

## **Lemons, Peaches and Creampuffs : the Economics of a Second-Hand Market**

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### I. INTRODUCTION

In reality, many goods possess a feature that makes them quite different from the typical economic textbook commodities like apples or wheat. The characteristic we have in mind is durability. That is the good provides a service to the consumer over a number of periods. Hence as soon as the consumer gets enough of the service, wants to replace it for superior performance or needs liquidity to service more urgent needs, he will try to resell the durable. This gives rise to transactions in second-hand goods, or as we will call it a second-hand market.

Now second-hand markets are best known in economics for their unexistence. In a seminal article, Akerlof (1970) introduced the "lemons" problem, showing that adverse selection in the used car market could lead to the collapse of a second-hand market in cars. Yet many goods, also cars, trade in reality on second-hand markets. Some of them are even in good shape, Kreps (1990) refers to them as "peaches" while Bond (1982) calls them "creampuffs". Furthermore, the existence of these markets has an important impact on the strategies of firms serving the new goods market as well as on the overall performance of the sector. Unfortunately then only a few facts

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This article reports on the preliminary results of a research project in which also the second-hand market for investment goods and the related financial markets are analysed. Filip Abraham, Leon Bettendorf and Hans Degryse have provided useful comments.

are known about the operation of second-hand markets. And often what is known tends to be an erroneous popular view of the matter.

This article addresses three sets of issues related to second-hand markets. First, the relation with the new goods market is investigated. It is shown that the existence of a second-hand market poses less problems to a seller as one might expect. On the other hand the particular organisation of a second-hand market might mitigate other problems faced by a new goods producer. Hence once established the influence that a second-hand market can exercise, the conditions for the existence of such a market are analysed next. Here, a number of unresolved questions emerge. Finally, some common misunderstandings about the organisation of second-hand markets are cleared out. By counterexample, it is shown that a feature commonly perceived essential to a second-hand market turns out to be oblique. So the purpose here is to understand the organisation of these markets in general by focussing on some of them in particular. A final section presents some conclusions and directions for future research.

## II. SECOND-HAND VIS-A-VIS NEW GOODS MARKETS

In this section we document the impact that a second-hand market has on the associated new goods market. In the emblematic contributions on durable good monopoly this impact is often overshadowed by the restrictions that arise from a lack of commitment power. We survey some of these contributions and point to the rather special circumstances in which the existence of a second-hand market is indeed only of inferior importance. For the sake of simplicity and in order to square up with the existing research, we assume that the new goods market structure is monopoly. Also, the good doesn't depreciate and demand is stationary. Finally, assume there are only two periods and there is no discounting. The durable good monopolist now faces either one of the following two situations: consumers only need the good for one period (resales case), or they continue to use it for the second period (expectations case).

The problems for the monopolist in the resales case apparently arise from the second-hand market that emerges at the end of the first period. The monopolist faces at that point in time competition from his former customers who try to resell the good to the consumers who are now in need of its' service. But a closer look at the

problem shows that the second-hand market is not the cause of the problem. Rather on the contrary, the more opportunities to resell the higher the price first period consumers are willing to pay since they can resell the good after they used it<sup>1</sup>).

To see this, suppose the second-hand market, perhaps for reasons that will be discussed below, cannot be organised. Hence the only supplier in the second period will be the monopolist who then is able to collect his monopoly profits. But the buyers in the first period knowing that no second-hand market exists will only pay for the use of it during a single period. They will not include any resale value since they will be unable to collect it due to the absence of a second-hand market. The monopolist then can sell in each period to consumers who value the use of the good for only one period, just as if he sold non-durables. In contrast, when a perfect second-hand market exists, the first period buyers can resell and will include this resale value in their willingness to pay in the first period. Hence the monopolist collects exactly the same amount with a second-hand market as without one<sup>2</sup>).

The true cause of the durability problem is to be found with the monopolist himself, more precisely with his inability to commit to be inactive during the second period. When we argued above that with a second-hand market the first period buyers can recover half of what they paid, we assumed that the stock of goods remains the same i.e. that the monopolist is not an active supplier during the second period. This is of course incredible: why would the monopolist remain inactive when he can sell? Precisely this supply in the second period spoils the resale value of those buying in the first period. In fact, if the monopolist doesn't sell but only rents the good, he will remain inactive since he has no incentive to deteriorate the value of the outstanding stock of goods of which he now is the owner. Essentially then renting internalises the externality that arises from selling and by doing so generates more profits to the monopolist.

The problem of having no commitment power is more transparent in the expectations case. There, one and the same consumer uses the good over two periods. Once the monopolist has sold to the consumers with a high reservation value, he again will not be able to remain inactive. He will cut prices so as to sell to the remaining consumers who have a lower valuation. But the high valuation consumers who rationally foresee the price cuts that will occur as soon

as they have bought then will postpone buying, unless they get a discount today. So the temptation to which the monopolist will be unable to resist implies that he competes with his future type and accordingly has to reduce his price in advance. In a multiperiod setting, this of course tends to generate the Coase conjecture, see Coase (1972) as well as Stokey (1981) and Ausubel and Deneckere ((1987) and (1989)) for a penetrating analysis.

Not surprisingly then, it is easy to show that whether the monopolist faces consumers who use the good for one period and resell to the next generation, or consumers who use the good for two periods, equilibrium profits for the monopolist are the same. Yet in proving that result one has to assume that used goods are perfect substitutes to the recently produced goods. Without depreciation, this is of course reasonable<sup>3</sup>). But it also implies that the monopolist cannot use discriminating devices to screen among consumers, or distinguish himself from the second-hand suppliers in any other way.

Consider the resale case. Assume the monopolist can induce the consumers who have the highest valuation always to buy from him. No matter how big the price differential with the second-hand market is, the absence of commitment will not reduce his profits. Although the first period consumers rationally foresee that the resale price will be driven down, the monopolist can serve everybody he wants in the second period. Clearly the ability to capture the highest valuation consumers in the second period doesn't mitigate the commitment problem but restores profits by keeping the "good" customers directly for the monopolist<sup>4</sup>). The collection of the resale value in selling to the first period buyers will yield less since they are stuck with the "cheap" consumers in the second period.

This ability to capture the highest valuation consumers wouldn't help the monopolist in the expectations case. In this setting the highest valuation consumers already have bought in the first period, so a device that reserves them to the monopolist is of not much use. Since the monopolist already has sold to them, he will face lower value consumers to whom he only can sell by reducing his price. The expectations regarding this price evolution therefore remain intact and hence cause the same problems as before.

Paradoxically, an exactly opposite situation regarding the consumer types captured alleviates both the resale and expectations case. When consumers who have the highest valuation always buy on the

resale market, again no matter the price differential that might exist between the resale price and what the monopolist charges, an even better outcome will result in both settings. First consider two subsequent generations. Since the highest valuation consumers always will buy on the resale market, the first period buyers are not affected by the absence of commitment power and will take into account the opportunity to resell at the price they paid themselves. In addition, the monopolist can make some second period sales which further increase his profits. Exactly the same outcome appears in the single generation case. Since the low valuations are served by the monopolist first, the high valuations know the price will come down but there is no use in waiting for the price to fall since they will not be able to buy at that price anyway<sup>5</sup>).

From this discussion a number of conclusions emerge and it is useful at this point to recapitulate.

- there exists an equivalence between a durable good monopolist serving a single generation of consumers who use the good for two periods (expectations case) and two subsequent generations which use the good one period (resales case). The lack of commitment power on behalf of the monopolist reduces his profits in both environments ;
- this equivalence only carries through for a particular form of interaction between sellers and buyers, i.e. one in which particular forms of discrimination are excluded ;
- some forms of discrimination then restore profits in the resale case but not in the expectations case, while other forms of discrimination restore profits in both cases.

So many problems attributed to the existence of a second-hand market are in fact different in nature, that is they derive from the lack of commitment on behalf of the monopolist. Yet for a durable good monopolist serving two subsequent generations the second-hand market can mitigate these problems in an important way. *First*, in the absence of a second-hand market the durable good monopolist is in exactly the same situation as one selling a non-durable and hence faces no particular problems. Hence it is *appropriate to investigate the existence* of a second-hand market. *Second*, since the particular organisation of a second-hand market co-determines the distribution of consumers over suppliers and hence the possibility to discriminate, it is *appropriate to investigate the particular organisation* of these markets.

### III. THE EXISTENCE OF A SECOND-HAND MARKET

In a narrow way second-hand markets can be defined as institutions dealing with transactions in used goods. Then of course durability of the good is a necessary condition for such a market to develop. In reality most second-hand markets indeed will handle used goods, but not exclusively so. In a broader definition the key concept then is not used goods but resales.

Second-hand book shops also sell unused copies. These consist of large parties of previously unsold books.

Often these goods are unsold stock from producer or retailer, casually they originate from a bankruptcy. While in the example of books the commodity involved still has a durable character, the broader approach could dismiss durability as a *conditio sine qua non*. The counterexamples being the second-hand markets for tickets to music concerts, sport contests a.s.o. While perishable - after the event has taken place they are worthless - they nevertheless are traded on second-hand markets which are better organised than the casual selling of soccer tickets at the gates of the sportsground.

Essential then is *some form of economic depreciation to certain users*. This occurs:

- in the case a consumer after using a durable has no further need for it (houses after the retired move to Spain or Florida);
- in the case a firm is stuck with a durable that doesn't sell in his outlet (books);
- in the case a consumer misperceived his needs of a perishable (the soccer fan after he finds out he's unable to make it on Saturday evening);
- in the case maintenance costs increase (cars).

The second-hand markets then all reallocate assets from agents with low valuations to agents who value them more, see Bond (1982). Some markets will perform this reallocation faster and hence are said to provide more liquidity, see Grossman and Miller (1988) for more on this.

The more durable a good is, the higher the possibility that it depreciates economically to its current user, who then will offer it for a resale or the longer the lifetime of a commodity, the more likely preferences will shift away from it. But on the other hand the more durable the good is, the longer it will do without maintenance. If the second-hand market then reallocates used goods with high main-

tenance costs to users who have a better maintenance technology, increased durability could reduce the usefulness of such a market.

As argued already, the necessary condition for the existence of a second-hand market then is the decay in utility to *some* users. This condition however is only a necessary one, it certainly is not sufficient. Instead of having no further use for a good, it could be that it malfunctions. The good then is of no use to *any* consumer. Hence, getting rid of it on the second-hand market and repurchasing it anew on the primary market is the solution. In the formation of prices on the second-hand market, potential buyers will take into account that they not only face sellers which have no more use for the good, but also those who own one of unacceptable quality and try to sell it. If this leads to the objects of higher than average quality not being offered on the market, the average quality at any price will downgrade, in turn leading to further price decreases. This in turn will eliminate even more sellers who truly have no use for the good anymore by having their goods sold to relatives and friends until finally the second-hand market completely collapses, see Akerlof (1970). In addition to the decay in utility documented above as a necessary condition, there thus cannot be too much adverse selection for a second-hand market to exist.

It now is tempting but wrong to conclude that we have derived the necessary and sufficient conditions for the existence of a second-hand market. We still have overlooked the apparently obvious condition that the producer of the good must be willing to sell. Yet in view of the entire discussion in the previous section, this is far from trivial. If a durable good monopolist has no commitment power and is unable to capture particular consumers, it was argued that he will make less profits than a non-durable good monopolist. But the durable good monopolist can easily replicate the environment of an ordinary monopolist simply by renting. The one period service the consumer receives from renting a car to satisfy his transport needs has the same nondurable effect as eating food. As a matter of fact, companies like Xerox and IBM initially only rented their equipment. But if there are no sales of new goods, there can't be sales of used goods.

In order to find necessary and sufficient conditions for the existence of a second-hand market, one then has to explain *simultaneously* the existence of sales of new goods and resales of used goods. That is the rental market has to break down as the preferred policy.

The first and easy way out is to assume the monopolist has the power to commit and/or can capture particular consumer groups. There is no reason why he would rent in these circumstances, and hence the conditions of decaying utility and no adverse selection are necessary and sufficient. A similar argument says he's required by law to make sales in addition to renting.

A second explanation appeals to the capital needs that a rental policy imposes upon the producer. It then is said that he has to sell in order to rotate his capital. It is hard to see why this "forced" sales explanation holds. Presumably specialised financial intermediaries would enter the market and provide for the liquidity needed by the monopolist while he retains ownership of the good. The profits made in excess of selling by such a "leasing" agreement then can be split between the monopolist and the leasing company. As a matter of fact, in many sectors leasing companies own a substantial fraction of the outstanding stock of capital goods. Hence one cause for the (profitable) existence of these companies, tax motives of course being another.

A third explanation calls upon the caretaking of individuals in the presence of asymmetric information. Ownership of the good then induces the user to be more careful, see Milgrom and Roberts (1991). A driver who rents a car will be more reckless compared to one who owns it, since his behavior harms an owner who cannot immediately detect the damage. Again this explanation is not entirely satisfactory, especially in jointly explaining the existence of sales of both new and used goods. Clearly, if a specialised agent (car manufacturer or dealer) has a hard time to figure out who drives carefully and who not, then a non-specialised agent (the second-hand buyer) will face even more problems to detect "lemons". The asymmetric information creating moral hazard problems to the new goods producer then creates even more adverse selection problems to the second-hand market<sup>6</sup>). It then is not clear whether asymmetric information helps in explaining the existence or the absence of a second-hand market.

So, except for the first "exogeneous" explanation, it is not easy to explain the co-existence of new-goods and second-hand markets and hence to derive necessary and sufficient conditions for the existence of the latter. Further research into this area is needed, especially in view of the organisational implications that often follow from exis-



tence conditions. Only a few facts regarding the organisation of the second-hand market are known. We discuss them next.

#### IV. THE ORGANISATION OF SECOND-HAND MARKETS

A common misunderstanding about the second-hand market is that it consists of many small-scale suppliers (ragmen). Often the concentration of second-hand bookshops is much higher than the concentration in the new books market. There are a few rather exclusive Mercedes-Benz second-hand garages exceeded in number by the primary dealers in a country. Of course, to these few second-hand "specialists" one has to add the official dealers that also sell second-hand cars as well as the individuals who sell their used car. The latter only account for fourty percent of the second-hand transactions. So again it is difficult to say a priori which market is more concentrated. If one assumes that not the dealers but the manufacturer is the relevant supplier of new goods, then of course the new goods market has stronger concentration. In aviation, there are only fifteen second-hand dealers on the entire European market, but there are very few constructors of new planes too. In any event, concentration is not a phenomenon limited to new goods markets and one must ask what factors determine concentration in the second-hand market.

In principle, the second-hand market is as fragmented as the number of individual consumers the primary suppliers have sold to. Therefore one has to look for scale economies in one or more of the following activities :

- searching for owners who have no further use for a good ;
- screening the "lemons" from the "peaches";
- collecting the used goods.

In addition many goods need some form of recycling before they can be resold. The recycling technologies then might exhibit scale economies as well.

Furthermore barriers to entry may prevent the emergence of many organised suppliers in the second-hand market. These entry barriers will be important when :

- special skills are needed to find out the quality of the goods offered on the second-hand market, for example to find out in which state an aeroplane sold by an aviation company is in or when the good becomes "antique";

- capital requirements are high, for example when "old-timers" or ancient art are involved.

These scale economies in and barriers to entry to the second-hand market have important implications for the new good suppliers. As pointed out in the second section, once the second-hand market is in place, these suppliers will face competition and hence it becomes important to know whether the competition is against a "competitive fringe of previous customers" or a well organised monopolist recycler.

In addition, who serves whom? Are the consumers with the highest willingness to pay served by the supply on the second-hand market or conversely, are the consumers with a high valuation served by the monopolist? Again the answer will depend on the particular market or even market segment studied<sup>7</sup>). Presumably in cars the high valuation consumers demand from the monopolist, yet the very expensive "old-timers" are to be found on the second-hand market. The same holds for ancient art works (by definition since the painter died), and for some clothes (for example unique pieces of designer clothes from Dior). For clothing in general however, the brand name manufacturers serve the high valuation consumers with only the poorer entering second-hand shops. Finally in some cases the quality of the recycled material (for example metal) is inferior and cannot be used for specific purposes. Here, a careful systematic investigation of particular second-hand markets would be welcome, especially in view of the importance of this issue, see section two above.

## V. CONCLUSIONS AND TOPICS FOR FUTURE RESEARCH

While environmental problems have become a key issue in economic life, we know only a few things on the performance of markets which trade goods that exceed their users in durability or endurance. Understanding how the market place copes with goods for which some consumers have no further use also is essential for understanding the durability choices made by producers<sup>8</sup>). In daily life, government policies impose new standards on emission, recyclability a.s.o. These regulations clearly affect the resale value of the outstanding stock of consumer goods. How does this interfere with the choices manufactures make? How do the expectations consumers

have regarding further environmental regulation affect the revenues of durable good manufacturers ?

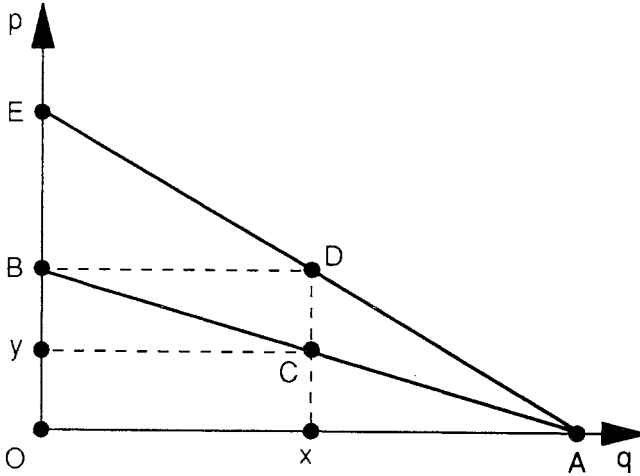
These are only a few questions one cannot provide an answer to without a thorough insight in the working of a second-hand market. But if one thing became clear in this article, it is precisely that still many questions regarding the existence and organisation of such second-hand markets remain open. In particular the exact nature and place of asymmetric information in explaining the existence or absence of a second-hand market is a question for theoretical investigation. Our views on the specific organisational forms that are encountered in reality hopefully can be sharpened by future empirical analysis.

#### NOTES

1. Liebowitz (1982) addresses a related issue. When in addition second period consumers can shift their demand to the first period, one can ask when it is optimal to prohibit second period sales. If second period sales are outlawed, some of the second period consumers together with those of the first period constitute first period demand. But the first period consumers will not include a resale value in their willingness to pay. If second period sales are not forbidden, first period buyers take into account the resale opportunities. A priori, it is unclear whether forbidding second-hand sales is best for the supplier.
2. Given the assumptions made in the beginning of the section, it is easy to show that the monopolist collects the same with and without a second hand market. In Figure 1 below,  $BCA$  denotes the rental demand curve. This curve tells us what a particular consumer ( $x$ ) wants to pay for the use of the good during a single period ( $y$ ). When there is no second-hand market, the willingness to pay for the good by consumers who only have use for it during one period then exactly is given by the rental demand curve. In the next period, the monopolist faces a new generation with exactly the same willingness to pay, hence he collects twice the area  $oxCy$ . With a second-hand market, the new generation buys from the old generation. Hence, all consumers between 0 and  $x$  can add a resale value  $y$  to their willingness to pay. The monopolist then can charge consumer  $x$  a price equal to  $B = 2y$ . He then collects  $oxDB$  which is twice the area  $oxCy$ , just as with no second-hand market present. Finally note the curve  $EDA$ . This curve represents the vertical sum of two identical rental demand curves  $BCA$ . It expresses the willingness to pay of consumers who use the good for two periods, but also is the relevant curve for the monopolist to determine his profit maximising sales in the case consumers use the good only one period and then resell. Hence  $x$  is the profit maximising output in each case considered.
3. Bulow (1982) rationalises this outcome by considering a world in which all output is sold to competitive leasing firms. So the monopolist determines his optimal quantity in the first period by taking into account that the leasing firms rent the good again in the next period. The price in that period will depend on how many additional leasing firms will supply the market, that is how much sales the monopolist will make the second period. Since all consumers are served by leasing firms, there is no distinction between supply from the monopolist or past consumers.
4. Much in this vein Gaskins (1974), Swan (1980) and Suslow (1986) reach the conclusion that the "Alcoa problem" was not much of a problem to Alcoa. The American Aluminium Company faced competition from secondary aluminium which is produced from

FIGURE 1

*Monopoly revenues with and without a second-hand market*



scrap. If recycling takes time and produces only an imperfect substitute for primary aluminium high valuation consumers (fastly expanding quality demanding companies such as aircraft constructors) might only use the Alcoa product. On the other hand in four-wheel-drive tractors, Carlton reaches the conclusion that the tremendous durability of these vehicles implies that new good producers have only a ten percent market share, see Carlton and Perloff (1990).

5. Van Cayseele (1991) shows in a setting in which the monopolist has commitment power that the ability to serve some low valuation consumers first allows the seller to make profits over and beyond the monopoly outcome. The best policy calls for an intertemporal price discriminating strategy in which first sales are made to the highest valuation consumers and then to the lowest valuations. Although the highest valuations know that prices will decline after they have bought, the probability that they will get the good at a reduced price can be made low enough so as to make them buy at the high price.
6. Some markets subject to adverse selection do function. It can be shown, see De Bondt (1992), Kreps (1990) or Hendrikse (1993), that the higher the proportion of goods that malfunction and the smaller the valuation gap (the difference between what a car is worth to a buyer and a seller), the problem aggravates. In the present context, the existence of a valuation gap may arise from the decay in utility for the initial owner. In another context, some users are better at maintaining a car than others. The second-hand market then reallocates the stock of assets from individuals with high maintenance costs to handymen with low costs, see Bond (1982). But again it is hard to see how individual car users would have a better service technology than the dealer specialised in the brand.
7. For heterogeneity between second-hand and new good supply, see Anderson and Ginsburgh (1989).

8. There exists an entire literature on the choice of durability by producers who always sell to the same consumers. Especially the effect of market structure on durability is analysed, for a survey see Schmalensee (1979).

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