

The Source of Excess Momentum in Technology Standard Adoption – The Case of Third Generation Mobile Communication in South Korea

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Introduction

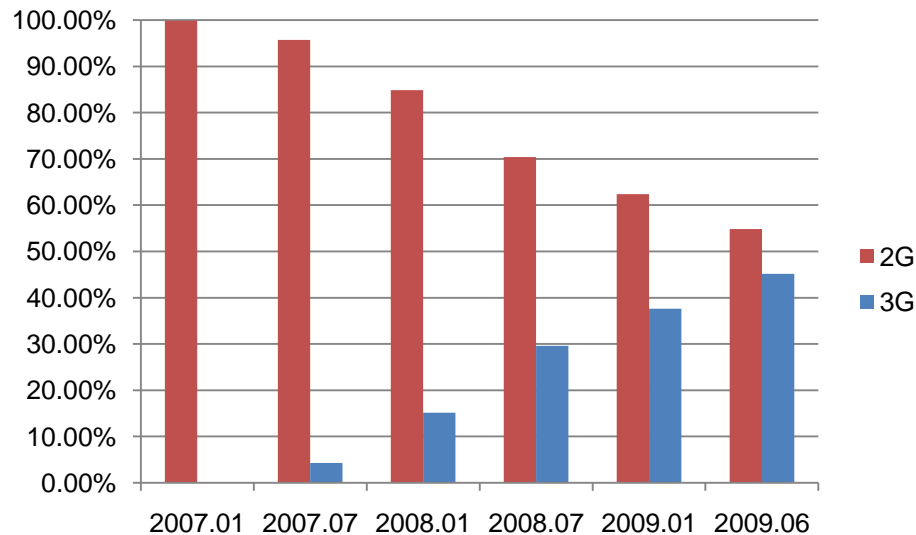
Background

- **Telecommunication technologies in South Korea**
- **Standardization as a strategic instrument, such as de jure standardization**
 - **Mobile telecommunication (Seong, 2004; Yoo, Lyytinen, and Yang, 2005; Jho, 2007)**

Introduction

Background

- The evolution of the mobile communication standard, from 2G to 3G
- Proactive policies led users to adopt 3G technologies, leading to large installed base



- But immature technologies → excess momentum

Introduction

Excess Momentum – literature (1)

- **The excess momentum means an inefficient adoption caused by a next generation technology which is not fully implemented or is immature**
 - **Farrell and Saloner (1986)**
 - **Analysis of the private and social incentives for the adoption of a new but incompatible technology**
 - **The sources of inefficiency are installed base and Penguin effect**
 - **Choi (1996)**
 - **Improved model of Farrell and Saloner (1986)**
 - **A converter can be a source of the excess momentum**

Introduction

Excess Momentum – literature (2)

- **Katz and Shapiro (1992)**
 - Analysis of product introduction and pricing in industries where installed bases are important
 - Private technology can induce the excess momentum
- **de Bijl and Goyal (1995)**
 - The incentives of firms that decide on the nature of the successor technology
 - The excess momentum in heterogeneous consumers
- **Clements (2005)**
 - Recent perspective on the inefficient adoption

Introduction

Limitations of existing literature

- **Analytical frameworks only**
 - **Simulation model in Swann and Shurmer (1994)**
- **Lacks of analysis on the excess momentum caused by policy interventions**
 - **New approach to the excess momentum**

Introduction

Research Goals

- **To analyze that whether the government policy intervention has negative effects on the adoption of standard or not**
- **To examine 3G technology standards in South Korea reveal the excess momentum which is likely to occur in inefficient market**

Standardization in Mobile Communication

Development of Second Generation

- **Natural monopoly**
- **1G mobile communication service in 1984, and privatization in 1994**
- **CDMA technology as a 2G mobile communication standard**
 - **Government and standard-setting organization played important roles to make a final decision among various stakeholders**
 - **The literature generally reveals successful results (Seong, 2004; Yoo et al., 2005)**

Standardization in Mobile Communication

Transition to third generation

- **3G and 3.5G**
 - **3G technologies began in early 2000s, and 3.5G technologies include HSDPA, WiBro, and 1xEVDO Revision A, services of which recently started**
 - **The effort of government by 3G and 3.5G viewpoints, while the excess momentum by 3.5G only**
 - **3G as a general term in this study**

Standardization in Mobile Communication

Transition to third generation

- **Flexible approaches - double standard and voluntary adoptions**
- **Government intervened in 3G standard-setting process with various ways quietly**
- **Enforcement of synchronous technology**
- **Similar to the 2G standard-setting - *de jure* standardization**

Standardization in Mobile Communication

Transition to third generation

- **After launching 3.5G services in 2007, government started to support with several policies in order to activate services and to draw firms' investments**
- **3.5G technologies were technically insufficient at that time – customer's dissatisfaction**
- **The effects gained by the intervention in 2G standard-setting could not be obtained any more**

Model – Simulation

Basic Setup

- **Simulation with real adoption data**
- **Technologies, A and B**
 - **Incumbent A, and new B**
 - **Utilities gained by each technology are represented by θ_A and θ_B**
 - **Normal distribution**
 - **$E(\theta_A) < E(\theta_B)$**
 - **A has installed base – 40 million**
 - **As B was insufficient technically, the level of maturity was considered, $\delta(t)$ ($0 < \delta \leq 1$)**

Model – Simulation

Basic Setup

- **Utilities for each technology**
 - **Prices are assumed to be exogenous and same for each service**
 - **Network externalities exist in this market, consumers will consider network externalities of each service when they buy**
 - $u(i, t) = \theta_i + k(n_{it}) \quad i = A, B$
 - $u(A, t) = \theta_A$
 - $u(B, t) = \delta(t)\theta_B + k(n_{it}) + s$
- **New users are not considered (Farrell and Saloner (1986)'s viewpoint)**

Model – Simulation

Parameters

- **1 million potential adopters for each period**
- **30 periods (from January 2007 to June 2009)**
- **Intrinsic benefits for each technology**
 - **B has twice benefit as much as A**
 - **Normalized form**
- **Network externalities**
 - **Linear form: Beck, Beimborn, and Weitzel (2008)**

Model – Simulation

Variable for Policy Intervention

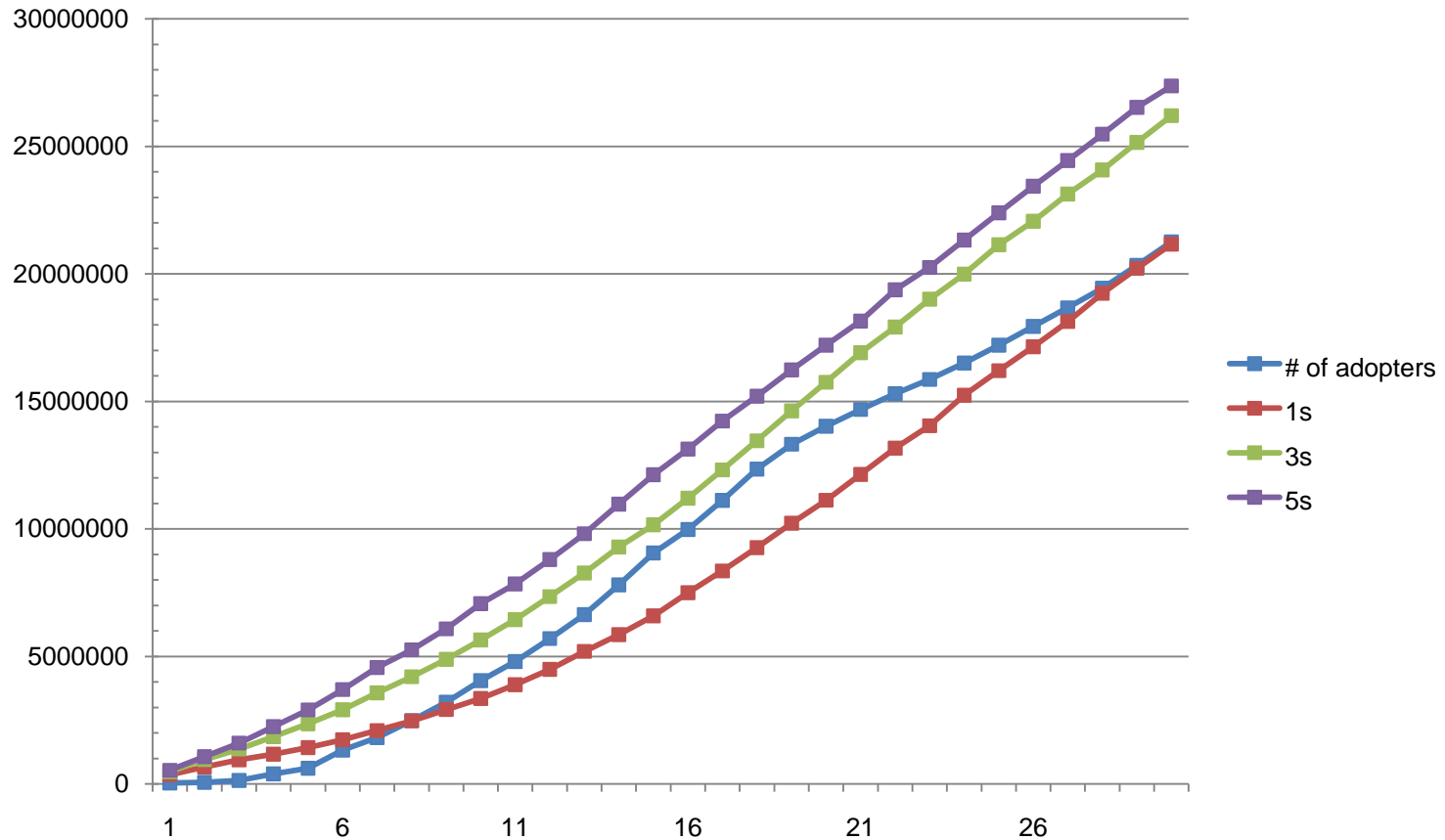
- **Scenario 1: subsidy**
 - **Only to the 3G market**
 - **The level of subsidies**

- **Scenario 2: technology development**
 - **Investment of \$ 200 million for each quarter**
 - **The degree of technology development**

Analysis

Scenario 1 - Subsidy

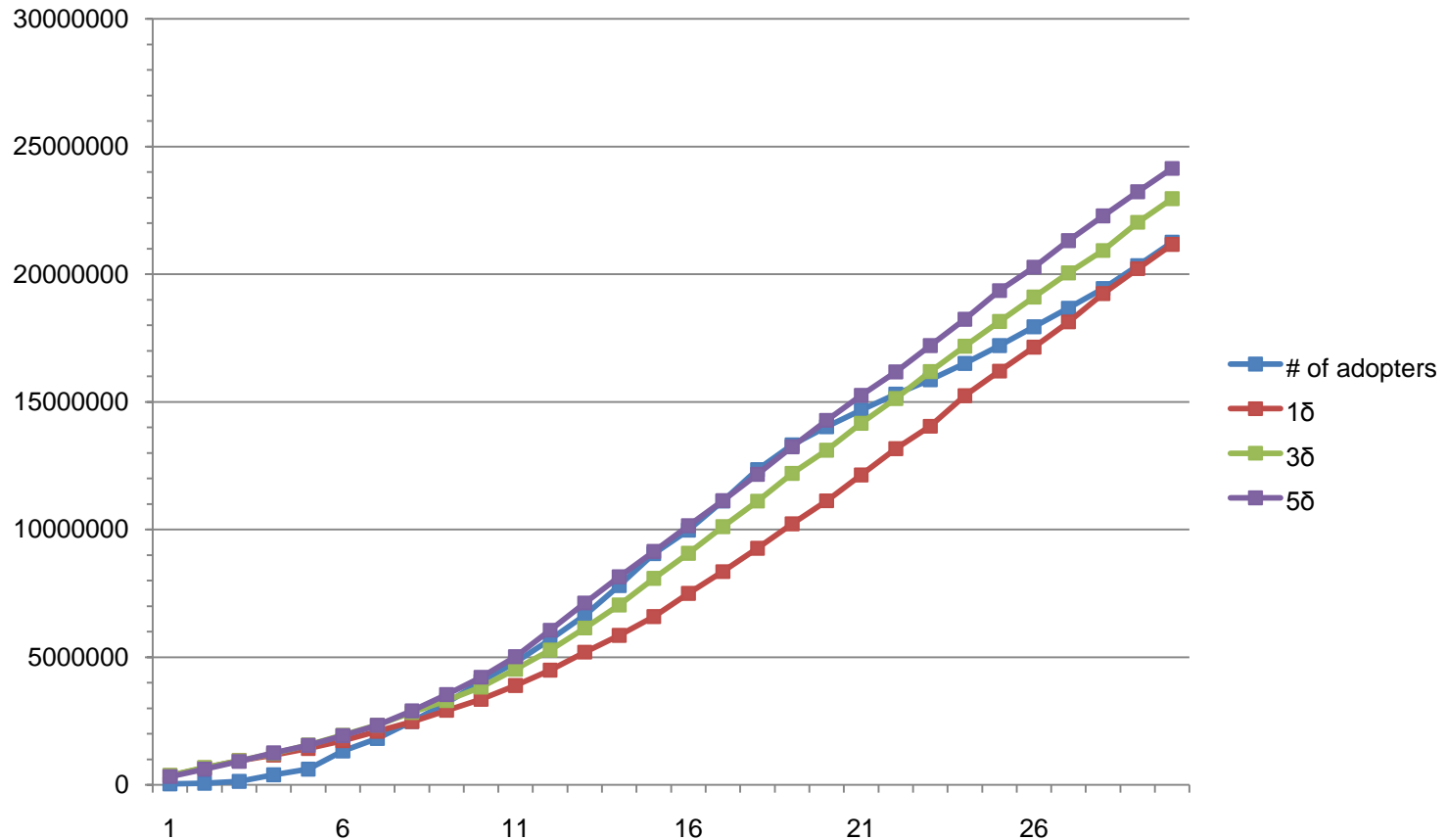
- The level of subsidies



Analysis

Scenario 2 – Technology Development

- The degree of technology development



Analysis

Detection of the Excess Momentum

- **The excess momentum can be found in some levels**
- **Scenario 1 - subsidy**
 - **More gaps between each level**
 - **Direct benefits to adopters**
- **Scenario 2 - technology development**
 - **Adopters care about technology less**
 - **Sufficient development might be achieved**
 - **Another reason of the excess momentum is possible**

Conclusions

Implications, Limitations and Further Studies

- **Implications**
 - The source of the excess momentum
 - Limitation of *de jure* standardization
 - Improved environment with less intervention
- **Limitations**
 - Too simple assumptions
 - The diffusion process of new technology is still on going
 - More elaborated model is needed to express consumers' attributes and the state of equilibrium
- **Further studies**
 - Elaborated model
 - Consideration of consumer surplus and social welfare

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Thank you!

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