

Supporting Secondary Markets

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Topic of Research

Ford, Chevy, Lexus, Honda, Hyundai, etc. encourage markets for their used cars (by certifying pre-owned vehicles or providing warranties for used cars). Similarly Apple allows I-Pod warranties to be transferred across owners. On the other hand, Universal Studios litigated against Redbox seeking to enforce the destruction rather than resale of used DVDs. Amazon and Barnes & Nobel prevent the resale of used books on the Kindle and Nook.



Research Question

Why do some firms support secondary (used goods) markets, while others shut them down?

Durable Goods

Firms may have an incentive to shut down used markets because they cannibalize new sales. For example everyone who purchased a used DVD from Redbox has little demand to buy that disk from Universal Studios.

This is balanced with two common reasons a firm might instead make an effort to ensure used markets operate smoothly:

1. In markets with adverse selection there is an incentive for the firm to restore used goods markets. Otherwise buyers will expect low resale values and adjust their willingness to pay for the new good downwards.
2. A well functioning used goods market allows the firm to practice price discrimination. Consumers with the highest valuation for quality purchase a new good, while the remaining consumers purchase a second-hand version.

This project formalizes a third reason that a firm may support secondary markets.

Imitation Goods

How should Apple react to knock-off versions of its iPod?



Model Intuition

Patent and copyright laws are imperfect, so that if one firm lags behind another it can directly copy a portion of the leader's technology. Thus while the lagging firm is catching up, it grows at a rate faster than the leader.

Assuming a duopoly, the younger firm initially produces a lower quality version but has the ability to imitate the leading firm's technology, during R&D, and **catch-up**. Durable goods depreciate and consumers are heterogeneous in their preference for quality; some consumers will always prefer the highest quality new good, but others will be roughly indifferent between the younger firm's new good or a used version of the leading firm's good. Therefore, the used good of the leader cannibalizes the lagging firm's sales more than the leader's.

Consequent Theory

There is an incentive for the leading firm to strategically support the secondary market for its good because it will take relatively more sales away from the younger firm. Fewer sales (less profit to put back into R&D) will slow down the lagging firm's catch-up process and postpone intense competition.

Model

R&D and Innovations¹

$\psi^L(x)$ The technological L leader improves its production technology with Poisson hazard rate x

$\psi^I(x+h)$ The Imitating firm catches up to the leader with hazard rate $x+h$

x represents the units of labor employed in R&D

h is a measure of the ease of imitation (ex: an imperfect enforcement of patent laws) or knowledge spillovers

Bellman Equation

$$V_t^L = \max_{x,s} \left\{ (\pi_t - x - s)dt + e^{-rdt} [V_{t+1}^L] \right\}$$

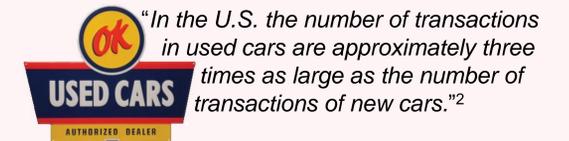
Where the leader's profit is a function of the quality of the imitating firm's good.

S represents the degree of support for secondary markets

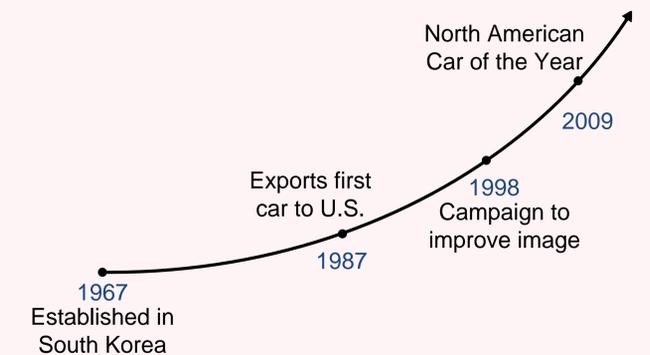
$s > 0$ if the leading firm extends warranty coverage to used goods

$s < 0$ if the leading firm practices planned obsolescence

The leader maximizes its expected lifetime profits discounted at rate r by optimally choosing investment into research and development and its degree of support for secondary markets.



Hyundai Motors: A Catch-up Story



Anecdotal evidence shows that Hyundai Motors was initially perceived to be of low quality, for instance the Late Show with David Letterman joked that one of the *Top 10* best pranks to play in space is to paste a Hyundai logo on the main control panel of the spaceship. Others joked that Hyundai stood for "Hope you understand nothing's drivable and inexpensive". However by 2009 the Hyundai Genesis was voted to be the North American Car of the Year.

Conclusion and Implications

The catch-up process is ongoing; now that Hyundai is on par with Ford, both companies face future competition from low-cost automakers such as Tata Motors of India. These

results are applicable to any durable good, in fact a similar process may have been followed as Samsung Electronics overtook Sony in 2004³.

The 2009 "Cash-for-Clunkers" program carried a \$3 billion price tag⁴ and had the effect of shifting demand away from used cars towards new cars. Policymakers must consider such a program's interaction with the strategic incentives of automakers.

The environmental impacts of increased support for secondary markets are indeterminate. Less extraction of natural resources for new production can be beneficial. However if innovation is rapid new products may operate more efficiently, as is the case for *Energy Star* certified durables.

Model Results

When the ease of imitation, h , is sufficiently high and consumers vary in their taste for quality:

$$(V^L \text{ for } s > 0) \geq (V^L \text{ for } s = 0) \geq (V^L \text{ for } s < 0)$$

The leading firm optimally supports the secondary market regardless of whether adverse selection exists or price discrimination is possible.