# Recycling of Durable Goods: Modeling and Experiments

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This paper describes how durable goods can be recycled.

A producer of recyclable goods faces an optimal pricing problem that is considerably complicated and difficult to solve mathematically. In a recycling market, a producer must make a decision about price and durability. For example, the producer must set numerous parameters, among which are: new unit price, used unit price, recycled unit price, durability of new units, and durability of recycled units. The producer can not find a profit-maximizing price in such circumstances. Moreover, several optimal prices are derived through a combination of production costs and recycling costs.

We have produced a model in which a monopolist produces new units of a durable good and sells them at Price $P$, while collecting (purchasing) some of the used units it produced in the previous period at Price $Q$ to sell as recycled goods at Price $R$.

We derive the equilibrium in the recycling market of durable goods, and conduct experiments with human subjects. Those experiments demonstrated that subjects were unable to attain the equilibrium, but were able attain a near optimal solution.

Then we specifically examined not whether subjects attain the equilibrium, but how recycled goods are spread in the market. Results of those experiments engendered our conclusion that when both production cost and recycling cost are large, the recycled goods are not likely to be sold. Therefore, it is implied that the producer should assign priority to recycling-cost reduction.

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