The Control of Porting in Platform Markets

Rufus Pollock

University of Cambridge

EARIE 2008, 9th September 2008

Microsoft and its (Many) Antitrust Actions

The Browser ‘Wars’

The Control of Porting

- Perfect example of 'platform' market with two-sides:
  - Platform: Operating system
  - One side ('software/services'): Applications
  - Other side (consumers): Want to use the 'software'
- Rents from feedback loop between consumers and applications (indirect network effects)
- Porting: conversion of 'software' from one platform to another (multihoming of software)
- Porting easy $\Rightarrow$ easy for consumer to switch $\Rightarrow$ lower rents

The Danger of Browsers

A cross-platform browser

$\Rightarrow$

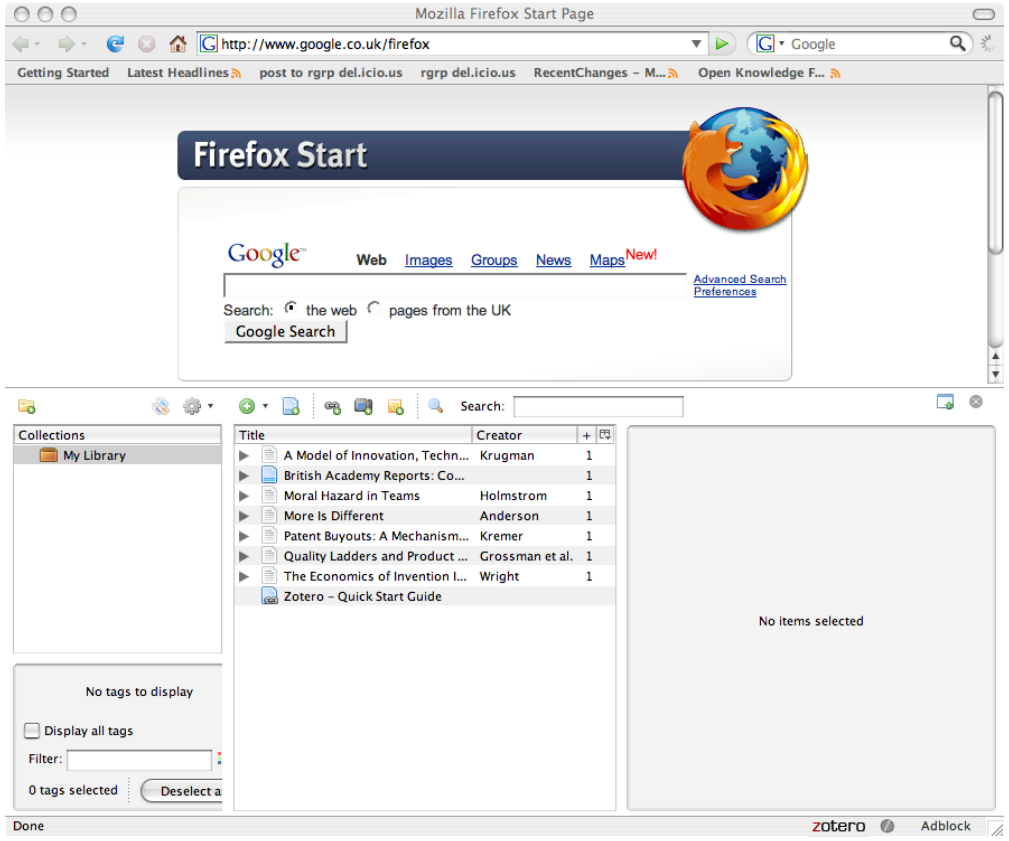
browser applications (e.g. websites) can be ported at zero cost

A new competitor 'born' on the Internet is Netscape. ... They are pursuing a multi-platform strategy where they *move the key API into the client to commoditize the underlying operating system* ...

– Bill Gates in the internal 'Internet Tidal Wave' Memorandum (1995)

Bill Gates' Fears are Being Realized

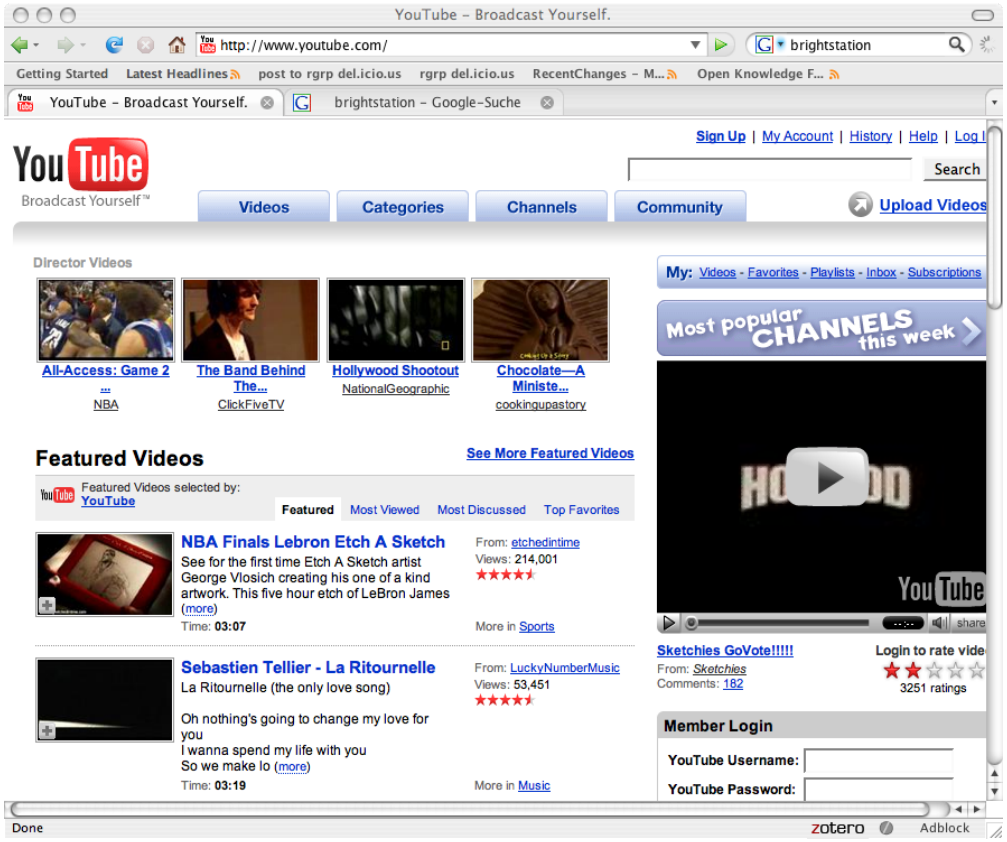
Search Engines, Web Mail, e-commerce, in-browser apps ...



eBay and MercExchange

If Other Sites Can ‘Import’ Auction Information ...

YouTube



Why Is It So Hard to Download?

What Do We Take From These Examples?

- Many examples of platform markets, especially online
- Platform owners: maximize their amount of ‘software’
- ... and minimize the amount on other platforms
- Specifically: want to prevent ‘software’ from being ported to another platform (want to ‘tie’ ‘software’)

The Impact of Porting

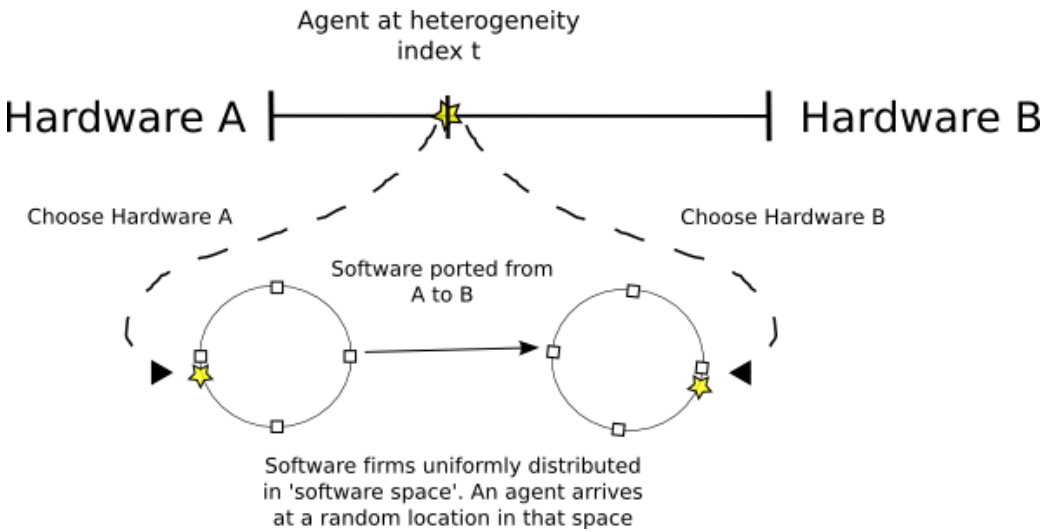
- Develop platform market model incorporating porting
- Look at a dominant firm who can (partially) control porting
- How important is control of porting for a dominant firm?
  - If important $\Rightarrow$ another reason to tie
- What is impact on welfare of its actions?
- How does impact of pricing compare to that of porting?

Relation to the Literature

- Tying and Vertical Foreclosure (Whinston, 1990, 2001, Gilbert and Riordan 2007, Carlton and Waldman 2002)
- Indirect Network Effects (Church and Gandal 1992, Church et al. 2003)
- Converters (Farrell and Katz 1992)
- Two-Sided Market Models: Rochet and Tirole (JEEA 2003, RJE 2006), Armstrong (RJE 2006)
- Tying and two-sided markets: Armstrong and Wright (2005) Choi 2006 (tying from outside monopolist)

The Model

Agents and Innovations



- Two platforms/networks A/B.
- Hotelling line of users indexed by $t \in [0, 1]$
- n_X = no. users on X (market share of X)
- 2 types of product provided for each platform/network:
- 'Hardware/Platform' (platform itself)
- 'Software/Services'
- Consumers must buy 'hardware' to use 'software'
- No multi-homing: consumers buy from only 1 platform
- Software produced directly or ported at (fixed) cost: f_X, f_p

Consumer's Utility on Network X

$$u_X = \phi - \underbrace{p_X}_{\text{Hardware price}} - \underbrace{h_X(t)}_{\text{Hardware Heterogeneity}} + \underbrace{u_X^s(s_X, p_X^s)}_{\text{Utility from Software}}$$

Imperfect competition in software (diff. products) $\Rightarrow$

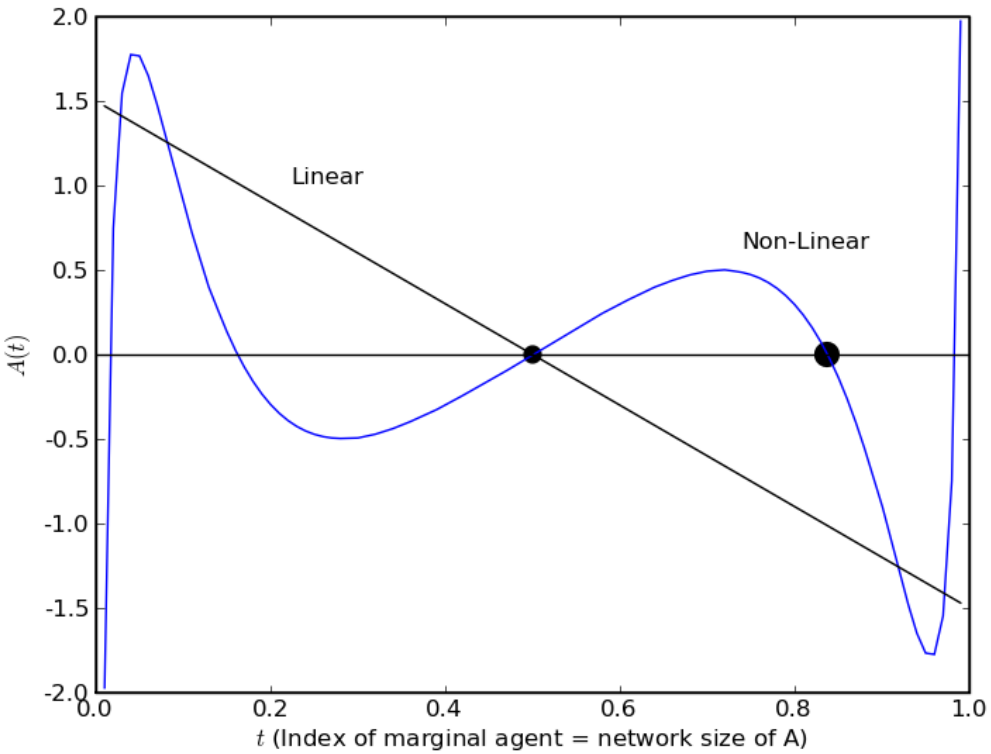
'indirect network effects' $u_X^s = \nu(n_X, f_X)$

$$u_X = \phi - p_X - h_X(t) + \nu(n_X, f_X)$$

Hardware Market and Porting

- Platform A controlled by monopolist M
  - M sets an access price p_A to consumers
  - Software on A has exogenous fixed cost f_A
- Platform B is competitively provided
  - Price normalized to 0
  - Software on B all ported from A: $f_B = f^p$
- Monopolist can control cost of porting from its platform
  - Requires costly effort $e = e(f^p), e' > 0, e'' > 0$
- NB: Paper endogenizes porting behaviour

Solving



- Standard 'network' effects model (once M has chosen p_A, f^p)
- Solve for equilibrium as fn of p_A, f^p in normal way using 'advantage function'
- $A(t) = U_A(t) - U_B(t)$
- $A(t) = \nu_A(t) - \nu_B(t) - (h_A(t) - h_B(t))$
- However use general heterogeneity and network effects $\Rightarrow$
- More complex than usual + no closed form solution
- Using simple linear forms not acceptable here ...
- Limit equilibrium configurations + not 'innocent' for welfare

Welfare

General Results

- Very weak assumptions on heterogeneity and 'network' effects
- $\Rightarrow$ no closed form solution for equil prices, porting cost etc
- $\Rightarrow$ can not make quantitative comparisons in general
- HOWEVER: can sign of welfare effects in neighbourhood of an equilibrium

Sources of Welfare Effects

- Price impact:
  - Direct: -ve (for consumers) higher prices (no d/w losses though)
  - Indirect: ? higher prices $\Rightarrow$ A's platform shrinks, B's grows $\Rightarrow$ welfare impact due to network effects (i.e. changed software amount)
- Porting cost impact:
  - Direct: -ve less software for platform B
  - Indirect: ? A's platform grows, B's shrinks

General Results

- What is welfare impact of increasing A's market share?
- Network effects curvature is crucial
  - Curvature = Level of diminishing returns
  - Value of 100th/1000th/1M new user to existing users
  - Low curvature (e.g. linear): +ve impact (standardization good)
  - High curvature: -ve impact (symmetry good)
  - Dividing line is natural log: $\nu(n_X) = ln(n_X)$
    - Common linearity assumption is not innocent

General Welfare Impacts

	Low Curvature	High Curvature
Direct Impact of Higher Price	-	-
Indirect Impact of Higher Price	-	+
Overall Impact of Higher Price	-	?
Direct Impact of Higher Porting Cost	-	-
Indirect Impact of Higher Porting Cost	+	-
Overall Impact of Higher Porting Cost	?	-

Table: Welfare Impact of Higher Price and Higher Porting Cost

Numerical Example

	Porting Cost	Price of A Hardware	A's market share	Net Profits for M	Consumer Welfare	Total Welfare
No Monopoly	1.0	0	75%	0	0.0	0.0
M controls price but not porting cost	1.0	0.079	70%	0.056	-0.046	0.010
M controls both	1.419	0.43	72%	0.252	-0.406	-0.154
%tage change with control of porting	41%	440%	3%	350%	-780%	-

Table: Using indirect network effects from circular city model of software production: $\nu(n, f) = -\sqrt{\frac{f}{n}}$ (NB: high curvature). Heterogeneity and monopolist effort functions chosen to given a stable asymmetric equilibrium with A dominant (situation in all antitrust/competition cases).

Numerical Example

	Porting Cost	Price of A Hardware	A's market share	Net Profits for M	Consumer Welfare	Total Welfare
No Monopoly	1.0	0	75%	0	0.0	0.0
M controls price but not porting cost	1.0	0.079	70%	0.056	-0.046	0.010
M controls both	1.419	0.43	72%	0.252	-0.406	-0.154
%tage change with control of porting	41%	440%	3%	350%	-780%	-

Table: Using indirect network effects from circular city model of software production: $\nu(n, f) = -\sqrt{\frac{f}{n}}$ (NB: high curvature). Heterogeneity and monopolist effort functions chosen to given a stable asymmetric equilibrium with A dominant (situation in all antitrust/competition cases).

Numerical Example

	Porting Cost	Price of A Hardware	A's market share	Net Profits for M	Consumer Welfare	Total Welfare
No Monopoly	1.0	0	75%	0	0.0	0.0
M controls price but not porting cost	1.0	0.079	70%	0.056	-0.046	0.010
M controls both	1.419	0.43	72%	0.252	-0.406	-0.154
%tage change with control of porting	41%	440%	3%	350%	-780%	-

Table: Using indirect network effects from circular city model of software production: $\nu(n, f) = -\sqrt{\frac{f}{n}}$ (NB: high curvature). Heterogeneity and monopolist effort functions chosen to given a stable asymmetric equilibrium with A dominant (situation in all antitrust/competition cases).

Concluding Remarks

Summary of Results

- A model of platform markets incorporating ‘porting’
- Porting interacts with pricing and network ‘effects’
- New reason to tie: control porting (directly and indirectly)
- Welfare effects depend on degree of diminishing returns to network size
  - High diminishing returns: control of porting bad
  - Low diminishing returns: control of porting ambiguous
  - Impact of porting+price can be large compared to price alone

Policy

- Model relevant wherever the control of porting is possible
  - OSes (Microsoft/Linux), Auction Platforms (eBay), Video Sharing (YouTube), Music Platforms (Windows/Real/...)
- Showed when control of porting can be good/bad
- Bad: policy-makers should aim to reduce control of porting
  - Encourage use of open standards to make porting easier
  - Take account of porting issues when evaluating 'tying'
- Innovation is unlikely to be porting neutral