Comments on Innovation, Network Externalities, Intellectual Property Right

(1) Monopoly caused by Network Externalities
(2) Optimum Protection of Intellectual Property Right

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Network Externalities: Problems

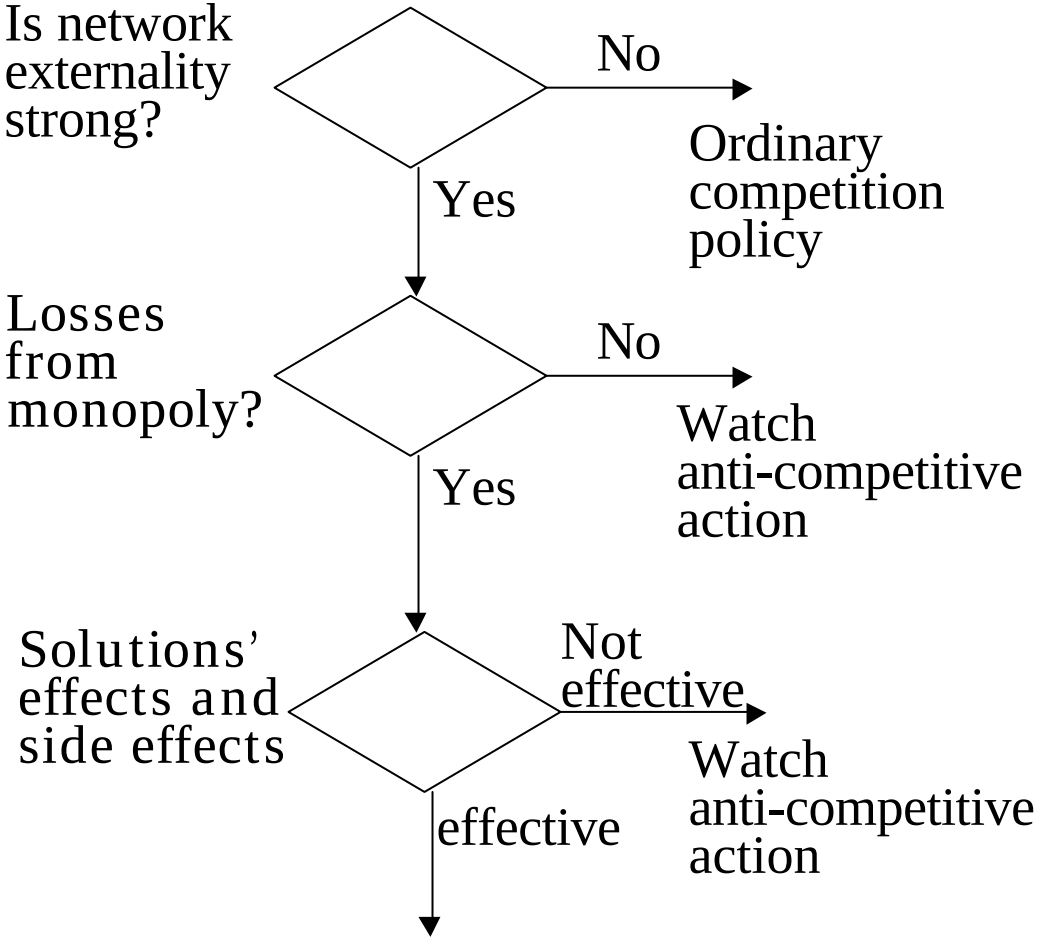
Prof. Bressnahan and Prof. Goto: Microsoft OS has monopoly power based on network externality, and use it as a leverage to drive out the competitor, Netscape, from the browser market. This fact will harm innovation incentives of challengers.

→ Agree. But problems are in the next step

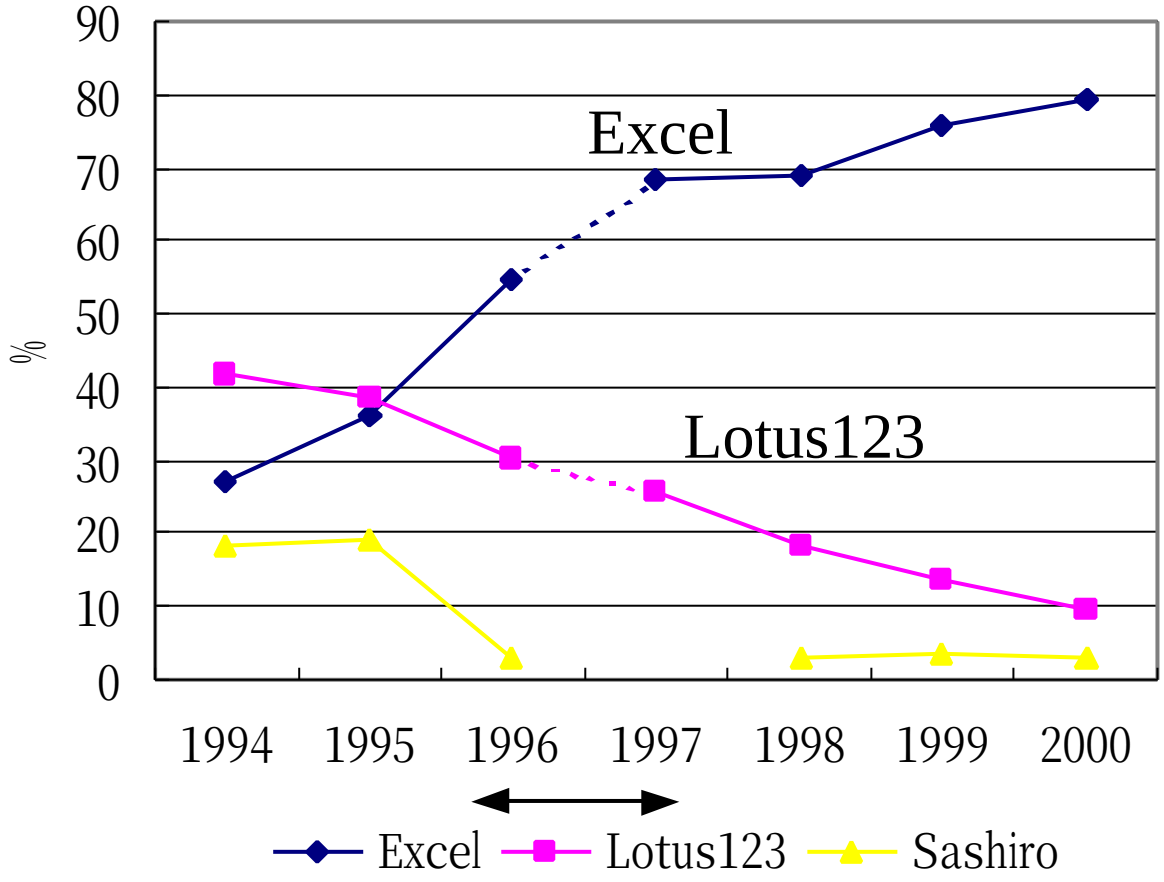
- Solution:Prohibiting anti-competitive actions is not sufficient solution, because the browser also has network externalities.
  - Even if MS stops all anti-competitive actions *now*, the dominance of IE will not erode, because compatibility among browsers is incomplete.
  - Example: Word and Excel.
  - Problem is not actions, but monopoly itself caused by network externalities.
- Counter argument: "Innovation can/will defeat the monopoly". (R. Schmalensee)
  - Defendants for MS argue that the innovation could defeat MS. See history of spreadsheet: Visiculc → Multiplan → Lotus123 → Excel
  - We should estimate and compare the effect of innovation and network externalities. Question:which is larger, innovation or network externalities?

An approach to this issue

- Start: High and stable share or profit. Strategic(predatory) pricing.
- Step 1: Estimate network externality
  - Compare the effect of network externality with functional changes by innovations.
- Step 2: Evaluate losses from monopoly
  - Price: Does price decrease continuously?
  - Innovations: Does the speed of innovation get slower?
- Step3: Consider solutions' cost and benefits
  - Make interface open
  - Disintegrate the firm and product



Step 0: Market share of spreadsheet in Japan



Excel's share increased to reach 80%.
Its dominant share has been stable since 1997.

Note that Excel's share beat lotus's share in 1996

Step1: Estimate network externalities and innovation effects

Tentative Results

dependent variable: natural log of retail price

Variables	Coeff.	t-stat
Intercept	8.937867	13.8923
Share	0.017178	1.914577
Academic	-0.72022	-3.5874
Upgrade	-0.47842	-2.71379
Function1	0.313891	1.300195
Function2	0.266078	0.533042
Function3	-0.02207	-0.08281
D_99	-0.1538	-0.55657
D_00	-0.23122	-0.77554
D_01	-0.28539	-0.93733
D_02	-0.44826	-1.37464
n	39	
R2	0.605	
Adjusted R2	0.464	

Source of retail price is POS data from GFK
Method of estimation: OLS

Share is significant at 10% level

1% point share increase raises the price by 1.7%. So, 70% difference of the share generates 120% difference of the price

Functions are not significant.

It is difficult to overcome the network externalities by new functions

Step1(cont.) Comparison with Brynjolfsson's result

Brynjofsson and Kemerer(1996)

dependent v. natural log of retail price

Variables	Coeff.	t-stat
Intercept	4.87	32.66
Share	0.0075	2.64
Embedcht	0.45	3.37
LAN_comn	0.45	3.64
Sort_col	0.33	2.50
WYSWYG	0.44	3.67

other variables are omitted

Coefficient is small.
1% share increase raises the price by 0.75%.
50% difference of the share generates 37.5% difference of the price.

Functions are significant and have almost the same amount effect on price as share

Why?

Network externality becomes strong.

(1)File exchange is common because of the penetration of Internet

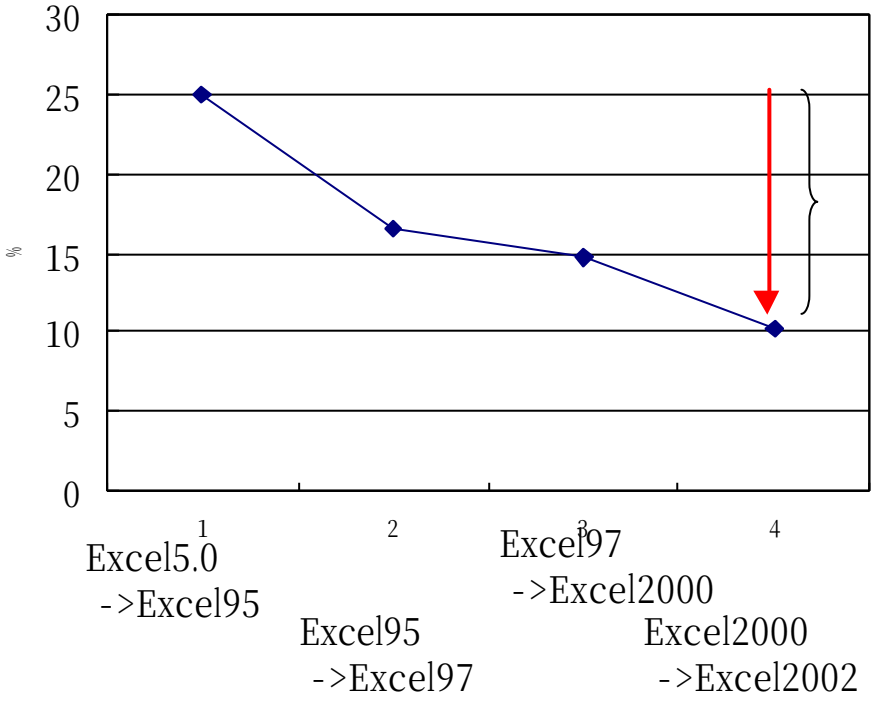
(2)Increase of (non expert) users

Functional innovations can overcome network externality

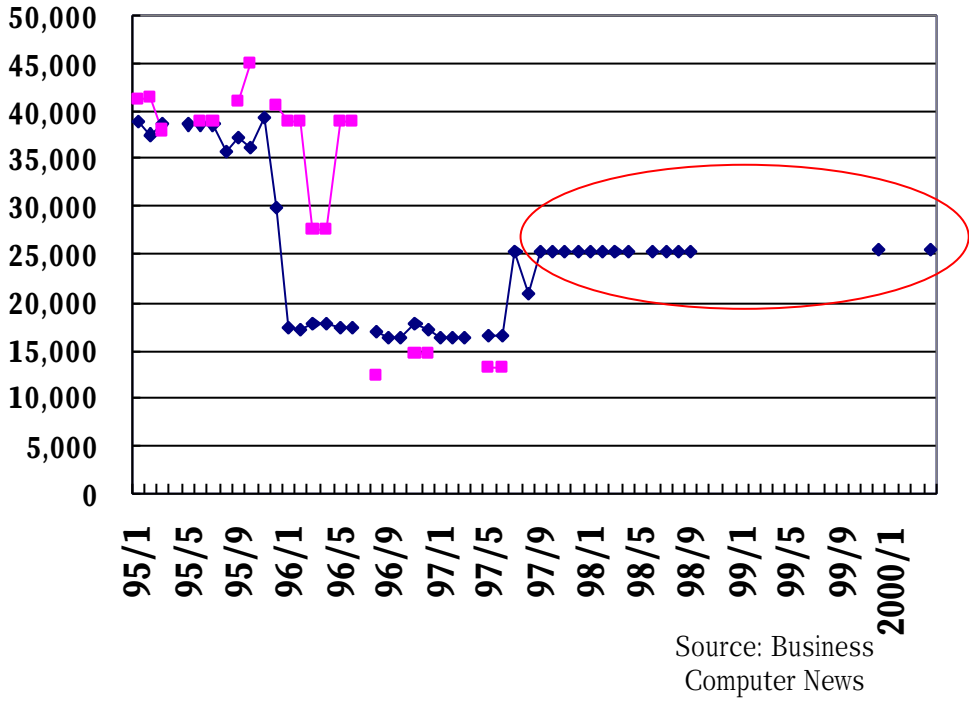
Step2: Losses of Monopoly

Questionnaire on innovations

Evaluate the benefit
of new version of Excel



Price:



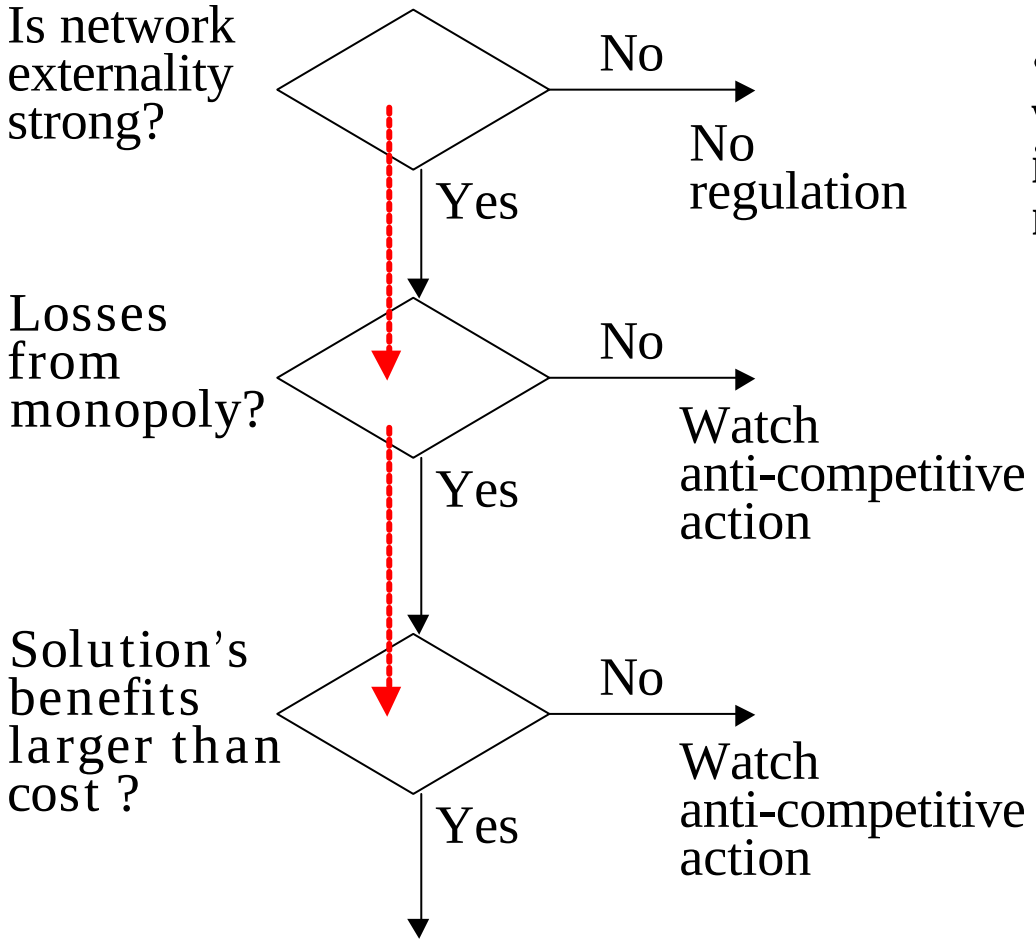
Quality improvement becomes small.

(1) Because of monopoly

(2) Because innovation reaches mature stage.

Price reduction stopped after Excel established its dominant share.

Tentative conclusion of spreadsheet



•Step1 : Network externalities work strongly. Functional innovations can't overcome the network externalities.

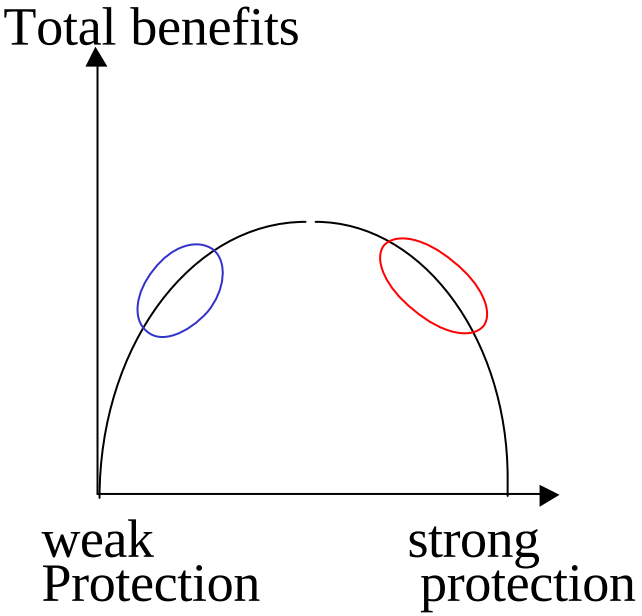
Step2 : Losses of Monopoly seem to exist.

Step3 : not examined yet

Intellectual property right : Problem

Prof Bresnahan and Prof Goto: Optimal protection of intellectual property right should be determined from the economic point of view, not legal point of view. Optimal level depends on the comparison between the incentive for innovation (appropriablity) and the benefit of sharing.

Agree. But problem is in the next step



- How do we know the optimum level?
  - Example-1: Casual copying of music CD. Recording Associates argue that casual copying reduces income and incentive of creators. Should we strengthen the IPR?
  - Example-2: Making the Interface open in the Microsoft case. Defendants of MS argue that such a solution discourages the incentive of developing the interface.

Example-1: casual copy

Reasoning of CCCD(Copy Controlled CD)

Benefit of casual copying < loss of incentive damage (=sales reduction)

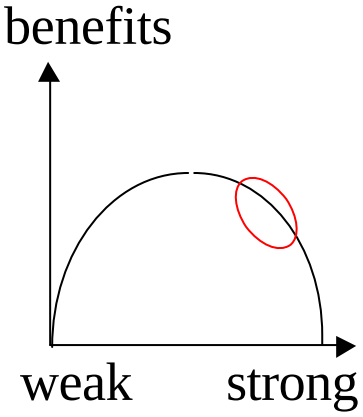
If the casual copy reduces the sale, sales of CCCD should increase because the casual copy is blocked.

However, sales of CCCD decreased or was not affected.

→No incentive damage

dependent variable ln(sale), period 2001:March-2003:Augus

	Single		Album	
	Coefficien	t-statistic	Coefficien	t-statistic
C	10.484	166.10	11.031	192.83
CCCD	-0.275	-2.73	0.014	0.09
FIRST	-0.147	-1.22	-0.234	-1.59
ENKA	-0.749	-4.88	0.034	0.24
RW	0.528	6.99	0.903	8.17
TIEUP	0.378	5.09		
R2	0.111		0.084	
Adjusted F	0.106		0.079	



CCCD: dummy 1 for Copy Controlled CD
first: dummy 1 for the special pack of the first release version
enka: dummy 1 for "enka" genre
RW: dummy 1 if the singer has been enlisted in the end-year song festival
TieUp: dummy 1 if the song is used in other contents such as TV drama or CM

Example-2: Opening the interface

- Questionnaire Survey to entrepreneurs
  - Q: How much return is sufficient incentive to your project?
  - Q: Let us assume that government introduces new rule that set an upper limit to the revenue from the intellectual property right. Do you exit from the entrepreneur activities?
  - Q: Let us assume that Windows' API became the public goods and MS lost most of its revenue. Do you, as an entrepreneur, feel you are discouraged because of government take away you would make your technologies standard

Summary

- Network Externalities and Intellectual Property Rights bring the new problems to competition policy.
- Empirical analysis is necessary to answer to these problems
  - Is the effect of network externalities larger than innovation?
  - Where is the optimum protection level of IPR?
- Not legal issue, rather economic issue (empirical question)
- If there is sufficient funds and human resource, we can do such an empirical research.

I expect this research center will do it

Thank you.

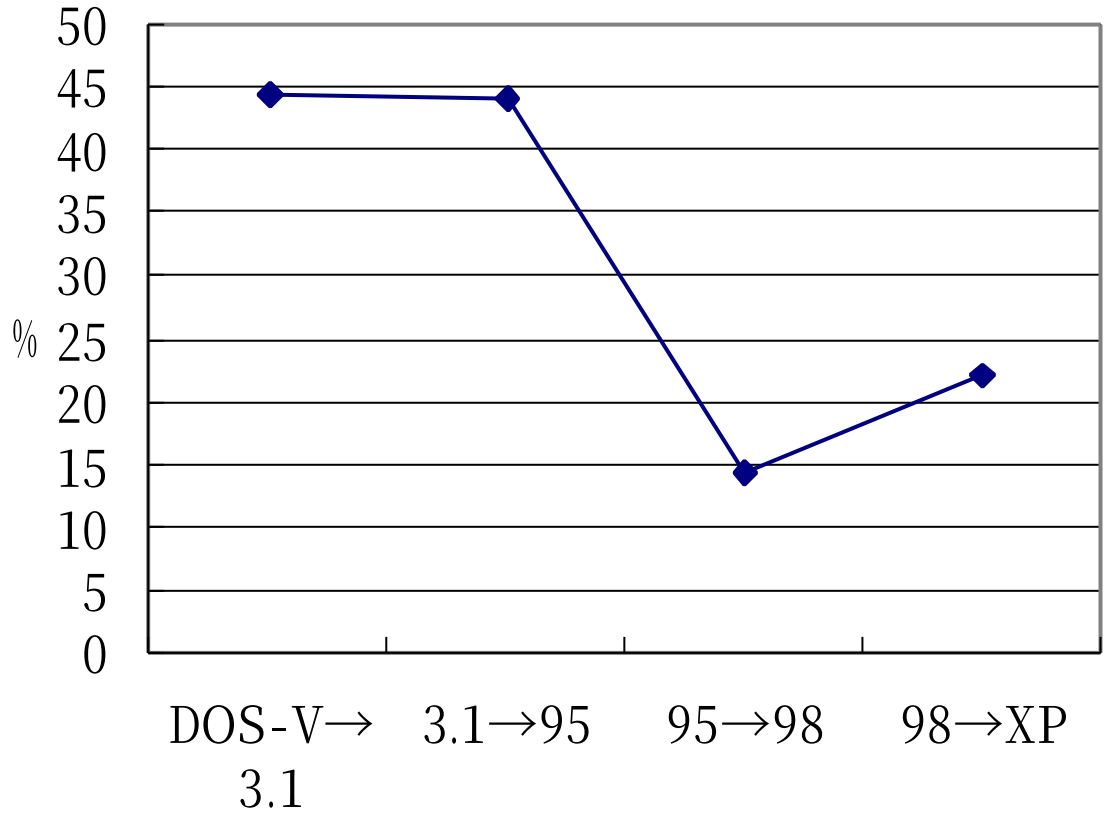
Competition policy in general

	No innovation	Innovation
No network externality No scale economy	Traditional (Anti-trust law)	IPR (patent system)
Network externality Scale economy	Natural monopoly (Regulatory laws)	IT industries (unknown)

- If innovation is large enough to overcome the monopoly based on network externalities, we don't need regulation.
- If network externality is large enough to overcome the innovation, we need some kind of solutions(regulation?). But we don't know good solution yet.
- Unfortunately anti-trust law handles only the traditional case.

Questionnaire survey on improvement of OS

How much percentage gain of benefit do you see in the new version OS compared with the old one?



Questionnaire survey of software

*Destinations of the Questionnaire

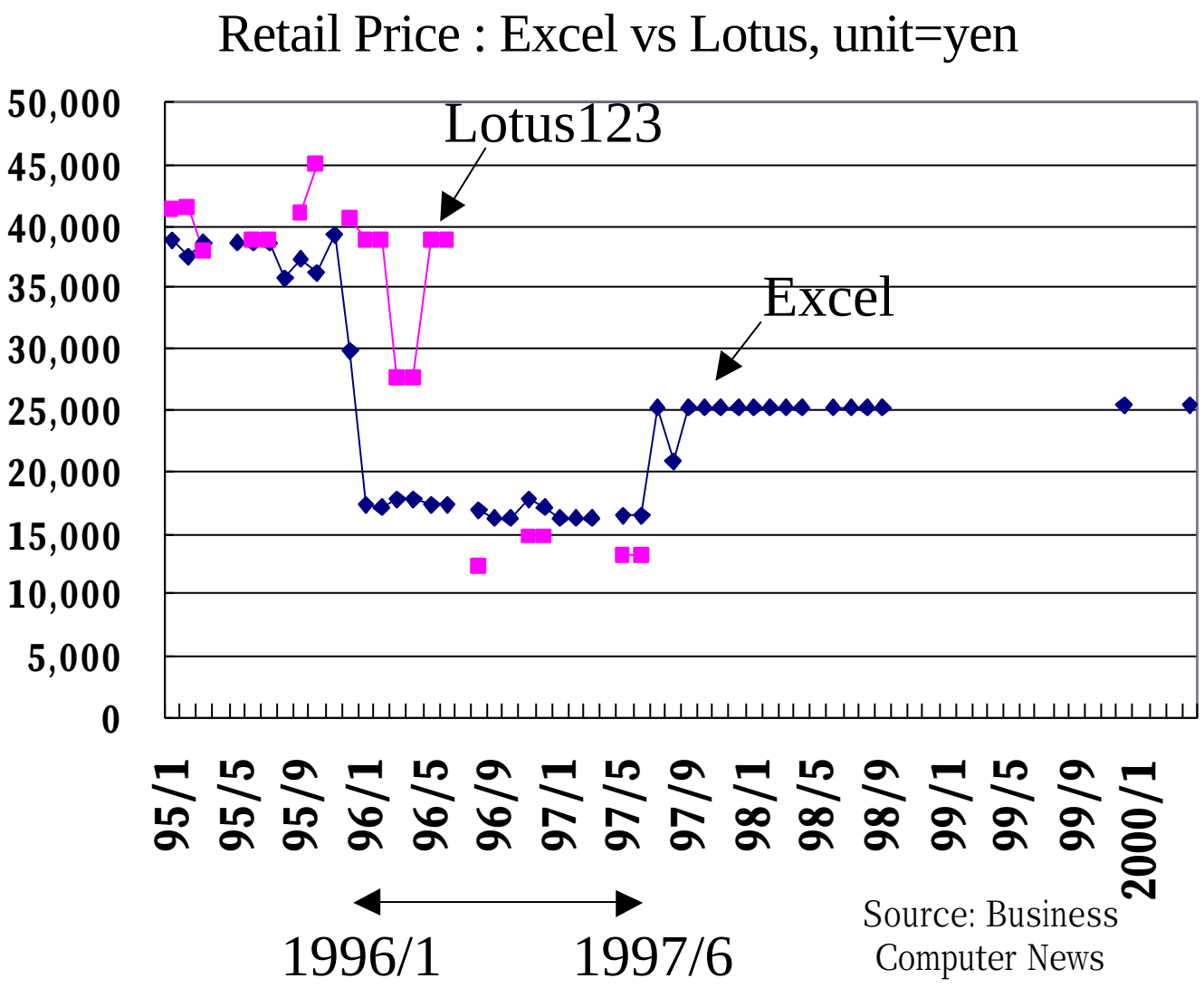
IT staff of Large Companies 953

IT staff of National and Private Universities 222

*Number of replies 738(62.8%)

*Date of survey December 2002

Strategic (Predatory) pricing



Excel's price is reduced by 50% during 1996 to mid-1997, and raised back after that.

Routers: Results of Hedonic model

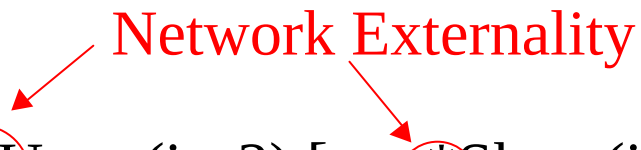
	Case 1			Case2		
Variable	Coefficien	t-statistic		Coefficien	t-statistic	
C	5.6126	(13.62)	***	11.930	(55.89)	***
SHARE(-1)	0.0055	(2.62)	***	0.004	(2.85)	**
LWAN	0.2377	(2.91)	***	0.335	(7.62)	***
OC3	0.2901	(1.47)				
OC12	0.1947	(1.03)				
OC48	0.0423	(0.15)				
OC192	0.7735	(3.22)	***	0.533	(2.50)	**
ATMOC3	0.0774	(0.32)		0.223	(4.38)	***
ATMOC12	0.2533	(1.56)				
E100	0.003	(0.01)				
EGB	0.444	(2.25)	**	0.595	(4.24)	***
REDUNP	0.8772	(4.64)	***	0.602	(3.69)	***
REDUNR	0.1483	(0.58)				
IPV6	-0.9837	-(2.83)	***			
CWQ	-0.1388	-(0.32)				
PRQ	0.7601	(2.41)	***			
RSVP	0.253	(0.81)				
MPLS	0.949	(3.16)	***	0.522	(2.97)	***
RED	-0.3671	-(0.77)				
NEBS	-0.2156	-(1.12)				
n	76			76		
F	81.6503			162.715		
R2	0.9652			0.943662		
AdjustedR2	0.9533			0.937863		

Network externalities work.
1% share difference increases price by 0.4%.
The 70% difference in share generates 28% difference in the price

These coefficients are large.
Introducing these new functions increase the price by 50%

Hedonic Price model

- Model



  - Price(i,t) = c+a*Users(i,t-2) [or a*Share(i,t-2)]
  - + b*(control variables) +e_{it}

  - Other control variables:Scanner image editing, address by Zip code, intelligent template, etc

Mobile Phone: Hedonic price model

- Price = 8014 +0.67*Users + 870*Area
  (7.78) (5.78)
  +4651*ln(melodies)+28*WaitTime+19*Memories
  (5.44) (2.87) (2.26)
  -2797*time+21*time^2 +e
  (-18.5) (9.81) n=124, R2=0.886(0.880)
- Price = 14389 +340*Share + 588*Area +(control variables)
  (16.7) (5.40) n=124,
  R2=0.929(0.925)

- Therefore network externality is verified
  - A million of users raises user's utility by 670 yen.
  - Ten percent point increase of the share raises user's utility by 3400 yen.
- Note that the power of NE is not much stronger than other variables such as area, waiting-time etc.