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Current issues of the Japanese mobile phone market caused by smartphones

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Current Issues of the Japanese Mobile Phone Market Caused by Smartphones.

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Abstract

The mobile market has been transforming quickly all over the world particularly caused by the diffusion of smartphones, and this study attempts to examine the effect of smartphones to the Japanese mobile phone market. Japan has so far the well-developed 3G mobile phone in terms of not only the diffusion rate but also affluent functionality to consumers' use; Japanese 3G mobile phones are not only for voice calls, but it can send e-mails, view homepages, download music (*Full Uta*), purchase goods and services (*Osaifu keitai*, wallet phone), and more. Based on authors' paper on 3G mobile in Japan (Akematsu, Shinohara, and Tsuji, 2012), this study examines policy issues of the mobile phone market caused by the emergence and growth of smartphones, which were firstly introduced in 2008 to the Japanese market. This paper focuses on the impacts of smartphones to competition between iPhone and Android-powered mobiles, and policy such as MNP. Based on results obtained, brief policy recommendations for further promoting competition in the mobile market are presented.

Keywords: Smartphone, iPhone, Android, feature phone, 3G mobile phone, panel data analysis.

1. Introduction

It is said that the mobile phone market is now satiated and the number of subscribers is more than the population. This is due to completion policy aimed to promote competition among mobile carriers and technological innovation of the 3G mobile phone such as a wide variety of services other than simple voice calls became possible which enabled 3G mobile phone users to improve greatly communications volume and speed. They began to use the mobile phone handset as a device for browsing the Internet, which led them not only to use data communications services such as e-mail, SNSs, blogs, and search engines, but also to utilize mobile phones with on-board IC cards such as FeliCa, allowing the 3G mobile phone, for example, to purchase products with electronic money and make train or airplane reservations. This evolution of multifunctionality is a characteristic specific only to Japanese 3G mobile phones (see Akematsu, Shinohara and Tsuji, 2012, in more detail).

Since the diffusion of multifunctional mobile phones had already advanced in Japan in the early 2000s, the interest in the smartphones themselves, which included fewer software applications, was low and the market share did not notably increase. Then, in 2008, as a result of the announcement of the iPhone 3GS and Softbank's enthusiastic campaigning, interest in the smartphone rose inside Japan and explosive diffusion began in 2009, as the diffusion of iPhone are analyzed and discussed in West et al. [2010], for example. In addition, a large number of Android-powered handsets were launched in 2010, aiding the Japanese smartphone market to become established. The mobile phone diffusion rate has currently achieved 100%, and the number of smartphones shipped is showing rapid growth, exceeding a phenomenal 50% for the past few years.

Based on the analyses of diffusion factors for 3G mobile phones in Akematsu, Shinohara and Tsuji, [2012] and Akematsu [2012], this paper attempts to identify the reasons for the explosive diffusion of the smartphone thus far and provide an empirical analysis of the factors for that diffusion. However, since there no data of smartphone subscribers, this paper analyzes its diffusion in the framework of the mobile market as a whole. Regarding diffusion factor of mobile phone in other countries, Yamakawa et al. [2013] analyzed in the case of Peru, Srinuan et al. in Thailand [2012], Schuurman et al. [2011] in Belgium and in particular Gerpott et al. [2013] examined smartphone adoption in Germany. Lee [2013] also examined smartphone diffusion among younger generations.

This paper first examines previous studies on the smartphone, difference between smartphones and feature phone (3G mobile phones), and then the framework for

empirical analysis by comparing the above two mobile phones. Followed by these, the estimation model and the results of analysis are discussed, as Lehr and Chapin [2010] discussed, various issues caused by the launch of smartphones those related to policy. Finally in conclusion, by discussing the recent phenomena occurred in the mobile market, policy recommendations toward further competition are suggested.

2 Previous Studies

Papers conducting a research on “smartphone” employing statistical analysis were surveyed such as Gerpott et al. [2013] which studies the characteristics and intensity of mobile internet use among consumers with different types of advanced handsets considering iPhone and Android in Germany. Gerpott et al. [2010] studies the impact of the intensity of mobile Internet use on the demand for SMS and voice services of mobile network operators in Germany by the method of cross sectional analysis. Yamakawa et al. [2013] examines the diffusion of mobile telephones in Peru by the method of time series analysis. Ward et al. [2012] studies mobile and fixed substitution for telephone service in China, while and Akematsu et al. [2012] analyzes the diffusion factors promoting the Japanese 3G mobile phone. Both employ panel data analysis.

In what follows, this paper studies the factors promoting the whole Japanese mobile phone diffusion including not only 3G but also other generations including smartphones by panel data analysis.

3. Current status of mobile phone and smartphone in six major countries

Here the contemporary status of mobile phone and smartphone in six major countries are presented including the U.S., European countries (UK, Germany and France) and Asian countries (Korea and Japan).

3.1. The U.S.

The service penetration ratio of mobile phone in population in the U.S. is 108% (as of 1Q of 2013). Verizon wireless, AT&T, Sprint and T-Mobile own the market share of 34 %, 31%, 16% and 10%, respectively. Total share of those four mobile carriers is more than 90%.

The generations of the mobile network in the U.S. is as follows: (i) 1G mobile phone: 0.1%; (ii) 2G mobile phone: 47.4%; and (iii) 3G mobile phone: 52.5%, as of the 2Q of 2007, when iPhone was launched, while Android was also launched in the same

year. Thus the 2Q of 2007 is designated as the benchmark period in this paper for launching major smartphone in all countries; notwithstanding the dates of launching smartphone are different up to one year over the countries, as shown in Figure 3.1. After smartphone was launched, 2G decreased and 3G increased rapidly, respectively. The shares of 2G, 3G and 4G mobile phones are 6.7%, 79.6% and 13.6%, respectively, in the 1Q of 2013.

Verizon launched LTE service as 4G mobile phone, firstly, in the U.S. in December, 2010. Verizon 4G's service coverage ratio in population attains to 99% so far. AT&T, Sprint and T-Mobile USA launched their 4G services in September 2011, July 2012, and March 2013, respectively.

The shares of handset vendors are as follows, Apple: 39.9%, Samsung: 23.7%, HTC: 8.5%, Motorola: 7.2% and LG: 6.6%, respectively, in the average of three months to Jun of 2013 (Source: ComScore.). As those figures changed +0.9, +2.0, -0.5 -1.3 and -0.2 from the average in the previous month, top two vendors won and other three vendors lost the shares.

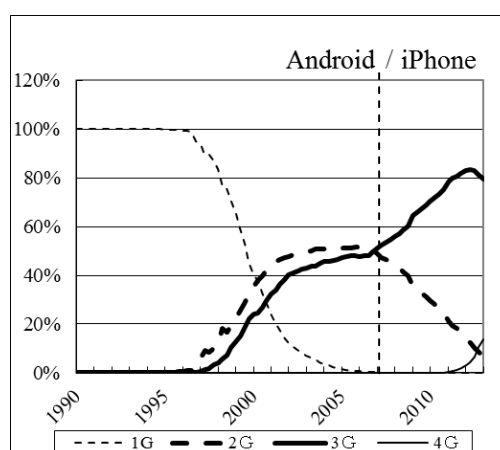


Figure 3.1 The Ratio of Cellular Services by Generation (U.S.).

Source: Informa

The shares of smartphone platforms are as follows, Android: 52.0%, Apple (iOS): 39.9%, and three other platforms such as BlackBerry, Microsoft, Symbian are less than 5%, respectively. These figures mean top tow platforms such as Android and Apple hold the share of 90%, totally.

As Android is an open platform, each mobile carrier provides smartphone powered by Android after it was launched in 2007. On the other hand, Apple provides iPhones to the selected mobile carriers. In the U.S., AT&T firstly launched iPhone in the 2Q of 2007. AT&T also launched iPhone4 in the 2Q of 2010. Before Verizon

launched iPhone4 in the 1Q of 2011, only AT&T provided iPhones. After iPhone4S started in the 4Q of 2011, in addition to AT&T, Sprint and Verizon launched iPhone5.

3.2. European countries

3.2.1. UK

The service penetration ratio of mobile phone in population in the UK is 126% (as of the 1Q of 2013). Everything Everywhere, Telefónica O2 UK and Vodafone UK own the shares of 36.8%, 31.1% and 22.5%, respectively. Total share of those three mobile carriers is more than 90%.

The generations of the mobile network in the UK are as follows: (i) 1G mobile phone: 0% (its services ceased in the 1Q of 2001); (ii) 2G mobile phone: 86.7%; and (iii) 3G mobile phone: 13.3%, as of the 2Q of 2007, the times of the major smartphones launched are as shown in Figure 3.2. After smartphone was launched, 2G mobile phone decreased and 3G increased rapidly. The shares of 2G, 3G and 4G mobile phone are 43.5%, 56.1% and 0.4%, respectively, in the 1Q of 2013.

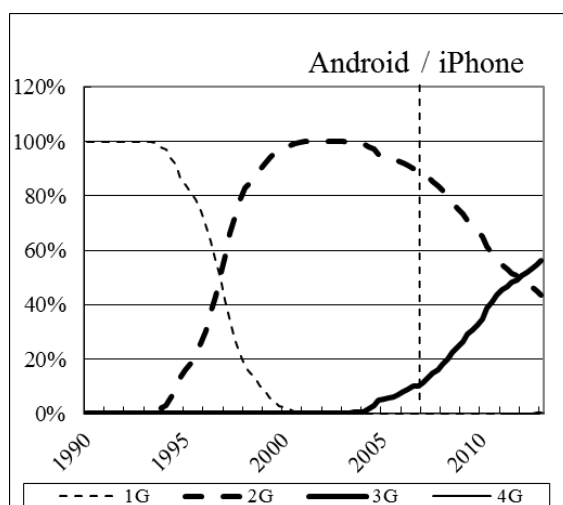


Figure 3.2 The Ratio of Cellular Services by Generation (UK)

Source: Informa

Telefónica O2 UK launched LTE service as 4G mobile phone as a trial, firstly, in the UK in December, 2011. Everything Everywhere launched its 4G service in October, 2012.

3.3.2. Germany

The service penetration ratio of mobile phone in population in Germany is 132%

(as of the 1Q of 2013). T-Mobile, Vodafone D2, E-Plus and Telefonica Germany (O2) own the shares of 34.2%, 28.0%, 19.7% and 18.1%, respectively. Total share of those four mobile carriers is 100%.

The generations of the mobile network in Germany are as follows: (i) 1G: 0% (services ceased in the 4Q of 2000); (ii) 2G: 90.8%; and (iii) 3G: 10.2% in the 2Q of 2007, when the major smartphones were launched. After smartphone launched, 2G mobile phone was decreased, while 3G increased rapidly. The shares of 2G, 3G and 4G mobile phone are 58.2%, 41.3% and 0.5%, respectively, in the 1Q of 2013.

T-Mobile, Telefonica Germany (O2) and Vodafone D2 launched LTE services as 4G in Germany in June 2011, July 2011 and October 2011, respectively. T-Mobile and Telefonica Germany (O2) agreed with the joint ownership for their facilities.

3.3.3 France

The service penetration ratio of mobile phone in population in France is 106% (as of 1Q of 2013). Orange (considered as in FT group), SFR, Bouygues Telecom and Free Mobile hold the shares of 40.2%, 33.8%, 17.1% and 8.9%, respectively. Total share of those four mobile carriers is more than 90%.

The generations of the mobile network in France are as follows; (i) 1G: 0% (service ceased in the 2Q of 1999); (ii) 2G: 89.8%; and (iii) 3G: 10.2% in the 2Q of 2007, when the major smartphones were launched. After smartphone was launched, 2G decreased and 3G increased rapidly here in France. The shares of 2G, 3G and 4G are 40.0%, 60.0% and 0.0% (8600 subscribers), respectively, in the 1Q of 2013.

Orange launched LTE service as 4G, firstly, in France in June, 2012 as a trial. SFR launched it November 2012.

3.3. Asian countries

3.3.1. Korea

The service penetration ratio of mobile phone in population in Korea is 111% (as of the 1Q of 2013). SK Telecom, KT and LG U+ own the shares of 49.9%, 30.3% and 19.1%, respectively. Total share of those four mobile carriers is close to 100%.

The generations of the mobile network in Korea are greatly advanced, that is, 2G almost ceased around the 2Q of 1999, while 3G dominated almost all. 4G was launched in the 3Q of 2011. The latest shares of 3G and 4G mobile phone are 63.1% and 36.1% (as of the 1Q of 2013), as shown in Figure 3.3. SK Telecom and LG U+ launched LTE service as 4G mobile, firstly, in Korea in July 2011. KT launched it January 2012.

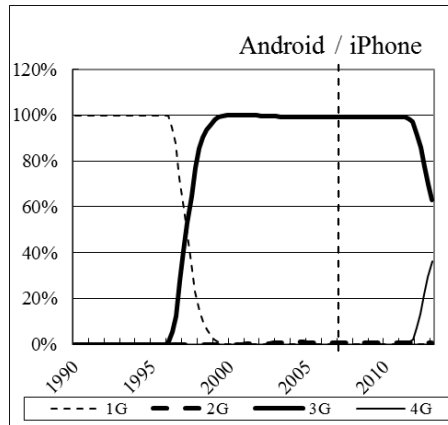


Figure 3.3 The Ratio of Cellular Services by Generation (Korea)

Source: Informa

3.3.2. Japan

The service penetration ratio of mobile phone in population in Japan is 108% (as of the 1Q of 2013). NTT DoCoMo, KDDI, Softbank Mobile and e-Access (Softbank bought in 2012 and now it is in the Softbank group) own the shares of 45.2%, 27.7%, 23.9 and 3.2%, respectively. Total share of those four mobile carriers is 100%.

The generations of the mobile network in Japan are as follows: (i) 2G: 23.3%; and (ii) 3G: 76.7% in the 2Q of 2007, when the major smartphones were launched, as shown in Figure 3.4. After smartphone was launched, 2G decreased, while 3G increased rapidly. The shares of 3G and 4G mobile are 89.8% and 10.2%, respectively, in the 1Q of 2013. NTT DoCoMo, KDDI and Softbank Mobile launched LTE service as 4G mobile in the 3Q of 2010, 3Q of 2012 and 1Q of 2012, respectively.

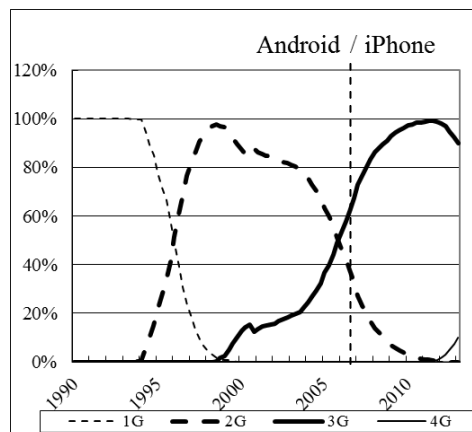


Figure 3.4 The Ratio of Cellular Services by Generation (Japan)

Source: Informa

3.4. Examining the status in six countries

In this section, the status for mobile phone and smartphone in six countries are examined considering the discussions mentioned above.

3.4.1 Latest status (as of the 1Q of 2013))

(1) The penetration ratio

The penetration ratios in population of mobile phone are more than 100% and still growing in all six countries.

(2) Generations

2G mobile still occupies around from 40% to 60% in European countries, while 2G occupies only 7% in the U.S. but it was already ceased in Korea and Japan. Mobile handsets in the U.S., and Japan and Korea have almost migrated into 3G or later, as shown in Figure 3.1-3.4.

3.4.2 Competition including the relationship between mobile and fixed services

(1) Incumbent dominant carrier and competition

“Incumbent dominant carrier(s)” is defined as the carrier(s) which has been dominating the fixed local loop and providing fixed services such as PSTN (legacy phone) and broadband. They are carriers such as Verizon, AT&T and CenturyLink in the U.S., BT in the UK, Telekom Deutschland in Germany, FT in France, KT in Korea, and NTT-East and NTT-West in Japan. They occupy almost all of subscriber lines in each country, except for KT in Korea which occupies around 78%.

In the mobile market, on the other hand, the incumbent dominant carriers occupy less than half of subscribers by themselves or their group carriers. The highest occupancy ratio is 45.2% by NTT DoCoMo in Japan. Those statuses indicate that there are intra-competition inside the mobile market as well as inter-competition both the mobile and fixed market.

(2) Incumbent dominant carriers and MNO

The incumbent dominant carriers provide mobile services by themselves or their group carriers as MNO in five countries except the UK, where BT separated and sold its mobile services (MNO, currently O2) in 2001, and BT provides mobile services as an MVNO of O2. They occupy the largest market share in four countries, such as U.S., Germany, France and Japan. The carrier which owns the largest share among these four is NTT DoCoMo in Japan at the share of 45.2%. Orange in France and T-Mobile follow at the share of 42.7% and 34.2%, respectively. But these shares are decreasing, after the 2Q of 2007, when major smartphones launched as mentioned earlier.

Korea is an exceptional case, where SK, which is not incumbent dominant carrier, occupies the largest share at 49.9%, whereas KT of incumbent dominant carrier owns 30.3%.

(3) HHI

The “Inter-platform HHI” is defined as the total market shares by carriers throughout all generations (summing up from 1G to 4G), which of five countries are shown in Figure 3.5, and they are in general decreasing at the range of from 4080 (Japan, in the 2Q of 2007) to 2669 (Germany, in the 1Q of 2013). But the U.S. is exceptional, since its HHI is the lowest among five countries and it is increasing from 1980 (2Q of 2007) to 2478 (1Q of 2013).

3.4.3. Smartphone

(1) Migration in generations

2G peaked out and 3G increased rapidly in the U.S., UK, Korea and Japan since major smartphones launched since the 2Q of 2007 as shown in Figure 3.1-3.4. Germany and France are similar to the UK. In addition, 4G increased and 3G peaked out after the launch of 4G particularly in the U.S., Korea and Japan.

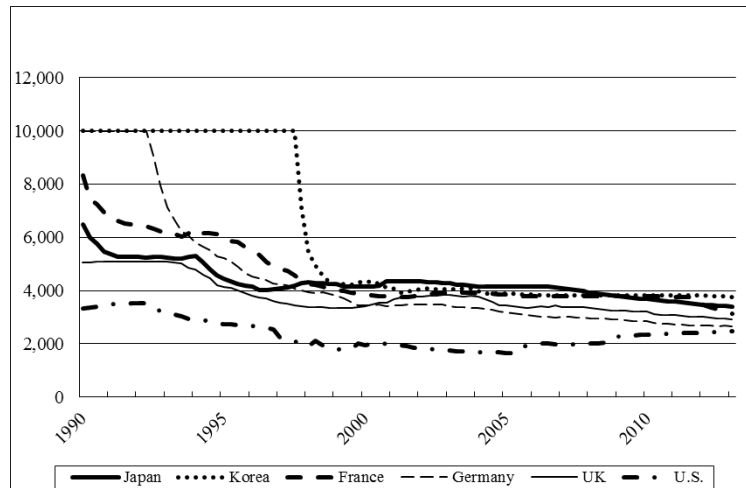


Figure 3.5 Inter-platform HHIs in major countries

Source: Informa.

(2) Platform (OS)

The shares of platforms (OSs) in the U.S. and Japan are presented here. Android occupies 64% in Japan (as of June, 2012), while 52% in the U.S. (as of June, 2013). iOS

including iPhone occupies 32% (June, 2012) and 39.9% (June, 2013). In both countries, Android occupies more than half and iOS occupies around 30 to 40%, and those two platforms occupy more than 90% in two countries.

3.5 Summary of this section

Let us summarize the discussions in the previous sections from the viewpoint of what smartphone led the transformation of the mobile market. These are as follows: (i) it accelerated the technological progress of upgrading generations. The most countries upgraded to newer generations; and (ii) it promoted competition in the market, as seen in decreasing in HHI. Then a natural question comes out; why smartphone causes these transformations. In order to search answers, this study takes the Japanese mobile market as an example and conducts analysis.

4. Smartphone in Japan

In this section, the characteristics of smartphone in Japan are presented in comparison with 3G mobile phones which are termed by feature phones.

4.1 Smartphones and feature phones

There is no strict definition of a smartphone. Globally speaking, the smartphone can be said to be the integration of a wireless telephone device, a mobile phone, and a microminiature computer as a PDA. The development of the smartphone began in the late 1990s and advanced during the first half of the 2000s. In Japan, however, the 3G mobile phone, known as the “feature phone,” achieved a unique development as a multifunctional portable data device, along the way incorporating many PDA functions, as mentioned earlier. In this sense it can be said that the smartphone overseas and the multifunctional mobile phone in Japan are very similar devices.

Nevertheless, in contrast to the fact that the Japanese 3G mobile phone developed through the unique specifications and services of each of the carriers, such as NTT docomo, au, and Softbank, it became possible, especially in the latter half of the 2000s, to make use of a common and open environment with the smartphone. A common and open environment signifies the fact that the specifications are not limited to any particular manufacturer, and as a result the connectivity and coordination with other information devices such as computers became easier. This point enables us to say that the smartphone is an open form of the 3G multifunctional mobile phone. Thus in Japan at the end of the 2000s, the change to smartphones was perceived as a more promising

future development than the change to the multifunctionality of 3G mobile phones, and the switch to smartphones from 3G mobile phones progressed accordingly.

The important differences between the 3G multifunctional mobile phone and the smartphone are enumerated below. In order to emphasize the differences between the two, the remarks here refer not to the current situation but to the period when the smartphone had just begun its diffusion into the market. As mentioned above, in contrast to 3G mobile phones, which included only closed functions limited by the carrier or the manufacturer, smartphones, similar to PCs, incorporated open functions not limited to manufacturers or carriers. Both 3G mobile phones and smartphones, however, had their various different features, since a large number of manufacturers launched a great variety of models which also contained innovations designed to overcome the disadvantages of either the mobile phone or the smartphone. Thus the distinction between the two types of device is not an absolute one, as mentioned by Gerpott et al. (2013), for example. The differences are summarized below.

(1) OS (Operating System) differences

In contrast to the 3G mobile phone, many of which use a specialized mobile phone OS (Operating System), the smartphone OS has, for example, adopted the general Internet protocols for functions such as the browser and mail, and is more easily adapted to other information devices. Further, almost all mobile phones use an OS specific to the carrier or manufacturer, whereas smartphones run on a common OS such as Windows Mobile or Android, some smartphones also using an open source OS.

(2) Service differences

In contrast to the independent service structure of each of the 3G mobile phone carriers, as a general principle with smartphones, the carrier and the services are mutually independent. For this reason, there are no official websites where users can go to download applications such as “*Dekome*” (picture letters and graphics for decorating email messages) or ringtone songs, and there were no special functions such as the “*Osaifu keitai*” (mobile phone wallet).

4.2 Types and characteristics of OS

The iOS and Android OS, which together hold an overwhelming share in the Japanese market, will be examined in detail. The iOS was developed in-house by Apple and is installed exclusively on Apple’s own iPhone series. In contrast, the Android OS is provided globally free of charge by Google and can be freely customized for installation by all terminal manufacturers. The Japanese market shares in September 2010 were 3.35 million iOS users in contrast to 840,000 Android OS users, the former

having an overwhelming market share roughly four times larger than the latter. By March 2011, however, the latecomer Android OS had staged a rapid catch-up to overtake the iOS and capture the top market share. Current market shares are just over 30% for the iOS and just over 60% for the Android OS, with the majority of the increase in the number of smartphone users tending to move toward the Android OS. Looking at terminal use by model, however, with iPhones accounting for three of the top five models, the iPhone brand is as ever maintaining a strong popularity. In fact, considering the ratio of the numbers of iPhones with the total numbers of terminals from other manufacturers, it can be said that Apple is maintaining a surprisingly large market share. Examining the situation by carrier, NTT docomo has released a wide range of terminals using an Android version that is matched with the company's market strategy. au also initiated a strategy with a specialized Android, but are now in the process of revising their strategy by introducing the Windows Phone and iPhone due to market needs. Softbank, which took the initiative in introducing the iPhone series, are continuing to place their major effort into iPhone sales, and have few terminals installed with the Android OS. Thus it is natural that the two OSs have their respective strengths and weakness.

5. Characteristics of Smartphone as Diffusion Factors

The diffusion factors of smartphones will be presented here from the general viewpoint in the comparison with feature phones (for the detailed analysis of smartphone, see Gueguen and Isckia [2012]).

5.1 Business models of smartphone

5.1.1 Open or closed strategy

The open strategy is one in which a company discloses its specifications in order to have them widely adopted, and to expand the company's products and services through collaboration with others. The smartphone Android OS is an example of the adoption of an open strategy. The Android OS here refers to the smartphone OS for which Google has taken the initiative to develop free of charge. The OS development, however, is not carried out by Google alone, but jointly with terminal manufacturers in many countries. The closed strategy, on the other hand, is where a company does not disclose its technology, choosing to implement technological development exclusively within the company. Apple is an example of a company that has adopted a closed strategy. The founder of Apple, Steve Jobs, took meticulous care over the company's

products, and thus the reason for adopting the closed strategy is thought to have been the ease of incorporating Apple's distinctive philosophy into its work. The OS used in the iPhone is known as iOS, and this stands as a counterpart to the Android OS mentioned above. It is not a simple matter to determine whether the open or the closed strategy is superior, since they both have their advantages and disadvantages. As it is the customer, the end-user, who will judge which product has the superior functionality, it may also be said that the open or closed strategy is nothing more than a classification for strategic dissimilarities in the companies' processes of planning and producing products.

A characteristic of the Android OS is the fact that its programming scalability is greater than iOS, and therefore the Android OS has the advantage that applications can be created which are not possible with iOS. A feature of the open strategy is that it assists the creation of products that find a very wide acceptance and which therefore diffuse more easily, and since large numbers of people are able to participate in the development of the product, competition becomes fiercer, with the result that quality improvements can be anticipated. In addition, intense competition under the open strategy will lead to price competition. For instance, just as the Windows OS for PCs has led to the market entry of large numbers of electrical appliance manufacturers producing the PC hardware, it is to be expected that the companies currently manufacturing the smartphone for the Android OS will eventually be faced with the same competitive environment as now exists for the PC.

The iPhone closed strategy depends heavily on the company's philosophy for product creation, and thus great profits are to be made if successful, but there is also the risk that consumers will turn their backs on a product and market share will be lost if something goes wrong. Further, participatory developers are completely disbarred from altering the iOS itself, and therefore can only participate at the level of the application development. Since the product is manufactured to a distinct specification, the fact that there is no risk of being involved in price competition can be pointed to as an advantage, but in that sense it is also possible to say that the iPhone is becoming "Galapagosized."

5.1.2 Branding of the iPhone

The existence of the iPhone cannot be ignored when discussing the diffusion of the smartphone. Indeed, it is only recently that knowledge of the market has deepened with the diffusion of the smartphone; when the smartphone first began to appear in Japan, the awareness of many was that the iPhone *was* the smartphone.

Branding is clarification of the distinctiveness from competing companies by the

strengthening of brand elements. The purpose of this is to have consumers make a distinction between one company's products and another's and engage in selective purchase. The benefits of branding are to enable price setting at a higher level through the creation of the added value of the brand, and to build up a strong competitiveness by enabling uniformity of direction in business strategy within the organization. It may also be possible to have the consumer engage in acts of repetitive purchasing, that is, to become a "repeater." Since design is also unified, it becomes easier to embark on the production and sales of associated peripheral equipment such as terminal covers once a certain number of users has been secured. Indeed, many companies are offering a wide variety of products for the market. This is one of the effects of branding, and it can be said that this is a part of the allure of the iPhone.

5.1.3 Vertical integration and horizontal integration

Vertical integration is one method of company consolidation in which two or more companies carrying out differing work processes are consolidated. Vertical integration has the benefit of enabling the uniform management of work. Taking manufacturing as an example, through a merger of companies that carry out upstream and downstream parts of the manufacturing process, the entire production process can be placed under uniform management and work efficiencies put into practice. In the case that the upstream company and downstream company are separate organizations, it is thought that disadvantages such as the generation of intermediate costs, wholesale price issues, rises in product prices, and problems of supply stability may occur, and that these can be resolved by vertical integration.

As disadvantages of vertical integration, a company that has become enormous through vertical integration may become unable to offer detailed services or to cater for niche markets, thereby failing to provide benefits for customers. The three major companies involved with the Japanese mobile phone industry are engaged in a vertically integrated business style that provides the telecommunication services, terminal sales, and also goes as far as to offer contents services, and this is recognized as an industry which has become successful through the vertically integrated model. This performed effectively during the dawn of the mobile phone business and while the technology was not yet fully established. At present, mobile phone terminals are being developed for extremely segmented user groups, such as women, business people, young people, the middle-aged and elderly, music lovers and so on, and thus it is expected that each terminal manufacturer will produce certain kinds of terminals. Additionally, for the mobile phones produced especially for the *Osaifu keitai* or for the enjoyment of music,

each mobile phone company engages in activities to boost the success of these, including capital investment, and these policies are also examples of vertical integration. The success of this vertically integrated model is also said to have obstructed the international competitiveness of the telecommunication equipment manufacturers, but at the same time there is no doubt that it has contributed to the success of the Japanese mobile phone market.

Horizontal division, on the other hand, is where a number of companies, rather than one company, implement a division of labor to carry out a business or manufacture a product. For instance, the manufacture of television sets is carried out by a division of labor that includes semiconductor manufacturers, LCD manufacturers, and the management of assembly plants, and this leads to the supply of low-priced products. It is said in the current mobile phone industry that a horizontal division of labor will be realized by the entry of MVNOs (Mobile Virtual Network Operators). The present situation is that vertically integrated carriers are offering comprehensive services, but it is thought that the entry of companies in the form of MVNOs and the horizontal division of labor is necessary in order to develop services to cater for further detailed needs and niche markets. In the future, it is surmised that along with the development of MVNOs, the vertical division of mobile phones will advance, but there are several issues involved and a wide range of debate is occurring on the subject.

5.2 Technological factors

5.2.1 Speed improvements from band spreading

Terrestrial digital broadcasting began in Japan at the end of 2003 and the transition from analog broadcasting to terrestrial digital broadcasting was completed under government initiatives in 2011. The frequency band used for television broadcasting before the transition was 90 to 770 MHz, but it was possible to compress this frequency band to between 222 and 710 MHz by shifting from analog to digital broadcasts, the remaining frequency band being allotted to mobile phones and other uses. Thus available frequency range was created for the wireless telecommunications, completing preparations for mobile phone data telecommunications, where traffic is expected to increase in the future. Improvements in telecommunication speed and data transmission volume are the most basic and crucial core of the mobile telecommunication medium of the mobile phone (smartphone), without which the development of the smartphone is unforeseeable.

5.2.2 Technological competition

It is well known that the catalyst for having large numbers of general consumers become aware of the smartphone in Japan was the launch of the iPhone 3G by Softbank in July 2008. However, as mentioned earlier, when the iPhone 3G first went on sale, not only did it not contain the functions installed in the hitherto *Galakei*, it could not even handle carrier mail. If the smartphone were to aim to become a substitute device for the mobile phone, as could be anticipated from the 3G mobile phone, known as the feature phone, it would be impossible to ignore the technological requirements of adding the *Galakei* functions and carrier mail in order to respond to the needs of Japanese consumers. This was the ground for thinking that Android, with its free OS and customizability, was at an advantage. In fact, at the beginning of diffusion, the iPhone became so well known that it was said that “the iPhone is the smartphone,” but the 60% market share of the iOS in 2010 fell to around 30% in June 2012 (Table 5.1).

Table 5.1 Growth of smartphone OS market share in Japan

	Sep. 2010	Dec. 2010	Mar. 2011	Jun. 2012
Android OS	15%	31%	47%	64%
iOS	59%	54%	40%	32%
Others	26%	15%	13%	4%

Source: Survey of Trends in Smartphone/Mobile Phone Use (Impress. Ltd., 2013)

Despite the drop in market share, however, the iPhone continues to enjoy a strongly-rooted popularity and a decline in handset sales numbers has not been seen. It is also clear that the Android, with its easily customizable technological and service aspects, has diffused explosively, and it is thought that the diffusion of the smartphone has been greatly promoted by the associated competition between the two OSs.

6. Analysis of the Diffusion Factors of Smartphone

The estimation model and method are discussed here to identify the recent diffusion of mobile phones.

6.1 Purpose of the estimation and variables

6.1.1 Content of the estimation

Based on the previous discussion, a panel data analysis will be carried out in order to extract empirically the basic factors that are thought to have influenced the diffusion of the smartphone. The data used are the monthly reports for the period April 2008 to August 2012 for the main three telecommunication carriers published by the

Telecommunications Carriers Association. Regarding carriers, a number of other companies have also entered the mobile phone market, but since they have extremely few subscribers in comparison with the three main carriers, these companies will not be included here. The period analyzed is the beginning of the fiscal year immediately prior to the launch of the smartphone up to the most recent time possible within the bounds of survey implementation and preparation of this paper.

Firstly, Figure 6.1 shows the monthly trend in total mobile phone subscription numbers for the three main carriers considered here. The rate of increase in the figure may appear to be gradual, but each carrier shows positive growth for the period of the analysis, and it can be seen, as mentioned in the previous chapter, the number of subscribers has recently exceeded 100% of the total population. Figure 6.2 shows the monthly trend in subscription numbers as the increase in subscription numbers for each month. Compared to the monthly total subscription numbers, the monthly increase in subscriptions shows large monthly differences. This is caused by seasonal short-term factors, examples of which are times of the year in which there is a significant time divide, such as the period just before the new school year (which begins in April in Japan) and the end of the fiscal year (March), and December, when sales may increase due to Christmas sales promotions and so on. There are also other events that have a direct relation with diffusion factors of new mobile phone products and new service provision. In this paper, events of the latter kind related to diffusion are used as dummy variables to analyze how they are related to the diffusion of the mobile phone.

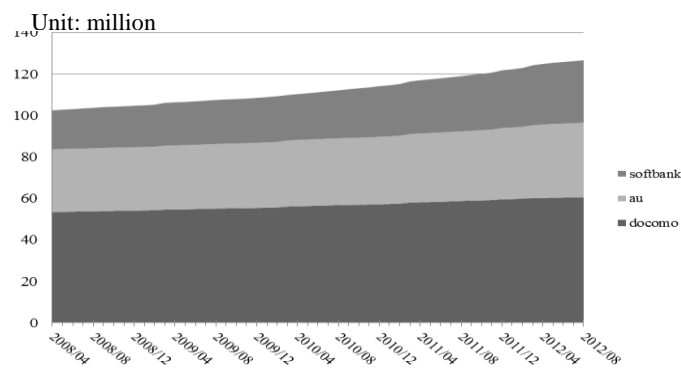


Figure 6.1 Monthly trends in mobile phone subscribers for the three main carriers
Source: Telecommunications Carriers Association

6.1.2 Explanation of explained variables

The total of the increase in mobile phone subscribers for each carrier, as shown in

Figure 6.2 in the previous section, are adopted as the explained variables used in the analysis. However, as this paper is an application of panel data analysis, it should be kept in mind that both the number of subscribers and the increase in the number of subscribers for each company are included in the explained variables. Further, since the purpose of this paper is to analyze the diffusion of the smartphone, in an empirical analysis it should in principle be the number of smartphone subscribers that is used as the explained variable. However, while data for shipped numbers of smartphone handsets within Japan are available, numbers of overseas models such as the iPhone are not given in the data and therefore cannot be used in the analysis. In addition, the numbers of subscribers for smartphones only are not published anywhere and are not even announced by the mobile phone carrier companies themselves. Survey agencies have also only released data prepared from questionnaire surveys carried out with respect to users who have changed mobile phone models from the 3G mobile phone, known as the *Galakei*, to a smartphone. In this paper, therefore, the use of mobile phone (including 2G and 3G) subscription numbers as explained variables has been unavoidable, but especially in more recent years, new mobile phone subscribers (i.e. the increase in the number of subscribers) can be thought of as representing smartphone purchasers. It is for these reasons that the increase in the number of subscribers is used as the explained variable in the empirical analysis.

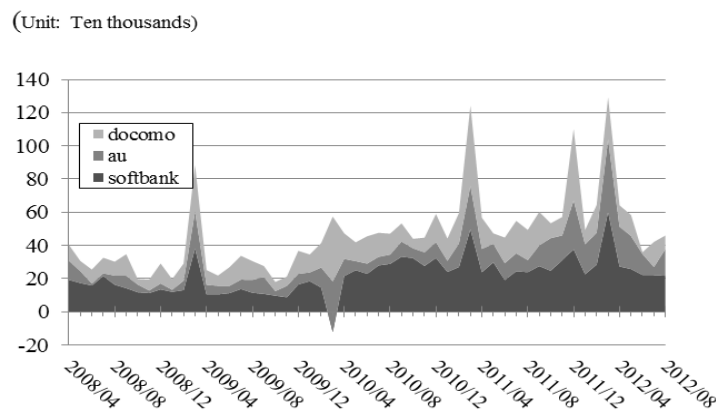


Figure 6.2 Trend in monthly increase in mobile phone subscribers of major carriers
Source: Telecommunications Carriers Association

6.1.3 Explanatory variables and hypotheses to be tested

The factors influencing the increase in the number of mobile phone subscribers, in addition to economic variables such as income and phone use rates, are thought to include the smartphone type, smartphone functions, the hitherto existing *Galakei* functions, policies, and regulations. With reference to the events that are the causes of

the sharp monthly increases and decreases indicated in the monthly trend graph of increases in subscription numbers (Figure 6.2) and other explanatory variables used in this analysis are summarized in Table 5.2 below. For the timing of introduction and the inception of services for (4) smartphone, (5) e-mail, (6) new function, (7) *Galakei* functions and (9) Android in Table 6.2 the date of introduction by the earliest carrier to release the product or service is shown. In the actual estimation, the timing of introduction for each of the carriers is used as the dummy variable.

Details are given below for the explanatory variables indicated in Table 6.2. Which functions, services and so on are adopted as variables is determined by the hypothesis. Therefore, the descriptions below do not merely give reasons why the variables were adopted, but it would be more accurate to say that they describe the hypothesis of the estimation model.

(1) Policy

MNP (Mobile Number Portability) was selected as the policy factor. MNP is a system which enables mobile phone users to switch between carriers without changing the mobile phone number. Through the introduction of this system, users are easily able to switch between carriers at will, thus intensifying competition between carriers for market share. While this may not result in an increase in absolute numbers of subscribers, it is thought that when users change to a new model there is a possibility that they will select a smartphone. Thus the hypothesis that MNP will promote the diffusion of the smartphone is adopted.

(2) Income

Real GDP, as published by the Cabinet Office, monthly smoothed, is used as the proxy variable.

(3) User rate

User rates will be explained in detail with the computation formulas in the following section.

(4) Smartphone

When the smartphone was originally released for sale, the carriers firstly began to sell models aimed at business (corporate) users by emphasizing compatibility with Microsoft software applications. Following that, they initiated sales of models that provided services featuring applications such as those for SNSs, games and music, along with the implementation of large-scale advertising campaigns. These were important factors in the smartphone becoming well known on the market. In this paper the former is positioned as the beginning of smartphone sales for business and the latter

the beginning of smartphone sales for general users.

Table 6.2 List of events and variables

Category	Date	Name of Variable	Content
(1) Policy	Sep. 2008	MNP	Increase or decrease in number portability
(2) Income		GDP	GDP trend
(3) User rate		ARPUm	Calculated from the ARPU, MOU of each company
(4) Smartphone	Jul. 2008	SP for Corp.	Softbank launches smartphone for businesses
	Jul. 2008	SP for Public	Softbank launches smartphone for general users
(5) e-mail	Sep. 2010	e-mail	NTT docomo launches smartphone with carrier mail capability
(6) New functions	Mar. 2011	Tethering	NTT docomo launches smartphone equipped with tethering function
	May 2009	Bluetooth	au launches smartphone equipped with Bluetooth function
(7) <i>Galakei</i> functions	Jun. 2010	IR	au launches smartphone equipped with infrared data transmission/reception function
	Dec. 2010	WaterProof	NTT docomo launches smartphone equipped with waterproof function
	Nov. 2010	MobileWallet	au launches smartphone equipped with mobile wallet function
	Jun. 2010	OneSegment	au launches smartphone equipped with <i>One-Seg</i> function
(8) iPhone	Jul. 2008	iPhone3G	Softbank launches iPhone3G
	Jun. 2009	iPhone3GS	Softbank launches iPhone3GS
	Jun. 2010	iPhone4	Softbank launches iPhone4
	Oct. 2011	iPhone4S	Softbank launches iPhone4S
	Oct. 2011	auiPhone	au launches iPhone
(9) Android	Jul. 2009	android	NTT docomo launches smartphone installed with Android
(10) Events	March each year	march	Increase in subscriptions in March, at end of fiscal year
	December each year	december	Increase in subscriptions due to December campaigns
	Dec. 2011	dc.PSV.cont	NTTdocomo PSVita contracts begin
	Jun. 2012	dc.PSV.canc	NTTdocomo PSVita contract cancellations
	Jul. 2011	au.800mhz.end	au halts former 800MHz band service
	Mar. 2010	sb.2G.end	Softbank halts 2G service

Source: Telecommunications Carriers Association and IR information for each carrier

(5) e-mail

When the smartphone first went on sale, characterized by the fact that it was

known as the “microminiature PC,” it was only able to handle PC mail and not the carrier mail provided by each of the carriers. This was a serious shortcoming for the smartphone, which had been launched onto the market as a substitute device for the hitherto mobile phone. It is therefore considered that the handling of carrier mail by the smartphone could be one of the diffusion factors, and the timing of the beginning of the e-mail service was adopted as a variable for analyzing whether this hypothesis is applicable or not.

(6) New functions

Tethering and Bluetooth were considered as new functions. Tethering is a function that enables a mobile phone to be used as a Wi-Fi hotspot to connect another device to the Internet via a smartphone. Bluetooth is a function that enables wireless communication with peripheral devices. For example, a separate earphone or speakers can be connected to the handset by a wireless connection. These are not main functions of the mobile phone, but in Japan, where the Galapagos mobile phone equipped with unique functions has diffused, these are considered both from a demand point of view and technologically to be beneficial functions, especially for the smartphone, a portable telecommunications device known as the “microminiature PC,” and thus this was set up as a hypothesis.

(7) *Galakei* functions

Galakei functions were uniquely developed in Japan and have been installed on the smartphone after its launch. According to the analysis by Akematsu, Shinohara, and Tsuji (2012), Akematsu (2012) among others, these functions contributed to the diffusion factors of the 3G mobile phone. In this paper, functions indicated as diffusion factors for the 3G mobile phone in the past are added to the list of variables, and the analysis is carried out with respect to the four functions of infrared data transmission/reception, waterproofing, *Osaifu keitai* and *One-Seg*. Each of these is an indispensable function to the Galapagos mobile phone that has diffused in Japan, and the hypothesis that they have also had an impact on the diffusion of the smartphone is analyzed.

(8) iPhone

The factors due to the launch of the four iPhone models, 3G, 3GS, 4 and 4S were analyzed, as West et al. (2012) also discussed. Softbank is the only company to have put all four models on sale, and au only placed the 4S on the market. NTT docomo has not introduced the iPhone series. After the launch of the smartphone, the iPhone became extremely well known in the early period and the later models are still retaining their popularity due to the establishment of the iPhone brand. In October 2011, au also began

to market the iPhone, undermining Softbank's monopoly and intensifying competition. Whether or not an advertising effect created by this intensification of competition was a factor in the diffusion of the smartphone is examined here.

(9) Android

Android is a smartphone OS provided free of charge by Google. As the smartphone appeared in Japan, Softbank carried out active sales efforts for the iPhone while other carriers, lagging a short time behind, began to market smartphones installed with the Android OS. The specification and sales strategy of Google's mobile phone OS, as mentioned above, greatly differed from the Apple iOS. Both of these were placed on the market along with the creation of various novel functions and services in order to gain users. As a result, consumer choice has been broadened by the introduction of a wide range of models and it is hypothesized that the promotion of diffusion could be anticipated due to the effect of competition.

(10) Events (temporary factors)

Events may be both regular and temporary. They obstruct the extraction of diffusion factors that are to be analyzed in this paper and were considered in order to eliminate them from the analysis. For instance, subscribers increase in March every year due to the end of the fiscal year and in December due to the end-of-year sales campaigns. Additionally, with reference to the NTT docomo PSVita contract and NTT docomo PSVita contract cancellation, when the Play Station Vita (PSVita) 3G model, which made use of the NTT docomo prepaid plan, was launched on December 17, 2011, new monthly subscription numbers rose rapidly from 8,400 in the previous month, November, to around 200,000. At the same time, as this was a six-month contract, six months later, in June 2012, users rushed to cancel their contracts, resulting in a net loss of roughly 100,000 contracts. Regarding the termination of the former au 800MHz band service, the service for the models that were not equipped to handle the cdmaONE, CDMA1X, CDMA1X(WIN) IC card that used this band was terminated, and the roughly 100,000 subscription cancellations that resulted are taken into account. Softbank's 2G service was terminated at 2 a.m. on March 31, 2010, and the fact that the net contract loss resulting from the subscription cancellations exceeded the number of new 3G subscribers is taken into account. The events described here are taken up as explaining temporary changes in the rate of increase in monthly subscription numbers and are separated from the factors that influence the explained variables for the period of the analysis.

The details of the variables used in the analysis are summarized in the descriptive statistics in Table 6.3.

Table 6.3 Summary of statistics

Variables	No. of Obser.	Mean	Std. Dev.	Max	Min
Increase in monthly subscription numbers (Log)	158	5.0938	0.3171	5.7802	0.3171
MNP	144	97.222	42782	94100	-145900
GDP (Log)	159	4.6004	0.0123	4.6296	0.0123
Price (ARPU/MOU, Log)	159	3.3760	0.0522	3.4884	0.0522
Smart phone for business customer	159	0.8553	0.3518	1	0
Smart phone for consumer	159	0.6667	0.4714	1	0
Carrier mail	159	0.3711	0.4831	1	0
Tethering	159	0.2201	0.4143	1	0
Bluetooth	159	0.5849	0.4927	1	0
Infrared light	159	0.4654	0.4988	1	0
Waterproof handset	159	0.3459	0.4757	1	0
Wallet function	159	0.4025	0.4904	1	0
One-seg function	159	0.4654	0.4988	1	0
iPhone3G	159	0.3145	0.4643	1	0
iPhone3GS	159	0.2453	0.4303	1	0
iPhone4	159	0.1698	0.3755	1	0
iPhone4S	159	0.1384	0.3453	1	0
au iPhone	159	0.0692	0.2537	1	0
Smartphone installed with Android	159	0.5912	0.4916	1	0
Monthly dummy (Mar.)	159	0.0755	0.2642	1	0
Monthly dummy (Dec.)	159	0.0755	0.2642	1	0
NTTdocomo PSVita contracts begin	159	0.0063	0.0791	1	0
NTTdocomo PSVita contract cancellations	159	0.0063	0.0791	1	0
au halts former 800MHz band service	159	0.0063	0.0791	1	0
Softbank halts 2G service	159	0.0063	0.0791	1	0

6.2 Result of estimation

The model for estimation is as follows.

$$Subscriber_{it} = \alpha_1 Subscriber_{t-1} + \alpha_2 Price_{it} + \alpha_3 GDP_t + \sum_j \alpha_4^j Factor_{it}^j,$$

where $Subscriber_{it}$ denotes the number of subscriber of carrier i at t , $Price_{it}$ the monthly charge described by $ARPU_{it}/MOU_{it}$ for carrier i , and $Factor_{it}$ the functions as well as strategies of each carrier. All of the variables except binary factors are taken logarithms, and the model is estimated by random effects model with generalized least squares (GLS) to control fixed effect of each carrier.

The result of the empirical analysis is shown in Table 6. 4. First of all, as the number of subscriber one period before was positively significant ($p < 0.01$), the larger the market becomes, the more likely users subscribe to the mobile because they benefit from the large network. In other words, the mobile market has network effects.

Table 6.4 Result of estimation

	Coeff.	S. E.	t value	p value	
Number of Subscriber one period before (t-1)	0.9804	0.3313	2.96	0.003	***
Income (GDP)	1.8988	0.3935	4.83	0.000	***
Price (ARPU/MOU)	-3.3941	0.9268	-3.66	0.000	***
Smartphone for business customer	0.1427	0.1855	0.77	0.442	
Smartphone for consumer	0.5161	0.2596	1.99	0.047	**
Carrier mail	0.4378	0.2454	1.78	0.074	*
Tethering	0.1201	0.2378	0.54	0.613	
Bluetooth	0.1658	0.2139	0.78	0.438	
Infrared light	0.1537	0.2208	0.70	0.486	
Waterproof handset	0.1515	0.1928	0.79	0.432	
Wallet function	0.0215	0.1514	0.14	0.887	
iPhone3G	0.3386	0.3427	0.99	0.323	
iPhone3GS	-0.0109	0.1661	-0.07	0.948	
iPhone4	0.5021	0.2889	1.74	0.082	*
iPhone4S	0.3698	0.1758	2.10	0.035	**
au iPhone (After iPhone4S)	0.6605	0.2788	2.37	0.018	**
Android	0.4533	0.1527	2.97	0.003	***
Number of observation	143				
Number of carrier	3				
Wald test for model (χ^2)	443.13***				
R-squared (overall)	0.7897				
R-squared (within)	0.7226				
R-squared (between)	0.9968				

Note: *, **, *** indicate significance at the 10%, 5%, and 1% level.

With regard to the economic variables such as income or price, income in terms of GDP was positively significant ($p < 0.01$), thus mobile subscription is enhanced according to the economic development. On the other hand, the price of mobile subscription had negatively significant coefficients ($p < 0.01$). As the coefficient of price can be regarded as elasticity, the mobile market was price-elastic.

As for the results of estimation, launch of smartphone for individual customer was positively significant ($p < 0.05$), while that of for business customer was not. Therefore, the development of mobile market clearly depends on the general consumers rather than business usage. With regard to the functions of smartphone, launch of carrier mail shows positively significant estimates ($p < 0.1$). When smartphones were launched in Japan in the first time, there are no functions of carrier mail for them, while it was commonly and frequently used for communications in Japan. The result of carrier mail thus implies that carrier mail is still important for Japanese mobile users. On the other hand, MNP and new functions such as tethering and Bluetooth are not significant. Launch of infrared light, waterproof handset and wallet function are not significant,

neither. These indicate that they were not considered as fresh and did not have much impact upon users. One of the major characteristics of smartphone can be highlighted by iPhone. Sale of iPhone4 ($p<0.1$), iPhone4S ($p<0.05$) and au iPhone (after iPhone4S) was positively significant, which demonstrated the large impact of iPhone in the Japanese mobile market.

The significant events are indicated in the trend in monthly increase in mobile phone subscribers of major carriers shown in Table 5.1, and Figure 6.3 shows how these events coincide with peaks of trend. That is, during 2008-middle of 2009, which was indicated as “Former,” “Smartphone for consumer” and “Smartphone for consumer” coincide with peaks of monthly increase, while after the middle of 2009 termed by “Latter,” “iPhone,” “smartphone for consumer,” and “Launch of iPhone4” coincide with peaks. It is easily seen that in the latter period the increase of mobile phone was promoted by fierce competition between iPhone and Android.

It is also noted that the first sales of “iPhone3” and “iPhone 3GS” in the latter period are not significant, while “iPhone4” and “iPhone4S” become significant, implying that iPhone came to establish its brand in several years after the first introduction to the Japanese market.

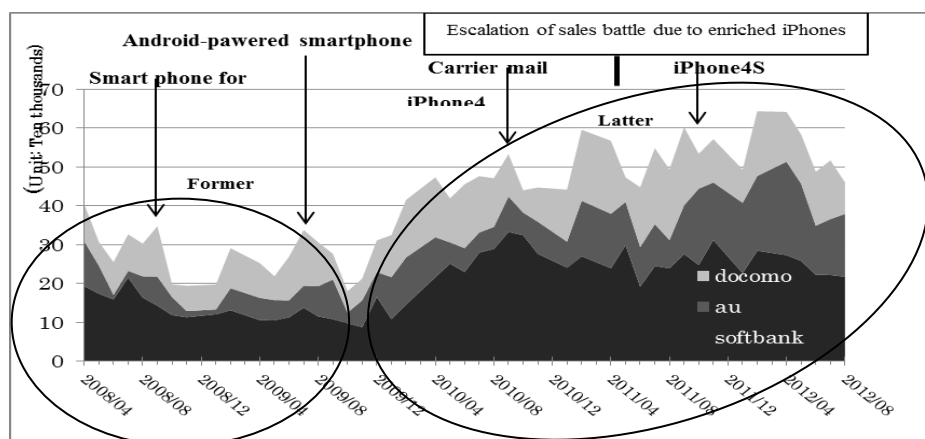


Figure 6.3 Significant events in monthly trend in mobile phone subscribers
Source: Telecommunications Carriers Association

7. Discussions and Conclusion

This study surveyed the correct transformations initiated by smartphone in six major countries and conducted a panel data analysis to clarify factors causing the growth of mobile phones since smartphone was launched in 2008. The sample period

already entered the satiation of mobile phone, and its growth rate is expected to be stable. What actually happened in the market is different from this expectation; much more fierce competition among the incumbent mobile carriers such as NTT docomo, au, and Softbank. The origin of competition lies in the launch of iPhone and then Android-based smartphone. iPhone was introduced by Softbank, and then au, which promoted their sales, and the result was the sharp decline of docomo's market share, since it did not sell iPhone. But as this study demonstrated, iPhone became brand and attracted many subscribers. These are good phenomena to the market in a sense of competition, because HHI in the mobile market has been declining. On the other hand, the share of smartphone in the total mobile phones reaches about two thirds, which creates new problems such as the explosion of traffic, congestion and the dominance of upper layer such as Apple and Google over lower layers. In addition to these, new issues related to market competition appeared, as Ballon and Heesvelde [2011] discusses in Europe, and Lehr and Chapin [2010] and Rosston and Topper [2010] in the US. In the conclusion part of the paper, the direction of the research related to the model presented as well as to policy.

7.1 Proxy variables for characteristics of smartphones

It should be mention about the limitation of this study. Since the data related to smartphones in those countries are not available in general, the estimation had to conduct by taking the number of all mobile phones as an explained variable, which prohibited the analysis of the diffusion of smartphones; smartphones were analyzed indirectly thorough the from all mobile phones. In contract, Akematsu et al [2012] which analyzes the diffusion factors of 3G mobile phones by taking variables related to 3G phones as many as possible including functionality such as e-entertainment and e-payment, technology, policy, and so on. Smartphones in Japan own the almost same characteristics, which were not included in the estimation in this study. The times of iPhone's sales employed in the estimation are considered to be proxy variables for the smartphones' characteristics.

The specific nature of smartphones is said to lie in its size which is referred to as a "micro-miniature computer," which enables almost all of functions a computer does. It is a powerful tool to browsing homepages, for instance. The most of users can find it much better function than 3G mobile phones. In case of e-payment of 3G mobile phones, only several million users actually utilized this function, although it was one of the factors promoting it (Akematsu et al. [2012]). Almost all users enjoy browsing in case of smartphones. Times when new iPhones began to sale are found to be significance in

the estimation, which are thought to be proxy of this kind. Japanese mobile users tend to adhere to iPhone and rushed to Apple stores when its new models were started to sale, which is a natural result such that the market share of iPhone in Japan is about 30%; much larger than in the global markets. In the previous sections, this is explained by “branding of iPhone.” For further research, more suitable variables must be utilized.

7.2 Further policy issues

In September 2013, the Japanese mobile market was jolted by big news: Apple started to sell new iPhones, and NTT Docomo sold them for the first time. NTT Docomo did not deal with Apple products since it launched iPhone, which is one reason why Docomo lost the market share sharply since then, as discussed in the paper. Three Japanese mobile carriers now sell iPhone, and this makes competition among three fiercer. The mobile market is shifted quickly as examined thus far, and the hypotheses analyzed may become irrelevant soon after, and the continuous analysis will be necessary to monitor the competition in the Japanese mobile market. The followings are the possible policy issues in the mobile market required further analysis.

(1) Pricing strategy of carriers

Since the market is satiated, price competition became much fierce, and carriers came to offer various discounts, while monthly basic fee is the same for all three carriers, which is about JPY 5,000 (USD 50.00). Due to complicated discount schemes offered by carriers, it is not easy for subscribers to recognize the real price that they pay. In addition to this, au launched a new discount scheme which is termed by “Smart value.” It offers discount to the family which owns FTTH of KDDI or related carriers such as J:COM (CATV) and power companies as well as owns more than four smartphones. This attracts lots of its smartphone and FTTH subscribers as well. Other competitors offered similar discount schemes. There is no demerit of these new discount schemes to each subscriber, but carriers’ profits tend to decline. This might create a problem to carriers.

(2) MNP

An obstacle for MNP is that openness of SIMs. This becomes issues between NTT docomo and Softbank which use the same wireless system, but that of au is different from them, and it is exempt from this problem. Almost all docomo’s handsets, which have 64 types, are SIM-lock free, while those of Softbank are only two. In the matured market like the mobile phone, to promote competition, some more deregulations to strengthen MNP are required (see the case of Finland in Tallberg et al. 2007). As mentioned earlier, NTT Docomo started to sell iPhone, but they are not

SIM-lock free. This seems to be a drawback from the viewpoint of competition and might cause a new problem.

(3) MVNO

The number of MVNOs has been increasing and it reaches about 400 recently, but their total number of subscribers is about one million, which is quite small. The role of MVNO is to provide niche services to particular customers. One area of this is services for light users with cheaper charges. Currently three MNOs (Mobile network operator) offer fixed charges for the Internet access and their limits are 7 Gbps at JPY 5,000 up to JPY 7,000 per month. However, the average use of customers is about less than 2 Gbps. Whereas MVNOs offer 2Gbps services at the JPY 1,000-3,000. From these, it is expected that MVNOs' subscribers become increase, but the reality is different. One reason for this is that MNOs' connection charges to MVNOs are still expensive, which may suppress the entrants of MVNO to the market.

(4) Acquisition of e-Access by Softbank

The third largest Softbank purchased e-Access in 2012 which is the fourth and owns 3% of the share. Softbank also obtained WILCOME, a PHS carrier, and City Wireless Access, and then the total market share of Softbank now second largest. Due to these acquisitions by Softbank, the HHI of the mobile market raised. Moreover, Softbank's acquisition of Sprint, the third largest MNO in the US, was approved by FCC. This will make Softbank the third largest in the global market. The series of acquisitions occurred recently and its aftermath is not certain. For example, it may utilize the merits of the global share as leverage to Japanese market, since Softbank will save JPY 200 billion (USD 1 billion) to purchase handsets or other equipment. The new market strategy of Softbank in the Japanese mobile market should be monitored and analyzed.

NOTE

- 1) The views expressed in this paper represent the personal opinions of the authors. They do not necessarily represent the views of the KDDI Group.

REFERENCES

Akematsu, Y. [2012] "Empirical Analysis of Factors and Policies in 3G Mobile Market in Japan," *Information and Communication Policy Review* (in Japanese), No. 3,

March 2012.

- Akematsu, Y., S. Shinohara, and M. Tsuji [2012] “Empirical analysis of factors promoting the Japanese 3G mobile phone,” *Telecommunications Policy*, Vol. 36, Issue 3, April, pp. 175-186.
- Ballon, P., and E. V. Heesvelde [2011] “ICT platforms and regulatory concerns in Europe,” *Telecommunications Policy*, Vol. 35, Issue 8, September, pp. 702-714.
- Gerpott, T. J. [2010] “Impacts of mobile Internet use intensity on the demand for SMS and voice services of mobile network operators: An empirical multi-method study of German mobile Internet customers,” *Telecommunications Policy*, Vol. 34, Issue 8, September, pp. 430-443.
- Gerpott, T. J., S. Thomas, and M. Weichert [2013] “Characteristics and mobile Internet use intensity of consumers with different types of advanced handsets: An exploratory empirical study of iPhone, Android and other web-enabled mobile users in Germany,” *Telecommunications Policy*, Vol. 37, Issues 4–5, May–June 2013, pp. 357-371.
- Gueguen, G., and T. Isckia [2011] “The borders of mobile handset ecosystems: Is competition inevitable?,” *Telematics and Informatics*, Vol. 28, Issue 1, February, pp. 5-11.
- Lee, S. Y. [2013] “Examining the factors that influence early adopters’ smartphone adoption: the case of college students,” *Telematics and Informatics*, forthcoming.
- Lehr, W. H. and J. M. Chapin [2010] “On the convergence of wired and wireless Access Network Architectures,” *Telematics and Informatics*, Vol. 22, Issue 1, March, pp. 33-41.
- Rosston, G. L., and M. D. Topper [2010] “An antitrust analysis of the case for wireless network neutrality,” *Information Economics and Policy*, Vol. 22, Issue 1, March, pp. 103-119.
- Schuurman, D., C. Courtois, and L. D. Marez [2011] “New media adoption and usage among Flemish youngsters,” *Telematics and Informatics*, Vol. 28, Issue 2, May, pp. 77-85.
- Srinuan, C., P. Srinuan, and E. Bohlin [2012] “An analysis of mobile Internet access in Thailand: Implications for bridging the digital divide,” *Telematics and Informatics*, Vol. 29, No. 3, August, pp. 254-262.
- Tallberg, M., H. Hämmäinen, J. Töyli, S. Kamppari, and A. Kivi [2007] “Impacts of handset bundling on mobile data usage: The case of Finland,” *Telecommunications Policy*, Vol. 31, Issues 10–11, November–December, pp. 648-659.

- Ward, M. R., and S. Zheng [2012] "Mobile and fixed substitution for telephone service in China," *Telecommunications Policy*, Vol. 36, Issue 4, May, pp. 301-310.
- West, J., and M. Mace [2010] "Browsing as the killer app: Explaining the rapid success of Apple's iPhone," *Telecommunications Policy*, Vol. 34, Issues 5–6, June–July, pp. 270-286.
- Yamakawa, P., G. H. Rees, J. M. Salas, and N. Alva [2013] "The diffusion of mobile telephones: An empirical analysis for Peru," *Telecommunications Policy*, Volume 37, Issues 6–7, July–August 2013, Pages 594-606.