

**Exploring mobile pricing strategies and innovations
in Thai mobile communication market**

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Abstract

This paper aims to explore the offered tariff plans of Thai mobile operators and analyze the role of demand characteristics in the development of new tariff plans. Also, this paper shows that how demand affects a firm's degree of innovativeness in terms of the number of new tariff plans. An empirical qualitative analysis will base on an original dataset from several secondary data sources which includes all the tariff plans offering in the history of the Thai mobile communication market between 2002 and 2010. The results show that mobile operators introduce several innovative price plans to attract and retain their consumers. Though the higher number of tariff plans can increase competition among operators, but several number of tariff plans have a complex combination which can lead to consumers' confusion. Therefore, tariff plan checker has to be implemented by telecom regulator in order ensure that consumer gets the correct and complete information about the tariff plan.

Keywords: pricing strategies; mobile communications market; innovation; Thailand

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1. Introduction

Innovations involving interactive communication are worth investigation, since quickly diffusing innovations nowadays often involve interactive communication. Such innovations include the Internet (Rogers, 2003, p. 346) and mobile communications. The number of cellular telephone subscribers reached 1.2 billion globally in 2002, exceeding the number of fixed-line subscribers (1.1 billion) (ITU, 2010). This extraordinary growth of mobile telephony has been due to two main factors: technological progress and regulation (Gruber, 2005; Koski & Kretschmer, 2005). Thus, mobile communication has been jumped to be the dominant communications since 2002.

The emergence of several pricing structures has been one factor driving the diffusion of mobile telephones (Dholakia & Kshetri, 2002, 2003). Some of the most significant pricing innovations have been virtual afterthoughts of technology development. They include for example prepaid, free minutes, frequent user benefits and other bonuses, family plans and location discounts. These represent what were initially considered trivial features and becoming drivers of mobile use, if not adoption, in many parts of the world.

From a broad diffusion perspective, the introduction of prepaid price plan was the most significant product innovation since the initial development of mobile communication market. It allowed adoption of mobile phones by users with variable usage needs and variable means to pay for access to the mobile network. Without prepaid, which consists largely of storage and billing software, mobile calling might have reached fewer than half of today's subscribers, especially those located in poor and moderate-income emerging markets, where participation in the cash economy often reflects itinerant activity (Kalba, 2008). Thus, the introduction of prepaid responded to, and further stimulated, the market for occasional or variable demand and affect the competition.

The impact of price plan on competition has been addressed by several well-known literature (i.e. Gans & King, 2001; Kim & Kwan, 2003; Fu, 2004; Birke & Swann, 2006; Corrocher & Zirulia, 2009). These studies note that during last decade mobile service providers introduce the termination-based price discrimination¹. Termination-based price discrimination induces network effects because

¹ Termination-based price discrimination means that an operator charges different prices for calls that place in different operators, own network or rival networks. An operator usually charges a higher price for calls that

it is convenient for users to adopt the operator with the largest customer base as Laffont, Rey, and Tirole (1998) define as *tariff-mediated network effects*. However, the price plans which are discussed in these studies are too simplified and no details on price plan characteristics. In fact, mobile operators have combined several types of price discrimination e.g. time-based, destination-based, and rebate mechanism in their tariff plans. Moreover, all of these studies focus on the role of price plan in affecting behavior of consumer, switching cost rather than competition and innovation between mobile service providers.

Few studies attempt to examine firm's pricing mechanism to consumer heterogeneity (i.e. Miravete, 2003, 2007; Miravete & Röller, 2004). These studies show that consumer behave rationally when choosing tariff plan. In term of firm, the development of new price plan is costly for firm. It is possible that firm offer a few tariff options (Miravete, 2007). Recently, Recently, Correcher and Zilulia (2010) investigate operator pricing strategies according to an innovation-based approach in order to fully account of previous studies. Their method captures the innovation process of price plan. Moreover, their result show that demand affect firm's pricing strategies both in term of providing information on user behavior and providing incentive to innovate new tariff.

These studies clearly show that applying an innovation-based approach is interesting approach in analyzing the pricing innovation of mobile communications. Furthermore, the mobile communication sector has evolved and reached a stage close to maturity. Some empirical studies conducted in early or immature stages might be too early to draw reliable conclusions and also focused mostly in developed countries. Hence, mature cases in developing countries are worth reexamining to search new findings beyond the previous empirical results.

The rest of this paper is organized as follows. The next section reviews the innovation-based concept and empirical studies. Overview of Thai mobile communication market is then presented in the following section, followed by results and discussions. Conclusions are finally drawn in summary section, along with recommendations for future research.

2. Overview of Thai mobile communication market.

First mobile communications services in Thailand were commercially introduced in 1986 by the state-owned companies: Telephone Organization of Thailand (now TOT Plc.) and Communications Authority of Thailand (now CAT Telecom). They provided mobile services based on analogue technologies. Two private companies, Advance Info Service (AIS) and Total Access Communication

place on another operators' network (off-net calls) and a lower price for calls that place on its own network (on-net calls).

(TAC²), were granted the concession agreements in 1990 and 1991 respectively to provide analog mobile services. This resulted from higher demand of mobile services and lower degree of flexibility on expanding the mobile networks of state owned companies.

Several limitations of analogue system required AIS and TAC to upgrade their mobile services. Then, they asked CAT and TOT for permission to introduce a digital mobile system since 1994. CAT also granted other concessions to TrueMove (Former WCS and TA Orange) and the Digital Phone Company (DPC³) to operate mobile communications services in 1996 and 1997 respectively. However, TrueMove did not commercially operate until March 2002.

In the following year, Hutch CAT wireless Multimedia (Hutch) which is a joint venture of Hong Kong-based Hutchison and CAT entered to the market by introducing CDMA technology (Bangkok Post, 2002). Hutch serves mainly 25 central provinces including Bangkok. It is now acquired all shares by Real Future Co., True subsidiary, since January 2011 (Bangkok Post, 2011). The last mobile network operator is Thai mobile. It was a joint venture company between TOT and CAT and came to participate in the market in 2004. TOT and CAT agreed to terminate the joint venture agreement on mobile phone services project from September 30, 2008. All assets, rights, and duties of the Thai Mobile Joint Venture were transferred to TOT as of September 29, 2008 (Srinuan, Srinuan, & Bohlin, 2011). It is now solely owned by TOT and renamed to TOT3G.

Mobile subscribers have increased gradually year on year and the mobile penetration rate had reached 100% by the end of 2010 (see Fig.1). However, more than 98% of mobile subscribers are served by three major operators: AIS, DTAC, and TrueMove. These operators provide similar services to their customers and operate nationwide (see Table 1). Nevertheless, AIS has relatively better network coverage. Its network covers 97% of populated areas while TrueMove never reports its network coverage to public but it is widely known among mobile consumers that its coverage is the worse as compared to its rivals.

During the periods of entry, new entrants launched different kinds of tariff plans acquiring customers. For example, TrueMove used handset subsidies and calling club price plan as its entry strategies. Hutch implemented similar strategies as TrueMove by offering buy one get one free handset, termination-based price discrimination, and market segmentation for student (Srinuan, 2005). This brought TrueMove to obtain a million of customers within one year of entry.

² It is now renamed to DTAC.

³ In February 2000, DPC merged with the Shinnawatra Group. It was a fighting band for AIS for a few years. This company does not exist in the Thai mobile communications market now.

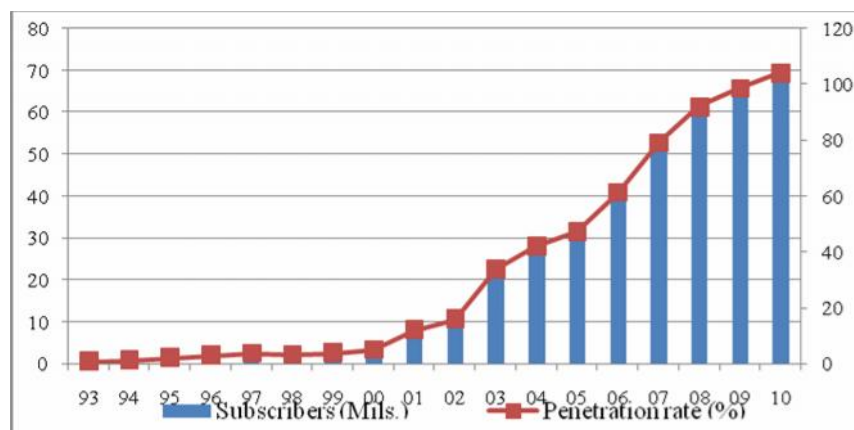


Fig. 1 Mobile subscribers and penetration

Source: ITU (2010) and NBTC (2011)

Table 1 Comparison of major mobile operators

| Characteristics | AIS | DTAC | TrueMove |
|--------------------------------------|-------------------------------|------------------------|------------------------|
| Mobile subscribers | 30,425,700 | 20,935,813 | 16,537,382 |
| Market share as 2010 (by subscriber) | 43.68 | 30.34 | 24.02 |
| Year of entry | 1990 | 1991 | 2002 |
| Concession end | 2016 | 2018 | 2018 |
| Current technology | GSM 900 MHz (1994) | GSM 1800 MHz (1994) | GSM 1800 MHz (2002) |
| Number of base stations | 15,400 | 10,082 | N/A |
| Populated coverage (%) | 97 | N/A | N/A |
| Introduced Mobile Internet | 2000 | 2001 | 2002 |
| Introduced Internet SIM | 2008 | 2008 | 2008 |
| 3G launched | 900 MHz and 2.1 GHz (2011) | 850 MHz (2011) | 800 MHz (2011) |

Note: N/A refers to not available

Source: Partly adopt from Srinuan et al. (2011) and medias

The National Telecommunications Commission (NTC) was established in late 2004 to take over regulatory roles from TOT and CAT. The NTC set up the necessary regulations, such as a licensing regime, interconnection regulation, market definition, Significant Market Power (SMP) regulation, and so on (Srinuan, Annafari, & Bohlin, 2011). It set a mobile number portability (MNP) as a first priority and wanted to implement within one year of the NTC establishing (2006), however, the implementation of MNP was delayed and introduced in December 2010. The MNP clearinghouse has 400 mobile numbers per operator per day capacity with three days porting duration (Asia News Monitor, 2012).

The NTC had prepared for a new chapter for Thai telecom industry. Awarding new 3G licences has been prepared for the past couple of years, but the political situation together with legal difficulties

has led it to fail. The Supreme Administrative Court has decreed that the NTC does not have authority to issue the 3G license. The National Broadcasting and Telecommunications Commission (NBTC) or a new regulatory body needs to be formed to oversee the matter, due to the 2007 Constitution (Srinuan et al., 2011). However, major mobile operators manage to launch 3G services in 2011. For instance, AIS launched 3G-900 MHz and signed agreement with TOT to use 3G-2.1 GHz to use data services. Real Move, a subsidiary of True Corp, jointly provides 3G services with CAT at a spectrum of 800 MHz for 14.5 years. DTAC has also managed to launch 3G services on the 850MHz band in spite of protest from CAT (The Nation, 2011; BMI, 2012). Mobile operators will compete fiercely on both voice and data packages in a near future.

3. Pricing strategies, innovations and competition in mobile communication market: An innovation-based approach

3.1 Pricing strategies, innovation and competition

Retailed prices in mobile communications are usually distinguished in two parts: *access and airtime or usage*. Access refers to subscription charge for post-paid mobile subscribers. This is a charge for the ability to make and receive calls in consumer's point of view. For pre-paid customers even though there is no explicit subscription fee, but there are minimum usage requirements which perhaps can be seen as implicit subscription fee. Usage charge or airtime is usually based on a per-minute charge. Airtime is normally charged only for outgoing calls with Calling Party Pay scheme (CPP). The usage charges are now applied with price discrimination. For example, calling charges are differentiated by time of the day (peak vs. off-peak), and by destination (on-net vs. off-net) (Gruber, 2005).

Recent literature on competition in mobile communications pays more attention on the impacts of termination-based price discrimination. In theoretical literature, for example, study by Hoernig (2007) and Gabrielsen and Vagstad (2008) investigate the impacts of on-net and off-net price differential. Their main finding is that the large network charges significantly higher off-net prices and sets a higher on-net and off-net differential to limit off-net calls of its customers in order to make the smaller network less attractive. Moreover, setting higher off-net than on-net prices give consumers an incentive to locate on the same network as friends and make each individual subscriber more unwilling to switch supplier at a later stage.

In empirical studies, the conclusions of previous studies indicate that the larger networks will get a much larger share of new subscribers compared to smaller rivals when the mobile operators apply termination-based price discrimination for their tariff plans (Kim & Kwon, 2003; Fu, 2004) and the existing mobile customers of larger operators tend to stay even though the smaller operators apply similar termination-based tariff plans (Srinuan et al, 2012). In addition, higher charges for off-net calls would lead to lower (higher) amount off-net (on-net) calls will be made by mobile subscribers (Birke & Swann, 2006). Mobile subscribers may reluctant to make calls to other networks due to high off-net

calls prices (Grajek, 2010). Therefore, mobile subscribers make a choice to select the larger subscriber based operator rather than smaller providers so as to minimize their phone bills due to the lower charges and larger among of subscribers in the same network. However, the price plans which are discussed in these studies are too simplified and no details on price plan characteristics. Moreover, all of these studies focus on the role of price plans in affecting behavior of consumer, switching cost rather than competition and innovation mobile service provider.

Most economists consider product and service prices as supply-side variable. The issue is elasticity: if prices are lowered demand will go up. For marketers pricing often reflects demand rather than driving it. If demand is considered broad the price is set low to reflect and capture this reality. If it is top-heavy (i.e., much more robust at the high-income consumer level) the price is kept relatively high, and if it is bifurcated (with distinct high- and low-end segments) two or more products with different prices are introduced (Kalba, 2008).

To understand the influence demand on firm's degree of innovativeness in mobile communication sector, this study will look at number and characteristic of new tariff plan. The interpretation of new price plan will be based on an innovation-based perspective. The introduction of a new tariff plan possesses a distinctive feature of innovation so called uncertainty. Uncertainty is strictly related to the characteristics of demand in particular in mobile communication market where demand of consumer is very heterogeneous (Corrocher & Zirulia, 2010). This heterogeneity is a source of opportunity and become incentive for firm to broader demand environment and rise competition (Adner & Levinthal, 2001, Adner, 2002). For example, a pricing strategy allows mobile service providers to adjust their prices to react to competition or to respond to demand in each period (Techatassanasoontorn & Suo, 2011).

Several empirical studies show that demand is as important as technological knowledge in determining the pattern of innovation. Firm attempts to interact with customers as a way to reduce uncertainty. Customers are considered as the most important sources of information for both innovation ideas and completion (Fontana & Guerzoni, 2008; Cantner & Guerzoni 2009; Guerzoni 2010; Fabrizio & Thomas 2012). Particularly, recent studies in telecommunications market confirm that demand heterogeneity evolves and acted as an important factor for new products, services, and technologies development. If mobile service provider is continuously increasing demand-side competence influences its ability to not only economize on its own demand-side investments but also increase its output (e.g., average revenue per user, profit) (Hüsig, Hipp & Dowling 2005; Manral, 2010; Whang & Hobday, 2011; Fabrizi, 2011).

Hence, the concept of innovation-based approach can be seen a complementary approach to examining many of the dynamics that offer a link between consumers and firms. It also helps

understand the contribution of demand-side factors on the emergence of new price plan and the evolution of competition within the industry structure.

3.2 Definition of innovation and examples

According to Corrocher and Zirulia (2010), an innovation is defined as a new tariff plan. A tariff plan can be conceived as the mapping between the pattern of the service use and the total price paid by the consumer, and its characteristics are given by all the elements affect such a mapping. They identified eleven characteristics of a price plan. However, a convergence of video, voice and data can lead to more price plans offered in mobile market. More precisely, three more characteristics of price plan are identified from what have been mentioned by Corrocher and Zilulia (2010):

1. Pre-paid cards-subscriptions: indicates whether the tariff plan is designed for pre-paid or for subscriptions.
2. Subscription fee: indicates whether the tariff plan includes a subscription fee.
3. Price per unit/price per minute: indicates whether the price of the call is calculated on the basis of units (e.g. one unit = 30s) or on the basis of actual minutes/seconds of the call length.
4. Call connection fee: indicates whether the tariff plan includes a call connection fee.
5. Time-based charges: indicates whether the tariff plan discriminates on the price according to time (e.g. morning hours or evening hours).
6. Day-based charges: indicates whether the tariff plan discriminates on the price according to which day of the week (e.g. weekday, weekend, or holiday).
7. Location-based charges: indicates whether the tariff plan discriminates on the price according to the geographical location of the caller/receiver.
8. On-net vs. off-net charges: indicates whether the tariff plan discriminates on the price between on-net and off-net calls.
9. Rebate mechanism: indicates whether the tariff plan includes a rebate mechanism.
10. Minutes for free/price related to the total expenditure: indicates whether the tariff plan provides discounts on the basis of total monthly expenditure (e.g. 40% off on national calls if one spends more than 120 euros per two months).

11. Variable prices: indicates whether the tariff plan provides variable prices during the time span of the call (e.g. 30 cents for the first 3 min, 15 cents afterwards).
12. Single price: indicates whether the tariff plan charges a single fixed fee for a service, regardless of calling time, location and network.
13. Bundling: indicates whether the tariff plan which bundle voice services together with either communication services or other services at discount price.
14. Calling club: indicates whether the tariff plan discriminates on the price according to pre-defined of the receiver(s).

The price plans outlined here reveal different categories of users in terms of socio-economics characteristics (Von Hippel, 1982, 1986; Morrison et al 200; Haddon, 2002). These also represent different types of innovation and can be considers as an extension of the static mode explaining market power in term of search and switching costs (e.g., Klemperer, 1995; Farrell & Klempere, 2002). On the demand side, new price plans in each period enable them to them to acquire and retain consumers, and influence consumers' willingness to purchase the range of services offered. The choice and degree of demand-side innovations vary across firms within an industry and even within firms over time. Gallouj and Weinstein (1997) highlight six types of innovations in service industry: radical innovation, incremental innovation, improvement innovation, ad hoc innovation, recombinative innovation and formalization innovation. The radical innovation obviously occurred in mobile communication market such as SMS and MMS during last decade while ad hoc innovation and formalization innovation rarely occur in this market. Hence, the innovations of price plan in this study refer to only three types of innovations.

Simplicity, consider a situation whereby tariff plan A has already been introduced into the market. Later, four other tariff plans are introduced in sequence (tariff plan B, tariff plan C, tariff plan D, and tariff plan E). The characteristics of these tariff plans are also summarized in Table 1.

- Tariff plan B constitutes an incremental innovation with respect to tariff plan A since it introduces a characteristic for the first time to discriminate on the basis of on-net vs. off-net call among consumers.
- A tariff plan that improves certain characteristics without any change to the structure of the system can be called an improvement innovation. This refer to tariff plan C. Tariff plan C has the same characteristics as tariff A but consider three time zones instead of two.
- When a tariff plan requires the combination of different final and technical characteristics or it may also derive from two or more existing tariff plans, it might be called recombinative

innovation. Tariff D is an example of this type of innovation since it combine characteristics of tariff plan B and C

- Finally, tariff plan E is not an innovation. Tariff E is identical to tariff plan A, the only difference being that prices are cheaper. Following the pre-defined definition, tariff E is not an innovation since it is not a new tariff plan for the market but it resembles pre-existing plans. Therefore, it could be considered either a ‘renaming’, if it is introduced by the same firm that introduced tariff plan A or an ‘imitation if it is introduced by another firm.

Table 1 Innovative and non-innovative tariff plans: an example

| | Tariff Plan A | Tariff Plan B | Tariff Plan C | Tariff Plan D | Tariff Plan E |
|---|--|--|---|---|--|
| Pre-paid/ subscription | Subscription | Subscription | Subscription | Subscription | Subscription |
| Subscription fee: | 159 Baht | 119 Baht | 199 Baht | 139 Baht | 99 Baht |
| Price per unit/price per minute: | Price per minute: 0 from 05:00 to 16:59 hrs, 1.5 from 17:00 to 04:59 hrs | Price per minute: 0 from 05:00 to 16:59 hrs, 1.5 from 17:00 to 04:59 hrs | Price per minute: 0 from 05:00 to 09:59 hrs, 0.5 from 10:00 to 16:59 hrs, 1.5 from 17:00 to 04:59 hrs | Price per minute: 0 from 05:00 to 09:59 hrs, 0.5 from 10:00 to 16:59 hrs, 1.5 from 17:00 to 04:59 hrs | Price per minute: 0.5 from 05:00 to 16:59 hrs, 2 from 17:00 to 04:59 hrs |
| Call connection fee | No | No | No | No | No |
| Time-based charges | Yes | Yes | Yes | Yes | Yes |
| Day-based charges | No | No | No | No | No |
| Location-based charges | No | No | No | No | No |
| On-net vs. off-net charges | No | Yes | No | Yes | No |
| Rebate mechanism | No | No | No | No | No |
| Minutes for free/price related to total expenditure | No | No | No | No | No |
| Variable prices | No | No | No | No | No |
| Bundling | No | No | No | No | No |
| Single rate | No | No | No | No | No |
| Calling club | No | No | No | No | No |
| INNOVATION | | Yes | Yes | Yes | No |

Corrocher & Zilulia (2010) also identified the degree of price plans innovativeness corresponding to a decreasing degree of uncertainty. Incremental innovation involves more uncertainty than combining characteristics (recombinative innovation) due to mobile service provider introduces new characteristics into a tariff plan. The lowest degree of uncertainty is presumably associated with tariff plans that differ from existing tariff plans is only in the definition of a specific characteristic or improvement innovation.

The offered price plans in Thai mobile market also illustrate the existence of a process of innovation-based. In order to attract new customers and retain existing customer, mobile service providers have either innovate or imitate existing price plans in response of the competitor’ strategy. Table 2 reports

the examples of new tariff plans that firm introduced to the market between 2002-2010 and their short description.

Table 2 Innovation and Imitation in Thai mobile communications market

| Characteristics | 2002 – 2004 | | | 2005 – 2007 | | | 2008 – 2010 | | |
|-----------------------------------|---|--|--|--|--|---|--|--|--|
| | AIS | DTAC | TrueMove | AIS | DTAC | TrueMove | AIS | DTAC | TrueMove |
| 1. Tariff plan (Introduced date) | | MY (Feb, 2003) | Closed friends (Feb, 2002) | | | One Baht per call (Aug, 2006) | | Suriyan/Chandra SIM (Feb, 2008) | Day/Night Buffet (Feb, 2008) |
| 1.1 Innovation | - | / | / | - | - | / | - | / | / |
| 1.2 Imitation | One Love One Number (Nov, 2002) | | | Oaw Pai Leay (Sep, 2006) | Happy Tee Neung (Sep, 2006) | | Day / Night SIM (Mar, 2008) | | |
| 1.3 Imitation from | TrueMove | | | TrueMove | TrueMove | | DTAC | | |
| 2. Characteristics | One selected number for discounted charge | Set amount of minutes and the deal date by customers | Free minutes and discounted charges for six selected numbers | 1 Baht per call during 00:00 – 14:00 hrs, 1 Baht per minute during 14:00 - 23:59 hrs | 1 Baht per call during 00:00 – 15:00 hr, 0.50 Baht per minute during 15:01 – 23:59 hrs | 1 Baht per call for on-net during 05:00 – 17:00 hrs, 3 Baht per call for off-net during 05:00 – 17:00 hrs, 2 Baht per minute for 1st - 3rd minute and 1 baht per minute for the rest during 17:01 – 04:59 hrs | Day SIM: discounted tariff for all calls during 06:00 – 17:59 hrs, Night SIM: discounted tariff for all calls during 22:00 – 09:59 hrs | Suriyan SIM: discounted tariff for all calls during 06:00 – 17:59 hrs, Chandra SIM: discounted tariff for all calls during 22:00 – 09:59 hrs | Day Buffet: Monthly 129 Baht get unlimited calls during 05:00 - 16:59 hrs, Night Buffet: Monthly 129 Baht get unlimited calls during 17:00 - 22:59 hrs |

Both the theoretical and empirical literature on demand and innovation (Von Hippel, 1982, 1986, Metcalfe & Miles, 2000; Miravete, 2003, 2007; Miravete & Röller, 2004; Kelpper & Malerba, 2010) note that by far most studies has not extensively discussed this mobile communication market in detail the role of innovation in affecting competition between firms in the mobile communications industry, in particular the development of innovation in developing countries. Therefore, this study aim to explore and analyze how demand affect firm’s innovative strategies and characteristics of new tariff plan in Thai mobile communication sector. The secondary data through three main sources: Srinuan

(2005) for data during 2002-2004, printed media for data during 2005-2007 and NBTC for data during 2008-2010.

3.3 Research questions and propositions

To understand the influence of demand on the price plan innovation and the degree of innovation in Thai mobile market, the two main research questions which have been proposed by Corrocher and Zilulia (2010) are applied:

- How does demand affect a firm's degree of innovativeness in terms of the number of new tariff plans?
- How does demand affect the characteristics of new tariff plans in terms of the relative importance of incremental/ recombinative/ improvement innovations and specific characteristics of the tariff plans?

Moreover, a guide for exploring the empirical evidence has been developed which based on the concept of demand as a source of information and incentive to innovate new tariff plans. Four propositions will be employed which mainly have been discussed in Corrocher and Zilulia (2010). These propositions aim to be a frame to answer the main research questions rather than the hypotheses to be tested.

Demand can be conceived as a flow of information from consumers to producers. Firms get the knowledge and learn from the socio-economics characteristics of consumers and their behaviors (Von Hippel, 1982, 1986; Morrison et al. 2000; Haddon, 2002). A number of empirical studies show that the size of the market as a proxy for the presence of demand. Firms attempt to interact with customers to learn what consumer needs and willingness to pay in order to reduce firm's uncertainty (Fontana & Guerzoni, 2008; Cantner & Guerzoni 2009; Guerzoni 2010; Fabrizio & Thomas 2012). It can be hypothesized that mobile service providers with broad-based relationships with customers would be more innovative than firms with a small installed customer based.

Proposition1: Mobile service providers with a larger installed customer base are more innovative than mobile service providers with a smaller installed based customer

On the other hand, mobile service providers with a larger based customer may have more heterogeneous consumers. Some of them may have the similar (preference symmetry), while other may have overlap (preference overlap) or difference degree of preference (Adner, 2002). This indicates that a larger mobile service provider need to concern about market segmentation (Adner, 2002). An important consequence of this heterogeneity demand is that the degree of innovation that mobile service provider introduce into the market may be different between large and small mobile

service providers. When the installed base of consumers is relatively small, firm tend to provide a small number of tariff plans, in order to attract as many new customers as possible with simple, clear price plans, without worrying too much about market segmentation (Corrocher and Zilulia, 2010). It is therefore logical to infer that mobile service providers with a larger installed based customer innovate more relatively improvement and combinative innovations than incremental innovation compared to mobile service providers with a smaller installed based customer.

Proposition2: Mobile service providers with a larger installed customer base introduce relatively more improvement and combinative innovations than incremental innovation compared to mobile service providers with a smaller installed based customer

The consumer's heterogeneity increases over time as the market grows and tends to saturate. Firms risk wasting time and resources in introduce innovation. (Adner & Levinthal, 2001; Adner, 2002). Under condition of market saturation, the number of potential new consumer decrease, the risk of consumer migration increases. Also, the development of new price plan is costly for firm. Then, firms should only offer a few tariff options if their commercialization and product development costs are non-negligible (Miravete, 2007). Alternatively, new price plan should be developed to retain or lock-in existing customer rather than attract new customers. Hence, the characteristics of new tariff plan are more likely to modify or recombine some of existing price plans both from their own and rival price plan rather than introducing the new one. It can be hypothesized that mobile service providers more focus on improvement and recombinative innovations than incremental innovation as the level of market becomes saturates.

Proposition 3: Mobile service providers more focus on improvement and recombinative innovations than incremental innovation as the level of market becomes saturates.

More specifically, mobile service provider understands that consumer faces with switching cost when switching from one service provider to another (Klemperer, 1995; Farrell & Klemperer, 2002). They can utilize the benefit of their installed based consumer to influence all existing and potential consumer as market grows. For example, they may introduce price plan with rebate mechanism or reward programs to their consumers. But not all exiting consumer equally influence a consumer adoption decision. Some key adopters in a consumer network may exert stronger influence on an individual' adoption decision through local network i.e. families and friends. If mobile service provider takes these factors into account for the new price plan with on-net vs. off-net characteristic, it will easily locked-in their consumers (Birke & Swann, 2006; Corrocher & Zirulia, 2009, Techatassanasoontorn & Suo, 2011). In addition, mobile service providers compete by offering various types of bundling services as market saturates. A various kinds of complementarity services

i.e. mobile- phone service, fixed- telephone and mobile Internet in one basket with some amount of discount are not only can locked-in their consumer but also can bring bring about monopoly profit to firms (Manral, 2010; Techatassanasoontorn & Suo, 2011). Hence, mobile service providers are more likely to offer tariff plans which characterized by rebate mechanisms, network-based discrimination and bundling as market saturation grows.

Proposition 4: Mobile service providers are more likely to offer tariff plans which characterized by rebate mechanisms, network-based discrimination and bundling as market saturation grows.

4. Pricing innovation in the Thai mobile market: Empirical evidence

The dataset consist of 463 tariff plans introduced by three mobile operators: AIS, DTAC and TrueMove over 9 years from 2002 to 2010. Each price plan is defined by the 14 characteristics as mentioned in section 3.2. Then, each price plan is classified whether it is an innovation or not and if it is the type of innovation will be identified following the described criteria.

Overall, the number of new tariff plan has increased over time (see Fig. 2), with a peak in 2008 coinciding with the introduction of Internet sim card from every mobile provider. *GSM Internet SIM 99* of AIS is the first mobile internet price plan at the beginning of January 2008. This price plan offer also on-net vs. off-net call. DTAC and Truemove introduce *Sabai Jai Chai Dai Khum* and *Cyber Sim*, which are the similar mobile Internet price plans in the later months.

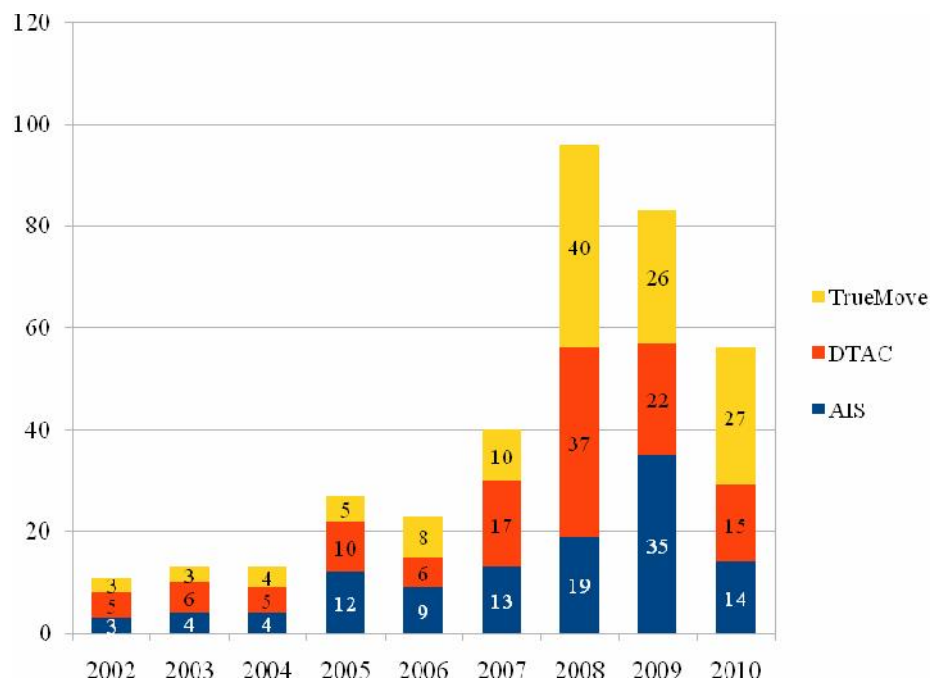


Fig. 2 Number of price plan introduced per year per firm

According to our definition of innovation, 362 out of 463 price plans are new as shown in Table 3. This means that mobile service providers do not imitate their competitor very much, but adopt their own strategies of service differentiation. In absolute term, Truemove and DTAC are leaders in terms of service offering, by providing over time 185 and 152 price plans in the market, while AIS has provided 126 price plans. Each firm introduced 13-14 new price plans per year. On the contrary, AIS has been the most innovative firm over time in relative term. Specifically, price plans of TrueMove are partly from re-branding price plans and imitation. Considering in relative term, AIS has highest percentage of total innovations to total tariff plans which is 90%, while DTAC and TrueMove has lower percentage of total innovation to total tariff plans about 81% and 68% respectively. This evidence can be interpreted in light of proposition 1, this study shows that mobile service providers with a higher installed customer base generally introduce a higher number of innovative price plan than the smaller one. This implies that larger mobile service providers attempt to utilize a flow of information from their consumers in order to reduce firm’s uncertainty.

Table 3 Innovation and imitations by firm

| Firm/Tariff plan | Incremental | Recombinative | Improvement | Total Innovations | Imitation | Renaming | Total tariff plans |
|------------------|-------------|---------------|-------------|-------------------|-----------|----------|--------------------|
| AIS | 32 | 36 | 45 | 113 | 5 | 8 | 126 |
| DTAC | 25 | 34 | 64 | 123 | 15 | 14 | 152 |
| TrueMove | 20 | 43 | 63 | 126 | 15 | 44 | 185 |
| Total | 77 | 113 | 172 | 362 | 35 | 66 | 463 |

In view of innovation characteristics, the finding show that the larger mobile providers introduce more incremental innovation than smaller mobile providers. For example, incremental innovations constitute of 28.31%, and 20.33% of AIS and DTAC’s total innovation, while this percentage is relatively lower for TrueMove (15.87%). But Truemove has higher recombinative (50.00%) and improvement (34.00%) innovation than AIS (31.85%, 39.82%) and DTAC (27.64%, 52.03%). These results are contrast with proposition 2: a larger firm introduces relatively more recombinative and improvement as compared to smaller firm. However, these findings can be related to TrueMove business structure. Though Truemove has a smaller consumer base in mobile market compared to AIS and DTAC, but Truemove has the related services in other communication market i.e. fixed-telephony, broadband and cable TV. Then, this firm tends to provide a number of new tariff plans in

order to attract new consumers and existing consumer from other segments as much as possible by using convergence strategy.

In exploring the mobile pricing innovation and competition, the period of the analysis divided into three periods according to Fig. 1 in section 2: the initial stage of competition (2002-2004) when all of three major mobile operators are in the market, the growth stage (2005-2007) and the maturity stage (2008-2010). Number of innovative price plans still increase in the last period of observation (2008-2010). Mobile operators rather concentrate on implementing recombinative and improvement innovations than incremental innovation. This provides an evidence for proposition 3, operators tend to provide improve innovations as market becomes mature (see Table 4). Incremental innovation increases significantly in this period since mobile operators start to create smart phone tariff plans which add mobile Internet services and Wi-Fi Internet connection to their packages. In addition, handset subsidy is reintroduced again for I-Phone and Blackberry tariff plans in all mobile operators.

Table 4 Type of innovation over time

| Year | Incremental | Recombinative | Improvement |
|--------------|-------------|---------------|-------------|
| 2002 | 7 | 1 | 3 |
| 2003 | 3 | 3 | 7 |
| 2004 | 4 | 4 | 5 |
| 2005 | 7 | 10 | 10 |
| 2006 | 7 | 7 | 9 |
| 2007 | 9 | 8 | 23 |
| 2008 | 18 | 27 | 51 |
| 2009 | 11 | 40 | 32 |
| 2010 | 11 | 13 | 32 |
| Total | 77 | 113 | 172 |

The empirical evidence shows some interesting results. As market grows, tariff plans characterized by network-based price discrimination, rebate mechanism, and bundling increase (see Table 5). For instance, network-based price discrimination tariff plans were implemented about 3% of total tariff in the first period (2002-2004) and they increase to 20% in the last period (2008-2010). Rebate mechanism increases from 4% to 7%. Bundling plans also increase two times compared the first and the last period. This evidence confirms proposition 4. In addition, mobile operators offer network-based price discrimination, rebate mechanism, and single fee heavily in market saturation period.

Considering each mobile operator in different period, their main strategies vary overtime. In the first period, AIS and TrueMove implemented minute for free as their main tariff plans, while DTAC used single fee strategy. AIS switched its major tariff plan to network-based price discrimination in the second period and it changed its focus again to single fee in the last period of study. DTAC and TrueMove use variable cost and network-based price discrimination as the same major tariff plans in the last two periods. However, DTAC also focuses on single fee tariff plan in the last period.

| Industry evolution | Characteristics | | | | | | | | | | Total |
|--------------------|--------------------|------------------------|-------------------|----------------------------|------------------|--|----------|----------|------------|--------------|-------|
| | Time-based charges | Location-based charges | Day-based charges | On-net vs. off-net charges | Rebate mechanism | Minute for free and price related to total expenditure | Variable | Bundling | Single fee | Calling club | |
| All firms | | | | | | | | | | | |
| 2002-2004 | 5% | 0% | 3% | 3% | 26% | 21% | 10% | 4% | 14% | 15% | 100% |
| 2005-2007 | 16% | 2% | 1% | 23% | 4% | 10% | 30% | 3% | 11% | 2% | 100% |
| 2008-2010 | 14% | 0% | 0% | 20% | 17% | 8% | 7% | 8% | 18% | 6% | 100% |
| AIS | | | | | | | | | | | |
| 2002-2004 | 9% | 0% | 0% | 5% | 18% | 27% | 18% | 0% | 14% | 9% | 100% |
| 2005-2007 | 12% | 4% | 0% | 25% | 4% | 8% | 24% | 2% | 22% | 0% | 100% |
| 2008-2010 | 12% | 2% | 0% | 17% | 13% | 11% | 9% | 6% | 25% | 4% | 100% |
| DTAC | | | | | | | | | | | |
| 2002-2004 | 0% | 0% | 7% | 0% | 41% | 10% | 10% | 7% | 17% | 7% | 100% |
| 2005-2007 | 19% | 1% | 1% | 17% | 3% | 11% | 33% | 0% | 8% | 6% | 100% |
| 2008-2010 | 16% | 0% | 0% | 20% | 17% | 6% | 5% | 12% | 20% | 4% | 100% |
| TRUE | | | | | | | | | | | |
| 2002-2004 | 9% | 0% | 0% | 5% | 14% | 27% | 0% | 5% | 9% | 32% | 100% |
| 2005-2007 | 15% | 0% | 0% | 26% | 4% | 11% | 32% | 6% | 6% | 0% | 100% |
| 2008-2010 | 14% | 0% | 0% | 22% | 18% | 7% | 7% | 8% | 16% | 7% | 100% |

Others interesting observations have been found. Location-based charges were implemented by AIS and DTAC. However, AIS uses it more regularly. This might due to AIS's customers are more spreading out nationwide. AIS also introduce every characteristics of price plan except Day- based charges, while others introduce fewer characteristics. This implies that the customers of AIS are more heterogeneous and AIS attempts to satisfy their customer demands. DTAC has their own tariff plan which is not introduced by others; Day-based

charges. It usually combines this with rebate mechanism. For example, customers could pay cheaper during weekend and national holidays. Sometime, it offers free of charge for customer's birthday. TrueMove has started to combine its mobile tariff plans with cable TV, broadband Internet access, and fixed telephony. For instance, pre-paid customers can get free installation costs of cable TV and several TV channels for free if they pay more than 300 baht per month for their mobile telephony.

These price plan innovations not only reflect the demand of consumers but also reflect the impact of price plan on competition. As mentioned, TrueMove is the most innovative firms in absolute term. This means that TrueMove tend to provide more alternative to attract new consumers and retain their existing consumers by utilizing their resources in other communication markets. This contradicts with what Corrocher and Zirulia (2010) have been mentioned: small firm are more likely to small number of tariff plans, simple and clear price plans. Moreover, it results in the market share of the larger firms i.e AIS has been decrease over time. At the end of 2002, AIS earned 59 % of total market shares while DTAC and TrueMove is about 31% and 7% respectively. Recently, TrueMove has 23% of market shares on mobile market, while AIS and DTAC gains 43% and 30% respectively. This implies that the innovative price plan of TrueMove have been successfully to cover heterogeneous needs of mobile customers both existing and new customers. Therefore, the price plan innovations also drive competition in this market.

5. Conclusion

In traditional industrail economics, several studies have investigated the impacts of price discrimination, in particular network-based price discrimination, and the analyses usually limit to simple tariff plan and deal with consumers' behaviors and switching costs. However, in reality mobile operators offer several different character of tariff plans; time-based, location-based, network-based, and so on. This study analyzes the competition in the Thai mobile communications services market by using innovation approach and employing the secondary data of price plan between 2002-2010.

The findings show that mobile operators use tariff plans as their competing tools. Larger mobile operators introduced more innovative in tariff plans in relative term. When the market is getting to be saturated, operators will introduce recombinative and improvement innovations. Moreover, as market grows, specific tariff plan i.e. network-based price

discrimination, rebate mechanism, and bundling increase. The smallest mobile operator has higher number of tariff plans in absolute term and it could use for expand its market share.

Though the higher number of tariff plans can increase competition among operators, but several number of tariff plans have a complex combination which can lead to consumers' confusion. Subscribers perhaps could not choose the plan according to their real needs to minimize their monthly costs. This issue is worth to investigate further to ensure consumer's benefits. Therefore, the roles of telecom regulator also need. Tariff plan checker has to be implemented since mobile subscribers could select the price plan that suit with his needs properly and increase competition in the market.

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