The effect of innovative services on mobile network traffic

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Abstract: Although current mobile network traffic is usually believed to exhibit the price sensitivity, this might not the case at the innovative mobile services since most mobile operators of today provided almost homogeneous services to their subscribers, based on a theoretical model of innovative services effect on mobile network traffic, we find frequent services innovations undoubtedly increase the traffic even in the conditions of price fluctuation, further analysis and empirical implementation show that mobile operators without innovative services will not be bound to increase their traffic or mobile services consumption even if they decline the tariff dramatically for attracting subscribers.
Keywords: innovative services, network traffic, MOU, price competition

1. INTRODUCTION

One of the most notable events in the telecom sector has been the remarkable growth of mobile subscribers due to technological changes and market competition, meanwhile, the monthly average revenue of per user (ARPU) of many mobile operators falls down year by year.

Traditionally, with the relaxation of telecom regulation, the incumbents surely complete against those entrants with low cost advantage in order to keep or strengthen their own market position, the price competition among those mobile operators becomes inevitable in providing consumers the homogeneous services, moreover, such competition will embody evidently in attracting potential customers in developing countries.

The problem associated with huge number of mobile subscribers is that the average mobile service consumption has been reducing yearly. In particular, more and more low-end users have entered the mobile network. According to ITU estimation, the period of 2G mobile system completely evolved into 3G system will at least need over ten years, but how to increase earning ability and service innovation for current mobile network seems to be a great task for those operators in coming years as numerous subscribers don’t bring about the corresponding high growth of revenue and profit.

originated by the specific service n is assumed to be given by :

$$V_n = \begin{cases} 0 & \delta u_n - p_n \le 0 \\ f(u_n, p_n) = \delta u_n - p_n & \delta u_n - p_n > 0 \end{cases} \qquad n = (1,2,...k)$$

Where δ is a stochastic variable which will reinforce the traffic if its value appears to increase, meanwhile, we assume the δ distribution function and density function are denoted by F(δ) and f(δ)respectively.

For simplicity, if $u_i > u_c$, the mobile subscriber then receive more utility from innovative service than that of conventional service in the mobile network, given $0 \leqslant u_i$, $u_c \leqslant u$, where u is the upper limit value of the service, and correspondingly, the $p_i > p_c$.

For $u_i / p_i \geqslant u_c / p_c$ and $\delta u_c > p_c$, which means the effect of innovative service by unit on network traffic is not less than that of conventional service, the result of network traffic V_i is surely larger than the traffic V_c is given by:

$$\Delta V = f(u_i, p_i) - f(u_c, p_c) = (\delta u_i - p_i) - (\delta u_c - p_c)$$
$$= p_i(\delta \frac{u_i}{p_i} - 1) - p_c(\delta \frac{u_c}{p_c} - 1) \ge \Delta p(\delta \frac{u_c}{p_c} - 1) > 0 \qquad (i \ne c) \qquad (1)$$

Where $\Delta P = P_i - P_c$, as for $\Delta V = V_i - V_c$ is always positive which shows the traffic has increased by the innovative or advanced services with relative low price.

If the parameter δ^* represents the indifferent subscriber preference between two specific mobile services and originated , so that $V_i = V_c$, and equations are then :

$$\delta^* u_i - p_i = \delta^* u_c - p_c, \qquad \delta^* \Delta u = \Delta p \qquad or \qquad \delta^* = \frac{\Delta p}{\Delta u}$$

where $\Delta u = u_i - u_c$, $\Delta p = p_i - p_c$.

From above analysis with respect to the innovative traffic increase, the essential condition is given by

$$V_i > V_c and \delta \ge \frac{p_i}{u_i}, \qquad \delta > \delta^* = \frac{\Delta p}{\Delta u} and \delta \ge \frac{p_i}{u_i} \qquad (2)$$

On other hand, note that by given $u_i / p_i \leqslant u_c / p_c$, the condition for innovative service can be written as $\Delta p / \Delta u \geqslant p_i / u_i \geqslant p_c / u_c$, due to $\Delta p / \Delta u \geqslant p_i / u_i$, which can be translated into $u_i \Delta p \geqslant p_i \Delta u$, that is $u_i p_c \leqslant p_i u_c$ or is shown as $u_i / p_i \leqslant u_c / p_c$, the traffic of innovative service is then given by

$$P(\delta \ge \frac{p_i}{u_i}, \delta \ge \frac{p_i - p_c}{u_i - u_c}) = 1 - F(\frac{\Delta p}{\Delta u}) = V_i(p_{i,}, p_c, u_i, u_c) \qquad (3)$$

Similarly, if traffic of conventional mobile service is in excess of the innovative service, the prerequisite should be in consistent with $V_i < V_c$ and $\delta \geqslant p_c / u_c$,, which also $\delta \leqslant \Delta p / \Delta u$

which shows traffic is sure to rise with elimination of the gap (Δu) between two distinctive services, on the other hand, the traffic will reduce with various mobile services innovated continuously while it will raises for the rivals new services providing in market.

3. THE EMPIRICAL IMPLEMENTATION

The mobile communications sector in China has experienced a number of technological and regulatory development over the last decade, the number of mobile phone subscribers registered at tremendous growth, for instance, China Unicom, incorporated as the second mobile services provider in domestic market in 1994, has more than 100 million users in year 2004 and its annual growth is close to 105 percent in the past six years. However, from the analogue cellular technology abandoned in 2000 to current digital technology adopted, the majority of the revenue of China two mobile operators is generated from the conventional voice service, and their growth rate of average revenue of per user (ARPU) and minute of usage (MOU) have showed a slow-down in near years.

The statistics used in this study are from the semi-annual and annual report of China Unicom corporation (HK) from December 1999 to June 2004, the data are published to domestic and oversea investors and can be obtained by browsing the company’s homepage, it includes the most important finance data and statistic for its operation such as traffic, revenue, ARPU and MOU.

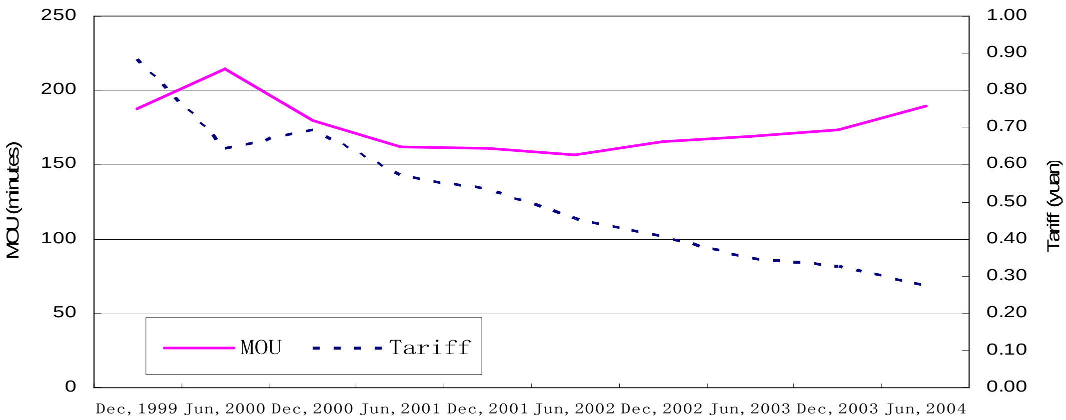

Fig.1. The conventional voice service of China Unicom: the MOU and tariff

As figure 1 illustrates, the average tariff, roughly estimated through the value of ARPU divided by MOU value as various and complicated pricing strategies of China Unicom carried out in regional markets, has declined by more than 60 percent, from around 0.88 yuan per minute to 0.27 yuan during the time period of 1999 to 2004. in contrast, the annual traffic generated by the subscribers, which can be measured by the MOU in the paper, has rise by less than 10 percent, the major reason of the non-equilibrium of the two indexes for the China

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