Aftermarket power and foremarket competition ☆

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ABSTRACT

I revisit the issue of aftermarkets by developing an infinite period model with overlapping consumers. If the aftermarket is characterized by constant returns to scale, then social surplus and consumer surplus are invariant with respect to aftermarket power. Under increasing returns to scale, however, greater aftermarket power leads to: greater concentration in the foremarket; higher barriers to entry; higher social surplus; and possibly higher consumer surplus.

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1. Introduction

Many consumers complain that they pay too much for printer toners. But the same consumers are also happy to purchase printers at fairly low prices. To some extent, lower printer prices compensate for higher toner prices. Or do they?

The printer–toner example is one of many instances of industries characterized by a foremarket that is complemented by one or several aftermarkets. Typically, the foremarket corresponds to a durable good, whereas the aftermarkets correspond to non-durable products or services. Other than printers, examples include cameras and film, photocopiers and repair service, videogame consoles and games.[1]

In these industries, an interesting policy question is how to treat seller power in the aftermarket. An old argument (associated to the Chicago school) states that a seller can only have so much market power, and that an increase in aftermarket power is compensated by an equal decrease in power in the foremarket: the price of blades may be very high, but razor holders are very cheap.[2] Some authors argue that the conditions for such an equivalence result are very stringent. For example, Borenstein et al. (1995) claim that "economic theory does not support the argument that strong primary market competition

will discipline aftermarket behavior, even without market imperfections" (p. 459). Other authors, while recognizing the welfare reducing effects of market power, suggest that these are rather small in magnitude. For example, Shapiro (1995) concludes that "significant or long-lived consumer injury based on monopolized aftermarkets is likely to be rare, especially if equipment markets are competitive" (p. 485).

In addition to market power, efficiency considerations may also play an important role. For example, where there is a risk of shared liability between an equipment manufacturer and a third party service provider, aftermarket power may be a "necessary evil." As another example, having the same seller supply both the basic product and the aftermarket product may also allow for welfare enhancing price discrimination.

The current US antitrust treatment of aftermarket power is largely based on the *Kodak* case. Kodak refused to sell spare parts to third parties offering after-sales photocopier services, thus effectively monopolizing an important aftermarket. In its defense, Kodak argued that, although it effectively monopolized the aftermarket, its share of the foremarket was only 2%. In its 1992 decision, the US Supreme Court decided held that lack of market power in the primary equipment market does not necessarily preclude antitrust liability for exclusionary conduct in derivative aftermarkets.[3]

Unlike the US Supreme Court, the European Commission (EC) and the European Court of Justice (ECJ), deciding on the *Kyocera* case, held

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[1] A related, but different, setting consists of secondary markets where the initial good may be resold. See for example Hendel and Lizzeri (1999).

[2] See Picker (2011) for a critical view on the common wisdom regarding razors and razor blades pricing.

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[3] *Eastman Kodak Company v. Image Technical Services, Inc.*, 504 U.S. 451 (1992). Justice Scalia dissented, arguing that Kodak lacked power in the equipment market.

that consumers are well informed and take into account aftermarket prices when choosing a certain piece of equipment. Since there is vigorous competition in the primary market for printers, the EC argued, Kyocera was not dominant in the market for printer consumables (toners).[4]

Although the *Kodak* and *Kyocera* decisions differ in several ways, both recognize the importance of economic analysis, in particular the simultaneous consideration of power in the foremarket and in the aftermarket.

In this paper, I revisit the relation between aftermarket power and foremarket competition. The novel element of my analysis is to consider a dynamic (infinite period) model with increasing returns to scale in the aftermarket (which may result from economies of scale, indirect network effects, or other causes). I assume consumers' lives overlap with one another. In each period, one consumer is born and joins one of the existing installed bases; next, aftermarket payoffs are received by sellers and consumers; and finally, one consumer dies. I derive the unique symmetric Markov equilibrium of this game and the resulting stationary distribution over states (which correspond to each firm's installed base).

I show that increasing returns in the aftermarket induce increasing dominance in the foremarket; that is, under increasing returns a large firm is more likely to capture a new consumer than a small firm. Moreover, an increase in aftermarket power increases the extent of increasing dominance. This in turn has several implications. First, aftermarket power implies a stationary distribution with greater weight on asymmetric states. Second, social welfare is greater with aftermarket power (basically because social welfare is higher at asymmetric states). Third, the value of a small firm (a firm with no installed base) is lower when there is aftermarket power. Fourth, because the difference in value between large firms and small firms widens, firms compete more aggressively to attract new customers when there is aftermarket power. And finally, because of more aggressive price competition, consumer welfare may be greater when there is aftermarket power.

Intuitively, my results are related to two important features of dynamic price competition. The first one is the *efficiency* or *joint profit* effect.[5] The idea is that a large firm has more to lose from decreasing its market share than a small firm has to gain from increasing its market share. This induces the large firm to be relatively more aggressive and makes the next sale with greater probability than the small firm: increasing dominance. In my model, I show that aftermarket power increases the stakes that firms compete for; and this in turn increases the extent of increasing dominance.

The second feature is what we might call the *Bertrand supertrap* effect.[6] Consider a symmetric bidding game, where the winner receives *w* and the loser gets *l*. Equilibrium bids are given by *w–l*; it follows that each player's equilibrium payoff is given by *l*: if you win, you get *w*, but you also have to pay *w–l*. In the present context, I show that aftermarket power, while increasing future profits, makes firms so much more competitive that, starting from a symmetric state, firms are worse off, whereas consumers are better off. In other words, in terms of future value a large firm is better off with aftermarket power, but a small firm is worse off; and the latter is what matters in terms of present value.

In terms of competition policy, my paper makes two points. First, given a set of firms and product offerings, consumers need not be harmed by aftermarket power. In fact, to the extent that there are increasing returns in the aftermarket and the foremarket is competitive, consumers can be strictly better off in the presence of aftermarket power. (Several authors have argued that aftermarket power may be welfare increasing, but for different reasons than the one I consider;

more on this below.) Second, increases in aftermarket power have important implications for market share dynamics. On average, foremarket concentration increases; and the barriers to entry of new firms increase as well. Taken together, these two points suggest that aftermarket power raises concerns from a consumer welfare point of view, but not for the reasons typically considered in the literature.

Prior literature on aftermarkets can be divided into two groups. (In both cases, the approach is essentially theoretical, although the motivation is grounded on actual cases.) One first strand looks at the balance between aftermarket power and foremarket competition. The early development of this literature is aptly summarized in Shapiro (1995), who acknowledges the potential for aftermarket power to reduce consumer welfare but estimates the impact not to be too significant. More recently, Fong (2008) shows that aftermarket power may enhance collusion. Zēgners and Kretschmer (2014), in turn, show that aftermarket power leads to lower prices in the foremarket, which in turn may inefficiently attract consumers whose valuation is lower than cost.

A second strand of the literature studies efficiency defenses of aftermarket power. For example, Chen and Ross (1993) argue that a seller may use the aftermarket as a "metering device to discriminate between high-intensity, high-value users and low-intensity, low-value users" (p. 139); whereas Carlton and Waldman (2010) show that "behaviors that hurt competition in aftermarkets can … be efficient responses to potential inefficiencies that can arise in aftermarkets."[7]

My paper can be seen as a contribution to both strands of the literature. First, it confirms the well-known idea that increases in aftermarket power are compensated by increases in foremarket competition, with the important qualification that, under increasing returns, the increase in competition in the foremarket exceeds the increase in power in the aftermarket. Second, I add a novel reason why aftermarket power may lead to efficiency gains, namely a better exploitation of increasing returns to scale — so much so that even consumers may benefit from aftermarket power.

As mentioned earlier, from a methodological point of view an important difference with respect to the previous literature is the development of an infinite period dynamic model where the state space is given by the installed base of each firm. In this sense, the paper is closely related to Cabral (2011), who studies dynamic price competition with network effects.[8] The present paper differs from Cabral (2011) in several ways. First, it puts more structure into the model so as to analyze the issue of aftermarket power explicitly. In particular, the central results in the present paper — that aftermarket power increases social welfare and may increase consumer welfare as well — are not present in Cabral (2011). Second, by considering specific functional forms, the present paper derives analytical results for ranges of parameter values where Cabral (2011) only obtained numerical results. In particular, the results regarding increasing dominance (bigger firms are more likely to make the next sale than smaller firms) are derived analytically for all parameter values, whereas Cabral (2011) only develops analytical results for limit values.

The paper is organized as follows. In Section 2, I introduce my dynamic model of foremarket and aftermarket competition. In Section 3, I consider the benchmark case of constant returns to scale and show that the one-monopoly-rent principle holds. In Section 4, I consider the case of increasing returns to scale in the aftermarket and two possible aftermarket configurations: perfect competition and monopoly. I prove that aftermarket power increases the degree of increasing dominance. Section 5 derives two implications of this result, one regarding long-run market shares, one regarding barriers to entry. Section 6 deals with social and consumer welfare. Finally, Section 7 concludes the paper.

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[4] *Pelikan/Kyocera*, (1996) 17 ECLR R-57.
[5] See Gilbert et al. (1982), Budd et al. (1993), Cabral and Riordan (1994), Athey and Schmutzler (2001).
[6] See Cabral and Riordan (1994), Cabral and Villas-Boas (2005).

[7] See Chen et al. (1998) for a review on the economics and legal literature on aftermarkets.
[8] See also Laussel and Resende (2014).