Discussion of:
The Law and Economics of Reverse Engineering

Xavier Vives
INSEAD
xavier.vives@insead.edu
http://faculty.insead.edu/vives
Summary

- Reverse engineering is the process of extracting know-how/knowledge from a human-made artifact
- Traditional manufacturing:
  - RE to make directly competing stand-alone product
  - Legal rule: RE is OK makes sense because RE is costly/time consuming
    (if RE too cheap/easy, like with plug-molding of boat hulls, it should be restricted)
Information-based industries

• Rules restricting RE adopted or proposed:
  _ Digital content is in the surface of the product
  _ Technical protections raise cost of RE
  _ Examples:
    • Semiconductor chip (SCPA, 1984)
    • Software industry: can decompile program code for interoperability reasons
    • Technically protected digital content

• Challenge:
  _ Design rules to balance incentives to innovate of incumbent and entrants
  _ Goal of intellectual property law: protect incentives to innovate
RE of software and the law

• Software distributed in object code form
• RE permits obtaining approximation to original source code
• From this information can develop interoperable program
  (very difficult to develop competing non-identical program)

• Questions:
  _ Do copies of programs made in the decompilation process infringe copyright/trade secrecy law?
  _ Can contractual restrictions in software licenses prevent RE?
Legal debate

• Intellectual property law: can decompile & disassemble program code, particularly for interoperability reasons
  _ European Directive (1991): for interoperability reasons

• Enforceability of contractual restrictions is contentious:
  _ Conflicting US caselaw
  _ EU Directive: anti-decompilation clauses in software contracts null and void

• Samuelson and Scotchmer:
  _ RE for interoperability should be allowed
    (on balance more beneficial than harmful effects)
The Economics of RE in the software industry

- System: platform (A) + applications(B) with interface to achieve interoperability
- Application Programming Interfaces (APIs):
  - To make a program interoperate with a platform need precise details about how platform sends and receive information
- Strategy: Open or closed interface?
  - IBM, Apple
  - MS in OS: de facto standard with “embrace and extend” (integrating applications in Windows, bundling, control of APIs)
  - Game systems: serial monopolies
RE in the software industry

• RE in software industry involves entry at applications level rather than development of competing platform
• RE turns closed interface into open interface at a cost
• Erodes commitment of incumbent to closed system/tying/technical bundling
• Can think of degree of RE has choosing a point between closed and open systems
Tying and bundling

• Bundling:
  _ Pure (credible with technical integration)
  _ Mixed: bundle offered at a discount from components

• Private incentives: bundling as
  _ Generating efficiencies
  _ Accommodating strategy
    • Facilitating practice
    • Price discrimination
  _ Exclusionary strategy
    • Vertical foreclosure
    • Leveraging market power
Tying: welfare analysis

• Short-run:
  - Decrease in prices: +
  - Decrease in variety (because mix and match not possible): typically _
  - Price discrimination: + or _

• Dynamic
  - Efficiencies of product integration for consumers, lowering costs: +
  - Exclusion of rivals (via pricing and/or innovation): typically _
  - Decrease (increase) innov. of rivals (tying firm): + or _

• Rule of thumb:
  - Efficiencies presumed if there is no exclusion of rivals
Tying and innovation

• Tying decreases (increases) innovation of rivals (tying firm)
  _ Tying makes successful entry prospects in complementary components markets A and B more uncertain and discourages investment by entrants because they have to succeed in both markets
    (Carlton-Waldman (2000), Choi-Stefanidis (2001))
  _ Incumbent when innovating in B (applications) internalizes profit generated for segment A (platform)

• Welfare analysis ambiguous: what matters is aggregate incentive for R&D
RE and innovation

• RE will
  _ increase rivals’ R&D in platform A and applications B (easier to enter)
  _ decrease incentives of incumbent in A and B

• Suppose closed interface yields too little aggregate R&D incentive in B and too much in A

• Can RE fine-tune incentives?

• Strike a balance between encouraging entrants’ R&D in B without killing incentive of incumbent in A
Prices

• Systems:
  _ Closed interface (incompatible and integrated systems)
  _ Open interfaces (compatible and unintegrated)

• Prices are lower with closed interface, because of "Cournot internalization effect" of bundling, but typically welfare also, because of no mix and match with heterogeneous preferences (Nalebuff 2000, Chiovenau (2002))

• Entry deterrence/ exclusion
  _ If incumbent bundles rivals have no incentive to bundle with inelastic demand (Nalebuff (2000)) but they do with elastic demand (Chiovenau (2002))
<table>
<thead>
<tr>
<th>Social Welfare Criterion</th>
<th>RE legal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Incentives to develop platform</td>
<td>lower for incumbent</td>
</tr>
<tr>
<td></td>
<td>Aggregate?</td>
</tr>
<tr>
<td></td>
<td>higher for entrants</td>
</tr>
<tr>
<td>Incentives to develop applications</td>
<td>lower for incumbent</td>
</tr>
<tr>
<td></td>
<td>Aggregate?</td>
</tr>
<tr>
<td></td>
<td>higher for entrants</td>
</tr>
<tr>
<td>System Price</td>
<td></td>
</tr>
<tr>
<td>Short run</td>
<td>higher</td>
</tr>
<tr>
<td>Long run (tipping)</td>
<td>lower</td>
</tr>
<tr>
<td>Duplicated costs</td>
<td>lower ?</td>
</tr>
</tbody>
</table>
Evaluation

• Samuelson and Scotchmer:
  _ Rule (can decompile & disassembly program code for interoperability reasons) is economically sound because it promotes development of a wider range of software

• Questions:
  _ Does it strike the right balance between encouraging entrants’ R&D without killing incentive of incumbent?
  _ Does it make exclusionary strategies more difficult?

• Answer: probably yes as long as it is fine tuned appropriately and put in the context of the other policy levers