressively towards entry, potential competitors might be discouraged from entering the industry at all. Although it has taken game theorists some time to prove this reputation argument formally, it is now rigorously established, as we shall discuss in Section 1.2.2.2.

Perhaps the most challenging point made by McGee is the third. Suppose that the incumbent is indeed endowed with more financial resources than a small rival, although they are equally efficient. Why should the small firm not be able to get further financing from banks or other lending institutions to resist the predatory attack? After all, outside investors should understand that predation could not be successful if they gave unlimited funding to the prey. Anticipating that, predation would

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not take place at all. Again, it is only recently, with the developments in corporate finance theory, that a convincing story has emerged of why predation might make the financial constraints of firms tighter, as we shall discuss in Section 1.2.2.1.

Finally, note that the fourth point made by McGee stresses an important general issue, namely that predation must not only be feasible but also more profitable than alternative options available to the incumbent. On the particular point that a takeover would be more profitable than predatory prices, three counter-objections can be made. First, buying out a competitor might encourage new ones to enter the industry with the aim of selling out to the incumbent at a profit: if it gains the reputation that new competitors will be bought out, a merger might not be a cheap option. Second, under some antitrust laws, taking rivals over might not be allowed for dominant firms. Third, as both Telser (1966) and Yamey (1972) argued, predation and mergers are not necessarily mutually exclusive options: aggressive price behaviour might well result in the prey being ready to sell out at a lower price (this would be the so-called 'predation-through-merger'). The merger strategy is therefore not necessarily in contradiction with a predation strategy but may be complementary to it.

Indeed, Burns (1986) looked at the expenditures made by American Tobacco to take over 43 competing firms between 1891 and 1906, and found econometric evidence that predation substantially decreased the acquisition prices. Aggressive price behaviour helped both directly (by reducing the price of acquiring a victim) and indirectly (by establishing a reputation for being a predator, that persuaded other rivals to sell out before any predatory episode would start).

This discussion of McGee's (1958) arguments and their possible counter-objections allowed us to point our attention to the main issues related to predatory pricing. In what follows, we briefly summarise some models which have addressed such issues.

1.2.2 Traditional Theories of Predatory Pricing

There is a common thread behind most of the traditional models of predatory pricing, namely the existence of some *imperfect information*. The predator will try to use the imperfect knowledge of the entrant (or of the outside investors that finance it), and behave so as to make them believe that the entrant would not make large profits in the industry. As a result, the entrant will exit, or will not enter, or its lenders will not be willing to provide it with more funding.

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Three main types of imperfect information stories can be identified, based on: (i) financial market models of predation, (ii) reputation and (iii) signalling models. In what follows, we briefly summarise them. We shall also argue that financial market models are very similar in spirit to a theory of predation based on scale economies and incumbency advantages.

1.2.2.1 Predation in imperfect financial markets

As we have seen above, a weak point of the deep pocket theory of predation is that it does not explain why the prey has limited access to external funding. Modern corporate finance theory, focusing on the imperfections existing in capital markets, provides an answer to this question. This leads to a financial theory of predation (due to Bolton and Scharfstein, 1990) where the prey's limited access to external funding is endogenous, since predation affects the perceived risk of lending money, thereby reducing external financial sources available to the prey.

The key point of this theory is the existence of imperfect information on the side of the lenders (be they banks, equity holders, or other financial institutions). Lenders do not operate themselves in the borrower's industry and cannot have precise knowledge about it (or cannot observe some of the actions taken by firms). This characterises the relationship between the lender and the borrower. (In these principal-agent models, the bank is the 'principal', and the borrower the 'agent'.) Outside investors cannot be sure that the money lent is used in an efficient and competent way rather than being used by the entrepreneur for his or her private benefit, or in an exceedingly risky way (there is a so-called 'moral hazard' problem). Accordingly, outside investors will have to devise a contract that induces the borrower to 'behave', thereby protecting their interest in receiving the money back. For instance, suppliers of capital can require collateral, or can extend financing (in staged commitments) under a threat of termination in case of poor performance. Contracts of this type mitigate the agency problem, but generate another inefficiency in the form of *credit rationing*: if the borrower is not endowed with enough collateral, or if the initial performance has been inadequate, a project with a positive net present value might not be financed. In turn, this may invite predation in the product market.

Consider competition between an incumbent and a new firm. The incumbent is a well established firm that has accumulated enough financial resources in the past (liquidity, retained earnings, assets that can be used as collateral), whereas the new firm does not have enough own resources

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and needs to borrow heavily to compete on a par with the incumbent. In such a situation, predation by the incumbent causes the prey's profits to fall, thereby limiting the amount of retained earnings (or more generally of collateral) the prey can put up to obtain external funds, or inducing the lender to deny the loan extension because of poor performance. It is therefore the aggressive behaviour by the incumbent that endogenously limits the access of the rival firm to external funds.

A possible objection to this predatory argument is that the lender, understanding that predation might occur, thus destroying its opportunity to make profits out of the loan, might have an interest in preventing it by announcing that it will finance the prey no matter its initial performance or the amount of collateral it owns. However, it might not be optimal for the lender to do so precisely because it would undermine protection from moral hazard (that is, inefficient behaviour by borrowers).

We believe this is a convincing story of why predation can take place. Aggressive market behaviour is used by the incumbent to modify the outside investors' evaluation of the risk of investing in the prey. As a result, the prey will have a lower ability to borrow and will be obliged to exit the industry or to reduce the scale of its operations.

Note that this theory does not predict that the incumbent has to set prices below costs to exclude the rival. The incumbent needs only to be sufficiently aggressive so as to make the rival's profits fall below the level required to obtain external funding. In doing that, the incumbent sacrifices profits but does not necessarily suffer losses.

Note also that this theory shares some similarity with the theory of predation based on scale economies that we will illustrate in Section 1.2.3. The basic mechanism is very similar: take away orders, or market, or profits, so as to make it impossible for the rival to survive – in the theory based on scale economies because this prevents the prey from achieving efficient scale, while in Bolton and Scharfstein's model because this denies access to external financing.

Empirical evidence We next summarise a few academic studies that provide empirical evidence consistent with the financial theory of predation.

Scott Morton (1997) looks at the British shipping cartel active at the turn of the twentieth century (that is, well before Europe had antitrust laws). Her econometric analysis shows that entrants were much likelier to be predated against when they had fewer financial resources (as well as less experience, less multimarket contact with the cartel and a smaller customer base).

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Lerner (1995) looks at the rigid disk drives industry of the 1980s. He documents that, in the earlier part of the period considered, when there was plentiful equity financing, there was no significant price difference among the products. However, in the latter part of the period studied (when financing became harder), drives whose closest substitutes were sold by undiversified thinly capitalised specialist firms were almost 20 per cent cheaper than drives without such close substitutes. Put simply, firms believed that it paid to be aggressive when aware that their close rival was in dire financial conditions.[5]

In addition, some economists have identified and commented upon specific real-world cases that could also be interpreted in the spirit of financial market predation. Gabel and Rosenbaum (1995) give a thorough account of the Wisconsin Telephone (part of the Bell family) case. Following Bell's patent expiration in 1894, Dane County Telephone began offering local services at half the price of the incumbent and signed up a good number of subscribers, including many switching away from Wisconsin Telephone. The entrant had difficulty though in raising capital to build larger (toll) networks. The authors argue that the strategy adopted by the incumbent was then to compete aggressively against the independent operator in its local markets (it undercut their price by 50 per cent). Lacking early profitability, the entrant was thus prevented from accessing financing opportunities and therefore from expanding into other markets.[6] The financial predation strategy was viable and profitable, according to the authors, because the incumbent operated in more markets than the entrant and because there were common costs (sunk investments) across these markets, where network externalities further exacerbated the handicap faced by the entrant.[7]

[5] The author controlled for a wide number of product features and the results were robust to a number of alternative definitions of what a 'close substitute' was. He also rejected the reverse causality (that is, the inability to raise capital for a firm producing drives similar to those of an efficient producer).

[6] Eventually (in 1908) Dane County was sold to Wisconsin Telephone for a low price. This case can therefore also be read in the spirit of predation-through-merger, which we alluded to in Section 1.2.1, and to which we will return in Section 1.2.2.3.

[7] Looking at the same industry, but in a different context, Weiman and Levin (1994) suggest that the Southern Bell Telephone Company gained its monopolistic position through financial predation. In particular, the authors argue, 'Southern Bell effectively eliminated competition through a strategy of pricing below cost in response to entry, which deprived competitors of the cash flow required for expansion even if it failed to induce exit.' This was complemented by pre-emptive investments in capacity, the authors also noted.

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Bolton et al. (2000) report on the cable TV industry in Sacramento (California) in the 1990s. The authors first stress the existence of high entry barriers (facilitating recoupment post-predation) and a strong incumbency advantage. As for financing issues, the authors point out that the entrant heavily relied on the personal wealth guarantees of two of the owners to obtain its original $6m investment; any extra outside financing was offered conditional on good market performance at an early stage. The incumbent reacted with drastic price-cutting, until the entrant was forced to cease its activities after a few months of losses.[8]

1.2.2.2 Reputation models

The main idea behind the reputational theory of predation is that the incumbent's aggressive conduct might allow it to create a reputation of being strong and aggressive, so as to discourage further entry into the market in the future.

To understand how Kreps and Wilson (1982) model this reputation-based theory of predation, suppose that there is an incumbent monopolist that is active in a number of identical markets, where it has the same technology and products (for example, a 'chain-store'). In each of these markets, it faces a potential entrant. Entrants can enter one at a time, in the following way. In the first market, first the potential entrant decides whether to enter or not, and if entry occurs the incumbent decides whether to fight or accommodate it. Then this same game is repeated, one by one, for all the markets.

Suppose also that the entrants have some uncertainty about the incumbent. When the game starts entrants believe that with some (possibly very small) probability the incumbent is 'strong', rather than 'weak' (or call it 'normal' if you prefer), where a 'weak' incumbent is one that has costs as high as the entrants and that, if the game was played only once, would not fight entry, because it would find this unprofitable. Fighting amounts to setting a low price that causes losses to both the entrant and the weak incumbent. Instead, a 'strong' incumbent is a very efficient firm whose costs are so low that fighting entry, that is, setting low prices that cause losses to the rival, represents its optimal strategy even in the short run.

Clearly, a strong incumbent will always fight entry, but this will not be predation: simply, it is so efficient that the entrant cannot coexist successfully. The interesting finding, as proved by Kreps and Wilson (1982),

[8] The authors report that discovery led to the finding of internal documents drafted by the incumbent that explicitly sought to assess the viability of the entrant's business, as well as the net personal worth of its two principals.

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is another: a weak incumbent would exploit the entrants' uncertainty and would fight entry at the beginning of the game, to establish a reputation for being strong and thus discourage further entry. It would be only towards the last periods of the game that a weak incumbent will accommodate entry, as the closer to the end of the game the lower the expected gain from pretending to be strong. In general, in any period, the weak incumbent's decision to fight reinforces its reputation to be efficient, but involves the sacrifice of current profits in order to deter entry and earn higher future profits. At the beginning of the game, the future is far enough and the trade-off is in favour of fighting, whereas at the end of the game there is less to be gained from deterring further entry (in the limit, in the last period there is no future gain at all), and the trade-off is in favour of accommodating.[9]

Empirical Evidence Commentators have identified a number of real-world cases whose facts seem to be consistent with the above theory. (In Section 1.6.11, we will discuss reputational issues in *Standard Oil* and *American Tobacco.*) Empirically, it is not a straightforward exercise, as this entails identifying entry that has not occurred but that would have occurred absent the reputation for predation enjoyed by an incumbent (where reputation itself is not a readily observable, quantifiable measure).

Gabel (1994) went through the business records of the telephony industry for the period from 1894 to 1910, with a focus on the US Midwest, and concluded that AT&T's dominance was due to predatory pricing.[10] The main channel through which predation took place, the author noted, was the reputation that AT&T built when scaring off independent companies that considered starting long-distance phone services. The multiplicity of geographic markets lent itself quite naturally to the interpretation of a reputation model here: when an incumbent signalled that it was 'strong' in one market, the reputation effect could be felt in several other markets too.

But there was also a financial predation motive, the author noted: AT&T would force the independents to make losses in their local markets so as to make it more difficult for them to raise capital to build a long-distance network; and this exacerbated the financing constraints these firms were already facing.

[9] Note that imperfect information is necessary for predation to exist. As showed by Selten (1975), if the entrants knew for sure that the incumbent is weak, they would never be 'tricked' into thinking that it is 'strong' instead. As a result, the incumbent would always accommodate entry and each entrant would enter the industry.

[10] The author notes that none of these AT&T cases was fully litigated.

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Last, we note that – to our knowledge – a predatory theory of harm *purely* due to reputation effects has never been successful before the courts on either side of the Atlantic. On the other hand, there have been a number of cases where reputation effects were raised alongside other anti-competitive theories of harm, as we shall note in Section 1.6, where we discuss cases that can be interpreted in the light of a number of economic models we present in this chapter.

1.2.2.3 Signalling models

Signalling models of predation are based, like reputation models, on imperfect information. Again, the potential entrant does not know whether the incumbent is low cost (strong, or efficient) or high cost (weak, or inefficient), and the incumbent will try to exploit this uncertainty to deter entry. The first signalling model is due to Milgrom and Roberts (1982) and it can be roughly summarised as follows.

Before making its entry decisions, a potential entrant observes the price set by the incumbent when it is still a monopolist. If it was certain that the incumbent is high cost, entry would be profitable. If it was certain that the incumbent is low cost, entry would entail a loss. Instead, the entrant is only in a position to conjecture that the incumbent is low cost with some probability, and it can only revise this probability by observing the monopoly price of the incumbent (if it enters, instead, it will immediately learn whether the incumbent is high cost or low cost). In this context, it is clear that a high cost incumbent might want to mimic a low cost one, to try and deter entry. However, a low cost one would not like to be mistaken for a high cost one, because it would attract entry, which lowers its profits.

There are two possible equilibria in the game. In the first (called 'separating equilibrium'), the low cost incumbent will set a price lower than its normal monopoly price in the first period (when it is the only active firm), and this price is so low that no high cost incumbents would like to set it, because it would involve too high losses. Since there is no scope for mimicking the low cost incumbent, the high cost one will instead choose its normal monopoly price. The entrant will immediately learn which incumbent it faces: if the price is low, it can only be the low cost one, and it will stay out. If it is high, it will face the high cost incumbent and will enter.[11]

[11] Note that in this equilibrium one could say that there is predation, in that the low cost incumbent is acting 'strategically' and sacrifices current profits to deter entry and gain more in the future. But, interestingly, its behaviour does not hurt welfare. To see why,

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In the second equilibrium (called 'pooling equilibrium'), instead, there is no price at which the low cost incumbent can profitably sell and be distinguished from the high cost one. As a result, it will simply set its normal monopoly price and the high cost incumbent will imitate it in order to deter entry.[12] In this case, we observe predation by the high cost incumbent, which sets a lower price than it would otherwise set in the first period (even though, it is important to notice that price might be above or below the incumbent's costs), but it can act as a monopolist in the second: it sacrifices current profits to increase the future ones. The impact on welfare is more likely to be negative in this case.[13,14]

Predation-through-merger An extension of the signalling model above allows us to explain why predation might be used to lower the price of taking over rivals, a strategy that has been alluded to in Section 1.2.1 (and to which we shall return in Section 1.6.11, where we discuss *Standard Oil* and *American Tobacco* in more detail).

Saloner (1987) changes Milgrom and Roberts' model slightly, to allow for the possibility that firms merge after the first period (also, in his model, entering when facing a low cost incumbent would not give rise to losses, but just lower profits). In this case, setting a lower price than would otherwise be optimal signals to the entrant whether it should expect to make high or low profits after entry. (This argument was also partly present, informally, in Yamey, 1972.) This conjecture thus instructs the entrant whether it should be willing to sell out to (or merge with) the incumbent at a high or

note that in a perfect information world the entrant facing the low cost incumbent would never enter (by assumption of the model), and consumers would have to pay the normal monopoly prices in both periods. In this equilibrium, instead, the low cost incumbent charges a much lower price than it would otherwise do, to signal its efficiency. Therefore, while in the second period the price is the same, consumers will be better off in the first period. In a sense, by signalling its true nature through low prices the low cost incumbent is providing a service that enhances social efficiency.

[12] The entrant does not learn anything from the observation of the first period prices, and decides on whether to enter or not on the basis of its *ex ante* probability of facing a weak incumbent. For the pooling equilibrium to exist, this probability must be low enough: the entrant will stay out only if it expects a high likelihood to face an efficient incumbent. If it expected with a high probability to meet a weak incumbent, it would enter. But then, it could not be an equilibrium as the high cost incumbent would have no reason to sacrifice current profits if it knows it will not deter entry.

[13] To be precise, the net effect is ambiguous *a priori*, since it involves a gain in the first period and a loss in the second.

[14] Note that signalling models of predation are not inherently associated with the incumbent setting a low price. If the entrant – new to the industry – does not really know its own costs, and expects them to be highly correlated with those of the incumbent, then the incumbent might deter entry by setting a *high* price, because this would signal the existence of high costs in the industry for both (see Harrington, 1986).

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at a low price. Again, predation takes the form of setting lower prices than a short-run calculation would imply, but this time its objective is not to deter entry, but rather to improve the terms on which the rival will accept being taken over.

Other predation models There are several other models where the incumbent might want to act strategically so as to make the entrant (or an existing competitor) expect lower profitability if it entered (or if it stayed in) the industry. Scharfstein (1984), for instance, analyses a model of 'test-market predation', where the entrant has a new product and is uncertain about the demand for it. Given this uncertainty, it introduces the product in a test-market first to see how it would be received. The incumbent might engage in various predatory practices (for instance secret price discounts to consumers) to make the entrant believe demand for its product will be low, thus leading it to abandon the market or reduce its scale of activity.

Fudenberg and Tirole (1986) suggest that the incumbent might also engage in 'signal-jamming predation', not to allow the entrant to improve its information. In a test-market model, for instance, the purpose of the entrant is to gather information about demand, and the predator defeats this purpose by openly cutting prices. The entrant knows that its demand is artificially low due to the incumbent's cut-throat prices, but it cannot have any information about what demand would be under normal competitive circumstances. In the absence of information, it will prefer to exit. A similar 'signal-jamming' mechanism might also be used in other circumstances where there is imperfect information.

1.2.3 A Theory of Predation Based on Scale Economies and Incumbency Advantage

We next propose a theory of predation based on the existence of scale economies – whether on the supply-side (unit costs of production decreasing with the number of units) or the demand side (such as when the utility derived from a product or service increases with the number of its users) – and an incumbency advantage.[15] Suppose that at a given moment in time, a dominant firm has an initial (incumbency) advantage over a rival: the former enjoys greater scale economies than the latter, perhaps because it has more market outlets, more captive customers, or a larger installed base than the rival. Suppose also that – in order to be profitable – the rival firm needs to reach a certain scale, that is, a certain

[15] See Fumagalli and Motta (2013) and Section 1.3 for a formal treatment.

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number of clients, or a certain installed base. Imagine that the dominant and the rival firm compete for a set of new buyers or for new markets (or for buyers/markets which are contestable).

In an industry of this type, the incumbent may engage in aggressive pricing to some early buyers (or in markets which develop first) to deprive the rival of the scale it needs to operate successfully. Once deprived the rival of key buyers (or markets), the incumbent will be able to raise prices on the remaining later buyers (or markets which develop subsequently), thereby recouping losses. The two usual ingredients of predation, early sacrifice of profits followed by later recoupment, are therefore present in a theory of harm based on a scale economies and incumbency advantages as well.

It is worth noting that this theory – that we develop formally in Section 1.3 – does not rely on imperfect information (unlike most of the traditional models of predation reviewed in Section 1.2).[16] It is the interaction between scale economies and an incumbency advantage which makes exclusion possible. Hence, the incumbent may exclude an as-efficient or even a more efficient rival even if the latter can approach buyers and submit bids at the same time as the incumbent.[17] Finally, note that our claim is that the existence of scale economies and of an incumbency advantage *may* lead to predation, not that predation always takes place under such circumstances. We will discuss in Section 1.4.2 the factors that we have identified as crucial in the theory to provide some guidance to competition authorities when dealing with predation cases.

1.2.3.1 A simple example

Perhaps the simplest setting to see the mechanism just introduced at work is the following. Suppose that the incumbent and its (smaller) rival compete for two *new* (that is, contestable) customers, or two new cohorts of customers, each with an order of one unit. The incumbent has a constant marginal cost of production $c_I > 0$. The rival's cost is equal to f for the first

[16] Also Cabral and Riordan (1994, 1997) and Farrell and Katz (2005) rationalise predation in the absence of information asymmetries. In Section 1.2.3.2, we will discuss the relationship between their theories and ours. Another model that does not rely on information asymmetries is Harrington (1989), where *joint* predation is used to sustain collusion when entry barriers are low: if entry took place collusive firms would implement a policy of predatory prices.

[17] If the incumbent also enjoys a *first-mover advantage*, that is, if it can make offers to buyers before the rival could react and make counter-offers, exclusion is easier and does not necessarily require any sacrifice of profits by the incumbent. In our setting, instead, the incumbent needs to sacrifice profits on early buyers to achieve exclusion. Most of the literature on the anti-competitive effect of exclusive contracts, that we discuss in Chapter 3, assumes a first-mover advantage for the incumbent.

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unit and to 0 for the second unit, with $c_I < f < 2c_I$. This cost structure depicts a situation in which the incumbent – possibly because it can rely on a larger base of captive customers than the rival – has already exploited scale economies and can supply the contestable buyers at a constant marginal cost. The rival, instead, needs to sell to *both* contestable buyers to achieve efficient scale. When that is the case, the rival produces at lower total costs than the incumbent, and for this reason it would be beneficial for society that the rival supplies the contestable buyers. However a *single* contestable buyer is insufficient for the rival to reach efficient scale and for this reason it suffers a cost-disadvantage vis-à-vis the incumbent when the supply of a single buyer is concerned. We will discuss below plausible situations in which such a cost structure may arise.

The incumbent and the rival can both make price offers to get the customers' orders. Suppose also that competition takes place sequentially, in the sense that first firms compete for the first buyer, and that after this buyer has decided from whom to buy, they will compete for the second buyer.

The cost structure described above implies that – if for some reason it were able to secure the first buyer – the incumbent would be able to extract higher revenues than the rival from the second buyer. The intuitive reason is that the rival is particularly inefficient in supplying a single contestable buyer: $f > c_I$ (that is, the cost of the rival of supplying one unit is higher than the cost of the incumbent). Hence, if the incumbent secures the first buyer, then it will face a very weak competitor in the second period, and it will be able to 'win' the second buyer by setting a relatively high price. If instead, it is the rival who secures the first buyer, the incumbent will not be such a weak competitor in the following period (its cost of supplying one unit is c_I, which is lower than the rival's cost of supplying the first unit, f), thereby limiting the revenues that the smaller rival can extract in the second period.[18]

[18] The formal proof presented in Section 1.3 will clarify this statement. Intuitively, when a given supplier (say firm i) secures the first buyer, competition for the second buyer involves one firm (firm i) who has already produced for one customer and the opponent who has not. Scale economies imply that firm i, who has already supplied the first buyer, is more efficient in serving the second buyer, thereby winning the competition in the second period. The key point is that the price that firm i will charge to the second buyer (and the rents it will be able to extract) will be pinned down by the opponent's cost to supply a *single* customer. Now, compare the situation where it is the incumbent that has secured the first buyer to the situation where it is the rival that has managed to. The assumption that the rival is less efficient than the incumbent in supplying a *single* customer, implies that the rents extracted by the incumbent in the former case are larger than the ones extracted by the rival in the latter case.

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When competing for the first buyer, each firm realises that whoever wins the first buyer will also win the second one, and this will result in aggressive bidding for the first buyer. Who will win the first buyer, then? There are two effects at work: on the one hand, the incumbent is less cost-efficient over the two units than the rival, and this limits its price aggressiveness; on the other hand, the incumbent expects to extract higher revenues than the rival from the second buyer, and this makes it more aggressive.

It is possible to show (for a formal treatment see Section 1.3.1) that if the (overall) efficiency advantage of the rival is not strong enough (that is, if c_I is sufficiently close to 0, other things being equal), then it is the incumbent which will make the winning bid for the first buyer. Therefore, predation will arise at the equilibrium, with the incumbent sacrificing profits on the first buyer (who pays a price below the incumbent's marginal cost) and recouping losses on the second buyer (who will end up paying a much higher price). Predation will also be welfare-detrimental since efficiency would call for the rival firm to serve both new buyers.

Instead, if the entrant's efficiency advantage is large enough (that is, c_I is high), it will be the rival who makes the best price offer to the first buyer (since the incumbent offers the first buyer a price which is below its marginal cost, the rival's equilibrium price will also be strictly below c_I), and the second buyer will also buy from the rival (at the duopoly price, which will be just a shade below c_I).

The result that inefficient exclusion can arise in this setting, as well as in the more general model discussed below, can be interpreted as a result of the existence of *contracting externalities*. Contracting externalities exist when the payoff of a contracting agent depends not only on her own terms of trade, but also on the terms of trade obtained by other contracting agents.[19] In this setting, the payoff of the incumbent depends not only on how much it sells to the first buyer, but also on how much the rival supplier sells to the first buyer which determines its second period cost and then the rents that the incumbent is able to extract from the second buyer. Then, exclusion of the more efficient rival takes place because, by removing (softening) competition in the second period, it allows the incumbent to extract larger revenues from the second buyer – that is, from the outsider of the first-period contracting – thereby increasing the joint payoff of the incumbent, the rival and the first buyer as compared to the situation where the rival supplies the first buyer. (On this, see also the discussion

[19] See Segal (1999) for a general framework to study contracting externalities and to understand the sources of inefficiencies.

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in Section 1.3.1.) Then, the incumbent is able to make an offer to the first buyer that the rival is unable to replicate, even though the rival is more cost-efficient over total production and submits bids at the same time as the incumbent. Further, since the agents contracting in the first period do not take into account the detrimental effect of their choice on the payoff of the outsider (that is, of the second buyer), the outcome that maximises their joint payoff turns out to be socially inefficient.[20]

1.2.3.2 Generalisation of the example and extensions

The simple example described above is based on a number of simplifying assumptions. Hence, it is important to show that most of those assumptions are not crucial for the argument to work, but it is also important to identify the ingredients that are key for predation to be feasible and profitable. Otherwise, we would not be able to help formulate useful policy suggestions on how to assess allegations of predation.

We now discuss informally the robustness of the theory when changing some of the basic assumptions. (For a formal treatment, see the technical Section 1.3.)

The cost structure The key ingredient of the above example is that the incumbent is more efficient than the rival at supplying a *single* buyer (in supplying a single cohort of contestable buyers), while the rival is more efficient than the incumbent at supplying *both* (cohorts of) buyers.

As we hinted above, a cost structure of this type may arise if both the incumbent and the rival produce under technologies characterised by scale economies. The rival is endowed with a more advanced technology that allows it to produce at lower cost than the incumbent once achieved the efficient scale. The incumbent and the rival differ also in terms of captive buyers: on top of competing for the contestable buyers, the incumbent also serves a certain number of *captive* buyers, who bought from it in the past and are not willing to switch to another supplier (equivalently, one can imagine that the rival does not have a distribution network in some areas of the market). The rival, who may be a recent entrant, has also some captive buyers, but fewer than the incumbent. Alternatively, the smaller rival has not entered the market yet, and for this reason it has no captive buyers at all.

[20] In the terminology of Bernheim and Whinston (1998) this is a setting with 'noncoincident market effects'. We further discuss the role of contracting externalities for inefficient exclusion in Chapters 2 and 3, when upstream suppliers compete for the first buyer offering conditional discounts or exclusive contracts. See also the deep discussion in Whinston (2006: Chapter 4.4).

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Under scale economies, this *asymmetry in the number of captive buyers* may translate in the fact that serving a single new buyer is insufficient for the rival to reach efficient scale. Hence, the incumbent preserves an advantage over the rival when supplying a single contestable buyer; such an advantage is lost if the rival supplies both contestable customers and achieves efficient scale.

Another situation in which the above cost structure may arise is the one in which the *asymmetry* between the incumbent and the rival stems from *sunk investments*: the incumbent has already sunk an entry cost f when competition for the first contestable buyer starts, while the rival (an entrant firm in this case) has not. The entrant has a lower marginal cost than the incumbent, but it manages to cover the entry cost only if it supplies both buyers. Instead, the demand of a single buyer is insufficient to make entry profitable. There exist several real-world cases which resemble this situation. Indeed, there exist markets (such as public procurement markets) where some buyers may have to decide on the basis of tender offers, or where there may be large business customers which negotiate prices with their suppliers, *before* one or more suppliers have had the time (or ability) to develop the necessary production or sales capacity. Think, for instance, of a situation where the entry investment consists of building a large and complex infrastructure, carrying out construction work, or obtaining licenses and planning permissions. Also, there may be situations where the liberalisation process or government's auctioning of new technologies may entail sequential opening of market segments in a context in which some market participants are already incumbent whereas others are not. Indeed, in some of the cases that we discuss in Section 1.6, we shall see that the dominant firm's rival was a firm that had still to make investments to complete its network (telecom operators competing for public procurement and large buyers in *Telecom Italia – Comportamenti abusivi*), to build capacity for a new product (AMD, in the *Intel* case discussed in Chapter 2), to start new bus routes (2 Travel, in *Cardiff Bus*) or to establish a new readership and credibility with advertisers (Aberdeen Independent in *Aberdeen Journals*).

Finally, the above cost structure may also arise in environments characterised by learning-by-doing, where greater past production translates into lower current production costs through the accumulation of experience. One can think of a situation where the incumbent, who has been on the market for a longer period than the smaller rival, has accumulated *more learning*. This provides the incumbent with a cost advantage in supplying a single (cohort of) contestable buyer, whereas serving both (cohorts) of the

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contestable buyers would allow the rival to fill the gap and produce more efficiently than the incumbent. Indeed, Cabral and Riordan (1994, 1997) study a duopoly model with endogenous learning-by-doing. They show that the incumbent may have an incentive to choose aggressive pricing in a first period to speed up learning, gain efficiency in the following period and, by stealing demand from the rival, to deny efficiency to the rival. If both effects are sufficiently strong, the rival may be induced to leave the market. However, differently from the model presented in this section, such an aggressive pricing policy is not necessarily welfare-detrimental, as the incumbent's acquired efficiency may benefit consumers and total welfare despite the exit of the rival. A recent paper, Besanko et al. (2014), isolates advantage-building and advantage-denying incentives for aggressive pricing in a fully dynamic model à la Cabral and Riordan (1994). They show, using numerical simulations, that the efficiency-denying incentive is the one leading to welfare-detrimental effects. In our model, the advantage-building motive is not indispensable, as the incumbent does not necessarily gain efficiency when it increases production during predation – see, for instance, the simple example discussed above in which the incumbent's marginal cost is constant. What is crucial in our model is the fact that predation denies efficient scale to the rival firm, thereby making it a weak competitor in the following period and generating rent extraction more favourable to the incumbent. And that is the precise reason why predation is welfare-detrimental.

An important implication of the above discussion is that the theory of predation presented in this section applies to situations in which the prey is a firm that is already in the market as well as to situations in which it is a new entrant.

Further, predation does not necessarily result in the prey exiting the market or being discouraged from entering the market. The prey may continue to operate and serve its captive buyers, but predation has allowed the dominant incumbent to marginalise its rival and relegate it to its niche market (that is, to its non-contestable buyers). The prey would have had the opportunity to expand its business and serve the new contestable buyers, but predatory pricing blocks this strategy.

These remarks are important for policy implications. First, because it is not necessary for the prey to exit the market in order for predation to be a feasible and profitable strategy for the incumbent. Second, because they show that the identification of contestable versus non-contestable (that is, captive) buyers may be crucial to appreciate the potential for exclusion in a given market: the larger the portion of contestable buyers

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the more difficult for predation to be successful. Also, it can be shown (see Section 1.3.2.1) that the stronger the incumbency advantage – as captured by an increase in the number of the incumbent's captive buyers – the more likely that predatory pricing will occur at equilibrium. This is because a larger non-contestable base makes the incumbent (weakly) more efficient in producing any of the two additional units. This, *ceteris paribus*, reduces the incumbent's overall cost disadvantage and limits the amount of rents that the rival firm can extract from the second buyer if it takes the first one, thereby making it easier for the incumbent to win the competition for the first buyer. This has an important policy implication: abuse (here in the form of predation) is the more likely the stronger the dominant position of the incumbent. We shall come back to this point in Section 1.4.

Finally, let us note that predation may take place to the detriment of a rival which is already operating in the market also in situations where scale economies are on the demand side (that is, there are externalities among consumers), whether due to direct network effects or to two-sided markets effects, and incumbency advantages are due to a stronger customer base.

Strategic buyers In the basic version of the theory of predation based on scale economies and on an incumbency advantage, buyers (i) make independent decisions from one another and (ii) have to buy at exogenously given times. It is worth discussing what happens if these assumptions are relaxed.

(i) Joint decisions If buyers could take joint decisions, predation would not take place. Imagine, for instance, that buyers could delegate an agent to decide on the ground of their joint payoff. In such a case, the common agent would take into account that buying from the incumbent in the first period exerts a negative externality on the second period purchase by leading to higher second period prices. Using the terminology introduced by Bernheim and Whinston (1998), inefficient exclusion would not take place because all the agents would be represented in the first period negotiation and the negative externality exerted on the second buyer would be internalised. Alternatively, inefficient exclusion would not take place if buyers could pool their orders in a single period. For instance, the second buyer could ask the first buyer to purchase on her behalf as well, thereby purchasing two units in the first period. Now the first-period order would be sufficiently big to allow the rival to reach the scale it needs, and the most efficient rival would always end up getting this (large) order. A similar outcome would arise if the first buyer did not incur a loss in delaying

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her purchase and both buyers could jointly decide in the second period.[21] This means, for instance, that agreements among buyers to establish a central purchasing agency, or to delegate their purchase decisions to an entity which sets up a common public procurement system, or any other device which allows them to take joint decisions, are pro-competitive in the situation we describe. Such agreements can be interpreted as expression of *buyer power*, which would then limit the scope for predation.[22]

(ii) Race to buy first (and simultaneous purchase decisions) Consider now the case where buyers do make independent decisions, but they are free to choose when to buy. Clearly, the first buyer would have no incentive to postpone her purchase because she obtains a higher surplus when buying first. However, the second buyer – if she could – would have an incentive to anticipate her purchase and be the first one to buy. Buyers will therefore engage in a race to be the first to buy. If there was an initial date before which purchases were not possible, both buyers would buy at that date.

It can be shown (see Section 1.3.2.2) that when the incumbent and the rival make simultaneous price offers to (independent) buyers exclusion could take place because of *buyer mis-coordination*. Consider again the simple example above, with the only variation that buyers receive simultaneous offers. In this case, it is possible that both buyers will end up buying from the incumbent even if it charges a higher price than its rival. Consider, for instance, a situation in which the incumbent sets the price f to both buyers 1 and 2, that is, $p_I^1 = p_I^2 = f$, while the rival sets a lower price to both of them: $p_R^1 = p_R^2 < f$. If one buyer expects the other buyer to choose the incumbent, then it has no incentive to deviate and turn to the rival, even if it offers a lower price. The buyer anticipates that its order alone is insufficient for the rival to achieve efficient scale so that the rival's cost to produce its unit alone (that is, f) exceeds the offered price. Then, the rival would prefer not to serve the deviant buyer.[23] In other words, if one buyer expects the other buyer to purchase from the incumbent, she would have no choice other than to purchase from the incumbent herself.

[21] In both cases, though, the first buyer will want to be compensated by the second buyer, and will receive at least the same surplus as when decisions are decentralised, since she benefits from competition between suppliers when orders are made sequentially rather than at the same time.

[22] Fumagalli and Motta (2008) arrive at the same conclusions. In that paper, though, as we discuss below (and analyse more formally in Section 1.3.2.2), buyers' (independent) decisions were simultaneous, and exclusion arose because of mis-coordination rather than because of the predatory mechanism highlighted here.

[23] Of course, mis-coordination problems do not arise if price offers represent an irreversible commitment to serve a customer.

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Note that, in this context, the mechanism behind exclusion is due to buyers' inability to coordinate on the more efficient rival. For this reason, price below cost is not necessary for exclusion. In the case just discussed, both buyers buy from the incumbent, which is charging a price as high as f, simply because each of them expects the other to buy from the incumbent.[24] Note also that in this simultaneous-move game, for the same parameter values, there exist entry equilibria as well, where both buyers buy from the entrant (each buyer expects the other not to accept the incumbent's offer) and entry takes place. Unlike the sequential-purchase decisions, therefore, under simultaneous decisions exclusion may or may not occur for any given cost efficiency difference among the suppliers, and if exclusion does happen it is not clear what prices will emerge in equilibrium.[25]

It is impossible to say *a priori* which environment among those discussed here would prevail in reality. Institutional features or legal constraints may explain the prevalence of a situation over another. Is it possible that buyers make joint decisions? Is it possible that buyers choose when to buy, and would they buy sequentially or simultaneously? For instance, legal constraints may prevent buyers from setting up joint purchases (maybe because regulators are afraid that if they agree on purchases they may also try to agree upon sales prices); the liberalisation process may be designed in such a way that a market would open before another; the existence of a patent may determine why a market may become contestable after another; some procurement rules may delay public procurement determining different purchase periods; financial constraints may delay purchase decisions of some consumers; and so on.

[24] Note that at this type of exclusionary equilibrium there are many prices which can be sustained by the incumbent. To be precise (technical remark): a continuum of prices can arise at equilibrium, each one supported by appropriate continuation equilibria concerning buyers' decisions.

[25] In cases where there is a multiplicity of equilibria, experimental evidence can provide some guidance for equilibrium selection. Experiments are studies, carried out in laboratories, where individuals are confronted with situations that seek to mimic the economic environment of interest. See Ochs (1995), for a survey on experiments on coordination games. The insights offered by Landeo and Spier (2009) and Boone et al. (2014) are particularly interesting for us. Even if in their framework the incumbent uses exclusive contracts to exclude, the nature of the coordination problem is the same as ours. These studies find that exclusion due to coordination failures occurs surprisingly often. Also, non-binding pre-play communication among buyers reduces the likelihood of exclusion. We discuss these findings more extensively in Chapter 3, where we consider exclusive contracts.

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Buyer power The discussion so far has assumed that the two buyers (or markets) have equal size and are small, that is, their individual order is insufficient to guarantee efficient scale to the rival.

Let us discuss now the implications for the analysis of the *existence of large buyers*, whose individual demand is instead sufficient for the entrant to reach efficient scale. It is straightforward to show that predation cannot occur if both buyers are large. Similarly, there is no scope for predation if buyers are asymmetric and the second buyer is large: the incumbent will not be able to extract more rents than the rival from the second buyer, once secured the first one, and will have no incentive to bid more aggressively than the rival for the first buyer. Also from this perspective, then, *buyer power* limits the scope for predation.[26]

A larger buyer in the second period can depict a market where the product is new and demand is expected to grow rapidly over time. This implies that in growing markets predation might be less of a concern. (For a more extensive analysis, see Section 1.3.2.3.)

Finally, the risk of predation is exacerbated if demand, in each of the two periods, is fragmented and buyers suffer from coordination failures. For simplicity, refer again to the simple example above. Imagine that in each period, instead of a single buyer with an order of size one, there are N buyers, each of them making an order of size $1/N$. In this context, as long as the rival needs more than $1 + 1/N$ orders to reach efficient scale, the incumbent may exclude the rival without charging below-cost pricing. The mechanism is similar to the one discussed for simultaneous offers: if a single first-period buyer expects the others to accept the incumbent's offer, then she has no incentive to address the rival – even if the latter offers a lower price – as its individual order added to the total second-period orders would not be enough for the rival to achieve efficient scale. Hence, buyer's fragmentation increases the likelihood of exclusion (by mis-coordination).

Downstream competition We have assumed so far that buyers are final consumers. This is not necessarily an innocent assumption in exclusionary models.[27]

[26] Instead, predation is still possible if the large buyer comes first. If the rival is very inefficient in supplying the small buyer as compared to the incumbent, rent extraction in the second period would still be favourable to the incumbent. If this effect is strong enough, the incumbent can bid more aggressively than the rival for the first buyer and inefficient exclusion takes place.

[27] Indeed, Fumagalli and Motta (2006) – in the context of exclusive dealing – and Fumagalli and Motta (2008) – in the context of (simultaneous) price competition – show that

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When buyers are downstream firms (for example, retailers) who are competing for consumers, we cannot assume any longer that the number of units they buy from their chosen supplier is fixed. In particular, in the extreme case where retailers are perceived as perfectly substitutable by final consumers, the buyer-retailer who pays the lower wholesale price will be able to win *all* the market demand (in our example, it will win both orders, not one). In turn, this means that even if the first buyer has committed to buy from the incumbent at a given wholesale price, the rival firm may guarantee itself enough scale to operate more efficiently than the incumbent by selling to the second buyer at a slightly lower price. Hence, even though the incumbent secured the first buyer, the rival does not suffer any disadvantage when competing for the second buyer, and the incumbent cannot benefit from more favourable rent extraction from the second buyer. In turn, this lack of advantage implies that the incumbent has no incentive to bid more aggressively than the rival for the first buyer. Note also that when competition is so fierce, the incumbent cannot recoup losses if it sells below cost to the first buyer. This buyer would dominate the downstream market and the incumbent could not make a profit on the second buyer. For these reasons, inefficient exclusion does not occur when there exists sufficiently fierce downstream competition.

If, instead, buyers-retailers were highly differentiated, or operated in different geographic markets (that is, downstream competition would be weak or absent), then exclusion might still occur: each retailer could bring only a share of the total market to the rival, and if the incumbent managed to win the first buyer, as long as the second buyer's order is not sufficient for the rival to reach efficient scale, the incumbent would act as a monopolist on the second buyer and would recoup the losses made on the first one.[28,29]

Predation in markets with scope economies The mechanism described so far applies to several buyers belonging just as well to the same market as to *different* relevant (either product or geographic) markets, which are related by the existence of common costs or more generally by scope economies. Suppose that each of the two contestable buyers is a buyer (or

exclusion may not take place when buyers are retailers who compete fiercely enough in the downstream market.

[28] For a formal analysis, see Section 1.3.2.4.

[29] As we discuss in Chapter 3 downstream competition might have an ambiguous role in the context of exclusive dealing, and it is conceivable that in some circumstances it could actually facilitate exclusion. However, in this simpler setting where suppliers cannot offer exclusive contracts, fierce downstream competition would unambiguously prevent predation from taking place.

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market) of a different product, with competition for buyer 2 taking place after competition for buyer 1 and with economies from joint production, for instance because of the presence of fixed costs common to the manufacturing of both products. In that case, the cost functions could be interpreted as total cost functions of the two products, and the interaction between scope economies and the incumbency advantage would lead to the rival being more efficient than the incumbent in supplying both products, but being less efficient when supplying the second product only. This latter assumption implies that the rival will be a weak competitor for the second buyer (or market) if the first is served by the incumbent in period 1. In turn, this determines that rent extraction in period 2, once the incumbent has secured the first buyer (or market), will be more favourable to the incumbent, and explains why the main results of our model carry over to this revised setting: the incumbent may act as a predator in the first market to preserve its dominant position in the other market.

Similarly, our mechanism applies and predation may arise in an environment where, in period 1, the rival can enter (or expand) in the market for the first product only, while in period 2 entry (or expansion) is possible in both product markets. The incumbent firm is already active in all of the markets. This may have been the case in some recently liberalised markets, such as postal services, where new entry is allowed in some segments of the market (mail-order parcel services and business-to-business mail), while the former public monopolist keeps a 'reserved area' for some period after liberalisation (for example, exclusive rights to carry letters and items weighing less than 200g); or it may be the case where tariffs or other barriers to trade are being phased out, or where it would take a long time to get all permits needed to operate locally, so that a new firm might be able to enter some markets immediately, but will be able to enter a particular foreign market only in the future.

The assumptions required in this case are that selling in both markets in period 2 is not enough for the rival to achieve efficient scale and become more efficient than the incumbent, while selling in the market for the first product in period 1 and in both markets in period 2 suffices. In this environment, it is easy to show that – in the presence of an incumbency advantage and economies of scope (in the postal service, a common distribution network that can be used to dispatch both letters and mail-order parcels, in the international markets example common R&D or technology) – the incumbent may predate in the markets which open first (for instance, the newly liberalised mail-order parcels' market), to preserve

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its monopoly position in *all* the markets where it is active.[30] We will use this argument to discuss the actual *Deutsche Post* case in Section 1.6.6.

Network effects We have so far discussed our theory of predation in a context where scale economies are on the supply-side, but exactly the same mechanism applies to demand-side scale economies, due for instance to direct demand externalities (treated in this sub-section) or to two-sided markets effects (see the following sub-section).

Suppose that the incumbent and a rival firm produce two incompatible network products, with identical marginal costs. Each manufacturer has an installed base consisting of old customers who are not buying any longer, but who continue to use the (durable) network product they have bought in the past.[31] The incumbent enjoys an *incumbency advantage* in that it can rely on a larger customer base than the rival. Suppose there are two *new* buyers who are considering buying one of the products, and whose utility increases with the number of (old and new) users of the network product they buy. This introduces a network externality which gives rise to (demand-side) scale economies: the more consumers a firm has, the more valued its network will be. Finally, suppose that the combination of network externalities and the incumbency advantage results in the following feature: even though at *full size* (that is, when both of the new buyers add to it) the quality of the rival's network is superior to the incumbent's, with only *one* new buyer the quality of the rival's product is inferior.

The reader will have noticed that this setting shares the same features as the general model described in Section 1.2.3.1, the only difference being that instead of assuming a relationship between number of units sold and cost-efficiency, we posit a relationship between number of units sold and perceived quality. One will therefore not be surprised that the game where the network firms compete sequentially for the two new buyers will produce a similar result to the examples described so far: if the quality gap between the rival's and the incumbent's network *at full size* is not too large, the incumbent will exclude the more efficient supplier by setting a price below its cost to the first buyer, and recouping the loss by charging the second buyer a much higher price. (Instead, for a sufficiently large quality

[30] This is very similar to the *defensive monopolisation* hypothesis which was first proposed by Carlton and Waldman (2002) in the context of a tying strategy inspired by the US *Microsoft* case and of markets related by complementarity in consumption (rather than by the existence of common costs). We discuss this in detail in Chapter 4.

[31] The same logic would apply to a case where the customer base is made of past customers who would buy again, but who have very high switching costs.

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gap at full size, both buyers will buy from the rival, the first one of course at a much lower price than the second.)

The intuition behind this result is similar to the case of supply-side scale economies. Competition for the first buyer will be particularly intense because whoever secures the first buyer will supply also the second. The fact that at full size the quality of the rival's network is superior represents an advantage for the rival firm when competing for the first buyer. However the fact that one buyer is insufficient for the rival firm to reach a sufficient scale may allow the incumbent to extract more rents than the rival from the second buyer which – *ceteris paribus* – makes the incumbent more aggressive when competing for the first buyer. When this latter effect dominates, the incumbent secures the first buyer and excludes the more efficient rival.[32,33] Similarly to the (general) model with supply-side scale economies, also in this case the stronger the incumbency advantage – that is, the more consolidated the customer base – the more likely predation arises in equilibrium. Again, this suggests that abuse is the more likely the higher the market share of the incumbent.

Despite its similarities, there are also some differences between the case of supply-side scale economies and the one with demand-side economies (due to the existence of network externalities between new and old consumers).

[32] The paper by Farrell and Katz (2005) shares some similarities with our analysis. They also investigate price competition in an environment with network externalities. Both in our setting and theirs, denying sales to the rival in early periods weakens its ability to compete in later periods by making the rival's product less attractive to consumers. Below-cost pricing in early periods is then a natural outcome of price competition. However, the focus of the analysis is different in the two studies. Our purpose is to identify under which conditions below-cost pricing harms welfare by leading to the exclusion of a more efficient producer. Rather than attempting to separate 'predatory' from 'non-predatory' behaviour, their focus is instead on the effect of the imposition of price floors (such as a ban on below-cost pricing) on market outcomes and welfare. Their main finding is that whether such rules are welfare-detrimental or not depends on the way consumers form expectations on other consumers' behaviour. (Expectations do not play a role in our analysis because we assume that there is a single consumer in every period, which can be also interpreted as if there are many consumers who always manage to coordinate their actions.)

[33] Also in Carlton and Waldman (2002) – in the variant based on network externalities – the first cohort of consumers is the key one and competition for it may result in exclusion of the more efficient entrant. In their case, though, it is the fact that the incumbent is already active in the market for a complementary product to the network product that makes it more aggressive in bidding for the first cohort of customers. In turn, this occurs because the incumbent extracts the entire surplus generated by the system, if it dominates the market for the network product, while it is only partially able to do so if the entrant dominates such a market.

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First of all, under network externalities the exclusion of the more efficient producer is not necessarily welfare-detrimental. The reason is that old customers, who are still using the incumbent's product, benefit when the new buyers join the incumbent's network. Their welfare gain may be large enough to dominate both the efficiency loss associated to the fact that new buyers use the inferior product and the loss suffered by the old customers of the rival due to the lack of expansion of their network. When this is the case, predatory pricing *excludes* the *more efficient* producer but is welfare-*beneficial*.[34] As the formal analysis of Section 1.3.2.7 will show, this situation is less likely to arise when the size of the incumbent's network is large enough to exhaust the externality generated by additional users, or to make it negligible. In this respect, the fact that the incumbent's dominance is pronounced, as proxied by the extent of its installed base of customers, makes welfare-detrimental predation more likely.

Two-sided markets Another instance of demand-side scale economies is given by two-sided markets. In such markets, a firm (or platform) typically sells its product or service to two different groups of consumers, each group (or side of the market) benefiting from positive externalities from the number of users on the *other* side. For example, credit card companies sell their services both to cardholders (shoppers who plan to use a card for their purchases) and to merchants (who accept cards as a way of payment). A cardholder's utility will typically increase with the number of merchants who accept her credit card (the card would have no value if no merchant accepted it), while a merchant's utility will increase with the number of users having a particular card. Other examples of two-sided markets are newspapers and yellow pages (who sell to readers and advertisers), game consoles (who sell to consumers and software developers), recruitment websites (matching firms and job-seekers), iPad and Kindle (competing for contracts with publishers on one side and for end-users on the other), pay-TV platforms (signing contracts with advertisers and content providers on one side, and with subscribers on the other), large music festivals (with fans valuing the quality and quantity of bands, and the latter being likelier to join provided the expected crowds are large enough or the venues are sufficiently prestigious), and so on.

In all these cases, a platform's success depends on its abilities to have both sides of the market 'on board'. As the economic literature well

[34] It is well known that in models with network externalities entry in the market by a new firm may be detrimental because it may lead to *stranding* (or reduced benefit from network externalities) of the old customers of the incumbent.

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emphasises,[35] asymmetric price strategies are often followed: consumers on one side of the market may be enticed to join the platform at a very low price (or can indeed be subsidised), thereby making it attractive for the other side of the market to join that platform too.

In this case, an incumbent platform's advantage is given by the existence of a stronger installed customer base on both sides of the market. To the extent that platforms are incompatible, a rival firm may have a more attractive platform (or be more cost-efficient), but it will suffer from a (demand-side) scale disadvantage. Similarly to the network externality model sketched above, it is straightforward to construct examples where predation may arise because of the mechanism repeatedly mentioned above. (See Section 1.3.2.8 for a formal treatment.) A dominant platform may set very low prices to (or even subsidise) consumers on one side of the market in order to prevent the rival from achieving scale on that side, thereby also making it much less attractive for the other side to join the rival platform (and precisely because the rival platform is much less attractive, the incumbent may be able to set very high prices on the other side of the market, thereby recouping any losses made by preying on the first side).

It is worth noting therefore that – contrary to what is often suggested in the literature – low prices on one side are not necessarily an innocent strategy with pro-competitive effects. True, when a market is in its infancy, an asymmetric price strategy might be the key to ensure that the market will not fail (the two-sided externality may mean that nobody on one side buys, expecting nobody on the other side will – and zero or low prices on one side would break this self-fulfilling market failure); but when a market is already established, one might expect the market failure problem to be less important, and very low prices on one side might be an indication of an anti-competitive strategy aimed at excluding a rival platform.

As Section 1.3.2.8 will show formally, welfare considerations are very similar to the ones discussed in the case of network externalities.

In Section 1.6.1, we shall see how this framework can be used to rationalise predation in the well-known *Napp* case. There, Napp and its rivals were selling a pharmaceutical product to hospitals and to the 'community segment'. While hospitals' utility was not influenced by decision in the community segment, community decisions were heavily affected by hospitals', making this an (asymmetric) two-sided market.

[35] See Schmalensee (2002), Evans (2003), Rochet and Tirole (2003, 2006), Armstrong (2006a).

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Relationships between traditional theories of predation and a theory based on scale economies and incumbency advantage The predation theory presented in this section neither invalidates nor generalises the traditional theories of predation – it is complementary to them. In some cases, the scale economies' mechanism we discuss might fit the evidence better. But in other cases, predation might be more likely motivated by the desire of an incumbent to build a reputation for aggressive behaviour or by the attempt of a well-funded dominant firm to make it more difficult for a new firm to obtain external funds. Further, these rationales might co-exist: the predation theory set out in this section does not rule out the possibility that an incumbent might want to deprive an actual entrant of the scale it needs while at the same time sending a message to other potential entrants that it is ready to do the same in the future; and being aggressive against an entrant might also have the effect of reducing the entrant's assets, and therefore making it more difficult for it to obtain funds in an imperfect capital market. (See the *ECS/AKZO* case discussed in Section 1.6.9.)

1.2.3.3 (Intertemporal) uniform prices and prohibition of below-cost prices

For predation to occur in a given relevant market, it must be that buyers will be charged different prices across periods, thus giving rise to some form of (*intertemporal) price discrimination*. If firms (or even only the dominant firm) were instead obliged to charge the same price in each period, then predation will never occur. Intuitively, the incumbent has an incentive to make losses on earlier buyers only if it can recoup them on later buyers, after it is clear that the prey will not be able to contest them. If (intertemporal) price discrimination were prohibited, this predatory strategy would not be possible: if the incumbent wanted to cut prices, it would have to do so for all buyers, thus implying that it would never want to sell below cost. Hence, the only equilibrium is such that the rival sets prices (slightly) below the marginal cost of the incumbent and it serves both buyers. (The proof can be found in Section 1.3.1.1.) At least in the case where scale economies are on the supply-side and the rival is more efficient than the incumbent over the entire contestable demand, it is straightforward to see that the same result would arise if a dominant incumbent was obliged never to sell below its marginal costs, as this would prevent it from undercutting the rival.

Leaving aside the practicability of these policies (for instance, supply and demand conditions change over time, so prohibiting price changes would

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not be a sensible policy), they provide us with a natural benchmark for welfare analysis. How does this situation contrast with the outcome of the model we have discussed (where price discrimination or below-cost pricing are allowed)?

The answer – contrary to what one might expect at first sight – is ambiguous. To understand why, recall first of all that when the incumbent can price aggressively to some buyers, predation is not necessarily observed at equilibrium, depending on the efficiency gap between the incumbent and the rival.

Suppose the incumbent and the rival's production costs are sufficiently similar. In this case, a theory of predation based on scale economies and incumbency advantage predicts that predation will indeed take place. With respect to the *per se* rules such as banning price discrimination or below-cost pricing considered above, predation will be welfare-detrimental. This is because the more efficient rival is displaced by the less efficient one. Moreover, consumer surplus declines (the higher surplus enjoyed by the early buyer is outweighed by the lower surplus enjoyed by the later buyer). In our model with rigid demand functions such decrease in consumer surplus is perfectly compensated by the increase in the incumbent's profits. However, in a more general model with elastic demand, predation would decrease welfare also through a loss in consumer surplus.

Suppose instead that the rival is much more efficient than the incumbent. In this case, the entrant will be able to match the aggressive prices of the incumbent and will supply both new buyers at equilibrium, the first at a price below the marginal costs of the incumbent, and the second at a price equal to the incumbent's marginal cost. However, this implies that prohibiting price discrimination would not improve the price faced by the second buyer, but it would raise the price charged to the first buyer. In other words, the ban would chill competition and lead to (weakly) higher prices. In our model we adopt rigid demand functions, to simplify the exposition. Then, in this case where the efficiency gap between the entrant and the incumbent is large, a ban on price discrimination (or below-cost pricing) would reduce consumer surplus but would leave total welfare unchanged: entry occurs anyhow, and the loss in consumer surplus would be exactly compensated by higher producer surplus. In a more general setting with elastic demand functions, a ban would also produce an allocative inefficiency, thereby reducing total welfare.

Since it is impossible for a competition authority or a government to follow a policy contingent on the costs of the firms, the only conclusion we can arrive at is ambiguous. Measures aimed at discouraging price

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aggressiveness by dominant firms would result in a trade-off. On the one hand, they would reduce the chances that anti-competitive exclusion would take place; on the other hand, when the entrant is sufficiently more efficient than the incumbent, exclusion would not occur and they would chill competition and result in higher prices.[36] We shall argue in Section 1.4 below that, if coupled with a plausible theory of harm consistent with the facts of the case, a dominant firm's below-cost pricing should be interpreted as strong evidence of anti-competitive conduct.

1.3 A Simple Theory of Predation*

In this section, we provide the analytical treatment of the theory of predation discussed in Section 1.2.3. We will start from a simple example (Section 1.3.1), and then we will prove that similar results arise in a more general setting (Section 1.3.2.1). Next, we will develop a number of extensions.

1.3.1 The Base Model (Supply-side Scale Economies)*

We assume that there are *two* buyers, B_1 and B_2, with unit demand and valuation v for a homogeneous product.[37]

An incumbent firm, I, and a rival firm, R, compete for the two buyers. The incumbent's marginal cost is constant and equal to $c_I > 0$. The rival's cost is f for the first unit and 0 for the second unit, with

$$c_I < f < 2c_I. \tag{1.1}$$

Assumption (1.1) ensures that two buyers are sufficient for the rival to achieve efficient scale and produce at lower costs than the incumbent, but a single buyer is not. We will discuss in the next section possible explanations for such property of the cost functions. Furthermore,

[36] See Karlinger and Motta (2012) for similar conclusions in a model with (simultaneous) price discrimination and network effects. See also Farrell and Katz (2005) for an analysis of the effects of the imposition of different forms of price floors in markets characterised by network externalities.

[37] The extension to n buyers would not create any conceptual difficulty and would leave qualitative results unchanged. By assuming elastic demands one would find similar qualitative results. The main difference would be that exclusion would entail not only a productive inefficiency but also an allocative inefficiency.

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$f < 2c_I$ implies that it is socially efficient that the rival supplies the two buyers. We also assume that $f < v$.

Firms play the following game.

1. First period.
   (a) Firms I, R simultaneously set prices p_I^1 and p_R^1 to buyer 1.
   (b) Buyer 1 decides from whom to buy and the transaction takes place.
2. Second period.
   (a) Firms simultaneously set prices p_I^2 and p_R^2 to buyer 2.
   (b) Buyer 2 decides from whom to buy and the transaction takes place.

Proposition 1.1 *(Sequential – and discriminatory – offers) Equilibria of this game are as follows:*

- ***(Exclusion)*** *If* $f > 3c_I/2 \equiv \widetilde{f}_s$ *then firm R and I set* $p_I^{*1} = p_R^{*1} = f - c_I < c_I$, *buyer* 1 *buys from I, firm R and I set the price* $p_I^{*2} = p_R^{*2} = f$, *the second buyer buys from I.*
- ***(Entry/Expansion)*** *If* $f \leq \widetilde{f}_s$ *then firm R and I set* $p_I^{*1} = p_R^{*1} = 2c_I - f < c_I$, *buyer* 1 *buys from R, firm I and R set* $p_I^{*2} = p_R^{*2} = c_I$ *with the second buyer buying from R.*

Proof. Let us move by backward induction. Consider first the subgame following the first buyer choosing firm R. Then, in the second period, the rival's cost to supply B_2 is lower than the incumbent's: $0 < c_I$ by assumption. Standard Bertrand competition between cost-asymmetric firms takes place and the more efficient rival supplies the second buyer at the price $p_R^{*2} = c_I$ (here and in the rest of the book we disregard equilibria in weakly dominated strategies). If instead in the first period B_1 chose the incumbent, the rival's cost to supply B_2 is equal to f, while the incumbent's cost amounts to $c_I < f$ by assumption (1.1). Hence, in this case, it is the incumbent who is the low-cost supplier. In equilibrium the incumbent serves the second buyer at the price $p_I^{*2} = f$.

We now consider competition for the first buyer. Each firm anticipates that, by securing the first buyer, it will be able to supply the second buyer. Then, if it secures B_1, the rival makes total profits $\pi_R = p_R^1 + c_I - f$.

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This inequality identifies the minimum price at which firm R is willing to supply B_1 : $\widetilde{p}_R^1 = f - c_I < c_I$ (by assumption (1.1)).

If instead B_1 decided to buy from the incumbent, then the incumbent's total profits are equal to $\pi_I = p_I^1 + f - 2c_I$. Then, the minimum price at which the incumbent is willing to supply B_1 is: $\widetilde{p}_I^1 = 2c_I - f < c_I$ (by assumption (1.1)).

Differently stated, competition for the first buyer is like an asymmetric Bertrand case where the incumbent and the rival have, respectively, 'adjusted' costs $\widetilde{c}_I = 2c_I - f$ and $\widetilde{c}_R = f - c_I$, which correspond to the total cost of producing the two units (who supplies the first buyer, will supply also the second) minus the rents extracted from the second buyer. Note that the incumbent extracts more rents than the rival from the second buyer (i.e. $p_I^{*2} = f > c_I = p_R^{*2}$). Hence, even though the rival is more efficient than the incumbent in producing the two units (i.e. $f < 2c_I$), it is not necessarily the case that its adjusted cost is lower. Indeed, the incumbent's adjusted cost is lower if (and only if) $f > \frac{3c_I}{2} \equiv \widetilde{f}_s$. The following situations can then arise:

(i) (**Exclusion**) If $f > \widetilde{f}_s$ the equilibrium is such that $p_I^{*1} = p_R^{*1} = f - c_I$, and B_1 buys from the incumbent.

(ii) (**Entry/Expansion**) If $f \leq \widetilde{f}_s$ the equilibrium is such that $p_I^{*1} = p_R^{*1} = 2c_I - f$, and B_1 buys from the rival. ■

Note that the exclusionary equilibrium arises even though the incumbent does not enjoy a first-mover advantage and the more efficient entrant can submit bids at the same time as the incumbent.[38] The source of exclusion is the interaction between scale economies and an incumbency advantage which leads to the incumbent being more efficient than the rival in producing a single contestable unit, even though the rival is more efficient than the incumbent in producing the two contestable units. It follows that, if the incumbent manages to serve the first buyer, the rival will be a weak competitor in the second period and the incumbent will charge a high price to the second buyer ($p_I^2 = f$). Instead, if the rival serves the first buyer, it will face tougher competition from the incumbent in the second period and it will be able to charge the lower price $p_R^2 = c_I < f$. This affects competition for the first buyer, where

[38] If the incumbent also enjoys a *first-mover advantage* exclusion will be easier. This is because the incumbent can take actions to attract the early buyer before the entrant can react, and can therefore exploit in the most profitable way the negative externality that the first buyer exerts on the other when it decides to buy from the incumbent.

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firms anticipate that whoever supplies the first buyer will also supply the second. On the one hand, the fact that the rival is more efficient overall makes it more aggressive; on the other hand, the perspective of higher rent extraction makes the incumbent more aggressive. The previous proposition shows that if the (overall) efficiency advantage of the rival is not strong enough, then it is the incumbent which will make the winning bid for the first buyer. Therefore, predation will arise at the equilibrium and is welfare-detrimental.[39]

Differently stated, exclusion of a more efficient rival allows the incumbent to extract larger rents from the second buyer (that is, from the outsider of the first-period contracting) thanks to a softening of competition in the second period. This maximises the joint payoff of the agents contracting in the first period (that is, the incumbent, the rival and the first buyer). This is the case both in the setting described here and in the more general model analysed below. Indeed, the condition that identifies when exclusion takes place can be interpreted along these lines. If the rival is excluded in period 1, the joint payoff of the contracting agents is given by:

$$\overbrace{v - p_I^{*1}}^{B_1} + \overbrace{p_I^{*1} + \underbrace{f}_{p_I^{*2}} - 2c_I}^{I} + \overbrace{0}^{R} \tag{1.2}$$

Instead, if the rival supplies the first buyer, the joint payoff of the contracting agents amounts to:

$$\overbrace{v - p_R^{*1}}^{B_1} + \overbrace{p_R^{*1} + \underbrace{c_I}_{p_R^{*2}} - f}^{R} + \overbrace{0}^{I} \tag{1.3}$$

[39] Another paper where exclusion may arise in the absence of a first mover advantage is Gans and King (2002). Differently from our setting, suppliers are perfectly symmetric and their focus is on asymmetries in contracting opportunities: there exist large buyers that can contract *ex ante* with suppliers and small buyers – whose demand is insufficient for a supplier to reach efficient scale – that can only trade *ex post* on a *single price* mass market. In this environment, it is in the interest of large buyers to commit *ex ante* to exclusivity with one supplier, to prevent the rival supplier from achieving the efficient scale. This will stifle competition in the mass market, thereby allowing to more rents to be extracted from small buyers. These rents are appropriated by large buyers through the *ex*

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Comparing the two expressions, it turns out that the joint payoff of the three agents is larger under exclusion when $f > 3c_I/2$, which is precisely the condition central to Proposition 1.1.

When this condition is satisfied, the incumbent is able to make an offer to the first buyer that the rival is unable to replicate, even though the rival is more cost-efficient and submits bids at the same time as the incumbent. Further, since the agents contracting in the first period do not take into account the detrimental effect of their choice on the payoff of the outsider (that is, of the second buyer), the outcome that maximises their joint payoff turns out to be socially inefficient.

An entry deterrence interpretation One would obtain the same results in a model in which the rival is a new entrant that has not sunk the entry cost f when competition for the first buyer starts. The incumbent, instead, has already supplied past buyers and has already paid the entry cost. The two firms have constant marginal costs, with $c_R = 0 < c_I$. The timing of the game would be the same as the one described above, with the addition of an explicit entry decision for firm R at the end of each period[40] (and with the transaction with firm R taking place after the entry decision). We will fully develop the entry deterrence version of the model in Section 1.3.2.6.

1.3.1.1 (Intertemporal) uniform prices and prohibition of below cost prices*

The base model assumes that buyers can be charged different prices across periods, thus allowing for intertemporal price discrimination. The following Lemma shows that, if firms were instead obliged to charge the same price to each buyer, then predation would never occur. It is straightforward to see that the same result would arise if the incumbent was obliged to never set prices below marginal costs.

Lemma 1.2 *(Sequential – but uniform – offers). Under intertemporal uniform pricing, for all parameter values, firm R and I set* $p_R^* = p_I^* = c_I$, *both buyers buy from R.*

ante contracting. Allocative inefficiencies arise because small buyers pay too high a price, but there is no exclusionary intent in the suppliers' behaviour.

[40] Note, however, that if the rival enters at the end of the first period, it will not need to pay a fixed cost again. It is only if it does not enter in the first period, that it will have the chance to do it at the end of the second.

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Proof. Since prices must be the same across periods, a firm cannot fix a price below cost in the first period recouping losses in the second period. The firms will therefore play the standard Bertrand game and $p_R^* = p_I^* = c_I$ is the equilibrium of the game, with the two buyers purchasing from the more efficient firm R. The incumbent has no incentive to undercut such a price because it should offer a price below cost to *both* buyers, which is unprofitable. In order to exclude the rival, the incumbent should offer a price $p_I < f/2$. Firm R would have no incentive to undercut such a price, but by assumption (1.1), $f/2 < c_I$ and the incumbent would make losses. ■

1.3.1.2 Welfare analysis*

The case of (intertemporal) uniform pricing provides us with the natural benchmark for welfare analysis.

Lemma 1.3 *(i) When $f > \widetilde{f}_s$ and predation arises at the equilibrium consumers suffer as compared to the case where either (intertemporal) price discrimination or below-cost pricing is forbidden.*
(ii) The predatory equilibrium is also welfare-inferior.
(iii) When $f \leq \widetilde{f}_s$ and exclusion does not takes place at the equilibrium, banning (intertemporal) price discrimination or below-cost pricing decreases consumer surplus.

Proof. (i) If the incumbent is not allowed to price discriminate (intertemporally), at the unique equilibrium both buyers pay the price c_I. At the predatory equilibrium, buyers pay prices $p_I^1 = f - c_I$ and $p_I^2 = f$, respectively. The total price is lower in the former case, and thus total consumer surplus is higher, precisely when the condition under which predation takes place is satisfied: $2c_I < 2f - c_I$ when $f > 3c_I/2$. (ii) Since demands are rigid, total welfare at the predatory equilibrium is $2 - 2c_I$, while it is $2 - f$ when (intertemporal) price discrimination is banned. The assumption that firm R is more efficient than the incumbent over the two units (i.e. $f < 2c_I$) implies that the latter is larger. (iii) At the entry/expansion equilibrium, buyers pay prices $p_R^1 = 2c_I - f < c_I$ and $p_R^2 = c_I$, respectively. Since the first buyer pays a lower price as compared to the uniform price case, while the second buyer faces the same price, total consumer surplus decreases when (intertemporal) price discrimination is banned. Since demands are rigid and entry occurs anyhow, total welfare would be equal under price discrimination and under uniform pricing. ■

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1.3.2 Generalisation of the Theory and Extensions*

In this section, we first present a more general setting where the interaction between supply-side scale economies and an incumbency advantage may give rise to predation (Section 1.3.2.1). We next also analyse in Sections 1.3.2.2-1.3.2.5 the robustness of our results to some of the simplifying assumptions we have adopted in the base model. Finally, we propose other settings where the same basic mechanism also applies: specifically, Section 1.3.2.6 analyses the case of products which develop over time, but are related because of common costs; Section 1.3.2.7 deals with scale economies on the demand side, created by the existence of network externalities; and Section 1.3.2.8 shows that predation may also appear in two-sided markets.

1.3.2.1 A more general model*

In the setting that we propose in this section, the incumbent's rival (denoted as R) may be interpreted either as a firm that is already in the market or as a new entrant but the asymmetry vis-à-vis the incumbent does not necessarily consist of the fact that the incumbent has already sunk the entry investment cost while the entrant has not.

We maintain the assumption that there are two contestable buyers/markets, B_1 and B_2, each demanding one unit of an homogeneous good for any price (weakly) lower than v. We denote as $C_i(q_i)$ the total cost function of firm $i = I, R$, and we assume that firm R is *more efficient* than the incumbent in producing the *two* contestable units (assumption (1.4)), but is *less efficient* if it produces only one *unit* (assumption (1.5)):

$$C_R(\overline{q}_R + 2) - C_R(\overline{q}_R) < C_I(\overline{q}_I + 2) - C_I(\overline{q}_I) \tag{1.4}$$

$$C_R(\overline{q}_R + 1) - C_R(\overline{q}_R) > C_I(\overline{q}_I + 1) - C_I(\overline{q}_I) \tag{1.5}$$

where $\overline{q}_I > \overline{q}_R \geq 0$ denote the demand of some captive (that is, non-contestable) buyers/markets the two firms may possibly supply. Captive buyers may be past customers who have arbitrarily high switching costs and thus continue to buy from firm i, or buyers located in other geographical areas where firm i is active and which are separated by arbitrarily high transportation costs, or even past buyers whose choice affects present production costs, for instance due to learning-by-doing effects. Note that we assume that firm I benefits from an *incumbency*

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advantage: it has been in the market for a longer period than the rival,[41] or it has developed a more extended activity in other geographical areas, which translates in a *larger number* of captive buyers than the rival firm. Finally, we assume that $v > C_R(\overline{q}_R + 1) - C_R(\overline{q}_R)$, and that $C_R(.)$ is strictly concave over the two contestable units, while $C_I(.)$ is weakly concave.[42]

The fact that the rival is less efficient than the incumbent on the first unit, in spite of being more efficient on the entire production, results from the interaction between the incumbency advantage discussed above and the existence of *scale/scope economies*. The fact that the incumbent supplies a higher number of captive customers may allow it to better exploit scale/scope economies and operate at lower incremental costs than the rival on the first contestable unit. Similarly, under learning-by-doing effects, an incumbent who has produced more in the past can produce an additional unit at lower costs.

Finally, we assume that the two buyers are approached *sequentially*, the timing of the game being as follows:

1. First period.
   (a) Firms I, R simultaneously set prices p_I^1 and p_R^1 to buyer B_1.
   (b) B_1 decides from whom to buy and the transaction takes place.
2. Second period.
   (a) Firms simultaneously set prices p_I^2 and p_R^2 to buyer B_2.
   (b) B_2 decides from whom to buy and the transaction takes place.[43]

The subgame perfect Nash equilibria of this game are described by the following proposition:

Proposition 1.4 *(Sequential – and discriminatory – offers) There exists a threshold level C_P of firm R's cost of producing the two units, with*

[41] A natural interpretation is that the incumbent is the former monopolist in markets that have been recently liberalised.

[42] Weak concavity of the incumbent's cost function simplifies the exposition. Indeed, we could allow $C_I(q_I)$ to be 'moderately'convex so as to ensure that a firm is more efficient in producing its second unit than the rival in producing its first unit. This property follows directly from assumptions (1.4) and (1.5) when the incumbent cost function is weakly concave.

[43] The results of the analysis would not change if both transactions took place at the end of the second period.

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$C_P < C_I(\overline{q}_I + 2) - C_I(\overline{q}_I)$, *such that:*

- **(Predation)** *If* $C_R(\overline{q}_R + 2) - C_R(\overline{q}_R) > C_P$, *then the incumbent supplies both buyers. It sells below cost to the first buyer, while recouping losses on the second:* $p_I^{*1} = \widetilde{C}_R < C_I(\overline{q}_I + 1) - C_I(\overline{q}_I)$, $p_I^{*2} = C_R(\overline{q}_R + 1) - C_R(\overline{q}_R) > C_I(\overline{q}_I + 1) - C_I(\overline{q}_I)$.
- **(Entry/Expansion)** *If* $C_R(\overline{q}_R + 2) - C_R(\overline{q}_R) \leq C_P$, *then firm R supplies both buyers. The price paid by the first buyer is lower than the price paid by the second:* $p_R^{*1} = \widetilde{C}_I < C_I(\overline{q}_I + 1) - C_I(\overline{q}_I) = p_R^{*2}$.

The threshold C_P *is (weakly) decreasing in* $\overline{q}_I$.

Proof. Let us move by backward induction. Let us consider first the subgame following B_1 choosing the incumbent. Standard Bertrand competition for the second buyer takes place, with the incumbent's cost to supply B_2 being lower than the rival's:

$$C_I(\overline{q}_I + 2) - C_I(\overline{q}_I + 1) \leq C_I(\overline{q}_I + 1) - C_I(\overline{q}_I) < C_R(\overline{q}_R + 1) - C_R(\overline{q}_R), \tag{1.6}$$

the first inequality following from weak concavity of $C_I(.)$ and the second from assumption (1.5). Hence, the incumbent serves the second buyer, at a price $p_I^{*2} = C_R(\overline{q}_R + 1) - C_R(\overline{q}_R)$. (Here, and in what follows, we disregard equilibria in weakly dominated strategies.)

Let us consider now the subgame following B_1 choosing the rival. In this case, the rival's cost to supply B_2 is lower than the incumbent's cost:

$$C_R(\overline{q}_R + 2) - C_R(\overline{q}_R + 1) < C_I(\overline{q}_I + 2) - C_I(\overline{q}_I + 1) \leq C_I(\overline{q}_I + 1) - C_I(\overline{q}_I), \tag{1.7}$$

the first inequality following from assumptions (1.4) and (1.5), the second from weak concavity of $C_I(.)$. Hence, it is the rival that supplies the second buyer, at a price $p_R^{*2} = C_I(\overline{q}_I + 1) - C_I(\overline{q}_I)$.

Let us move to competition for the first buyer. Each firm anticipates that, by securing the first buyer, it will be able to supply also the second, thereby obtaining a total profit equal to:

$$\pi_i = p_i^1 + p_i^{*2} - (C_i(\overline{q}_i + 2) - C_i(\overline{q}_i)) \tag{1.8}$$

with $i = R, I$. We can thus denote as $\widetilde{C}_i = C_i(\overline{q}_i + 2) - C_i(\overline{q}_i) - p_i^{*2}$, with $i = I, R$, each firm's adjusted cost to supply the first buyer, which corresponds to the total cost of producing the two units minus the rents extracted from the second buyer. Note that, by assumption (1.5), the

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incumbent extracts more rents than the rival from the second buyer (i.e. $p_I^{*2} > p_R^{*2}$). Hence, even though the rival is more efficient than the incumbent in producing the two units, it is not necessarily the case that its adjusted cost is lower. More precisely, $\widetilde{C}_R \leq \widetilde{C}_I$ if and only if:

$$C_R(\overline{q}_R + 2) - C_R(\overline{q}_R) \leq C_I(\overline{q}_I + 2) - C_I(\overline{q}_I) - [C_R(\overline{q}_R + 1) - C_R(\overline{q}_R) - (C_I(\overline{q}_I + 1) - C_I(\overline{q}_I))] \equiv C_P \tag{1.9}$$

with $C_P < C_I(\overline{q}_I + 2) - C_I(\overline{q}_I)$ by assumption (1.5).

It follows that when $C_R(\overline{q}_R + 2) - C_R(\overline{q}_R) > C_P$, the incumbent secures B_1 and sells at a price $p_I^{*1} = \widetilde{C}_R$. If instead $C_R(\overline{q}_R + 2) - C_R(\overline{q}_R) \leq C_P$, firm R secures B_1 and sells at a price $p_R^{*1} = \widetilde{C}_I$.

Note that:

$$\begin{aligned} p_I^{*1} = \widetilde{C}_R &= C_R(\overline{q}_R + 2) - C_R(\overline{q}_R) - [C_I(\overline{q}_I + 1) - C_I(\overline{q}_I)] \\ &< C_I(\overline{q}_I + 2) - C_I(\overline{q}_I + 1) \leq C_I(\overline{q}_I + 1) - C_I(\overline{q}_I) \end{aligned} \tag{1.10}$$

the first inequality following from assumption (1.4) and the second from weak concavity of $C_I(.)$. Also:

$$\begin{aligned} p_R^{*1} = \widetilde{C}_I &= C_I(\overline{q}_I + 2) - C_I(\overline{q}_I) - [C_R(\overline{q}_R + 1) - C_R(\overline{q}_R)] \\ &< C_I(\overline{q}_I + 2) - C_I(\overline{q}_I + 1) \leq C_I(\overline{q}_I + 1) - C_I(\overline{q}_I) \end{aligned} \tag{1.11}$$

the first inequality following from assumption (1.5) and the second from weak concavity of $C_I(.)$.

Weak concavity of $C_I(.)$ also implies that the threshold C_P is weakly decreasing in $\overline{q}_I$. ■

Note that, from the last item of Proposition 1.4, the stronger the incumbency advantage – as captured by an increase in the number of the incumbent's captive buyers $\overline{q}_I$ – the more likely the predatory equilibrium. This is because a larger $\overline{q}_I$ makes the incumbent (weakly) more efficient in producing any of the two units. This, *ceteris paribus*, reduces the incumbent's overall cost disadvantage and limits the rival's rents extraction, thereby making it easier for the incumbent to win competition for B_1.

Note also that the base model of Section 1.3.1 can be interpreted as a specific application of this general setting where:

$$C_R(\overline{q}_R + 1) - C_R(\overline{q}_R) = f \tag{1.12}$$

$$C_R(\overline{q}_R + 2) - C_R(\overline{q}_R + 1) = 0 \tag{1.13}$$

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$$C_I(\overline{q}_I + 1) - C_I(\overline{q}_I) = C_I(\overline{q}_I + 2) - C_I(\overline{q}_I + 1) = c_I \tag{1.14}$$

Hence, assumptions (1.4) and (1.5) translate into:

$$c_I < f < 2c_I \tag{1.15}$$

Finally, the welfare considerations developed for the base-line model apply also to the general model.

1.3.2.2 Simultaneous (uniform) offers*

A crucial ingredient of the basic version of the model of predation based on scale economies and on incumbency advantage is that price offers to buyers are made sequentially. In this section, we analyse the case where offers to buyers are made simultaneously (and buyers choose simultaneously). We assume that prices are uniform across buyers, an assumption that we can rationalise and make consistent with the setting analysed so far by saying that only intertemporal discrimination is possible. (In Chapter 2, we consider the case of price discrimination within the same period.) We shall show that exclusion can still occur, but just because of *coordination failures among buyers.*[44]

Let us rewrite the game as follows.

- **a.** Firms I, R offer uniform prices p_I, p_R to buyers B_1 and B_2.
- **b.** Buyers independently and simultaneously decide from whom to buy (and are committed to their choice.)
- **c.** Firms decide whether to honour their order and transactions are made. (If a firm got orders from a buyer B_i at stage **b.**, but later it decides not to honour it, then stages **a.-c.** are repeated for B_i.)

Proposition 1.5 *(Simultaneous uniform pricing) The game admits two types of equilibria.*

- ***Exclusionary (mis-coordination) equilibria**. Firm I sets a price $p_I^* \in [c_I, f]$, firm R sets $p_R^* \leq p_I^*$, both buyers choose I.*
- ***Entry/Expansion equilibria**. Firm R sets $p_R^* \in [f/2, c_I]$, firm I sets $p_I^* \in [p_R^*, f]$, both buyers choose R.*

[44] As we discuss in Chapter 3, coordination failures are the source of inefficient exclusion also in a model where buyers are offered exclusive contracts. See Rasmusen et al. (1991) and Segal and Whinston (2000).

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Proof. The proof is by backward induction. First of all, note that at stage c, if firm R has received an order and decides not to honour it, then the incumbent would set $p_I = f$ and serve the buyer. Note also that at stage c firms decide to honour orders only if they have collected enough revenues to cover production costs.

Let us now consider the buyers' game at stage b, given the prices bid at stage a. To understand the logic of the proof it suffices to focus on the following price configurations:[45]

- If $p_I < p_R$, it is easy to see that there is a unique equilibrium where both buyers choose the incumbent firm.
- If $f/2 \leq p_R < p_I \leq f$, there are two equilibria in the buyers' game: the first one, where both buyers choose firm R and the second where both buyers choose firm I. Let us consider first the equilibrium where both buyers choose firm R. Since $2p_R \geq f$, firm R will honour its orders, and B_i will pay the price p_R. She has no incentive to deviate and choose the incumbent, as she would pay the higher price p_I. Let us consider the second equilibrium, where both buyers choose firm I. Given that B_j buys from I, B_i has no incentive to deviate and choose R. If she did so, firm R would not honour the order as her demand alone is insufficient to make firm R cover production costs ($p_R < f$), and she would then be obliged to buy from the incumbent at the price $f \geq p_I$. (The argument is the same when $p_R = p_I < f$. When $p_R = p_I = f$ any buyers' choice is an equilibrium.)
- If instead $p_R < p_I$ with $p_I > f$ the unique continuation equilibrium is such that both buyers choose firm R. Now choosing the rival is a dominant strategy for any buyer: she will pay a lower price both if the rival honours the order (since $p_R < p_I$) and if the rival does not and she will buy the good later from the incumbent ($f < p_I$).

We can now move to stage a. We characterise the equilibrium solutions. According to the continuation equilibria following the bids where $p_R \leq p_I \leq f$ exclusion may either occur or not.

Consider first the **mis-coordination equilibria**. The pair of prices $p_I^* = f$ and $p_R^* \leq f$ is sustained as an equilibrium by having both buyers choosing the incumbent following any bid where $p_R \leq p_I = f$. Such

[45] For a complete proof see Fumagalli and Motta (2008). Even though it analyses a setting with n buyers and elastic demand, the logic of the proof is the same.

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continuation equilibria ensure that firm R has no incentive to deviate and decrease its price, as this would not attract buyers. Clearly, firm R has no incentive to increase its price as the unique continuation equilibrium is such that both buyers would choose the incumbent. Turning to firm I, it has no incentive to decrease its price. It has no incentive to increase its price either as it would lose both buyers.

Mis-coordination equilibria also exist where $p_I^* = p < f$ and $p_R^* \leq p$. They are sustained by having both buyers choosing the incumbent following any bid where $p_R \leq p_I = p$, while both buyers choosing the rival following any bid $p_I > p$ and $p_R \leq p_I$. These continuation equilibria ensure that the incumbent has no incentive to deviate and bid a price above p because it would lose all buyers; also, the rival has no incentive to change its bid because this would not allow to attract buyers nor to make sales profitable.

Finally, a mis-coordination equilibrium where $p_I > f$ does not exist. Firm R would have an incentive to deviate and slightly undercut the incumbent as this allows it to capture both buyers.

Let us turn now to **entry/expansion equilibria**. First, firm R cannot supply the buyers at the equilibrium if it bids a price $p_R > c_I$: the incumbent could profitably undercut and obtain all buyers. Firm R cannot supply the buyers at the equilibrium if it bids a price $p_R < f/2$ either: the revenues from both buyers are not enough to cover the production costs.

Equilibria where $p_R^* = p \in [f/2, c_I]$ and $p_I^* = p$ are sustained by having both buyers choosing the rival following any bid where $p_R < p_I$. The rival cannot deviate by increasing its price as it would lose all orders. In turn, the incumbent is indifferent between p and any higher price because no buyer would patronise it in any case; instead, it captures both buyers by decreasing its price but it would not break even as the deviation price would be below c_I.

Finally, there are also entry/expansion equilibria where $p_I > p_R$: $p_R^* = p \in [f/2, c_I]$ and $p_I^* \in (p, f]$. They are sustained by having both buyers choosing the rival following any bid where $p_I > p_R = p$ and both buyers choosing the incumbent following any bid where $p < p_R \leq p_I$. The latter ensures that firm R cannot increase its payoff by increasing the price and setting it equal or lower than the incumbent's because it would lose all the buyers. ■

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1.3.2.3 Growing markets*

In our base model, we assume that buyers (markets) have the same demand (or equivalently that markets are equally sized). To understand how the relative importance of buyers affects the results, consider the same setting as in the base model, but assume that buyer B_1's demand is $1-k$, and B_2's demand is $1+k$, with $0 \leq k < 1$, so that the total market size does not change and is still equal to 2. The base model is embedded here for $k=0$. We assume in this case that the incumbent has a constant marginal cost c_I, while the rival bears a total cost f on the first $1+k$ units and a total cost equal to 0 on the subsequent $1-k$ units, with:

$$(1+k)c_I < f < 2c_I. \tag{1.16}$$

Note that the condition that ensures that the demand of the second buyer is insufficient for the rival to achieve efficient scale becomes more stringent, since the demand of that buyer has increased. Also, as the following Proposition shows, as the second buyer becomes more important, exclusion is less likely to take place.

Proposition 1.6 *If the second buyer is more important relative to the first one, exclusion of the more efficient rival arises if (and only if)* $f > \widetilde{f}(k) \equiv (3+k)c_I/2$. *The threshold* $\widetilde{f}(k)$ *is increasing in* k.

Proof. Let us move by backward induction. If B_1 decided to buy from the incumbent at the price p_I^1, then the incumbent wins the second buyer as it is more efficient than the rival in supplying B_2: $f > c_I(1+k)$ by assumption. This means that, if the incumbent secures the first buyer offering the price p_I^1, then it makes total profits equal to $\pi_I(p_I^1) = p_I^1(1-k) + f - 2c_I$. The incumbent's minimum price to supply the first buyer is $\widetilde{p}_I^1 = (2c_I - f)/(1-k)$.

If instead B_1 decided to buy from firm R, the rival is more efficient than the incumbent in supplying the second buyer. Indeed, the total cost of the rival in supplying B_2, once it has already supplied B_1, is $2kf/(1+k)$ which is always lower than the incumbent's cost to supply B_2:

$$\frac{2kf}{1+k} < (1+k)c_I \Leftrightarrow f < \frac{(1+k)^2 c_I}{2k} \tag{1.17}$$

which is always satisfied since $(1+k)^2/(2k) \geq 2$ for $k \in [0,1]$ and $f < 2c_I$ by assumption (1.16). Then, if B_1 decided to buy from the rival at the price p_R^1, the total profits that firm R makes are: $\pi_R(p_R^1) = p_R^1(1-k)$

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$+(1+k)c_I - f$. The rival's minimum price to supply the first buyer is $\widetilde{p}_R^1 = f - (1+k)c_I/(1-k)$.

Combining the above results one obtains that $\widetilde{p}_I^1 < \widetilde{p}_R^1$ if (and only if) $f > \frac{(3+k)c_I}{2}$. ■

In the simple example just described, the rents that the incumbent extracts from the second buyer are pinned down by f and do not vary with the second buyers' size, whereas the rents that the rival extracts from B_2 do increase as B_2's size expands. This leads to the unambiguous conclusion that predation becomes less likely as the second buyer becomes more important.

In a more general setting, the implications are less clear-cut. To see why, recall that a necessary condition for (inefficient) exclusion is that the $1+k$ units are insufficient for the rival to reach the efficient scale and produce more efficiently than the incumbent:

$$C_R(\overline{q}_R + 1 + k) - C_R(\overline{q}_R) > C_I(\overline{q}_I + 1 + k) - C_I(\overline{q}_I), \tag{1.18}$$

that is what allows the incumbent to extract more rents than firm R from the second buyer, once the first one has been secured, which in turn is necessary for the incumbent to have an incentive to bid more aggressively for B_1. When $k = 1$, the above condition cannot be satisfied as it would contradict assumption (1.4), which ensures that firm R is more efficient than the incumbent on the entire production and thus that exclusion (if any) is welfare-detrimental. Instead, by assumption (1.5), the above condition is satisfied when $k = 0$ and buyers are symmetric. By continuity, there exists a critical size of the second buyer $1 + k^*$ such that the above condition does not hold and thus inefficient exclusion cannot arise if the size of the second buyer is above the threshold level.

Now, when condition (1.18) is satisfied, following the same logic of Section 1.3.2.1, one can easily show that predatory pricing and inefficient exclusion take place if (and only if) firm R's cost advantage is not too large, that is, iff $C_R(\overline{q}_R + 2) - C_R(\overline{q}_R) > C_P(k)$ where

$$\begin{aligned} C_P(k) \equiv\ & C_I(\overline{q}_I + 2) - C_I(\overline{q}_I) - [C_R(\overline{q}_R + 1 + k) - C_R(\overline{q}_R) \\ & - (C_I(\overline{q}_I + 1 + k) - C_I(\overline{q}_I))]. \end{aligned} \tag{1.19}$$

Note that, without imposing specific restrictions on the slope of the cost functions, one cannot tell whether inefficient exclusion becomes more or less likely as buyers' asymmetry increases, that is, as k increases. Indeed,

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an expansion of the second buyer's demand allows both suppliers to extract more rents from B_2, once secured B_1, thereby inducing a more aggressive bidding for the first buyer by both suppliers. The only possible claim is that for values of k sufficiently close to k^* the threshold $C_P(k)$ is increasing in k, and thus exclusion becomes less likely as the second period demand expands.

1.3.2.4 Downstream competition*

To formalise the situation where buyers compete downstream, keep the same assumptions on parameters as in the base model, but assume that in each market $i = 1,2$ there is a mass of consumers normalised to 1 and with unit valuation and demand for a certain product. Consumers cannot be served directly by firms I and R, but only by retailers. Consider the following timing of the game:

1. In the first period, firms I, R set wholesale prices w_I^1 and w_R^1 to retailer B_1, who decides from whom to buy (but does not commit on the size of the order).
2. In the second period, firms simultaneously set prices w_I^2 and w_R^2 to retailer B_2, who decides from whom to buy.
3. In the third period, retailers set prices p_1 and p_2. Consumers in each market decide. Transactions take place.

In what follows, we limit ourselves to state the result for two extreme cases: (a) independent markets: consumers in market i can buy only from retailer B_i; (b) perfect substitutes with Bertrand competition: consumers can buy from either retailer or both.[46] For intermediate competition cases, we would expect that – as in Fumagalli and Motta (2008) – if there is sufficiently fierce competition downstream, predation will not take place in equilibrium.

Proposition 1.7 *(Downstream competition) Suppose buyers are retailers who sell to final consumers. Equilibria of this game are as follows:*

- ***(Independent market areas)*** *If each retailer sells in a separate final market of size* 1 *and with unit valuation, then the equilibria are the*

[46] One can rationalise the two cases as due to transportation costs. If retailer B_i is located in market i, the independent markets case corresponds to segmented geographical markets

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same as in the base model (in particular, predation arises if $f > 3c_I/2 \equiv \widetilde{f}_s$*).*

- (*Fierce competition*) *If the two markets are integrated and retailers compete in prices for final customers, exclusionary equilibria do not exist. Entry/Expansion equilibria exist and are such that firm R supplies one or both retailers at a wholesale price* $w_R = c_I$.

Proof. *(Independent market areas)* If retailers are selling in independent markets, then each retailer can sell at most one unit of the product. Hence, everything will be as in the base model where buyers are final consumers who buy at most one unit.

(Fierce competition) Let us move backwards. In the third period, standard Bertrand competition between retailers takes place. Note that, for any w^1 and w^2 paid to upstream suppliers, the low-cost retailer (if any) captures the entire downstream market and sells two units of the product. In the second period, for given w^1 set for the first retailer, the incumbent and the rival compete for the second retailer. Let us distinguish the following cases:

1. Let us consider first the case where $w^1 > c_I$. Then, irrespective of whether the first buyer committed to buy from the incumbent or the rival, competition for B_2 will result in the second retailer buying from firm R at a price $w_R^2 = c_I$ (or slightly below) and selling *two* units to final consumers. Firm R covers its total production costs as $f < 2c_I$.
2. Let us consider now the case where $w^1 \in (f/2, c_I]$. If the first retailer committed to I, then in the second period the second retailer will pay a price w_R^2 slightly below w^1 to firm R and will dominate the final market selling *two* units to final consumers. If the first retailer committed to R, then any $w_I^2 \geq w^1$ and $w_R^2 \geq w_1$ is an equilibrium, with firm R either selling two units to the first retailer or one unit to each retailer (when $w_R^2 = w_1$). In all the cases it is firm R that sells the input and cover its total production costs.
3. Finally, let us consider the case where $w^1 \in [0, f/2]$. If the first buyer committed to buy from firm i (with $i = I, R$), then firm j (with $j = I, R \neq i$) has no incentive to secure the second buyer. In order to sell a positive amount of input, firm j should offer a price $w^2 < w^1$

with arbitrarily large transportation costs, the perfect competition case corresponds to integrated markets with zero transportation costs.

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to the second buyer, which would allow the latter to dominate the downstream market and sell two units to final consumers. However, firm j would not cover its production costs, as $w^2 < w^1 < f/2 < c_I$. Then, any $w_i^2 \geq w^1$ and $w_j^2 \geq w^1$ is an equilibrium with firm i either selling the two units to the first retailer or one unit to each retailer (when $w_i^2 = w^1$).

Let us now consider price offers to the first buyer. Firms anticipate that for any $w^1 > f/2$, firm R will end up selling the two units, with the final market being dominated by either of the retailers, or being shared by both of them. In order to exclude the rival, the incumbent should capture the first buyer by offering $w_I^1 \leq f/2 < c_I$. However, the incumbent makes losses if it offers such a price to the first retailer: even though the rival is excluded, the second retailer will not sell unless it pays a price $w^2 \leq w^1$; hence the two units would be sold below costs either to the first retailer (if I chooses $w_I^2 > w_I^1$) or to both (if I chooses $w_I^2 = w_I^1$).

Hence, an equilibrium where the rival is excluded from the market cannot exist. It is easy to see that equilibria involve many different combinations of wholesale prices, with the incumbent making zero profits in each of them and the entrant selling the two units at a wholesale price which cannot exceed $w_R = c_I$.

Note the role played by fierce downstream competition. Even if the first buyer has committed to buy from the incumbent at a certain wholesale price, the rival firm can guarantee itself enough scale to operate more efficiently than the incumbent by selling to the second buyer at a lower price. Hence, when downstream competition is fierce, even though the incumbent secured the first buyer, firm R does not suffer any disadvantage when competing for B_2 and the incumbent cannot take advantage of more favourable rent extraction from the second buyer. Moreover, when competition is so fierce, the incumbent cannot recoup losses if it sells below cost to the first buyer: this buyer would dominate the downstream market and the incumbent could not make a profit on the second buyer. For these reasons, inefficient exclusion cannot arise at the equilibrium. ■

1.3.2.5 Renegotiation (or breach of orders)*

The base model of Section 1.3.1 assumes that transactions take place in each period, immediately after the buyer has chosen the supplier. Imagine, instead, that in each period buyers decide from whom to buy

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(with their decision having commitment value), whereas transactions take place at the end of the two periods. The predatory equilibrium in which both buyers choose the incumbent even though the rival could supply the two units at lower costs may arise also in this context. However, the fact that transactions take place at the end raises the question of whether the predatory equilibrium would survive to the possibility of renegotiating the buyers' decisions. There exist contexts where there might be little scope for renegotiation. For instance, renegotiation might require some form of agreement/coordination between suppliers and antitrust laws might prohibit or impose restrictions on this type of behaviour. Alternatively, renegotiation costs might be high because breaching the initial decision may involve substantial legal costs or because of the costs of delaying consumption and production until a new agreement is reached. In an environment where, instead, renegotiation costs are sufficiently low, an equilibrium where both buyers choose the incumbent might still arise – sustained by the incumbent's ability to extract part of the gain from renegotiation – but it would not involve exclusion of the more efficient supplier: it is the rival that ultimately serves the customers, following a payment from the customers to the incumbent in the renegotiation phase.

1.3.2.6 Predation in markets with common costs*

In this section, we present a slightly modified version of the base model of Section 1.3.1. First, we will assume that the rival is an entrant firm that has not paid the entry cost yet when competition in the first period takes place. Instead the incumbent is an established firm that has already sunk the entry cost. The analysis will show that the mechanisms leading to exclusion are the same as in the base model. Second, we assume here that there are two *distinct* markets denoted as L and M. There is independence on the demand side. There is one consumer in market L and one in market M, and each of them attaches a unit valuation to the product. Third, the evolution of the markets is the following. Market M is the market which opens first to competition (for instance, in the postal service, market L is the market for letters, market M that for mail-order parcels): in the first period firm E can enter only market M; in the second period firm E can enter both market M and market L. This timing reflects the situation created by liberalisation processes which have opened to competition some segments of a given market

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before others. The discussion of the *Deutsche Post* case in Section 1.6.6 refers to this version of the model.

The entry cost f is common to the two markets: once paid f for entering market M, a firm does not need any other set-up costs. In both markets, marginal costs are given by $c_E = 0 < c_I < 1/2$. Finally, we assume that

$$2c_I < f < 3c_I \tag{1.20}$$

The game is as follows:

1. First period.
   (a) Firms I, E simultaneously set prices $p_I^{L,1}$, $p_I^{M,1}$ and $p_E^{M,1}$ to the buyers, who decide if and from whom to buy. (b) Firm E decides whether to enter market M (and pay f) or not. (c) Transactions take place. If E got the order in market M but did not enter, the buyer purchases from I at the offered price $p_I^{M,1}$.[47]
2. Second period.
   (a) Firms I, E simultaneously set prices $p_I^{L,2}$, $p_I^{M,2}$ and $p_E^{L,2}$, $p_E^{M,2}$ to the buyers, who decide if and from whom to buy. (b) Firm E decides whether to enter in either market L, or market M, or both. If it has not entered market M yet, by paying the cost f firm E can enter both markets. If it has already entered market M, it does not need to pay any additional set-up cost to operate in market L. (c) Transactions take place. If E got an order in a market but did not enter that market, the buyer purchases from I at the offered price $p_I^{j,2}$ with $j = M, L$.[48]

In what follows we show that if the fixed cost f is large enough there will be a predatory equilibrium with deterred entry; otherwise, firm E will enter market M in the first period, and market L in the second. As in the base model, there is scope for predation because the incumbent – but not firm E – has already sunk the common fixed cost when offers are

[47] The results would not change if we assumed that the buyer whose order remains unfulfilled is forced to buy from the incumbent which would then charge the monopoly price.

[48] Allowing the entrant to enter also at the end of the second period only affects the 'maximum' price that firm I could charge in the second period when firm E did not enter in period 1. Allowing for a second chance of entry implies that the incumbent will charge the limit price $p_I^{L,2} + p_I^{M,2} = f$ (if the price was higher, the entrant would undercut the incumbent and would enter) instead of the monopoly price $1 > f$ in each market. Hence,

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made, and because demand in the second period alone is insufficient for firm E to reach efficient scale.

Proposition 1.8 *(Predation in sequential markets with common costs.) Equilibria of this game are as follows:*

- *(**Predation**) If $f > 5c_I/2$ then: in the first period, firm E and I sets $p_E^{M,1} = p_I^{M,1} = f - 2c_I < c_I$, $p_I^{L,1} = 1$, firm I supplies both markets and E does not enter M. In the second period, firm E and I set $p_E^{L,2} = p_I^{L,2} = z$, $p_E^{M,2} = p_I^{M,2} = f - z$ (with $z \in [0,f]$), and I supplies both markets. Firm E does not enter any market.*
- *(**Entry**) If $f \leq 5c_I/2$ then: in the first period, firm E and I set $p_E^{M,1} = p_I^{M,1} = 3c_I - f < c_I$, I sets $p_I^{L,1} = 1$, E supplies market M, I market L. In the second period, firm E and I set $p_E^{L,2} = p_I^{L,2} = p_E^{M,2} = p_I^{M,2} = c_I$, and E supplies both markets.*

Proof. By backward induction. Consider the second period first. If E already entered market M in period 1, then it does not have to incur any cost to enter market L. Standard Bertrand competition with cost-asymmetric firms takes place, and the more efficient firm E supplies both markets fixing the price $p_E^{L,2} = p_E^{M,2} = c_I$. If E did not enter M in period 1, then it has still to pay the common entry cost when it competes with the incumbent in the second period. Since $f > 2c_I$ (by assumption (1.20)), in equilibrium firm I sets any pair of prices that satisfies $p_I^{L,2} + p_I^{M,2} = f$ and entry will not occur.

Consider now the first period. Since second-period rents alone are insufficient to cover the entry cost, if the incumbent captured market M in the first period, firm E does not enter. Hence, the incumbent will dominate both markets in the second period (at a total price f), thereby making total profits $p_I^{M,1} + 1 - 2c_I + f - 2c_I$. The incumbent's minimum price to supply market M in the first period is thus $\widetilde{p}_I^{M,1} = 3c_I - f < c_I$. (Note that the incumbent supplies market L in the first period at the monopoly price $v = 1$ irrespective of whether it secures market M.) If firm E captures market M in the first period, then it finds it profitable to pay f if the rents collected in market M are large enough: $p_E^{M,1} + 2c_I - f \geq 0$.

by assuming that entry is possible also in the second period we make it more difficult for exclusion to take place.

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The minimum price that firm E is willing to offer to supply market M in the first period is then: $\widetilde{p}_E^{M,1} = f - 2c_I < c_I$ (by assumption (1.20)). It is easy to check that when $f > 5c_I/2$ it is the incumbent who is willing to bid more aggressively for market M in the first period. ■

1.3.2.7 Network effects*

In this section, we assume that the incumbent and the rival are equally efficient in producing two differentiated and incompatible network products, and have a constant unit cost equal to c. Each manufacturer has an installed base of customers b_i with $i = I, R$, that is, old customers who are not buying any longer, but continue to use the network product. Also in this case, we assume that the incumbent enjoys an *incumbency advantage* and can rely on a larger installed customer base than the rival: $b_I > b_R \geq 0$. There are two *new* buyers, B_1 and B_2, who enjoy utility $U_i = v_i(n_i) - p_i$ if they buy one unit of the network product from firm $i = I, R$, where $n_i \in N^+$ indicates the total number of users (including present and past buyers). There are direct network externalities in that the utility enjoyed by a user of network i increases with the total number of users of that network: $v_i'(n_i) \geq 0$. Even if not necessary for our results, we also assume that $v_i''(n_i) \leq 0$. Finally, similarly to the analysis of Sections 1.3.1 and 1.3.2.1, we assume that the combination of network externalities and the incumbency advantage results in the following feature: even though at *full size* (that is, when both of the new buyers add to it) the quality of the rival's network is superior to the incumbent's (assumption (1.21)), with only *one* new buyer the quality of firm R's product is inferior (assumption (1.22)):

$$v_R(b_R + 2) > v_I(b_I + 2) \tag{1.21}$$

$$v_I(b_I + 1) > v_R(b_R + 1) \tag{1.22}$$

The game is as follows.

1. First period.
   (a) Firms I, R simultaneously set prices p_I^1 and p_R^1 to the first buyer.
   (b) B_1 decides from whom to buy.
2. Second period.
   (a) Firms I, R simultaneously set prices p_I^2 and p_R^2 to the second buyer. (b) B_2 decides from whom to buy.

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3. Third period.
   Consumption takes place and utilities are realised.

The following Proposition shows that also in this case – if the quality gap between the rival's and the incumbent's network at full size is not too large – by pricing below cost, the incumbent can exclude the more efficient supplier.

Proposition 1.9 *There exists a threshold level v_P of the utility of firm R's network, with $v_P > v_I(b_I + 2)$ such that:*

- ***(Predation)** If $v_R(b_R + 2) < v_P$, then the incumbent supplies both buyers. It sells below cost to the first buyer, while recouping on the second buyer: $p_I^{*1} = \tilde{c}_R - [v_R(b_R + 2) - v_I(b_I + 2)] < c$ and $p_I^{*2} = c + v_I(b_I + 2) - v_R(b_R + 1) > c$.*
- ***(Entry/Expansion)** If $v_R(b_R + 2) \geq v_P$, then firm R supplies both buyers. The price paid by the first buyer is lower than the price paid by the second: $p_R^{*1} = \tilde{c}_I + [v_R(b_R + 2) - v_I(b_I + 2)] < c + v_R(b_R + 2) - v_I(b_I + 1) = p_R^{*2}$.*

The threshold v_P is (weakly) increasing in b_I.

Proof. Let us move by backward induction. The outcome of competition for the second buyer, B_2, depends on the choice made by the first one. Let us consider first the subgame following B_1 choosing the incumbent. From assumption (1.22) and from $v_I(n_i)$ being (weakly) increasing in the total number of users, it follows that the quality of the incumbent's network when B_2 joins is superior to the quality of the rival's network when B_2 joins:

$$v_I(b_I + 2) \geq v_I(b_I + 1) > v_R(b_R + 1) \tag{1.23}$$

Hence, in order to attract B_2, the rival should discount the incumbent's price by an amount equal to the quality gap between the two network products: $p_R^2 < p_I^2 - [v_I(b_I + 2) - v_R(b_R + 1)]$. Bertrand competition results in the incumbent serving B_2 at a price $p_I^{*2} = c + v_I(b_I + 2) - v_R(b_R + 1)$.

If, instead, B_1 chose the rival, from assumption (1.21) and from $v_I'(n_i) \geq 0$, it follows that for the second buyer the quality of the rival's

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network is superior to the incumbent's:

$$v_R(b_R+2) > v_I(b_I+2) \geq v_I(b_I+1) \tag{1.24}$$

In this case, it is the incumbent that suffers a competitive disadvantage and must offer a discount in order to attract B_2: $p_I^2 < p_R^2 - [v_R(b_R+2) - v_I(b_I+1)]$. In equilibrium, the rival supplies the second buyer at a price $p_R^{*2} = c + v_R(b_R+2) - v_I(b_I+1)$.

Let us move to the first period. Agents anticipate that the second buyer will follow the choice of the first one. Hence, B_1 is willing to address the incumbent if (and only if) $v_I(b_I+2) - p_I^1 > v_R(b_R+2) - p_R^1$. By assumption (1.21), at full size the rival's network exhibits higher quality than the incumbent's. This represents a disadvantage for the incumbent when competing for B_1 and calls for a discount relative to firm R's price in order to win B_1: $p_I^1 < p_R^1 - [v_R(b_R+2) - v_I(b_I+2)]$. However, the supplier who wins the first buyer will win also the second, thereby obtaining a total profit equal to:

$$\pi_i = p_i^1 + p_i^{*2} - 2c \tag{1.25}$$

with $i = I, R$. We can thus denote as $\tilde{c}_i = 2c - p_i^{*2} = c - [v_i(b_i+2) - v_j(b_j+1)]$ with $i \neq j = I, R$ each firm's adjusted cost to supply the first buyer, which corresponds to the total cost to supply the two buyers minus the rents extracted from the second one. Note that, even though higher quality at full size favours rent extraction by the rival, the fact that one buyer is insufficient for firm R to achieve efficient scale is favourable to the incumbent. If the latter effect is sufficiently strong, the incumbent extracts more rents than the rival from the second buyer and may manage to win the first buyer despite the discount it has to offer. This is the case if (and only if):

$$\tilde{c}_I < \tilde{c}_R - [v_R(b_R+2) - v_I(b_I+2)] \tag{1.26}$$

which is equivalent to

$$v_R(b_R+2) < v_I(b_I+2) + \frac{v_I(b_I+1) - v_R(b_R+1)}{2} \equiv v_P \tag{1.27}$$

with $v_P > v_I(b_I+2)$ by assumption (1.22). From the equation above, it is clear that v_P is increasing in b_I.

It follows that when $v_R(b_R+2) < v_P$, the incumbent wins B_1 and sells at a price $p_I^{*1} = \tilde{c}_R - [v_R(b_R+2) - v_I(b_I+2)] = c - [v_R(b_R+2) - v_I(b_I+1)] - [v_R(b_R+2) - v_I(b_I+2)] < c$ by assumption (1.21). If instead

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$v_R(b_R+2) \geq v_P$, then firm R secures B_1 and sells at a price $p_R^{*1} = \tilde{c}_I + [v_R(b_R+2) - v_I(b_I+2)] = c - [v_I(b_I+2) - v_R(b_R+1)] + [v_R(b_R+2) - v_I(b_I+2)]$. ■

Welfare analysis Under demand externality, the fact that, at full size, the quality of the rival's network is superior to the incumbent's is not sufficient to guarantee that exclusion of the rival is welfare-detrimental. Indeed, the utility of old consumers who bought from the incumbent in the past cannot be ignored when studying the welfare effects: even if they do not buy any longer, they continue using the network product and their utility is affected by the decision of the new customers.

To see whether predation is welfare-detrimental, let us compare total welfare at the exclusionary equilibrium with total welfare when the new buyers buy from the rival firm. Note that the assumption of inelastic demands implies that prices can be ignored when computing total welfare, as they reduce consumer surplus by the same amount as they increase profits.

Exclusion of the more efficient rival is welfare-detrimental if (and only if):

$$W^{exclusion} = b_R v_R(b_R) + (b_I+2)v_I(b_I+2) - 2c < (b_R+2)v_R(b_R+2) + b_I v_I(b_I) - 2c = W^{expansion}$$

Rearranging, exclusion is welfare-detrimental if the increase in the utility of the new customers if they joined the rival's network instead of the incumbent's (firm term on the left-hand side below) plus the increase in the utility of the rival's old customers if their network increased in size because of the new customers' decision to join it (second term on the left-hand side below) outweighs the increase in utility that the old customers of the incumbent enjoy when the new customers choose the incumbent's network:

$$2[v_R(b_R+2) - v_I(b_I+2)] + b_R[v_R(b_R+2) - v_R(b_R)] > b_I[v_I(b_I+2) - v_I(b_I)] \quad (1.28)$$

Note that when the utility functions are concave and reach an asymptote v at $n = b_I$, the fact that new customers join the incumbent's network does not increase the utility of the incumbent's old customers. Hence, the right-hand side in the above condition is zero, whereas the left-hand side is positive by assumption (1.21). Hence, in this specific case,

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predation is welfare-detrimental when it arises at the equilibrium, that is, when $v_R(b_R+2) < v_P = \frac{3v}{2} - \frac{v_R(b_R+1)}{2}$.

At the same time, one can find situations in which predation arises at the equilibrium (that is, $v_R(b_R+2) < v_P$) and is not welfare-detrimental, precisely because of the role played by the externality on the old buyers.

1.3.2.8 Predation in two-sided markets*

In this section, we consider the case where each firm (or platform) can sell its product to two different groups of consumers, each group (or side of the market) benefiting from positive externalities from the number of users on the *other* side. We assume that a consumer on side k and using product i will receive a utility $U_{ki} = v_{ki}(n_{li}) - p_{ki}$, with $k, l = 1, 2, k \neq l$, $i = I, R$, with n_{li} being the total number of users (both old and new buyers) of platform i on side l and with $v'_{ki}(n_{li}) \geq 0$. Platforms are incompatible.

The incumbent and the rival have a constant unit cost c. Each platform has an installed base of old customers b_{ki} with $k = 1, 2$, $i = I, R$, who are not buying any longer, but continue to use the product. For simplicity, we assume that a given platform has the same customer base on each side: $b_{1I} = b_{2I} = b_I$ and $b_{1R} = b_{2R} = b_R$, with the *incumbency advantage* amounting to $b_I > b_R \geq 0$. We also assume that $v_{1i}(\cdot) = v_{2i}(\cdot) = v_i(\cdot)$, with $i = I, R$.

When the game starts, there are two *new* buyers, B_1 and B_2, one on each side of the market, who are making purchase decisions sequentially.

Finally, similarly to the previous sections, we assume that the rival is overall more efficient but it has an initial disadvantage:

$$v_R(b_R+1) > v_I(b_I+1) \tag{1.29}$$

$$v_I(b_I) > v_R(b_R) \tag{1.30}$$

The game is the usual one, with firms first competing for B_1 and then for B_2.

The following can be shown:

Proposition 1.10 *There exists a threshold level v'_P with $v'_P > v_I(b_I+1)$ such that:*

- ***(Predation)** If $v_R(b_R+1) < v'_P$, then the incumbent supplies both buyers. It sells below cost to the first buyer, while recouping on the second buyer: $p_I^{*1} = \tilde{c}_R - [v_R(b_R+1) - v_I(b_I+1)] < c$ and $p_I^{*2} = c + v_I(b_I+1) - v_R(b_R) > c$.*

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- ***(Entry/Expansion)*** *If* $v_R(b_R+1) \geq v_P^{'}$, *then firm R supplies both buyers. The price paid by the first buyer is lower than the price paid by the second:* $p_R^{*1} = \tilde{c}_I + [v_R(b_R+1) - v_I(b_I+1)] < c + v_R(b_R+1) - v_I(b_I) = p_R^{*2}$.

The threshold $v_P^{'}$ *is weakly increasing in* b_I.

Proof. Proceed by backward induction and consider the second period. (a) If in the first period B_1 bought from I, then B_2's utility from buying from I and from R, respectively, will be: $U_{2I} = v_I(b_I+1) - p_I^2$ and $U_{2R} = v_R(b_R) - p_R^2$. Note that B_2 enjoys the additional benefit from one extra user on side-1 if she buys from I, but not from R. From assumption (1.30) and from $v_I(n_i)$ being (weakly) increasing in the total number of users, it follows that in order to attract B_2 the rival must offer a sufficiently large discount as compared to the incumbent's price: $p_R^2 < p_I^2 - [v_I(b_I+1) - v_R(b_R)]$. Bertrand competition results in the incumbent serving B_2 at a price $p_I^{*2} = c + v_I(b_I+1) - v_R(b_R)$. (b) If in the first period B_1 bought from R, then B_2's utility from buying from I and from R, respectively, will be: $U_{2I} = v_I(b_I) - p_I^2$ and $U_{2R} = v_R(b_R+1) - p_R^2$. This time, B_2 enjoys the additional benefit from one extra user on side-1 if she buys from R. From assumption (1.29) and from $v_I^{'}(n_i) \geq 0$, it follows that it is the incumbent that suffers a competitive disadvantage and must offer a discount to attract B_2: $p_I^2 < p_R^2 - [v_R(b_R+1) - v_I(b_I)]$. In equilibrium, the rival supplies B_2 at a price $p_R^{*2} = c + v_R(b_R+1) - v_I(b_I)$.

Consider now competition for B_1. Agents anticipate that the second buyer will follow the choice of the first one. Hence, B_1 is willing to buy from the incumbent if (and only if) $v_I(b_I+1) - p_I^1 > v_R(b_R+1) - p_R^1$. By assumption (1.29), overall efficiency represents an advantage for firm R when competing for B_1 and the incumbent must offer a discount relative to firm R's price in order to win B_1: $p_I^1 < p_R^1 - [v_R(b_R+1) - v_I(b_I+1)]$. However, the platform that serves the side-1 buyer will also serve the side-2 buyer, thereby making *total* profits $\pi_i = p_i^1 + p_i^{*2} - 2c$, with $i = I, R$. Also in this case, we can denote as $\tilde{c}_i = 2c - p_i^{*2} = c - [v_i(b_i+1) - v_j(b_j)]$, with $i \neq j = I, R$, each firm's adjusted cost to supply the first buyer. Again, higher overall efficiency favours the rival, but the initial advantage is favourable to the incumbent. If the latter effect is sufficiently strong, the incumbent extracts more rents than the rival from the second buyer and may manage to win the first buyer despite the discount it has

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to offer. This is the case if (and only if):

$$\tilde{c}_I < \tilde{c}_R - [v_R(b_R+1) - v_I(b_I+1)] \tag{1.31}$$

which is equivalent to

$$v_R(b_R+1) < v_I(b_I+1) + \frac{v_I(b_I) - v_R(b_R)}{2} \equiv v_P^{'} \tag{1.32}$$

with $v_P^{'} > v_I(b_I+1)$ by assumption (1.30). From the equation above, it is clear that $v_P^{'}$ is increasing in b_I.

Then, when $v_R(b_R+1) < v_P^{'}$, platform I wins competition for B_1 and sells at a price $p_I^{*1} = \tilde{c}_R - [v_R(b_R+1) - v_I(b_I+1)] = c - [v_R(b_R+1) - v_I(b_I)] - [v_R(b_R+1) - v_I(b_I+1)] < c$ by assumption (1.29). When instead $v_R(b_R+1) \geq v_P^{'}$ it will be platform R which obtains B_1, with $p_R^{*1} = \tilde{c}_I + [v_R(b_R+1) - v_I(b_I+1)] = c - [v_I(b_I+1) - v_R(b_R)] + [v_R(b_R+1) - v_I(b_I+1)]$. ■

An application of this model can be used to rationalise the *Napp* case that we will discuss in Section 1.6.1. In that case, firms were selling to hospitals (our side-1) and to the community segment (side-2). While hospitals' utility was not influenced by decisions in the community segment, community decisions were heavily affected by hospitals'. In terms of our model, we would have $v_{1i}(\cdot) = \overline{v}_i$ while $v_{2i}(\cdot) = v_{2i}(n_{1i})$ – that is, utility of side-2 buyers (the community segment) depends on the number of side-1 buyers (the hospital segment).

Welfare analysis

The welfare analysis in the case of two-sided markets is quite similar to the one developed for the case of network externalities.

Since the two sides are perfectly symmetric, we develop the welfare analysis by looking at only one side of the market. Exclusion of the more efficient rival is welfare-detrimental if (and only if):

$$W^{exclusion} = b_R v_R(b_R) + (b_I+1)v_I(b_I+1) - c < (b_R+1)v_R(b_R+1) + b_I v_I(b_I) - c = W^{expansion}$$

Rearranging, exclusion is welfare-detrimental if the increase in the utility of a new customer when she joins the rival's platform instead of the incumbent's (first term on the left-hand side below) and the increase

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in the utility of the rival's old customers when their platform increases in size because of the new customers' decision to join it (second term on the left-hand side below) is large enough to dominate the increase in utility that the old customers of the incumbent would have enjoyed had the new customer chosen the incumbent's platform:

$$[v_R(b_R+1) - v_I(b_I+1)] + b_R[v_R(b_R+1) - v_R(b_R)] > b_I[v_I(b_I+1) - v_I(b_I)] \quad (1.33)$$

Note that when the utility functions are concave and reach an asymptote v at $n = b_I$, the fact that new customers join the incumbent's network does not increase the utility of the incumbent's old customers. Hence, the right-hand side in the above condition is zero, whereas the left-hand side is positive by assumption (1.29). Hence, predation is welfare-detrimental when it arises at the equilibrium, that is, when $v_R(b_R+1) < v_P^{'} = \frac{3v}{2} - \frac{v_R(b_R)}{2}$.

At the same time, one can find situations in which predation arises at the equilibrium (that is, $v_R(b_R+1) < v_P^{'}$) and is not welfare-detrimental, precisely because of the role played by the externality on the old buyers.

1.4 From Theory to Practice

In this section, we discuss the policy implications that can be drawn from the literature reviewed in this chapter and we identify some criteria that can guide antitrust intervention in the area of predatory allegations. To do so, we shall discuss the main implications of the theories of predation, which will lead us to propose a two-tier test requiring first the finding of dominance (as a proxy for recoupment) and then the adoption of a price-cost test (to show profit sacrifice). In what follows we will also highlight that the implementation of both steps should be far from mechanical and, instead, should be guided by a clear and consistent theory of harm.

1.4.1 Policy Implications from Theories of Predation: Profit Sacrifice and Recoupment

In the previous sections we have reviewed different theories of predatory pricing. The role of such theories should not only be to demonstrate that predation may occur in general, but also to help competition authorities

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and courts identify the circumstances under which predation may take place in practice.

As we have seen, there are different mechanisms whereby an incumbent firm might profitably use a predatory strategy to deter entry of new competitors or to force exit of existing ones. However, whether relying on reputation, signalling, deep-pockets or denial of scale economies, theories of predatory pricing present some common pattern: at the beginning, during the predatory phase, there is a *sacrifice of profits*, which is then followed – after the rival has exited the market or has been marginalised, or the potential entrant has given up on entering – by a period during which there is *recoupment*, through high prices and profits.

Hence, we propose a two-tier test of predation.[49]

First, *in lieu* of proving recoupment, it should be demonstrated that the alleged predator enjoys a strong dominant position.[50,51] This is because only if a firm has a lot of market power, will it be able to recoup any profits lost during the predatory phase. At this stage spelling out a theory of harm, that is, looking for a coherent economic rationale behind the predatory conduct is fundamental because it helps understand the extent to which the alleged predator is able to recoup any profits lost during the predatory phase.

We do not believe, however, that the recoupment test should be as stringent as indicated by the US Supreme Court in its recent case-law (see Section 1.5.1), because this would make it almost impossible for plaintiffs to prove predation. And after all, a prerequisite for the finding of dominance is that the firm has substantial market power, which implies that current rivals do not exercise strong constraints on prices, and that sufficiently large barriers to entry exist in the industry, which makes it likely that – after the exit of the prey – the dominant firm will increase prices.

Second, we propose a particular way of interpreting the existence of profit sacrifice; that is, that there has been an *actual loss* by the alleged predator. This entails the use of a price-cost test, as will be discussed in more detail in Section 1.4.3. The spelling out of a coherent theory of harm

[49] Joskow and Klevoric (1979) were probably the first to suggest a two-tier test for predatory pricing. This type of tests has later been endorsed by many authors. Here we follow in particular Motta (2004: 442–3).

[50] The discussion of how to establish dominance in practice is beyond the scope of this book. On this, see for instance, Motta (2004: Chapter 3).

[51] We comment below on why it would not be recommendable to pursue predatory cases against 'borderline' dominant firms.

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provides crucial guidance also in the implementation of the price-cost test, as we will discuss below.

Note that in this two-tier test the analysis of dominance should come before the analysis of profit sacrifice. This is because the former will in most cases be simpler to carry out than the latter, and would allow to screen out some cases (those where the alleged predator is not dominant) saving the competition authorities and courts time and resources.

1.4.2 How to Recognise Predation: The Theory of Harm

As just mentioned above, the spelling out of a coherent theory of harm is fundamental both to understand the scope of recoupment and to implement the price-cost test. Of course, it is not sufficient to invoke a certain theory of harm, but it must be shown that the facts of the case are consistent with such a theory. We now turn to a discussion of observable factors that would be consistent with each theory. We first deal with the more traditional theories,[52] and then with the scale economies theory that we presented in the previous sections.

1.4.2.1 Facts consistent with traditional theories of harm

In the case of a theory of harm based on *financial market predation* (see Section 1.2.2.1), there are two necessary features to make the predatory claim compelling in a real-world case.

The first step requires showing that *financial frictions* are particularly severe in the relevant industry. For instance, access to external finance tends to be problematic in industries with a low proportion of tangible assets, as assets that are more tangible increase the value that can be pledged to creditors in default states.[53] Likewise, financial constraints are more of a concern in innovative industries, as various factors limit the payouts that can be credibly pledged to external financiers, including the fact that informational asymmetries between managers and outside investors tend to be larger than in more mature industries.[54] In addition, financial frictions vary across countries, both due to historical and institutional

[52] See also Bolton et al. (2000) for a detailed analysis and examples.

[53] The corporate finance literature has exploited in different ways the idea that tangible assets can reduce the severity of financial constraints. See, for instance, Almeida and Campello (2007) and Braun and Larrain (2005).

[54] Several papers have provided indirect evidence of severe financial constraints in innovative industries, by examining the sensitivity of R&D investment to cash flow shocks (see Hall, 2010, for a comprehensive survey). More recent evidence relies instead on firms' own assessment of financial constraints: Hajivassiliou and Savignac (2016) document that in

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reasons, as well as to the development and the market structure of the financial industry. Institutional reasons include the quality of corporate governance regulations, which affect the scope for divergence between managers' behaviour and shareholders' interests. Access to finance also depends on the time period in question; for example, external financing becomes harder during or just after an economic or financial crisis, *ceteris paribus*, whereas booms are usually associated with looser credit conditions.

The second step requires showing that there is an *asymmetry between the predator and the prey* in terms of ability to raise external funds, for instance because the predator owns more collateralisable assets, can rely on more (internally generated) liquidity or is part of a conglomerate with an active internal capital market.[55] Note that this asymmetry may make new or recent entrants vulnerable to predatory strategies particularly in industries that for intrinsic (technological) reasons depend on external finance more than others. For instance, firms (especially those in their early life stage) are highly dependent on external sources of finance in industries that require a large initial scale, continuing investment and have a large gestation period before cash flows are harvested (think of the pharmaceutical as opposed to the textile industry).[56]

In this environment, it is more likely that predatory pricing would deprive the prey of the cash flow that it crucially needs to obtain external funding and continue operating.

In the case of a theory of harm based on *reputation effects*, the discussion in Section 1.2.2.2 has shown that the necessary ingredients are: (i) the existence of multiple markets (either different goods or different geographic markets) with potential entry in each case; (ii) the notion that aggressive behaviour at earlier stages (or in some markets) increases the probability perceived by rivals that the incumbent will be aggressive later (or in other markets).

French manufacturing industries innovative firms are more likely to report difficulties in raising external capital.

[55] A copious literature in corporate finance, dating back to Fazzari, Hubbard and Petersen (1988), has emphasized how the availability of internally generated cash affects firms' real investment decisions by alleviating their financial constraints. Recent empirical findings in Maksimovic and Phillips (2008), Kuppuswamy and Villalonga (2016), Almeida et al. (2016) and Boutin et al. (2013) show that multidivisional firms and business groups mitigate financial constraints faced by segments operating in industries where access to external funding is particularly problematic.

[56] A vast literature starting with Rajan and Zingales (1998) has highlighted that financial frictions have more significant real effects in financially dependent industries.

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Assessing the expectations of the market agents and their interpretation of competitors' strategies is quite demanding. Some evidence (for example, internal documents of a corporate plan, press releases) that shows that the alleged predator consciously behaves aggressively in order to build such a reputation for entry-deterrence may be useful.

As for *signalling theories of predation* (see Section 1.2.2.3), we believe that they are of rather limited practical relevance. In the case of cost-signalling, for instance, one should look for observable actions (including prices) by the incumbent that make the potential entrant conjecture that the variable costs of the alleged predator are lower than they actually are. Furthermore, one should be able to prove that the incumbent would not have taken the same actions had it not faced entry. It is difficult to imagine that a competition authority may build a solid predation case on this basis.[57]

By contrast, one of the advantages of the theory of predation we have proposed in Section 1.3 is that it allows us to specify a number of arguably more readily observable factors that make (profitable) predation more or less likely. We now turn to a discussion of such factors, which a competition authority referring to such theory in a given case should show to hold in the industry at issue.

1.4.2.2 Facts consistent with a scale-economies theory of harm

- *Economies of scale* – whether due to fixed costs, learning effects, demand externalities, two-sided market effects, or other reasons – are obviously crucial for this theory, where predation hinges upon depriving the rival of the scale it needs to achieve minimum efficient scale. Recall though that predation may be used not only to exclude a rival from the industry altogether, but also to relegate it to a market niche. So the fact that the rival has reached minimum efficient scale in a segment, region or niche of the market does not imply that scale economies do not play a role any longer: scale may be crucial

[57] Bolton et al. (2000) argue that signalling theories of predation may represent a plausible predatory theory of harm, and identify the *General Foods* case as a possible illustration of test-market predation. In this case, General Foods, owner of the Maxwell House coffee brand, sharply decreased its price when Folger coffee entered in the eastern states of the US. Hilke and Nelson (1987) rather interpreted the facts of this case in the spirit of a reputation-based theory of harm. The two stories are not observationally inconsistent, although the interpretation provided by Hilke and Nelson (who worked on the case as FTC economists) may reflect the facts of the case more closely in our view than one based on test-market predation. The FTC dismissed the case based on a finding that General Foods lacked monopoly power, in a market that the FTC defined more broadly than the plaintiff. The FTC also found barriers to entry and to expansion to be low.

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to recover investments by the rival in additional capacity, to build a more connected network, to expand in new markets, to provide new products, and so on. Moreover, the scale-economies theory also fits situations in which success in one market is key to enter in another market.

- There must be a *strong incumbency advantage*, which, as a first approximation, may be captured by a very high and persistent market share of the incumbent; this would be reinforced by the presence of switching costs, by the infrequency of purchases and by demand externalities. In other words, the existence of a dominant position is an important requirement for a theory of harm based on the scale-economies mechanism, which reinforces the role of dominance as a necessary prerequisite for a finding of predation.

  However, it would make little sense to open a predatory case when there is borderline dominance. Indeed, recall that the higher the proportion of captive buyers (or the larger the established base) of the incumbent relative to the rival, the more likely for predation to occur. Therefore, the theory suggests that a predation case where the defendant has 70–80 per cent of the market will be (other things being equal) much stronger than one where the defendant has 40 per cent of the market. In some jurisdictions, it is possible to find that a firm has a dominant position even with a relatively low market share (for instance, in South Africa the Competition Act defines as dominant any firm with a market share above 35 per cent), but the predation theory based on scale economies and incumbency advantage suggests that it makes sense to potentially be concerned only where the alleged predator has a really strong dominant position.
- By its very nature, predation consists of low prices, followed by high prices. Quite trivially, therefore, the possibility to engage into *intertemporal price discrimination* is another necessary condition for predation. If for any reason there are obstacles to price discrimination over time, then predation will not be possible.
- *Weak buyer power* (and uncoordinated buyers) is another crucial determinant of the theory. Indeed, predation hinges upon the ability to exploit the externality that earlier buyers will impose upon later ones, and this is possible only to the extent that buyers cannot take joint decisions or cannot pool their orders into a single period. Furthermore, the existence of large buyers, whose demand is sufficient for the entrant to reach efficient scale, limits or indeed removes the scope for predation.

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- Under this theory, predation is more likely to be a potential concern in *mature markets*: first, a rapidly growing market is one where demand in later periods is likely to be sufficient for the prey to reach minimum efficient scale, thereby making predation on early buyers unfeasible; second, the number of contestable buyers will be larger relative to the captive ones, limiting the incumbency advantage. As a result, we believe that predation based on the scale-economies mechanism presented in this chapter is less likely to occur in industries where there are no entrenched market positions or where there is a rapidly expanding demand.
- Note, however, there are other reasons why predation may be a concern in *markets that are expected to grow considerably* in the future or that may undergo an evolutionary change. Consider for instance a market in which a new technology, which represents an alternative to the existing technology dominated by the incumbent, can be introduced. In such a context, the entrant may suffer from both the need to win sufficient scale to challenge the incumbent on the whole market, and the need to receive sufficient backing from outside investors. Note that financial frictions may be particularly severe in a period when the prospects of the new technology are difficult to assess. This creates the scope for financial predation by the firm that dominates the old technology: by setting aggressive prices in early periods, it may prevent the rival from obtaining the funds that are key to invest and compete in later periods when demand for the new technology will grow.[58] Similarly, the dominant firm may have an incentive to be aggressive on early buyers because they are the crucial ones to legitimise the entrant in the eyes of external financiers and to facilitate it in obtaining funds for future investments. In this case, even though the demand of early buyers is small compared to future demand, it may still be critical for the expansion of the new rival.
- We have also seen that predation may be more of a potential concern, all else equal, if there is *weak downstream competition*: if buyers are downstream firms (for example, retailers) which compete fiercely for final consumers, few buyers will be able to bring large business scale to a supplier, and hence it will be more difficult for the dominant

[58] Of course, this argument hinges upon the assumption that dominance over the old technology makes the incumbent less vulnerable to financial constraints than the entrant. Should the entrant be an established firm coming from a different sector, it may well enjoy enough assets for obtaining credit not to be an issue.

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incumbent to prevent the rival from reaching the scale it needs (in the limit, the incumbent would have to 'block' all the buyers because any of them could bring sufficient orders to the prey: but then, no recoupment would be possible). Clearly, the degree of competition is not a variable which can be easily measured. However, a careful analysis of the industry may give hints in this respect. For instance, an industry where firms sell products that are highly differentiated (either physically or geographically), or where capacity constraints are prevalent is an industry where product market competition is likely to be weaker than otherwise. Similarly, we expect downstream competition to be weaker – other things being equal – in industries where switching costs and lock-in effects are important.

1.4.3 How to Recognise Predation: Tests for Profit Sacrifice

The second tier of the test involves the establishment of a sacrifice of profits. Here, the crucial question is what exactly is meant by *sacrifice of profits*. Indeed, in the traditional (financial, reputation, signalling) theories of predation, sacrifice of profits does not necessarily mean that the predator incurs actual losses; it may simply mean that it earns lower profits than it would have earned if it had behaved in a non-abusive way. This opens the possibility to find predation also in cases where prices are above some relevant measures of cost.[59]

In principle, therefore, a literal interpretation of economic theory would require a comparison between actual (allegedly predatory) prices and some counterfactual optimal prices that the incumbent would set if it accommodated the rival. However, the calculation of such counterfactual prices would be extremely difficult, and would probably give rise to mistakes and huge uncertainty in the process.[60]

[59] Under the scale economies theory, there is in principle similar uncertainty over how to define 'profit sacrifice' in practice. Indeed, we have seen in Section 1.3.2.2 that when exclusion occurs because of buyers' coordination failures, i.e. when offers are made simultaneously to all buyers, below-cost pricing may not occur.

[60] Ordover and Willig (1981) propose a test whereby an action is deemed predatory if it is optimal only because it induces the exit of a rival. Similarly, according to the 'no economic sense' test a conduct is considered as *exclusionary* if it 'would make no economic sense for the defendant but for the tendency to eliminate or lessen competition'. Indeed, some versions of these tests have often been proposed to identify not only predatory pricing but exclusionary practices in general. We find it difficult to use a general 'test' of this type to assess conducts which are very different (for instance, exclusive dealing may be exclusionary but it does not necessarily entail profit sacrifice), and we believe that they are

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Therefore, we suggest to interpret 'profit sacrifice' in a stricter way, that is, as 'negative profits', and to use an Areeda-Turner's type price-cost test (see Areeda and Turner, 1975). The logic of this test is to identify two cost benchmarks, an *upper bound* and a *lower bound*. (We shall discuss the cost thresholds below, but for the time being one can associate the upper bound with Average Total Costs, 'ATC' and the lower bound with Average Variable Costs, 'AVC').

If the dominant firm's prices are *above* the upper bound, then predatory allegations should be dismissed. Hence, prices above the upper bound represent a 'safe harbour' for dominant firms.

Instead, if prices are *below* the lower bound, there should be a strong presumption of abusive conduct, with the defendant having the burden of proving otherwise, in particular that there are objective justifications for below-cost pricing.

Finally, with prices falling *between* these two thresholds, the plaintiff (or the competition authority) should have the burden of proving that predation took place. Similarly, there may be cases in which the evidence is uncertain, for instance because there may be different methods of estimating cost thresholds. We would treat such cases like those in which prices fall between the two thresholds. Under these circumstances, spelling out a rigorous theory of harm – that is, showing that there is a precise theory that rationalises the predatory conduct and that the facts of the case are consistent with that theory – plays an even more pivotal role than otherwise.

Documentary evidence proving the *intent* to exclude may also play an important role when prices fall between the two thresholds. From an economic point of view, evidence from internal documents that the alleged predator's managers would be happy if competitors exited the market is not by itself relevant: after all, this is what one should expect to find in any situation where firms are fiercely competing. However, if there was evidence showing that a coherent business strategy has been put in place with exclusionary purposes, and especially if those documents reveal the intention to sacrifice profits to achieve that aim, and this was consistent with the theory of harm put forward by the plaintiff, this would certainly represent strong evidence of predatory conduct. This would be the case if, for instance, in an environment in which financial frictions are severe, a competition authority found the existence of internal documents of the

very difficult to administer in practice. We refer the interested reader to the discussions in Vickers (2005), Kobayashi (2010), Salop (2006) and Werden (2006).

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alleged predator showing particular attention to the financial situation of the prey and indicating a rational strategy to limit significantly the prey's access to external funding. This approach is in line with the EU law, according to which the existence of evidence pointing to a strategy to exclude a competitor may help determine the illegality of a conduct in a case where prices are below average total costs but above average variable costs (see Section 1.5.2).

The process of assessing whether the facts of the case are consistent with the proposed theory of harm may also involve the analysis of the *effects* of the alleged predatory conduct on the competitors of the dominant firm. The observation that their market shares are stable or increase during the allegedly predatory phase, for instance, may be hard to reconcile with a coherent predatory conduct undertaken by the dominant firm.[61]

Consider for instance a market in which there is a dominant firm. Suppose there is entry by a very large multinational firm endowed with a lot of financial resources, whose products are internationally known and well regarded, and which has entered the market with a very large, modern and efficient production plant, and a very large marketing campaign, resulting in a significant market share gained in little time, unaffected (both financially and in its market performance) by aggressive price counter-moves by the dominant firm. We might even find that some of the dominant firm's brands are sold below one or the other cost threshold, but the lack of effects on the rival would beg some questions. Perhaps the strong price reaction is an attempt by the dominant firm not to lose too much market share too quickly, and since it is unlikely that the large rival would exit (given the financial resources available and the strong commitment in production and brand recognition), the facts of the case would hardly point to a predatory strategy. Further, an intervention by the antitrust authority may completely backfire, converting what looks like healthy competition between two powerful firms wrestling for domination of the market into possible soft competition, induced by the fear of the dominant firm of possible antitrust penalties, and accommodated by the powerful entrant which once obtained a large share of the market may prefer a more accommodating pricing strategy.

[61] This does not mean, of course, that in order to find predation we should always observe market exit or a strong downsizing in the market share of the rival of the dominant firm. On some occasions, the prey may be willing to undertake losses not to lose customer base and perhaps while waiting for antitrust intervention.

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1.4.3.1 Too favourable to defendants?

The price-cost test described above is admittedly favourable to the defendant. First, because it may lead to some false negatives (type-II errors): profit sacrifice does not necessarily mean actual losses, so there may be cases where predation *did* take place but would not be detected by the test. Second, because as we will discuss in the next sections, showing that prices are below some relevant measures of costs is a tricky exercise. As a consequence, because of lack of data, or because of different classifications of costs, a cautious agency may be unable to determine with reasonable certainty that prices are below costs.

However, the price-cost test is easier to administer than a rule that requires actual profits to be compared with the hypothetical profits that the dominant firm would have made absent the exclusionary motive.[62]

The price-cost test also limits the risk of stifling price competition by decreasing the rate of false positives (type-I errors). Low prices are precisely what one would like to have from a consumer welfare perspective, and the outcome of competitive markets. Distinguishing bad (predatory) low prices from good (competitive) low prices is extremely difficult, and it is crucial to avoid rules which – to prevent the former – end up discouraging the latter.[63]

For these reasons, and most notably for the sake of administrability, we suggest treating prices above the upper bound of costs as a safe harbour.

However, we would not consider it outrageous if a judge or a competition authority decided to depart from this approach in *exceptional circumstances*. If, for instance, the antitrust agency found that the dominant firm is pricing above (the upper bound of) costs, but it held strong documentary evidence of predatory conduct (for instance, showing that the top management had deliberately followed a certain strategy which leads to

[62] For the importance of administrability when setting policy on predatory pricing (and more generally in antitrust), see (then judge) Stephen Breyer in a classic quote from *Barry Wright*: '[...]while technical economic discussion helps to inform the antitrust laws, those laws cannot precisely replicate the economists' (sometimes conflicting) views. For, unlike economics, law is an administrative system the effects of which depend upon the content of rules and precedents only as they are applied by judges and juries in courts and by lawyers advising their clients. Rules that seek to embody every economic complexity and qualification may well, through the vagaries of administration, prove counter-productive, undercutting the very economic ends they seek to serve.' Also for this reason, Breyer argues that although it may conceivably be anti-competitive in very particular situations, it is best to consider prices above average total costs as a safe harbour.

[63] See also Elhauge (2003a) for a discussion of restrictions to above-cost pricing. He concludes against such restrictions.

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lower profits for the sole purpose of excluding a rival), then we would find it difficult to dismiss the allegation of abusive behaviour.

Furthermore, using above cost-pricing as a safe harbour reflects great concerns about over-enforcement and the risk of chilling competition. This makes a lot of sense in those countries where there is sufficient ease of entry (financial markets work reasonably well, administrative barriers to operate are low) and one can therefore rely on entry as a disciplining device. However, in less developed countries, where barriers to entry tend to be higher, markets are sometimes smaller, and entrenched dominant positions often prevail in many sectors, the major concern should probably be about under-enforcement. In that case, it would appear legitimate to us for competition authorities and courts in such countries to have a less conservative approach, and for instance adopt a presumption of abusive behaviour whenever prices are below ATC, or intervene also when a small proportion of the market is affected by the alleged exclusionary conduct (see discussion below).

1.4.3.2 When are prices below costs legitimate?

The test described above raises the question of whether circumstances may exist in which an alleged predator is legitimately setting below-cost prices.

In general, there may be many reasons why firms might price below costs as part of a normal competitive process (think of product complementarities, of the need to enhance consumers' goodwill, of markets characterised by switching costs, learning economies, network effects, or two-sided externalities: in all these cases, one would expect firms to sell below cost, absent any intention to exclude).

In most cases, however, such arguments would *not* apply to a firm which is already dominant in the relevant market where the alleged predation takes place. Dominance implies that the firm is already well established in the market: therefore, a dominant firm does not need promotional pricing to make itself known, nor does it need to lower prices to win customers locked in by switching costs or network effects, nor does it need to expand production to benefit from learning effects since it has probably already reached the minimum efficient scale of production and benefited from learning effects. For the same reason, a meeting-competition defence argument to justify below-cost pricing by a dominant firm should not be accepted.[64]

[64] This principle is well established in EU law. See, for instance, *France Télécom.*

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In other cases, though, one cannot immediately dismiss the possibility that below-cost pricing is pro-competitive or in any case unrelated to a predatory strategy. Consider for instance a firm selling complementary products, or a firm selling to two sides of the market. In these cases, pricing one product below-cost on one side of the market may be a standard business practice. It may be possible, for instance, that firms in the industry have always used this pricing structure, and this should obviously be taken into account: one cannot ask a dominant firm to raise the price of razors (or to charge a positive price for its newspaper) if the business model has always been to sell razors below cost and blades at a higher price (or to give away newspapers for free while charging advertisers). In those cases, though, it is important to assess whether the below-cost pricing has always been adopted or it has been introduced only when rivals start to threaten the firm's dominant position. For instance, in Section 1.6.1 we shall see how the UK Competition Appeal Tribunal did not accept Napp's defence that below-cost pricing was motivated by its selling in a two-sided type market when it found that losses were made only for those product specifications in which Napp was facing competitors.

Likewise, below-cost pricing may be accepted as a defence if an industry features excess capacity and is currently downsizing, as operating plants at higher utilisation levels can be efficient.

Another circumstance in which a dominant firm may be justified in its selling below-cost may be when a new product or standard appears in the market. Consider for instance internet access services. At a certain point in time, telecom operators upgraded their fixed networks and began offering retail broadband access services, which offered better (faster) internet connections to residential and business users; these thus started to replace (slower) narrowband access services. Shortly after broadband services became available, it would have probably made sense to define the relevant market as the market for all (narrowband and broadband) retail internet access services. This would have implied that an operator that was historically dominant in retail narrowband access services would have also likely been dominant is this new combined market at its infancy. However, one has to be cautious if wishing to prevent the dominant operator in the old technology from offering good deals (which may include promotional below-cost prices) in the new technology. Such promotional pricing may well have the effect of stimulating demand, operating closer to minimum efficient scale, and promoting the use of complementary services (for example, live TV streaming, online gaming, etc.) which use the band intensively. Note also that this is consistent with our warning against

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predatory cases when there is a growing market and highlights again the importance of checking whether the facts of the case are consistent with the proposed theory of harm.

Furthermore, a predatory strategy should be systematic and not occasional: the finding that a dominant firm has charged below-cost prices only in very precise and limited circumstances (for instance, to dispose of existing stock or perishable goods) or to a very small part of the market, or on a small volume of orders should generally not be sufficient to support a predatory case. For instance, in terms of our theory of predation, it would be difficult to argue that a rival is denied sufficient scale when only – say – 5 per cent of the market has been affected by the predatory episode. However, as we stressed in the previous section, one should take into account that in some cases demand in early periods, even though small as compared to future demand, may still be crucial for a new firm to be able to invest and develop in the future. Hence, predation on (relatively) small volumes may still be a successful strategy to exclude the rival. This observation highlights again the importance of spelling out a rigorous theory of harm to interpret the facts of the case and to avoid a mechanical implementation of the test.

1.4.3.3 Cost benchmarks

The cost benchmarks that have been most often used in practice when assessing allegations of predatory pricing are the *average total costs* ('ATC') of the dominant firm – as an upper bound – and its *average variable costs* ('AVC') – as a lower bound. Variable costs are those that increase with the amount of output produced (for example, energy or labour costs, in most settings). Fixed costs, by contrast, do not vary as output increases (for example, management's office rent). The term 'average' (or 'unit') refers to the fact that costs incurred over the whole output level are divided by the level of output produced.

While these definitions seem fairly straightforward, following this taxonomy in practice may be more difficult. For instance, advertising costs are typically categorised as fixed. But we will see in Section 1.6 how, in *Wanadoo*, the European Commission held that France Télécom's marketing costs incurred in promoting its new broadband products in 2001 should be deemed to be variable, on the basis that France Télécom incurred 'advertising and marketing [costs] specific to Wanadoo Interactive's ADSL services' and that these were 'quite specific and correspond[ed] to successive campaigns which focus[ed] strongly on sales promotion'.[65]

[65] See paras 62 and 64 of the Commission's decision.

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In *Aberdeen Journals* (which we discuss in Section 1.6) the Office of Fair Trading ('OFT', the then UK competition authority) found that predation in the market for advertising space in local newspapers occurred only over one month, March 2000.[66] Over such a short timeframe, the OFT recognised that most costs would be fixed and very few costs would be variable. In doing so, the OFT only considered the newsprint and circulation costs as variable. The costs of the editorial staff and the advertising team were instead considered to be fixed given the very short timeframe considered.[67] (See below for further discussion on the impact of the time dimension on predatory cases.)

Partly to overcome the difficulty in determining the fixed or variable nature of a certain cost, the notion of *long run average incremental costs* ('LRAIC') has been proposed as a substitute for ATC.[68] This concept is particularly well suited to the context of firms producing multiple products, which usually face common costs, that is, (typically fixed) costs incurred in the production of more than one good or in the provision of more than one service (for example, a fixed telecoms operator historically used a copper network both for voice services and for broadband). The LRAIC of a product is the firm's total costs (when also producing the good at issue) minus what the firm's total cost base would have been had it not produced that good, divided by the quantity of the good produced. LRAIC thus includes all product-specific costs incurred in the research, development and marketing of the allegedly predatory product, even if those costs were incurred before the alleged period of predatory pricing. As Bolton et al. (2000) stress, LRAIC is a superior cost measure over ATC for a firm producing multiple products because it does not require joint and common costs (these are typically excluded from LRAIC) to be allocated, an exercise which lacks a precise methodology and is particularly unsuited for jury resolution (or for decision-making by a competition authority lacking the resources and expertise of a sector regulator).

For instance, the European Commission opted for an 'average incremental cost' benchmark in *Deutsche Post* (which we discuss in more detail

[66] A previous decision by the OFT in 2001 had been set aside by Competition Appeal Tribunal due to an unsatisfactory definition of the relevant market. The OFT could not condemn the abusive practice over an earlier period as the Competition Act 1998 only entered into force on 1 March 2000.

[67] The Competition Appeal Tribunal would have broadened the scope of the variable costs (and included further printing costs), but it did not overrule the OFT on the basis that it treated the evidence in the most favourable way to the defendant.

[68] The original proposal is due to Joskow and Klevorick (1979). See also Bolton et al. (2000).

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in Section 1.6). This case focused on the German market for mail order parcel services. The Commission explicitly excluded all common costs that would be incurred upon the provision of other postal services (such as the costs to build and maintain Deutsche Post's network of freight centres and delivery points, used for a variety of services). The Commission supported this with reference to the fact that Deutsche Post incurred costs to fulfil its statutory obligation to maintain network reserve capacity, but that these should not 'burden' its mail order parcel services, which was a liberalised market. By contrast, the Commission included in the relevant cost measure 'the staffing and equipment costs of [sorting] activities dependent on the volume processed' (para. 13 of the decision).

Note that we interpret the price-cost test as a test for profit sacrifice. Another frequent interpretation is that of a *replicability* test.[69] Following this logic, a case in which the dominant firm's prices are above ATC (or LRAIC) should be dismissed because a rival firm at least as efficient as the dominant firm can profitably match such prices. Thus, such a cost standard identifies a reasonable safe harbour for the pricing policy of the dominant firm.

Concerning the lower bound, there are two variants of AVC that may be considered. One is the notion of *short run average incremental costs* ('SRAIC'), which is the average of all the (short-run) costs associated with an increase in production, in this case the extra output due to the allegedly predatory conduct. The notion of SRAIC includes both fixed and variable costs, but does not include the costs incurred *before* the period in which the allegedly abusive conduct took place (for example, the costs for infrastructure set up before the predatory period and that is used for the incremental production associated with the predatory output). Such costs are instead included in the LRAIC.

The other is the notion of *average avoidable costs* ('AAC'), which is the average of all variable costs and fixed costs that are *not sunk* and that are associated with the predatory output, so that they can be avoided if the firm stops producing.[70] One of the key advantages of the AAC standard is that it does not call for a categorisation between fixed and variable costs, which can often be problematic as we saw above. One drawback of the AAC measure, on the other hand, is that it is not always straightforward

[69] We note that the tests we discuss in Chapter 2 (on rebates) and in Chapter 5 (on margin squeeze) can also be interpreted as profit sacrifice tests for the incumbent, or as tests of replicability by a rival which is at least as efficient as the incumbent.

[70] Quoting Baumol (1996), 'avoidable costs can be thought of as the *decremental* cost to a firm if it decides to stop production.'

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to determine which assets are not sunk and therefore could be redeployed upon exit/production stop and at what value, especially in the context of an event that never took place, namely the incumbent's exit (see O'Donoghue and Padilla, 2013: 304ff). In *Cardiff Bus* (which we review in greater detail in Section 1.6), the OFT found AAC to be the most appropriate benchmark.[71] Specifically, the OFT included drivers' payroll, fuel, tyres, lubricants, insurance, road tax and maintenance, as well as the costs of restoring certain buses to deploy them on the 'white service routes' (that is, where the OFT found predation). The OFT found that the revenues from these routes did not even cover the salaries of the drivers who were serving these routes.

Note that, in practice, AAC and SRAIC are often used as synonymous. Indeed, in many situations AAC and SRAIC coincide, but this is not always the case and failing to distinguish between them may create confusion. What matters in computing the AAC is that a given cost is not sunk; whereas what matters in computing SRAIC is that a given cost has not been incurred before the predatory period.

Moreover, from a replicability perspective, the choice between the two notions of costs depends on the specific case at hand.[72] If the predatory strategy aims at taking demand away from an *existing* rival and inducing it to leave the market, the pertinent notion is the one of the AAC, because, if the price of the dominant firm is below the AAC, an as-efficient rival is better off leaving the market rather than making a counteroffer. If instead, the predatory strategy aims at excluding a competitor from a *new* market (think, for instance, of a procurement auction to win a given amount of production), the pertinent notion is the one of SRAIC. Indeed, a price below the SRAIC indicates that a firm is not covering both the variable costs and the additional investments made to increase production. Then an as-efficient competitor cannot serve the auctioned production without incurring a loss.[73]

[71] See paras 7.150 *et seq.* of the OFT's decision.

[72] We are grateful to Michele Polo for sharing insights with us on the discussion that follows.

[73] Consider the following stylised example to see how SRAIC, may sometimes differ from AAC. Imagine that a large, well-established chain of hairdressers that has hitherto only catered for men begins to cater for women as well (who, for simplicity, are offered just one type of service). To do so, this firm needs to rent more salons, hire specialist hairdressers and pay an annual insurance premium (which does not depend on the number of salons or customers). It also needs to run a large marketing campaign, to let potential customers know that it is beginning to cater for women as well. After one year of operations, one may consider the following categories of costs for the women's hairdressing business.

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The time dimension is crucial to determine which costs are fixed, variable, avoidable or incremental. Over a sufficiently long period of time, all costs will be variable. Indeed, the 'long run' in microeconomics is often defined as the period over which firms can adjust all factors of production (that is, all costs become variable). The UK Competition Appeal Tribunal recognised this:

> The longer the period that is taken, the more likely it is that cost will be classified as variable since, for example, over a longer timescale, employees can be dismissed or plant closed in response to changes in output. (Para. 353)

The relevant timeframe has to be assessed on a case-by-case basis. In *Aberdeen Journals* the incumbent's behaviour (in the market for advertising space in local newspapers) was deemed predatory only with reference to the month of March 2000. The OFT had found – also by analysing the monthly management accounts available – that the revenues received from advertisers for Aberdeen Journals's *Herald & Post* paper did not cover its average variable costs of production over that month (note that this weekly attracted no revenues from readers, as it was distributed free of charge). In fact, in March 2000, the losses from the *Herald & Post* equalled 42 per cent of its revenues.

In *Deutsche Post*, the Commission considered the six-year period from 1990 to 1995. A paper reviewing this case (OFT, 2005) suggested that the Commission's rationale for adopting such a temporal horizon was as follows:

> Over six years all overheads (ie: costs that on a short term basis do not vary directly with output) were deemed avoidable because this was ample time to realize that the mail order parcel service was not covering such costs and therefore raise prices or dispose of the additional assets required to provide that service. To put it another way, over this period [Deutsche Post] would have had the choice not to re-incur all incremental costs of running its mail order parcel services business. (Para. A.21)

> The short run incremental costs are the costs of incremental 'production'. These therefore include the variable costs (salons rental and specialist hairdressers' salaries) and the fixed costs (the insurance premium plus the cost of the marketing campaign).
>
> The avoidable costs, instead, are the costs incurred during the period that the firm could avoid by discontinuing the women's hairdressing business. Such costs therefore include the variable costs as defined above and the annual insurance premium. They do not include, however, the costs of the marketing campaign, since these are completely sunk.
>
> For both categories, these costs can be divided by the number of customers (women) during the period to determine the equivalent 'average' measures.

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In *Wanadoo*, the Commission held that the relevant timeframe over which the customer acquisition costs should be assessed was the average length of a subscription (48 months).

In *Cardiff Bus*, the OFT opted for a 10-month timeframe (19 April 2004 to 18 February 2005), corresponding to the period over which Cardiff Bus operated one or more of its 'white service routes' (that is, over which the OFT found predation).

1.5 Case-law

In this section we provide a brief account of the history and evolution of landmark decisions by competition authorities and of the key case-law on predation on both sides of the Atlantic, paying attention to key judgments and to how enforcement policy evolved, all the way to recent cases. This overview will highlight a clear divergence in the US and EU jurisprudence: while in the US in the last 20 years we hardly observe cases involving predatory pricing, in particular cases favourable to the plaintiff, in Europe we observe a number of recent cases where the prices set by a dominant firm have been considered abusive. We proceed chronologically, beginning with US cases, followed by EU ones.

1.5.1 United States

In the US, the complaints by small firms of unfair business practices (including predatory pricing) adopted by their large rivals, which allegedly aimed to drive them out of business, are one of the reasons that led to the adoption of the Sherman Act in 1890. These concerns were addressed in Section 2 of the Sherman Act, which prohibits monopolisation, attempts to monopolise and conspiracies to monopolise any part of the trade or commerce among the several states, or with foreign nations.

The monopolisation provisions in the Sherman Act (1890) were tested before the Supreme Court already in *Standard Oil* (1910) and *American Tobacco* (1911), two cases affecting different industries but characterised by very similar behaviour by the incumbents. Neither case was specifically about predatory pricing, but in both instances the Supreme Court found strong evidence of a broad set of exclusionary practices, aimed at threatening and then eliminating competitors. The key behaviour in both cases was characterised by a sequence of forced acquisitions of competitors,

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together with ancillary exclusionary conduct.[74] We describe these two cases in greater detail in Section 1.6.11, where we explain how the facts could be read in the context of a reputation effects' model.[75]

More than half a century went before another notable case with a predatory element reached the Supreme Court. *Utah Pie* concerned the frozen (dessert) pies market, in the period from 1958 to 1961.[76] The *plaintiff* (not the defendant) had two-thirds of the market at the beginning of the predatory phase (this dropped to around 45 per cent at the end and allowed the plaintiff to earn positive profits). Yet in 1967 the Supreme Court ruled in favour of the plaintiff. This judgment was based, according to leading commentators, on evidence of 'occasional prices below full cost, weak evidence of animus against the plaintiff, and a declining price structure' (Areeda and Hovenkamp, 2006). Areeda and Hovenkamp also point to the presence of a competitive fringe of six or seven smaller rivals to observe that entry barriers could not be particularly high either, thus making it very difficult to believe that a predator could foresee sufficient recoupment.

Both economists and legal scholars remained puzzled by *Utah Pie*: in a market with relatively low barriers to entry and the presence of a competitive fringe, how could consumers be harmed if a firm with two thirds of the market loses 20 percentage points of market share following price competition by a rival? It is in this context that the scholarly article by Areeda and Turner was published in 1975. It immediately caused a structural break in how antitrust law was applied to predatory pricing cases, in the US and beyond. The basic idea of their test (similarly to what we discussed in Section 1.4) was to draw the line between abusive conduct and competition on the merits at the average variable cost level (a reasonable proxy for marginal cost): only prices below this line truly entailed a short-term profit sacrifice (an actual economic loss) and should thus be presumed unlawful (even if these prices are set to match those of a rival). Prices above average variable costs should be presumed lawful. Temporary promotional pricing, the authors added, should not be deemed harmful to the competitive process either.

[74] For a richer summary of the facts in these two cases, see Evans (1912).
[75] In addition to the reputation effect, these two cases could be read in the spirit of a signalling model based on 'predation-through-merger'.
[76] Here we also draw from Areeda and Hovenkamp (2006). This case was not assessed under the Sherman Act but under the Robinson-Patman Act (price discrimination leading to competitive injury).

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Another important milestone in US antitrust law on predation is *William Inglis*, which dealt with the pricing of 'white pan bread loaves' in California between the mid-1960s and the mid-1970s. Crucially for subsequent jurisprudence, the Appeals Court was very clear that predatory intent alone is not enough for a liability finding.[77] It was nevertheless one of the three necessary elements for a successful predatory claim, together with the actual conduct and a 'dangerous probability' of successful recoupment. *William Inglis* was also important because it was one of the very first cases, together with *Pierce Packing* and *Janich Bros*, that explicitly referred to a comparison of prices against (variable) costs, in the spirit of the Areeda and Turner (1975) article. Going against that tide though, in *Transamerica* (dealing with IBM's responses to emerging competition in the 'plug-compatible' peripherals market in the early 1980s) the Court of Appeals (Ninth Circuit) specified that there should be no safe legal harbour and that predatory pricing could in principle occur even above average total costs, for instance in the form of limit pricing. The Court believed it 'should hesitate to create a "free zone" in which monopolists can exploit their power without fear of scrutiny by the law' (para. 58 of the judgment).

Matsushita is the leading case on collective predation. This case related to the sale of consumer electronics (mostly television sets) in the United States over the 1950s and 1960s.[78] The allegation was that the 21 Japanese producers engaged in predatory pricing in the United States and cross-subsidised these losses through monopoly pricing in the Japanese market through cartelisation. In spite of a vast amount of documents presented, the District Court could not find sufficient evidence for admissibility of the conspiracy claims. Absent this, predation could only occur as unilateral behaviour, but none of the Japanese producers had sufficient market power to engage in such a practice. The case nevertheless reached the Supreme Court, which, in 1986, stated that predatory pricing conspiracies are speculative by their very nature; and it noted that 'if the factual context renders respondents' claim implausible – if the claim is one that simply makes no economic sense – respondents must come forward with more persuasive evidence to support their claim than would otherwise be necessary' (para. 587 of the judgment). The Supreme Court also stressed the need to show the likelihood of recoupment, else the predatory strategy would be irrational: 'if predatory pricing conspiracies are generally unlikely to occur, they are

[77] In line with *William Inglis*, the First Circuit held in *Barry Wright* that predatory intent cannot be a basis for a liability finding.
[78] This part draws from Elzinga (1989).

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especially so where, as here, the prospects of attaining monopoly power seem slight' (para. 590).

Brooke (decided back in 1993) is certainly one of the most prominent judgments in US antitrust case-law on predation. The alleged predator (Brown and Williamson) only had a 12 per cent share in the cigarettes manufacturing market. The allegation related to a fierce price war, which began after the Brooke Group introduced a (commodity-level) unbranded cigarettes pack; as a result, Brown and Williamson introduced its own generic version and started to compete aggressively on price.

The Supreme Court – without embracing the average variable cost rule of Areeda and Turner – nevertheless stated that a finding of predatory pricing first required evidence of pricing below some level of cost. Second, and very importantly, recoupment had to be shown to be a 'dangerous probability'. The Supreme Court also stated the principle of recoupment sufficiency: could the alleged predator truly recoup (at least) the entire sacrificed profits in the same relevant market(s) after the predation period? In other words, there should be a quantitative exercise in addition to the qualitative one of determining that the predator has the generic ability to raise the price above competitive levels post-predation.[79] This imposed a very high standard of proof for the plaintiffs and it was inspired by the Court's concern to avoid type-I errors and the possibility to chill legitimate price competition.

Largely as a result of this new high bar set in *Brooke*, there have been few predation cases in the United States since, and even fewer successful ones for the plaintiffs (Hovenkamp, 2001, counted none at the time he wrote). Bolton et al. (2000) wrote that 'the Supreme Court's Brooke decision, [...] as applied by the lower courts, has become virtually a per se rule of non-liability'. Even very recently, Evans (2009) referred to the 'effective elimination of predatory pricing cases in the US'.[80]

One more recent case worth mentioning is *Weyerhaeuser*. Ross-Simmons Hardwood (the plaintiff) and Weyerhaeuser competed in the market for lumber sawmills in the Pacific Northwest region. In 2001, after going into debts of several million dollars, Ross-Simmons closed its

[79] It is important to note that this case was brought under the Robinson-Patman Act, and not the Sherman Act; however, as noted in Hovenkamp (2005: 346), as the former is 'more expansive' than the latter, any restriction found under the Robinson-Patman Act should equally apply to the Sherman Act.

[80] In contrast to these authors, Crane (2005) observes that in spite of the high hurdle set in *Brooke*, plaintiffs have kept bringing cases: the author counted at least 57 federal antitrust suits including predatory pricing allegations.

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mill. In its antitrust lawsuit, Ross-Simmons claimed that Weyerhaeuser engaged in predatory bidding, that is, it resorted to overpaying for alder sawlogs (an input amounting to about three quarters of total costs) so that prices would rise, as part of a plan to eliminate competition from Ross-Simmons (which could not afford to pay such high prices for its inputs); predatory overbuying was also alleged (that is, Weyerhaeuser would have bought more input than it really required, or about two thirds of the total supplies in the Pacific Northwest). In spite of rising input prices, supply could not expand due to natural resource constraint (annual lumber production was semi-fixed). The District Court ruled in favour of the plaintiff and awarded damages; it also rejected Weyerhaeuser's arguments that the Brooke predatory pricing standards[81] should also apply to predatory bidding. The Court of Appeals (Ninth Circuit) affirmed. But the Supreme Court reversed, on the basis that the Brooke criteria should indeed apply to predatory bidding (*mutatis mutandis*), since the two practices are analytically and practically similar and that the plaintiff itself admitted that it did not meet the *Brooke* standards in its claim.

As Kobayashi (2010) noted, the *Brooke* standards were again tested both in *American Airlines* and in *Spirit Airlines*. In both cases, the courts compared revenues against average variable cost on the routes considered. In addition though, the author remarked, both courts also adopted an 'incremental' version of this test. That is, they 'considered a test that compared whether the incremental profits that resulted from the addition of capacity to certain routes exceeded the incremental costs of adding this capacity'. The courts also opted for opportunity costs, as opposed to accounting cost measures (that is, they considered the revenues foregone by diverting airplanes from more profitable routes to those where predation was alleged). In *American Airlines*, the District Court dismissed the case based, *inter alia*, on the lack of evidence of below-cost pricing (and the Appeals Court affirmed). We consider this case in greater detail in Section 1.6.10.

By contrast, in 2005, in *Spirit Airlines*, the Court of Appeals reversed a District Court judgment, which (by granting summary judgment) had dismissed allegations of predatory behaviour in two leisure passenger

[81] That is, the plaintiff must show competitive injury by proving both that the alleged infringer's prices were below cost and that the defendant had a dangerous probability of recouping its investment in below-cost prices after the prey's exit.

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airline markets. The parties subsequently settled.[82] The allegations against the incumbent airline (Northwest) included both predatory pricing and predatory capacity expansion (adding more flights per day) on the Detroit-Boston and Detroit-Philadelphia routes. The Court of Appeals reversed on the basis that it was wrong to grant summary judgment, given that the evidence produced (when read in the most positive light for the plaintiff, Spirit) called for a full trial. The Court of Appeals was presented with a large amount of evidence. First, Northwest had a high market share on the two relevant routes: prior to Spirit's entry, Northwest had a 72 per cent market share on the Detroit-Philadelphia route (with US Airways being the only competitor), and 89 per cent on the Detroit-Boston and these had been stable over time. Northwest had an incumbency advantage: Detroit-Metro was one of three Northwest's hubs; Northwest controlled 64 out of 86 gates under long-term leases at Detroit-Metro; and it had an overall share of 78 per cent of all outbound passengers. In addition, it appeared that the market exhibited high entry barriers, mostly in the form of scarce access to gates.[83] Northwest's price reductions and increases in flight frequency had a significant impact on Spirit's cost structure: Spirit saw its load factor on the Detroit-Philadelphia route drop from 88 per cent in April 1996 (Northwest had not originally reacted to Spirit's entry) to 31 per cent five months later. Being less able to fill airplanes implied a rise in average costs for Spirit, which was in fact forced to leave these routes in September 1996.[84] Finally, the Appeals Court also noted that '[t]he trier of fact could reasonably find that Northwest recouped any losses from its predatory pricing quickly after Spirit left these routes' (para. 189 of the judgment).

1.5.2 European Union

Moving to Europe, *ECS/AKZO* is the key case in the European jurisprudence on predatory pricing, dating back to 1985 (we discuss the case in

[82] See Sagers (2009), who argued that predatory behaviour in the airline industry is far from being an 'impossible' phenomenon and has instead been 'a key tool to preserve market power'.

[83] In this sense, for a potential entrant, gates were less of a variable input of production and much more of a fixed barrier (cost) to overcome in order to operate from Detroit-Metro on any given route. Further, it was noted that an entrant would have had to pay 25 per cent more in landing fees than an airline with gates with long-term leases like Northwest.

[84] As a sidenote, Northwest's lowest unrestricted fares on this route went from $355 before Spirit's entry to $49 at the end of June 1996 to $279 one month after Spirit's exit and up to $416 in April 1998.

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more detail in Section 1.6.9). In *ECS/AKZO*, the European Commission found that AKZO had made a direct threat to ECS (a small competitor), asking it to stop its recent business of selling benzoyl peroxide to the polymer industry, else AKZO would harm ECS through aggressive price cuts in the UK flour additives market, ECS' main business. The threat was then carried out. The European Commission explicitly rejected the Areeda-Turner test which we discussed above. Price-cost analysis was only one of the elements to be assessed, it argued; valuable information on the potentially abusive conduct comes instead by contextualising the pricing practice within a wider exclusionary strategy, so that in principle even prices above average total costs could be predatory. On appeal, the Court of Justice upheld the Commission's decision, but it also made further clarifications: first, prices below average variable cost must be regarded as abusive; second, a price between average variable cost and average total cost would be deemed predatory only if this was part of a wider strategy aimed at eliminating a competitor, that is, if there was evidence of intent. This judgment effectively set the European standard on predation.

Another European landmark case on predation is probably , which involved a number of exclusionary practices identified by the Commission. Insofar as predatory pricing in the market for non-aseptic cartons was concerned, the Commission found an infringement with respect to the Italian market, where sales at a loss were judged to be part of a deliberate strategy aimed at eliminating competitors. The courts agreed. The Court of Justice further clarified that there was no requirement (at least in that case) for the Commission to prove the likelihood of recoupment, that is, that the alleged predator would have the ability to offset its short-term losses (arisen during the predatory process) through subsequent profits once the prey had been eliminated from the market.

Contrary to the US though, European jurisprudence on predatory pricing did not become scantier from the early 1990s. Indeed, we have observed several recent cases on predatory pricing decided either by the European Commission or by the national authorities, some of which made their way up the courts.[85] One reason for this jurisdictional divergence

[85] In *Wanadoo*, the European Commission found that France Télécom (through a subsidiary, Wanadoo Interactive) had engaged in predatory pricing in high-speed internet access services to residential users in the early 2000s. In its investigation, the Commission applied a price-cost test. It also examined evidence of intent, recoupment (although it clearly stated that this was not a necessary condition for a finding of predation) and effects of Wanadoo's conduct on competitors. The Commission's decision was upheld by both the General Court, which *inter alia* noted that a finding of predation does not require the

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is that in Europe, as stressed in *Tetra Pak II*, there is no need to prove the likelihood of recoupment, considerably lowering the standard of proof vis-à-vis the US. Another reason can be found in the wave of liberalisation that took place in Europe in the 1980s and 1990s. Suddenly, markets that were previously state monopolies (such as railways, postal sector, telecommunications, energy) opened up to competition, but players were clearly very asymmetric, with a strong incumbency advantage and persistent dominant positions enjoyed by the former monopolistic firms, which at times resorted to pricing and contractual practices to avoid competition from new entrants. Several of these exclusionary cases will be reviewed in this book, starting with some recent predation cases in the next section.

1.6 Cases

In this section we review a number of international cases. We shall focus in particular on those where scale economies and strong initial advantages on the side of the incumbent seem to play an important role, in a way that is consistent with the theoretical considerations we made earlier in this chapter. Of course, highlighting industry elements that broadly match the conditions of economic models of predation is not enough to claim that there has been actual predation; they simply suggest that there may be a theory of harm which supports the allegation of predation. To make a precise statement on the merit of a case, we should have access to more detailed information (especially on relevant cost measures) that is usually not publicly available. Likewise, as mentioned in Section 1.5.2, EU competition law does not require proof that there is a high probability of recoupment, implying that the available documents do not shed much light on this issue. Still, in what follows we shall try to discuss to what extent recoupment may have been possible in some of the EU cases.

In any event, the message of this chapter is not that predation is a pervasive phenomenon that arises whenever there exist scale economies

effects of the predatory conduct to be demonstrated) and by the Court of Justice. We review this case in more detail in Section 1.6.5, where we also discuss the application of the price-cost test applied in this case.

At the time of writing, the European Commission is investigating a number of potentially anti-competitive practices by Qualcomm. In December 2015, the Commission announced that it had taken the preliminary view that, *inter alia*, between 2009 and 2011 Qualcomm engaged in predatory pricing by selling certain baseband chipsets at prices below costs, with the intention of hindering competition in the market (see European Commission, press release IP/15/6271 of 8 December 2015 and Case 39.711 *Qualcomm*).

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and an incumbency advantage. Rather, we are interested in identifying those (likely exceptional) situations where predation is likely to occur, as well as those where predation will be unlikely.

1.6.1 Napp

We begin our review with a landmark case from the UK, *Napp*. This is a case which can be interpreted in the spirit of the two-sided markets version of the model we presented in Section 1.3.2.8 (see Section 1.2.3.2 for a non-technical discussion of this model). In 2001, the UK Office of Fair Trading ('OFT') found that Napp, a pharmaceutical company, had abused its dominant position in the market for the supply and distribution of sustained release morphine in the UK. This infringement involved both a charge of predatory pricing in the hospital segment and one of excessive pricing in the community segment (we explain the nature of these two groups of buyers below).

Napp had an incumbency advantage at the beginning of the predatory period, with a market share of 80 per cent in the hospital segment and of over 90 per cent in the community segment. This original advantage arose from patent protection over the period from 1980 to 1992. This was reinforced by moderate entry barriers upon patent expiry which took the following forms: the time needed to acquire the authorisation to manufacture the drug; a separate authorisation to market the drug; and the need to build a reputation as a trusted brand for a given drug. Marketing campaigns were considered to be costly: direct marketing (also known as detailing) to general practitioners ('GPs', or family doctors) was a very expensive endeavour given how numerous and scattered they were.

While it may appear odd that Napp could engage in too low prices in a market segment and too high prices in another market segment, our theory helps interpret the case, as we next discuss.

Sustained release morphine was sold to two completely different groups of buyers. One group was represented by hospitals, which were very price-sensitive (pharmaceuticals had to be paid out of their budget) and could count on the advice of specialist doctors for an assessment of quality of the competing products. The other group (about eight times as large, by volume sold) was represented by the community segment, where buyers were GPs who prescribed products for their patients (with the National Health Service paying the bills, thus making these buyers not particularly price-sensitive). Moreover, GPs – not being experts (as well as to facilitate

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treatment continuity) – tended to select those products which had already been chosen by hospitals (further raising entry barriers in the segment where price competition was less fierce).

The facts in *Napp* can therefore be consistent with an asymmetric two-sided market, where hospitals mostly care about prices (and do not care about choices made by GPs), while the demand of the community segment strongly depends on the choices made by hospitals. As discussed in Section 1.3.2.8, an incumbent like Napp – who has already acquired a solid reputation – may want to sell below costs to the crucial side of the market, where entry barriers are lower (the hospital market in this case) to make sure the rival does not gain a significant foothold there. As a result, it would deter the rival's activity also on the other side of the market (in this case, the community segment, where entry barriers were much higher), whose demand closely followed the choice made by hospitals. Thus, the incumbent can behave like a monopolist on the community side of the market, recouping any losses made to win the other side (the hospitals' segment).

Indeed, Napp's pricing strategy had an appreciable effect on its main competitors. While their combined market share in the community segment hovered around 4 per cent over the predatory period, the product of Napp's only significant competitor (Boehringer Ingelheim), Oramorph, saw its market share in the hospital segment decline from 20.1 per cent in 1997 to 4.1 per cent in 2000.

One of Napp's key defences for its low prices in the hospital segment was that there was a 'follow-on' effect that had to be taken into account: it estimated that one unit sold to the hospital segment led on average to 1.35 units sold in the community segment. The OFT remained unconvinced for a number of reasons (see pages 50–4 of the decision). The main one was that Napp's aggressive discounts in the hospital segment were only offered on drug strengths where there were competing alternatives and in geographic areas where there was a competitor. But if the follow-on effect had been the key motive for Napp's pricing policy (given that, in principle, even a monopolist would offer a low price on one side of the market in order to attract both sides), there should have been aggressive discounting across all product categories and geographic areas.[86]

[86] The UK Competition Appeal Tribunal also pointed out that there was no contemporaneous evidence (internal documents) suggesting that Napp adopted this pricing strategy to benefit from the claimed 'follow-on' effect; rather, this was put forward *ex post* during the proceedings.

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1.6.2 Sanofi-Aventis

Sanofi-Aventis, a French case, had several features in common with *Napp*. Yet, there were some critical differences which (correctly, in our view) led to a different outcome in that case.

Sanofi-Aventis was found to have a dominant position in the market for low molecular weight heparins ('LMWH', an anti-coagulant). Since 2001, it had been offering Lovenox (its branded LMWH) to hospitals free of charge. The theory of harm put forward by the French Economy Ministry before the French Competition Authority was similar to that in *Napp* (the case we have just discussed above): Sanofi-Aventis was allegedly engaging in predatory pricing in the hospital segment so as to be able to lock patients in for treatment once out of the hospital (through a 'sourcing effect'); and to subsequently charge supra-competitive prices in the community segment. As evidence, the Ministry showed an increase in Lovenox's market share (by volume) in the hospitals' segment (for prevention use): from 35–40 per cent in 1998 to 65–70 per cent in 2004. The Ministry also pointed towards an increase in Lovenox's market share in the community segment.

This is where the high-level similarities with *Napp* ended. In fact, there were three crucial differences.

First, Sanofi-Aventis faced competition by two large, well-established global players (including Pfizer, with a 15–20 per cent share of the community segment by the late 1990s) and by a mid-sized player, Léo Pharma (with a 5–10 per cent share). This raises doubts about the rationality of a predatory strategy.

Second, it is difficult to see an intention to pursue a predatory strategy, since Sanofi-Aventis did not start, but simply followed the rivals in their price reductions in the hospital segment. As a further caveat, the increase in Sanofi-Aventis' market share in the community segment between 2001 and 2006 actually reflected the merger between Sanofi and Aventis (the sum of the separate market shares was even slightly larger than that of the merged entity).

Third, the link between the hospital and the community segment was weak[87] and definitely less clear than in *Napp*. The key fact which was

[87] This was probably due to the fact that while there was no price regulation in the hospital segment, prices in the community segment were negotiated between the pharma companies and a specialised public authority (CEPS). The French Competition Authority noted that drugs that entered the market later commanded a lower price, possibly due to more uncertainty over their effectiveness. By contrast, hospitals would simply choose the cheaper LMWH drug available.

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inconsistent with the theory of harm proposed (via the 'sourcing effect') was that the collective market share (by volume) in the community segment of the large firms offering hospitals LMWH drugs free of charge actually *dropped* by about 20 percentage points (85–90 per cent to 65–70 per cent) between 2001 and 2006. (That is, contrary to the rationale behind the proposed theory of harm, heavy discounting in the hospitals' segment by some companies did *not* result in a higher market share in the community segment.) A large fraction of this drop was taken up by Léo Pharma: its share of the community segment grew from 10–15 per cent to 20–25 per cent over the same period. Léo Pharma achieved this in spite of no longer offering its LMWH drug free of charge to hospitals and in spite of its share of the hospital segment being below 5 per cent for the entire period. This element cast a serious doubt over the supposed strength of the 'sourcing effect'.

Eventually, the French Competition Authority dismissed the case and – based on the public information available – this seems a reasonable decision to us.

1.6.3 Cardiff Bus

In November 2008 the UK Office of Fair Trading ('OFT') found that Cardiff Bus had infringed Chapter II of the UK Competition Act by engaging in predatory conduct in Cardiff's local bus market. In response to 2 Travel's entry into the market with a new no-frills bus service, Cardiff Bus introduced its own no-frills bus service (the 'white service'), running on the same routes and at similar times of the day as 2 Travel's services (with the added value of a single ticket valid on the whole Cardiff Bus network at no extra charge). The OFT showed that the white services were run at a loss (their revenues were not even sufficient to pay the wages of the drivers on those routes) until shortly after 2 Travel's exit, when Cardiff Bus discontinued them altogether (and raised fares on other services). 2 Travel was facing difficult financial conditions, up to the point where it failed to comply with safety requirements for lack of funds available (most of its buses had been bought second-hand); this contributed to its early exit.

The economics behind this case could be read in the spirit of the predation mechanism we proposed in Section 1.3. First, there appeared to be significant economies of scale and scope, partly driven by network effects: profitable entry was only attainable at a certain scale, that is, only once a critical network size was in place (as consumers value the combination of schedules and routes). The OFT noted that scale

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economies at a network level were compounded by the significance of scale (density) economies at the level of a single route, as consumers value frequency of services. Second, barriers to entry were also found to be high, due for example to limited bus depot availability. Reflecting such entry barriers, 2 Travel was actually the first entrant since 2000.

Cardiff Bus' incumbency advantage took the form of its established routes' network. In the Cardiff area, it controlled about two thirds of total network traffic, with the competition being geographically very fragmented, and no other single operator having a sizeable share of the network; moreover, it had 72 per cent of the services (by frequency) stopping at Cardiff Central Bus Station. Drawing from a report it commissioned, the OFT wrote that:

> [O]nly via large scale, multi-market entry, might an entrant deprive the incumbent of its multi-market advantage, and thus avoid being selectively targeted. (Para. 6.47)

Against this structural setup, 2 Travel's entry with only four routes was fairly limited (Cardiff Bus had 42 different services); it had 20 buses operating within a 30-minute journey from Cardiff Central Bus Station (Cardiff Bus had 223). Speculating, one could argue that this was the first stage of a wider entry strategy, but Cardiff Bus' predatory strategy choked such staged entry while still nascent.

In principle, one could also read this case in the spirit of a reputation model: the OFT, having collected testimonies from competitors, also drew the conclusion that Cardiff Bus had built a reputation (mostly among smaller operators) for fiercely fighting entry or expansion, especially on Cardiff city routes.

The OFT discussed recoupment in this case and found that recoupment was very likely, due *inter alia* to a combination of high barriers to entry and Cardiff Bus' reputation.[88]

1.6.4 Telecom Italia

Another interesting European case brought by a national competition authority is *Telecom Italia – Comportamenti abusivi*. In 2004 the Italian Competition Authority (the 'Authority') found that Telecom Italia ('TI'), the public monopolist before the liberalisation process, had abused its

[88] See chapters 6 and 7 of the OFT decision.

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dominant position by using a variety of practices (in what follows, we focus on the price-related abuses). The case was concerned with the provision of services to government bodies (typically tendered through the CONSIP agency) and large business customers.

From a legal perspective, the Authority did not challenge TI's retail prices as predatory (see para. 262 of the decision). By contrast, it sanctioned TI's retail offers to the above customer categories that could not be matched by TI's competitors. These were companies that were themselves customers of TI, buying wholesale services at regulated prices. The Authority stated that these abusive retail offers could also be interpreted as illegal price discrimination at the wholesale level (in that TI was implicitly 'charging' its downstream affiliates a discriminatory price with respect to the price offered to the other telecom operators).

From an economic perspective, however, the case may be read in the spirit of the model we presented in Section 1.3.1 (see Section 1.2.3.1 for a non-technical discussion).

Evidence referred to during proceedings suggested that TI set prices in a selective and aggressive way, seeking to take away key customers (the so-called 'key contributors') from competitors, thereby hindering rivals' expansion.[89] The Authority also pointed to the existence of significant scale economies enjoyed by TI, strengthening its incumbency advantage over new entrants, which still had to build up or fully develop their infrastructure (viable only if they reached sufficient scale) and customer bases.[90]

Further, the presence of staggered tenders by government bodies and large business customers likely meant that buyers were not able to coordinate or pool their purchases. In Section 1.2.3.1 (and technical Section 1.3.2), we explained how such a market feature (customers buying at different times) may make exclusion potentially easier to implement, all else equal.

1.6.5 Wanadoo

Another interesting case from the telecom industry is *Wanadoo* (known on appeal as *France Télécom*). In 2003, the European Commission found that

[89] Internal documents showed TI's management was willing to incur losses in order to win – or win back – important business customers (see para. 122 of the decision).

[90] For instance, at para. 275 of the decision, a cable rival, Fastweb, argues that Telecom Italia's strategy aimed at eliminating competitors' incentives to invest in new and non-recoverable alternative telecom infrastructure, with the ultimate effect of inhibiting the development of competitors in the long-run.

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France Télécom (through a subsidiary, Wanadoo Interactive, henceforth 'Wanadoo') had engaged in predatory pricing in high-speed (ADSL) internet access services to residential users.

In the early 2000s, the broadband market in France (as elsewhere in Europe) was at an infant stage. Operators had to overcome consumers' doubts over a new technology and establish a reputation as providers of high-quality and reliable services (in addition to having to offer value for money, given the presence of narrowband, or dial-up, alternatives). Operators who were most successful at this would gain an early foothold in the market and thus a competitive advantage. As the Commission put it:

> [...] Service providers must, during this high-speed market development phase, build an image as the default supplier of a product viewed by the consumer as technically sophisticated and become large enough to benefit from economies of scale.
>
> In this process, the chronological sequence of entry into the market is far from neutral. Clearly, a service provider that has a considerable head start over its competitors during the initial phase of market growth is able to capitalise on the momentum thus gained. By contrast, laggards must make a much bigger effort to acquire customers if they wish to make up for lost time and bridge the resulting image gap and confer on their high-speed service the same notoriety as that of the dominant undertaking's flagship offering. In these circumstances, new competitors are confronted with the need not only to carry out the expenditure technically necessary in order to provide the service but also to undertake substantial advertising and promotional expenditure both to raise their product's profile and to undermine loyalty to the dominant undertaking's brand. (Paras 351–52 of the decision)

In the context of nascent technological markets, it is not uncommon to observe prices that are *prima facie* 'low' (this practice is often referred to as penetration pricing). These markets often involve consumer goods where end-users also need to purchase some expensive hardware to benefit from a service (for example, a player, a games console, a TV decoder or set-top box, an internet modem). Penetration pricing can therefore incentivise consumers to buy earlier on when there is uncertainty about the true value of the consumer good or service. Operators, from their side, benefit from early uptake also through scale and network economies.

Against this background, the Commission first carried out a price-cost test in *Wanadoo*. It showed that retail prices were below average variable costs between March 2001 (when the mass marketing of the ADSL services began) and August 2001; and that in the following period up to October 2002 they were approximately equivalent to variable costs, but significantly below total costs.

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A first difficulty with this case was the determination of the cost items to include in the relevant cost benchmark (variable cost). Wanadoo claimed that its marketing costs had a long-term nature and were fixed. The Commission disagreed (see paras 61–6). In particular, it stressed that even abstracting from general marketing, Wanadoo incurred 'advertising and marketing [costs] specific to Wanadoo Interactive's ADSL services' and that these were 'quite specific and correspond[ed] to successive campaigns which focus[ed] strongly on sales promotion'; the Commission also pointed towards a strong correlation between advertising campaigns and new subscriptions rates. Further, as part of the customer acquisition costs, it highlighted the existence of 'special offers', which 'by their very nature [...] are directly linked to the purchase of each new product unit sold (discounts, refund offers, etc.)'. (There was no mention, however, of direct subsidies to customers in the form of hardware such as modems, within the Commission's discussion of marketing costs.) In sum, the Commission thought that these costs should be treated as variable.

A second, related, problem was the number of years over which such costs should be depreciated (the Commission opted for 48 months, that is, the average length of customer tenure, see paras 76–9).[91]

Next, going beyond a pure price-cost analysis, the Commission (and then the General Court) went three steps further. First, the Commission sought to establish the intent of the predatory strategy.[92] To do so, it relied on the internal company documents it discovered. Most of the relevant quotations were omitted in the Commission's decision for confidentiality reasons (paras 110–17). Some, however, can be found in the General Court's judgment, which itself refers to documents discovered by the Commission. These include:

> – the framework letter for 2001 containing the following wording: 'our pre-emption of the ADSL market is imperative'; [and]
>
> – a note of [Wanadoo]'s strategic management of December 2001 stating: 'The high-speed and ADSL market will, for the next few years, continue to be conquest-driven, the strategic objective being to gain a dominant position in terms of market share, the period of profitability only coming later.' (Paras 199 and 215 of the General Court's judgment)

[91] The Commission, however, noted that for the period considered in the decision, 'the length of the period over which the non-recurrent costs are to be spread is immaterial to the finding that the full costs are not covered, because the full costs are not covered even if depreciation takes place over an infinitely long time' (para. 79).

[92] The Commission needed to establish the intent of the predatory strategy only for the period during which the prices of Wanadoo were above AVC but below ATC.

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As with many quotations taken from internal business documents, it is difficult to understand the full context and how they should be interpreted through an antitrust lens.

Second, differently from US law, to establish predation, there is no requirement in the EU to show that a dominant firm engaging in below-cost pricing can actually recoup the lost profits once the prey has left the market (see the Court of Justice's judgment on this very case). The Commission nonetheless looked at this aspect and found that recoupment was plausible, because of high entry barriers (paras 332–67), such as: disincentives for existing customers to change supplier; the costs for a potential competitor to enter and acquire critical size; and the major difficulty in replicating a telecommunications network and entering upstream. The Commission further pointed to Wanadoo's margin levels post-October 2002 as part of the evidence making recoupment a plausible argument.

Third, there was a brief analysis of the effects of Wanadoo's pricing behaviour on competitors. The General Court (paras 259–67) noted that Wanadoo's market share (in residential access to broadband internet) increased from 50 per cent (in March 2001) to 72 per cent (in August 2002), before falling to 63.6 per cent (in October 2002). The nearest competitor had an 8 per cent share, while all others had less than 3 per cent. Mangoosta, another competitor, left the market. Cable operators also saw their market share decline significantly. Further, the General Court added that there had been few and insignificant instances of entry, which the Commission and the General Court attributed to Wanadoo's aggressive pricing. Some operators, however, saw their market share slightly increase during the predatory period (see para. 385 of the Commission's decision). The Commission dismissed this fact on the basis that their share could have grown more absent the abuse (see Chapter 2 – Section 2.6 – for a discussion of similar 'counterfactuals' in competition law enforcement).

It is not clear to us, from the decision and the judgments, whether Wanadoo's behaviour was predatory. The above facts (both the market features and the Commission's findings) are, however, compatible with a framework other than a predatory one: competition *for* the market. As stated above, the broadband market in the early 2000s was clearly a nascent, growing market, with strong network externalities. Operators getting an early foothold in this market would be the likely 'winners', that is, obtain a strong competitive advantage and thus quickly gain market share.

Network externalities are indeed a key ingredient of the model described earlier in this chapter (Section 1.3.2.7). On balance, though, it is unlikely

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that Wanadoo's strategy was exclusionary with reference to the models presented earlier in this chapter. We saw in Sections 1.2.3.2 and 1.3.2.3 how in the presence of growing markets, predation is a *less* likely equilibrium outcome, as the large 'prize' in future periods can be sufficient to stimulate entry: in 2001, expectations about growth in broadband uptake were very high (growth which indeed materialised over the years to come).

Moreover, as stated at the outset, low prices at an early stage can help consumers overcome uncertainties about the adoption of a new technology and there are efficiencies associated with such pricing strategies.

In sum, it is not clear whether the facts in *Wanadoo* should have led a predatory finding; and it is even less clear which coherent theory of harm could support it. More generally, an aggressive antitrust stance in a nascent, fast-developing market could stifle incentives to innovate in the first place and thus reduce consumer welfare over the long run; as such, caution would therefore be required.

1.6.6 Deutsche Post

Shortly before, in 2001, the European Commission found that Deutsche Post AG ('DPAG') had abused a dominant position in the market for mail order parcel services. The Commission argued that by making use of predatory pricing and fidelity rebates, DPAG tried to prevent competitors in the mail-order service from developing the infrastructure needed to compete successfully.

The notion of costs used by the Commission in the decision was that of 'average incremental costs' (or 'AIC').[93] This explicitly excluded all common costs that would be incurred upon the provision of other services. DPAG's network included freight centres and delivery points. This infrastructure was used for a variety of services. The cost of capital and maintenance for common sorting infrastructure could not be attributed to any business line in particular and was therefore excluded from the AIC of mail-order sales. The Commission considered several

[93] This was in line with the European Commission's Notice on the Application of the Competition Rules to Access Agreements in the Telecommunications Sector, where the Commission suggested that the examination of average incremental costs (over a longer period than one year) could be more suitable for network industries, since these industries have much larger common and joint costs compared to most other industries (see OJ [1998] C 265/02, paras 113–15).

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cost categories. The next excerpt (referring to the sorting costs[94]) highlights the difference between service-specific and common costs quite clearly:

> The capital costs of setting up the 33 freight centres and 476 delivery points cannot be attributed to a particular service. These costs will be incurred as long as the statutory obligation to meet demand to legally required service-quality standards applies. The staffing and equipment costs of sorting, on the other hand, are entirely dependent on the actual volume of parcels to be conveyed. Thus the staffing and equipment costs of activities dependent on the volume processed can be attributed in direct proportion to the mail order parcel service. (Para. 13 of the Commission's decision)

Another key dimension of this cost benchmark was the temporal horizon over which to consider a cost to be incremental. The Commission considered the six-year period from 1990 to 1995, that is, coinciding with the alleged predatory period. For a more thorough discussion of the case, and of the Commission's use of AIC, we direct the reader to OFT (2005). The following quote therein contained suggests the rationale of adopting such a cost measure and such a temporal horizon:

> Over six years all overheads (ie: costs that on a short term basis do not vary directly with output) were deemed avoidable because this was ample time to realize that the mail order parcel service was not covering such costs and therefore raise prices or dispose of the additional assets required to provide that service. To put it another way, over this period DPAG would have had the choice not to re-incur all incremental costs of running its mail order parcel services business. (OFT (2005), para. A.21)

Having thus defined AIC, the Commission found that DPAG's prices in mail order parcel services were below such cost measure in each year between 1990 and 1995 and ruled against Deutsche Post.[95]

In light of the above considerations, the AIC defined in *Deutsche Post* seems to us, *mutatis mutandis*, more akin to a good proxy for average

[94] The other service-specific costs included by the Commission were: collection, regional and local transport (proportionally to mail order parcels volumes); delivery (specifically, the handing over of a mail-order parcel), as opposed to driving, which was considered a cost that would be incurred as part of its statutory requirements in relation to letter deliveries.

[95] Eventually, the Commission only imposed a fine for DPAG's rebates scheme, but not for its predatory pricing (since it was the first time the Commission applied the notion of AIC in an abuse case). Moreover, DPAG offered commitments that amounted to a structural separation of its commercial parcel services from its letter business.

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variable cost (for the case of a firm producing multiple products) than for average total cost.[96]

Therefore, according to our proposed policy rule (see Section 1.4), there should have been a strong presumption of predation at the outset of *Deutsche Post*, purely based on a strong dominant position and on prices being below variable costs (profit sacrifice). In addition, though, we believe that it is useful to attempt to interpret the facts of that case in the spirit of the predatory mechanism we proposed in Section 1.3.2.6, which may contribute towards a coherent theory of harm.

The scale and scope economies in the postal sector were significant, and DPAG had an incumbency advantage: DPAG was the former state monopolist and, as such, could rely on a fully developed distribution infrastructure and on exclusive right in the market for letters and small parcels. Further, DPAG had a stable market share in excess of 85 per cent in the market for mail-order parcels for the whole of the 1990s. Also, the following quote from the Commission's decision suggests that the incumbent's pricing policy had the ability to deprive rivals of the scale and scope economies required to compete effectively:

> Contrary to what DPAG maintains, all of the disputed fidelity rebates are likely to have an effect on the opportunities that other suppliers of mail-order parcel services have to compete. Successful entry into the mail-order parcel services market requires a certain critical mass of activity (some 100 million parcels or catalogues) and hence the parcel volumes of at least two cooperation partners [customers with very large orders] in this field. By granting fidelity rebates to its biggest partners, DPAG has deliberately prevented competitors from reaching the 'critical mass' of some 100 million in annual turnover. This fidelity rebating policy was, in precisely the period in which DPAG failed to cover its service-specific additional costs (1990 to 1995), a decisive factor in ensuring that the 'tying effect' of the fidelity rebates for mail-order parcel services maintained an inefficient supply structure [...]. (Para. 37 of the Commission's decision)

The rationale of DPAG's strategy might therefore have been to prevent competitors from achieving the efficient scale they needed to expand in the market of mail-order parcel services.[97]

Moreover, given the existence of important common costs with other postal services, mail-order operators could later start to compete with other

[96] We direct the interested reader to Sappington and Sidak (2003) for an insightful piece, which includes a lengthy discussion of the *Deutsche Post* case.

[97] While the above excerpt refers to fidelity rebates (and not predatory pricing), the economic mechanism at work is the same (i.e. making the entrant unable to reach a critical mass), as we shall argue in Chapter 2.

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services offered by DPAG. Hence, as informally discussed in Section 1.2.3.2 (and formally shown in Section 1.3.2.6), DPAG might have sought to price aggressively in the 'early' markets to preserve a dominant position in all the markets where it operated. Indeed, after the end of the abuse found, some competitors managed to reach such critical mass and operate across adjacent markets. For instance, Hermes Versand Service was initially created for the mail-order trade's own use, but its infrastructure was later used to convey parcels for third parties and by 2000 it became the sixth largest courier, express mail and parcels operator in Germany (see para. 38).

1.6.7 Aberdeen Journals

In *Aberdeen Journals*, the UK Office of Fair Trading ('OFT') found that Aberdeen Journals adopted predatory behaviour in March 2000 in the pricing of advertising space in its local newspapers, in an attempt to drive the Aberdeen & District Independent newspaper (the only competitor) out of the market.[98] The OFT could not condemn the abusive practice over an earlier period as the Competition Act 1998 only entered into force on 1 March 2000. So, it is not that the predatory practice necessarily lasted only for one month, it is that only a certain period out of the all duration of the practice could be sanctioned. The Competition Appeal Tribunal ('CAT') upheld.[99]

The relevant market was that of the supply of advertising space in local newspapers (both paid-for and free) within the Aberdeen area. Aberdeen Journals was found dominant, with a market share in excess of 70 per cent (by value).

The OFT found that the revenues received from advertisers by Aberdeen Journals for its Herald & Post did not cover its average variable costs of production (this weekly was offered free of charge to readers). The pagination (that is, the number of pages) of the Herald & Post increased significantly after the launch of the Independent, from under 100 pages per

[98] A previous decision by the OFT in 2001 had been set aside by Competition Appeal Tribunal due to an unsatisfactory definition of the relevant market.

[99] Whish and Bailey (2015: 794–5) suggested that the CAT judgment contains various elements of special interest, including: the cost-based rules set in *AKZO* and *Tetra Pak II* should not be applied 'mechanistically'; the timeframe over which costs are calculated is important, as the longer this is, the likelier the chance that costs should be assessed as variable and not fixed; and there could be, exceptionally, an objective justification for below-cost pricing by a dominant firm, but this rebuttal is unlikely to be accepted if the pricing in question is part of a wider exclusionary strategy or follows an aggressive entry by a competitor.

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month in the period from October 1995 to April 1996 to 148 pages in May 1996. Pagination then peaked between September 1998 and October 1999, at around 350–480 pages per month.

As for barriers to entry and expansion, the OFT – referring to earlier analyses of the newspaper industry by the UK Competition Commission – suggests that they are significant:

> The [UK Competition Commission] has found that the initial cost of launching a free newspaper is relatively low, with desktop publishing technology becoming readily available, but has recognised that the cost of sustaining or expanding a presence can be higher (particularly where there are calls for an expansion of the editorial content). In particular, a new entrant might expect to incur losses during its first years, the time taken to establish credibility and acceptability with advertisers (the only source of revenue for free titles). A free paper must establish credibility with readers to be able, in turn, to attract advertisers. Further, establishing distribution networks can be difficult and time-consuming. (Para. 145 of the OFT's decision, footnotes omitted)

Further, based on the information available to us, Aberdeen Journal had an incumbency advantage, consisting essentially of an established distribution network, a set of local newspapers and journalists and a sound reputation with advertisers. The entrant clearly did not.

One may therefore argue that by preventing the Independent from obtaining revenues from advertisers at an early stage, Aberdeen Journal could limit its ability to expand (or even be viable) at a later stage. This effect was likely to be compounded by a feedback mechanism via readership: lack of the rival newspaper's credibility also implied fewer readers and thus fewer advertisers, in turn limiting revenues.

These ingredients are broadly consistent with those we highlighted in Section 1.3.2.1, where we discussed how an incumbent could prevent an existing rival or a new entrant from expanding, in the presence of scale economies.

In addition, the OFT referred to an earlier remark made by the UK Competition Commission on the newspaper industry suggesting that reputation effects might also be at work:

> The [UK Competition Commission] has also recognised that the behaviour and reputation of an incumbent influences ease of entry. In particular, it notes that established newspaper publishers can respond to new entrants in several ways and that the expectation of the incumbent's response can deter potential entrants and, if entry does take place, could reduce the entrant's chances of success. [...] A reputation for predatory response to new entry creates a barrier to entry. This is particularly important where the incumbent operates in several product or

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geographic markets: [...] Northcliffe [Aberdeen Journal's parent company] is active in many geographic markets. Accordingly, in this case, the predatory response of Aberdeen Journals to entry could create a reputation that acts as a significant barrier to entry and maintains its position in this and other markets. (Paras 146–7, footnotes omitted)

Overall, though, the robustness of a theory of harm in this case exclusively based on reputation effects is unclear to us, based on the information available.

1.6.8 Media24

Another interesting case related to local newspapers is *Media24*, which provides a useful basis to discuss the relevance of cost benchmarks and of any evidence of predatory intent.[100]

Following a reference by the Competition Commission of South Africa ('the Commission'), the Competition Tribunal of South Africa ('the Tribunal') found that Media24, a media group, used its Forum community newspaper anti-competitively, driving the Gold Net News ('GNN') community newspaper out of the local market in the town of Welcom.

According to the account in the Tribunal's judgment, at the time of the alleged predatory conduct, there were three community newspapers in the town of Welcom. Media24 owned two of these, Forum and Vista, with a combined share in the relevant market of about 75 per cent. GNN, an independent competitor, had the remaining share of the market. These community newspapers were free of charge to readers and raised revenues from advertising.

The Commission alleged that Media24 used Forum as a 'fighting brand', by selling adverts below cost and with the objective of driving GNN out of business. While the allegation of predatory conduct related to the period from 2004 to 2009, the Commission also pointed to evidence of Forum being loss-making from 2001 (shortly after GNN's entry) until 2009, when GNN exited the market. Media24 then closed Forum in January 2010.

One important aspect of this case is what was referred to in the proceedings as the 'cannibalisation effect': by keeping Forum's prices for adverts 'low', Media24 was forgoing some advertising revenues that Vista would have earned, as some of the advertisers in Forum would have switched to Vista (which charged higher prices), had Forum's prices been

[100] At the time of writing, this judgment is under appeal at the Competition Appeal Court of South Africa.

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higher. The Tribunal noted that these foregone revenues represented an economic cost to Media24 and were therefore considered in detail in the Tribunal's assessment, as we shall see below.

The Tribunal was asked to analyse this case under two provisions of the Competition Act of South Africa (the 'Act'): Section 8d(iv), which prohibits dominant firms from 'selling goods or services below their marginal or average variable cost' (unless the firm concerned can show technological, efficiency or other pro-competitive gains which outweigh any anti-competitive effects); and Section 8c, which prohibits dominant firms from engaging in an 'exclusionary act' (if any anti-competitive effect outweighs any technological, efficiency or other pro-competitive gain).

This distinction is insightful in our view, both in policy terms and for the assessment of this case, and we shall return to this below.

Pricing below average variable cost or marginal cost The Tribunal noted that the economists on both parties (Commission and Media24) agreed that the appropriate cost benchmark to consider from an economic perspective, given the facts of the case, was that of average avoidable cost ('AAC').

There was substantial disagreement between the parties on the level of Forum's AACs. The Tribunal found that whether Forum's prices exceeded AACs depended on the assumptions on the cannibalisation effect, which we introduced above. But due to the significant uncertainty on its magnitude, the Tribunal found that the Commission had not established on a balance of probabilities that Forum's revenues were below its AACs during the period of the alleged predation.

In sum, the Tribunal dismissed the Commission's allegations around an infringement of Section 8d(iv) of the Act as there was insufficient evidence that Forum's prices were below the relevant cost benchmark.

Exclusionary conduct To reach a view as to whether Forum's conduct was exclusionary under the meaning of Section 8c of the Act, the Tribunal considered various categories of evidence. Next, we summarise the Tribunal's findings on: (i) the relationship between Forum's prices and its average total costs; (ii) direct predatory intent; and (iii) indirect predatory intent.[101]

[101] The Tribunal also considered the issues of recoupment and of whether GNN was an equally efficient competitor. The Tribunal noted that evidence of recoupment is not required by the Act, but in the context of Section 8c of the Act this evidence 'can either serve to bolster a conclusion reached around intent or to serve to throw some doubt on its reliability' (para. 491). The Tribunal, inter alia, pointed to evidence adduced by the

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First, on the relationship between Forum's prices and its average total costs, the Tribunal found evidence that Forum's prices failed to cover average total costs over the whole period of the alleged predatory conduct.

Second, in relation to evidence of direct predatory intent, the Tribunal reviewed internal documents dating back to the period of the allegations and heard various witnesses. The Tribunal pointed to a Forum manager and his superior having 'many discussions [...] about using Forum as a vehicle to prevent GNN expanding in the market. These discussions were never documented to avoid them falling into the hands of the Commission' (para. 290). The Tribunal also noted that the same Forum manager 'emphasised that since he knew his own titles costs, and that Forum was not profitable, he confidently assumed that GNN, lacking Media 24's economies of scale and scope could not be making money. Indeed he was surprised the paper lasted as long as it did' (para. 297 of the Tribunal's decision). He also stated, the Tribunal reported, that 'Forum was kept alive [...] to keep GNN out of the market, if it hadn't been there [...] Media 24 would have closed it' (para. 298).

The Tribunal concluded that 'the evidence of direct intention to use Forum as a predatory vehicle against GNN [was] supported, not only by the oral testimony of an erstwhile employee, but also documentary evidence in the record throughout the period' (para. 372).[102]

Third, the Tribunal considered evidence of indirect predatory intent. It considered three categories of such evidence, and found the following:

Commission showing that (i) Vista's average monthly profit (while dipping in the period immediately following GNN's exit) subsequently increased in the period from March to December 2010, and was higher than during the period of the complaint; and that (ii) there was a highly likelihood of recoupment by Forum under a range of assumptions. The Tribunal also noted that there had been no entrants into the market by the time of its judgment. In relation to whether GNN was an equally efficient competitor the Tribunal commented on various submissions in this regard, but ultimately concluded that GNN was not inefficient. According to the Tribunal's judgment, GNN was well run and well regarded in the local community newspapers market by both readers and advertisers, which appreciated its quality over its approximately 10 years of operation. It also won about one quarter of the market (making it larger than Forum). Media24 was suggesting that GNN was an inefficient competitor and as a result its exit would not cause consumer harm.

[102] We note that this manager's testimony was considered as controversial. As the Tribunal wrote: '[this manager] was dismissed from his employment with Media 24 in April 2008 for allegedly making false travel claims. Criminal charges were levelled against him and he was convicted on some counts [...]' (para. 384) However, the Tribunal noted that it 'only accepted his testimony in respect of direct intent to the extent that it was consistent with documents from the record at the time, or where it has been corroborated by other witnesses' (para. 389).

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1. Forum's profitability: Forum was consistently loss-making during the period of the alleged predatory conduct.
2. Forum's exit: following GNN's exit in April 2009, Forum's activities were downsized in mid-2009 and later in 2009 Media24 decided that Forum would be closed (the closure occurred in January 2010).[103]
3. Forum's cannibalisation of Vista's advertising revenues: while, as set out above, the Tribunal could not reliably conclude on the magnitude of such effect, the Tribunal was comfortable that it was 'substantial' (para. 482).

In sum, based on the evidence summarised above, the Tribunal ruled that Media24 had engaged in exclusionary conduct through Forum's commercial practices and was in breach of Section 8c of the Act.

Comments We find this case instructive in a number of ways.

First, the taxonomy in the Act explicitly allows us to distinguish between: anti-competitive behaviour due to (predatory) pricing below average variable cost by a dominant firm; and anti-competitive behaviour due to more general exclusionary conduct, which the Tribunal accepted could occur as a result of a dominant firm pricing consistently below average total cost, with the intent of driving a competitor out of business.

This taxonomy broadly mirrors the *AKZO* rule discussed earlier in this chapter. The corollary to it is that an examination of evidence on intent is fundamental for the assessment of any predatory claims where prices are above average variable costs (though below average total costs). Media24 constitutes a case where the Tribunal appeared to have devoted significant effort in examining such evidence.

Second, the 'cannibalisation effect' set out above raises an important question on the treatment of opportunity costs (that is, in this case, foregone revenues) in the context of the calculation of avoidable costs following allegations of predatory conduct. As the Tribunal noted, one could criticise the inclusion of opportunity costs on the basis that any business decision that was not profit-maximising may lead to a dominant firm being found guilty of predation; and this may generate a chilling effect on competition. The Commission's economic expert responded to this critique by stating that he was not claiming that the opportunity

[103] As for why Forum was not closed immediately after GNN's exit, the Tribunal stated at paragraph 432: 'the delay in closing Forum was driven by two strategic considerations – the possible re-emergence of another competitor and legal concerns given the Commission's investigation.'

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costs incurred by the dominant firm were about a failure to maximise profit by not charging some hypothetical price. Rather, he argued that the relevant benchmark was the 'clear and obvious alternative that the dominant company would have pursued had it not pursued the allegedly abusive strategy' (para. 150). This position seems sound to us as a matter of economics and policy, along with the need to consider opportunity costs carefully in a case such as this.

As for the theory of harm providing a rationale for predation, a potential candidate may be a reputation-based theory of harm. The Tribunal briefly considered this in its discussion of recoupment:

> Academic writing and case law has also recognised what is termed 'reputational recoupment' or leveraged recoupment. Where the dominant firm operates in multi-geographic markets, as is the case with Media 24, then it benefits in its other markets from a reputational effect – i.e. being seen as a robust competitor. The reputational recoupment effect is thus a multi-market benefit from predation and not a benefit recouped in a single market. On the facts of this case Media 24, which has numerous community newspaper titles throughout the country, would have benefited in this way as well. (Para. 509)

The judgement also contains elements which are reminiscent of the 'deep pocket' theory of predation. For instance, at paragraphs 276–8 and 296–8, the Tribunal reports evidence according to which Media24's managers seemed to be well aware that their strategy was inflicting losses on GNN (since Forum was not profitable, it was reasonable to assume that GNN, lacking Media 24's economies of scale and scope, could not be making money). In fact, they seemed to be surprised that their rival paper lasted as long as it did.

More generally, throughout the judgement there appears to be the idea that Forum (a smaller and less profitable publication) was used as a 'fighting brand' to protect the market position of Vista. For instance, at paragraph 383 the Tribunal states: 'The evidence of direct intention, whilst comprising some bellicose language, constitutes more than just war talk by a competitor about its rival. The strategy devised at Moolmanshoek and which is evidenced later in the documents, constitutes a plan to eliminate a competitor in the market by using one of its titles, which they had earlier on considered closing, as a barrier to expansion in the market to protect the market position of the larger title.'

1.6.9 ECS/AKZO

In what is probably the best known European case on predation, the European Commission found AKZO guilty of predatory pricing in the

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market for organic peroxides, a chemical product used as a flour additive in the UK and more generally in the chemicals' industry. The Court of Justice upheld. According to the Commission, AKZO started to prey upon its smaller rival ECS when this (previously limiting itself to sell organic peroxides to be used as a flour additive in the UK) started to target a bigger market (organic peroxides for the polymer, or plastics, industry). ECS' attempted expansion included making competitive offers to BASF, one of AKZO's biggest continental clients in the polymer industry. The following excerpt from the Commission's decision suggests the motive behind AKZO's strategy:

> The policy documents found at AKZO UK and AKZO Chemie show an explicit link between AKZO's policy in the plastics market and its action in the flour additives market. This link had in fact been crucial to the threats made to ECS in December 1979. AKZO was concerned in the long run to protect its market position in the plastics market and the most effective method of achieving this in the case of ECS was to react in the smaller flour additives market which was of only marginal importance to itself but accounted for most of ECS's turnover. (Para. 48 of the decision)

AKZO was found to be dominant in the market for organic peroxides sold as a flour additive, with a steady market share in excess of 50 per cent. To further substantiate the allegations, the Commission's decision reports instances of AKZO making below-cost offers to ECS' most important business clients, with serious effects on ECS:[104]

> The value of ECS' flour additives sales in the United Kingdom had by 1984 declined to 70 % of its 1980 sales [...]. In effect the 'independents' and Allied Mills lost to AKZO UK accounted for almost one-third of its flour additive business in the United Kingdom. The general decline in prices of flour additives also involved a reduction in the margins on the business which ECS retained. In order to remain in business (says ECS) it was obliged to increase its bank borrowings substantially thereby incurring additional bank charges and interest. The lack of available funds also caused ECS to reduce its budget for research and development and to delay modifications to its plant intended to deal with new organic peroxide business. (Para. 50)

The facts in *ECS/AKZO* are potentially consistent with several of the theories we presented in this chapter, though the limited public information prevents us from making a conclusive statement on the full applicability of any of them.

[104] The Commission also found some documentary evidence of a predation plan.

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First, the above excerpt refers to facts that seem to be broadly consistent with the financial market predation discussed in Section 1.2.2.1 (by reducing ECS' profits, AKZO forced it to rely on more costly acquisitions of finance thereby limiting its ability to expand).

Second, there may have also been a reputation element in *ECS/AKZO*. According to the Commission (para. 48), the incumbent had already forced out of the market a competitor (Scado), which had tried to fight AKZO on its key customers and markets. The strategy vis-à-vis ECS looked similar - AKZO may have wished to build (or maintain) a reputation as a fighter against existing or new competitors that began attacking AKZO's key markets:

> [T]he elimination of ECS would have a dissuasive effect upon any other small producer which might be minded to attack AKZO's established market position. (Para. 86)

Finally, at least in principle, this case may have featured the mechanism we explained in Section 1.3.2.6: with common costs (or more generally scope economies) to expand operations in the two markets (both involving organic peroxides), AKZO might have preyed upon ECS in its key market (flours' additives to UK and Irish customers) to deprive ECS of the scale it needed to expand also in the plastic market and thus allow AKZO to maintain its dominance across a broader range of markets. However, publicly available information prevents us from understanding how ECS (and not AKZO) understood the strategic link between the two markets, that is, the significance of potential scope economies.

1.6.10 American Airlines

Next, we consider a fairly recent US case, *American Airlines*. As mentioned in Section 1.5.1, where we briefly reviewed the history of the US case-law on predation, the District Court in *American Airlines* dismissed the case mostly on the basis that the Department of Justice ('DOJ') had failed to show that the defendant had priced below a reasonable measure of cost (and the Appeals Court upheld). Nevertheless, it is interesting to look at the economics of the case in more detail.

The complaint referred to American Airlines' ('AA') behaviour at one of its hubs (Dallas-Fort Worth, or 'DFW') over the period from 1995 to 1997. AA's strategy, which was a response to the pricing strategies of three low-cost carriers serving the hub, included fare reductions and capacity expansion over four routes (scheduling of extra flights, using larger planes

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and/or making low fares available more frequently on these routes). At the end of the allegedly predatory period, the low-cost carriers abandoned certain routes where they were competing with AA or even exited the industry altogether. AA then realigned its prices to the pre-price war period and reduced its frequency in certain markets.

AA served around two-thirds of the passengers at DFW; its costs per available seat-mile, however, were almost twice as high as those of a competing low-cost carrier (mostly due to stringent trade union contracts), according to Edlin and Farrell (2004). This handicap was offset by economies of scope arising through the hub-and-spoke network at DFW which, as Edlin and Farrell (2004) – providing an extensive commentary of this case – noted, was the key mechanism for AA's success. The District Court too explained this quite clearly:

> Operation of a hub, like American's at DFW, provides economies of traffic density that lowers the costs on a per-passenger basis and/or permits the hub operator to increase frequency. (Page 5 of the District Court's judgment)

Moreover, Edlin and Farrell (2004) referred to a DOJ Appellant's brief where there was a suggestion that AA began to worry that the low-cost carriers, if successful, would expand and set up a 'mini-hub' at DFW.

AA's incumbency advantage arose through its historic presence at DFW (serving over two thirds of passengers), with stable, high market shares on several routes. As the District Court noted:

> On a number of nonstop routes from DFW, American had market shares ranging from 60% to 100% [...] for the period from 1990 to 1999. (Page 10)

The incumbency advantage materialised more broadly:

> Frequency dominance or origin point presence advantages are reinforced by marketing programs including frequent flyer programs and travel agent commission overrides. American [Airlines'] investment in establishing its DFW hub involved a large sunk investment, and another airline with similar cost structure would also have to make large investments to build a similar hub at DFW. (Page 11)

The above elements are consistent with a plausible theory of harm based on the model we presented in Section 1.3.2.1. By preventing an entrant from serving a critical mass of (early) consumers, the incumbent may have successfully prevented the entrant's expansion, or even excluded the entrant altogether, as this could not build a network of a critical size, thus forgoing crucial economies of scope (and scale). The fact that AA worried about the entrants setting a mini-hub at DFW (its own hub) set this case apart from

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Spirit Airlines, in the context of the model we proposed. In *Spirit Airlines* (which we discussed in Section 1.5.1), the entrant wanted to expand its own hub at Philadelphia, by providing two more routes (to Boston and Detroit-Metro); but this entry strategy was fiercely fought by Northwest, one of whose hubs was at Detroit-Metro, not Philadelphia.

Some commentators have argued that the case may be interpreted in the spirit of the reputation models we discussed in Section 1.2.2.2. Edlin and Farrell (2004) pointed out how the DOJ indeed put forward a theory of harm based on AA wishing to build a reputation as an airline that would fight entrants at its hub. AA itself – the District Court noted – conceded that there is a strategic element in the interaction between low-cost carriers ('LCCs') and the incumbent:

> American [Airlines] believes that LCCs engage in 'game-theory' analyses when determining whether to enter, expand in, or remain in, a market in competition with an incumbent. American [Airlines] believes that if it permits an LCC to fly one flight in a market, that LCC will increase its frequencies and become a powerful competitor, and believes that it is valuable for competitors taking note of American [Airlines'] actions. (Page 73)

In addition, Kim (2009) used data from the period and routes that were broadly relevant for the *American Airlines* case, in the context of a reputation model where potential entrants observe the incumbent's actions, update their beliefs about the incumbent's 'type' (that is, soft or aggressive) and then decide whether to enter. He found some evidence supporting the (reputation) model he proposed.

However, the District Court strongly rejected a reputation-based predatory theory of harm (and the Appeals Court agreed).

The District Court also rejected the notion that AA could have made a recoupment, referring to the high bar set by *Brooke*. It stated that:

> the uncontroverted evidence establishes that [Dallas airport] routes are not structurally susceptible to the supra-competitive prices which is a prerequisite to a successful predatory pricing scheme. That is, the nature of the relevant [Dallas airport] airline routes demonstrates that recoupment is not a dangerous likelihood. No hub airport in the country is served by more [low cost carriers] than [Dallas airport]. (Page 121)

There was some significant dispute between the parties on the exact price-cost test to apply, and which cost categories should be included in the correct cost benchmark for the price-cost test (see Edlin and Farrell, 2004, for a detailed account). In short, the DOJ performed four versions of price-cost tests, for each route under investigation, testing:

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1. Whether AA's incremental cost exceeded incremental revenue: the DOJ compared the route-level profits after the capacity expansion to the route-level profits prior to the capacity expansion (but following the reduction in AA's fares that followed entry on each route) – ('Test One').
2. Whether AA's long-run average variable cost exceeded price: the DOJ adopted an 18-month period for the definition of long-run – ('Test Two').
3. Whether price was persistently (defined as for longer than 12 months) below AA's internal accounting cost measure used to measure profitability – ('Test Three').
4. Whether AA's incremental cost of a capacity expansion exceeded AA's prices – ('Test Four').

The DOJ submitted that the results of these tests showed evidence of profit sacrifice, consistent with a predatory strategy. AA retorted that, for each route under investigation, its prices were consistently above the average variable cost level.

The DOJ's Test One was dismissed by the Courts as they argued that it was a test of short-run profit-maximisation, which compared the route-level profits before and after the capacity expansion. The Appeals Court stated that '[s]uch a pricing standard could lead to a strangling of competition, as it would condemn nearly all output expansions, and harm to consumers' (para. 23 of the Appeals Court's judgment).

Both the District Court and the Appeals Court dismissed the DOJ's Tests Two and Three on the basis that the measure of AA's internal accounting cost used for these included some categories of fixed costs. And since the Appeals Court held that the correct cost benchmark to use was marginal cost (and that average variable cost was generally a good proxy for it, albeit not necessarily the only one), the measure of AA's internal accounting cost used for Tests Two and Three was therefore an inappropriate proxy for marginal (or incremental) cost.

Finally, Test Four was dismissed on the basis that both Courts found that the measure of AA's internal accounting cost used for this test did not solely capture AA's avoidable costs of the incremental capacity expansion on a given route, but also some general common costs (that is, costs that were not specific to that capacity expansion).

Overall, it is not clear based on the information available in the public domain that in this case there was sufficiently robust evidence of prices below the relevant cost benchmark to support a predatory finding.

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In sum, *American Airlines* is an interesting case in the sense that it broadly matches the features of an economically sound theory of harm (based on scope economies), and perhaps of a reputation-based one, but where the evidence on whether a price-cost test is met is mixed.

1.6.11 Standard Oil and American Tobacco

We conclude this section with a discussion of two very early cases in US antitrust, *Standard Oil* and *American Tobacco*, which we already touched upon in Section 1.5.1. We provide a joint commentary, as their facts were strikingly similar and so were the economic mechanisms at work.[105] Further, differently from the previous discussion of other cases, we draw more extensively from other authors for our discussion of these cases. This is due to the fact that these landmark US cases are quite dated and have attracted significant research and commentary, which we believe to be insightful and worth reporting.

The Standard Oil company was born in Ohio in 1870 through the merger of three refining businesses. The newly formed entity then started expanding through subsequent acquisitions of refineries in other States, until it reached (by 1882) a national market share of 90 per cent, in the businesses of refining, transporting and retailing petrol. Its business model was based on obtaining preferential rates from railroad companies, closing many of the plants bought and putting certain plants under control that was only apparently separate from the parent company. After the turn of the century, Standard Oil further resorted to other practices, including selective price cuts and organising a market sharing scheme among its 37 affiliates across the United States. The Supreme Court condemned these practices as both restraints of trade and unlawful monopolisation.

The American Tobacco Company was also formed after a merger between (five) competitors. It was active in the cigarettes and tobacco markets. The company then grew through subsequent acquisitions, often closing plants, reaching a national market share of 86 per cent in domestic cigarettes by the turn of the twentieth century. The few competitors who did not oblige were fought off with very strong price cuts, some leading to prices below cost (in the case of plug tobacco American Tobacco lost more $4m, at that time's prices). By 1904, American Tobacco had purchased (and closed down in certain cases) over 30 companies.

[105] In what follows, we also draw from Evans (1912).

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As we already noted in Section 1.2.1, McGee (1958) remained unconvinced of the use of predatory pricing in *Standard Oil*. His main argument was that engaging in a price war would have simply been irrational, as the alternative of buying the competitor off and starting earning monopoly rents immediately was more profitable, an argument espoused more generally by Telser (1966).[106] McGee complemented his logical arguments with an analysis of the records of the proceedings (including testimonies) and concluded against the finding of predatory pricing, without, though, any econometric evidence as such.

McGee admitted that, in principle, an intimidating strategy revolved around predatory pricing could yield lower purchase prices and thus be overall beneficial to the incumbent.[107] Yet, he argued that the predation-through-merger hypothesis failed in the case of *Standard Oil*.

Dalton and Esposito (2007) re-examined the judgment records of four of the five 'major' cases considered in McGee (1958) and drew the conclusion that Standard Oil had actually engaged in predatory pricing. The authors distinguished between predation and competition on the merits (referred to as 'aggressive pricing') on the basis that both entailed low prices, but the latter caused supply to expand and prices to remain low in the long run, whereas the former had the opposite effects. The authors complemented their analysis with a price comparison against Standard Oil's own costs and with evidence on the intent to predate where these elements were available in the records; both tests supported their conclusion.

Burns (1986) set out to test the predation-through-merger hypothesis in the context of *American Tobacco*. He went even further, postulating that predatory pricing against a competitor may generate further benefits – in terms of lower purchase prices of subsequent preys – through a *reputation effect*. Using a sample of 43 competitors bought out by American Tobacco at the turn of the twentieth century, Burns found evidence consistent with his rational predation hypothesis: predatory pricing had a significant downward effect on the purchase price of the prey in question (up to 60

[106] Yamey (1972) – writing more generally, and not specifically about this case – also suggested that a more profitable alternative to predatory pricing might be the formation of a cartel with some entrants.

[107] Recall from Section 1.2.2.3 that the argument behind a predation-through-merger strategy runs as follows: by setting 'low' prices, an incumbent could (profitably) give a (false) signal to an entrant that the market conditions are structurally bad; the entrant would therefore expect its future cashflows to be low and in turn accept that its valuation as an enterprise should likewise be relatively low (since the value of a firm is the present discounted value of its expected future profits). With this conjecture, the entrant should be willing to be taken over for a low price, to the benefit of the incumbent.

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per cent of what they would have cost absent predatory pricing) as well as an additional indirect downward effect (of around 25 per cent) on the acquisition price of other preys (which can be interpreted as a reputation effect). These findings would be consistent with the interpretation of *American Tobacco* also within the framework of the reputation model described in Section 1.2.2.2 (with the minor difference that the original models entail an entry versus no entry decision, whereas in *American Tobacco* the corresponding choice variable was fighting versus selling out to the incumbent).

In sum, both *Standard Oil* and *American Tobacco* presented features consistent with both a theory of harm based on signalling (via predation-through-merger) and with one based on reputation effects.

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