Switching costs and network effects in competition policy

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Levin on Internet markets

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But what do we know about the relationship between switching costs and network effects?
Three themes

How do switching cost models and network models differ?

What are the consequences of heterogeneity of consumers in dynamic models of both types?

How do switching cost and network effects mix?

No two sidedness!
Three themes

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How do we model inertia in networks?
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No two sidedness!
The simplest possible models

- Main assumptions:
  - One incumbent;
  - Free entry;
  - No discrimination.

\[ \text{Switching cost} = \text{price} = \sigma. \]

\[ \text{Efficient Network effects} = \text{price} = \nu. \]

\[ \text{Efficient.} \]
The simplest possible models

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Efficient
The simplest possible models

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- **Switching cost**

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- **Efficient**

- **Network effects**

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- **Efficient.**
Modeling coordination failures in network effects
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- Our solution: strong non-coordination.
Efficiency issues revisited

Assume that the entrants offer (stand-alone) utility $W + \varepsilon$.

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Note that we can have inefficiency without discrimination.
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Elementary repeated games with homogenous consumers

\[ p = (\delta \sigma + \sigma) + \delta \sigma = \sigma. \]
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\[ p = (-\delta \sigma + \sigma) + \delta \sigma = \sigma. \]

\[ p = (-\delta \nu + \nu) + \delta \nu = \nu. \]
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You do not become rich on switching costs (or network effects) alone.
Heterogeneity of consumers: static model

Some consumers with switching costs equal to zero (or with no value for network effect).

\[
\text{price} = \sigma; \\
\text{profit} = \alpha\sigma.
\]

Remark: With heterogeneous consumers a no-discrimination rule can be costly in terms of social welfare.
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Dynamics with heterogeneous consumers
With an $\infty$ horizon, the profit is not equal to the one period profit, $\alpha\sigma$.

\[
\Pi = \alpha(-\delta\Pi + \sigma) + \delta\Pi
\]

\[
\implies \Pi = \frac{\alpha\sigma}{1 + \alpha\delta - \delta}.
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Profit is smaller than discounted flow of one period profit.
With an $\infty$ horizon, the profit is not equal to the one period profit, $\alpha \sigma$.

$$\Pi = \alpha (-\delta \Pi + \sigma) + \delta \Pi$$

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\Pi = \alpha (-\delta \Pi + \sigma) + \delta \Pi \\
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When \( \delta \to 1 \), \( \Pi \to \sigma \).
With an \( \infty \) horizon, the profit is not equal to the one period profit, \( \alpha \sigma \).

\[ \Pi = \alpha (\sigma - \delta \Pi) + \delta \Pi \Rightarrow \Pi = \frac{\alpha \sigma}{1 + \alpha \delta - \delta}. \]

Same results hold with network effects.
\( \sigma_L > 0 \)

is different from

\( \nu_L > 0 \).
Two periods: $\sigma_L > 0$ and $\alpha \sigma_H > \sigma_L$ 

In 1st period,
1. incumbent charges $(1 - \alpha \delta)\sigma_H$ (this requires some work);
2. entrants charge $-\delta \sigma_L$. 
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\[
(\delta \sigma_L - \sigma_H) + \delta \sigma_L = \sigma_H \\
< (1 - \alpha \delta) \sigma_H + \delta \sigma_H = (1 + \delta - \alpha \delta) \sigma_H
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$$(-\delta \sigma_L + \sigma_H) + \delta \sigma_L = \sigma_H$$
$$< (1 - \alpha \delta)\sigma_H + \delta \sigma_H = (1 + \delta - \alpha \delta)\sigma_H$$
$$< (-\delta \sigma_L + \sigma_H) + \delta \sigma_H = (1 + \delta)\sigma_H - \delta \sigma_L,$$
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a proportion strictly between 0 and 1 of \( \sigma_H \) consumers will purchase from an entrant.
Two periods: \( \sigma_L > 0 \) and \( \alpha \sigma_H > \sigma_L \)

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  2. entrants charge \(-\delta \sigma_L\).

- Because

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( -\delta \sigma_L + \sigma_H ) + \delta \sigma_H = (1 + \delta) \sigma_H - \delta \sigma_L,
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Because

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(-\delta \sigma_L) < (1 - \alpha \delta) \sigma_H + \delta \sigma_H = (1 + \delta - \alpha \delta) \sigma_H
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Network effects
+
switching costs
In static model with only network effects, incumbent charges $\nu$; 

In static model with only switching costs, incumbent charges $\sigma$. 

$\sigma$ and $\nu$ — static
In static model with only network effects, incumbent charges $\nu$;
In static model with only switching costs, incumbent charges $\sigma$.
Focal equilibrium with both effects: incumbent charges $\sigma + \nu$.
Profits are the sum of the profits in the pure network model and in the pure switching cost model.
1/2 consumers have switching cost 0 and 1/2 switching cost \( \sigma \). Assume also \( \sigma < \nu \).
1/2 consumers have switching cost 0 and 1/2 switching cost $\sigma$. Assume also

$$\sigma < \nu.$$ 

With both effects present, if the incumbent charges $\nu + \varepsilon$, the 0 switching cost customers switch.

Then, the $\sigma$ switching cost customers will also switch.
1/2 consumers have switching cost 0 and 1/2 switching cost $\sigma$. Assume also

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The focal equilibrium has the incumbent charge $\nu$.

*Additivity disappears.*
An illustrative story
"Some have argued that once a consumer purchases a body of music from one of the proprietary music stores, they are forever locked into only using music players from that one company."
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...On average, that’s 22 songs purchased from the iTunes store for each iPod ever sold.
On average, that’s 22 songs purchased from the iTunes store for each iPod ever sold. Today’s most popular iPod holds 1000 songs, and research tells us that the average iPod is nearly full. This means that only 22 out of 1000 songs, or under 3% of the music on the average iPod, is purchased from the iTunes store and protected with a DRM.
On average, that’s 22 songs purchased from the iTunes store for each iPod ever sold. Today’s most popular iPod holds 1000 songs, and research tells us that the average iPod is nearly full. This means that only 22 out of 1000 songs, or under 3% of the music on the average iPod, is purchased from the iTunes store and protected with a DRM. It’s hard to believe that just 3% of the music on the average iPod is enough to lock users into buying only iPods in the future."
“Many iPod owners have never bought anything from the iTunes Store. Some have bought hundreds of songs. Some have bought thousands. At the 2004 Macworld Expo, Steve revealed that one customer had bought $29,500 worth of music.
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If you’ve only bought 10 songs, the lock-in is obviously not very strong. However, if you’ve bought 100 songs ($99), 10 TV-shows ($19.90) and 5 movies ($49.95), you’ll think twice about upgrading to a non-Apple portable player or set-top box.”
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Conclusions

- Distribution of switching costs/network effects is important.
- Even consumers to which the incumbent/dominant firm does not sell can influence the outcome.
- There are still many things we do not understand at the fundamental theoretical level about the dynamics of markets with switching costs and/or network effects.
- Identifying anti-competitive behavior requires close attention to the specific of the case.