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Perceptions of Traditional Voice Calls and Over-the-Top (OTT) Communication Services among Thai Consumers¹

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Abstract

We analyzed unique panel data from NBTC to uncover Thai consumers' preference toward Over-the-top (OTT) communication service and traditional voice call in the post-Covid-19 period. Employing a dynamic panel model, we estimate the demand relationship between telecommunication services. We found that Thai consumers perceive traditional voice call and OTT communication as separate services. Moreover, they remained unchanged from pre-pandemic time. Traditional voice call service is likely used to return incoming traditional voice call. This helps the regulators in defining market around OTT communication service and traditional voice call service.

Keywords: OTT communications, Substitution, Traditional voice calls, Dynamic panel model, Thailand

Working Paper, Preliminary results

1. Introduction

Over the past decade, Thailand has witnessed a gradual increase in internet consumption, driven by factors such as the availability of lower-cost devices, advancements in connectivity through 4G and 5G technologies, and the abundance of high-quality audiovisual content. This surge in internet usage has paved the way for a diverse array of applications that utilize internet connections to deliver their services, earning them the designation of Over-the-Top (OTT). These applications have become immensely popular, finding a place in every device and offering a wide range of services. These services span from formal offerings, such as government services, to various entertainment platforms and communication services.

While National Broadcasting and Telecommunication Commission (NBTC), Thailand's National Regulation Authority (NRA), has been monitoring Over-the-Top (OTT) services, which have the potential to compete with traditional telecommunication and broadcasting services, no specific actions have been taken

¹The opinions and analysis in this paper are solely those of the authors and do not represent the official stance or policies of the NBTC.

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thus far. Jirakasem and Mitomo (2019) study revealed that the perception of OTT services varies depending on the payment scheme, with OTT communication seen as complementary in prepaid schemes and as a substitute in postpaid schemes.

This study utilizes panel data from 2019, a year before the unprecedented impact of Covid-19 on Thailand. The pandemic resulted in a substantial increase in data consumption and a shift in digital behavior. Surprisingly, even after the initial surge in data consumption, the habits of Thai consumers remained unchanged, raising questions about the potential evolution in the adoption of OTT communication services from 2019.

The primary objective of this work is to offer a nuanced understanding of the usage patterns of OTT communication applications compared to traditional voice calls. By doing so, it not only provides the NBTC with essential insights into users' perspectives on OTT voice calls but also informs regulatory decisions concerning traditional voice calls in the current landscape. Therefore, we raised 2 research questions:

RQ1: Do Thai consumers perceive Over-the-top (OTT) communication as a complimentary service, a substitute, or an entirely distinct service compared to traditional voice calls?

RQ2: Do Thai consumers change their demand for traditional voice calls and Over-the-top (OTT) communication service post-pandemic?

2. Literature Reviews

Topic on over-the-top (OTT) services had been raised since 2000s. Green et al. (2006) provided a meaning of OTT as followed: Over-the-top (OTT) services is the buzz-expression for services carried over the networks, delivering value to customers, but without any carrier service provider being involved in planning, selling, provisioning, or servicing them – and of course without any traditional telco booking revenue directly from them. The paper analysed trend, cost, features, and other important aspect of OTT services. One of the key findings is the OTT has the cost advantage over traditional telecommunication services. Nowadays, OTT services have flourished in consumer market, ranging from entertainment services, government services, and reaching even to telecommunication service, service of their carriers. This sparks interests in dynamic of telecommunication market structure due to the contrast between an important characteristic of telecommunication service and OTT service, price.

Sujata et al. (2015) studied the impact of OTT services on telecommunication service providers. They found that the traditional telecommunication service was becoming obsolete. However, the relationship between OTT service providers and telecommunication carriers are not completely competing each other. Telecommunication carriers also benefit from OTT services through internet connectivity services.

In broadcasting industry, OTT services depict a huge surge in usage where traditional TV usage declines continuously. There are even consumers who chose to “cut the cord”, or cancelled their TV subscription

completely. According to Malone et al. (2023), the behavior of consumers “cutting the cord” (cancelling TV subscription) change. Cord-cutters increase internet usage, reduce multiple system operators spending, and increase OTT subscription. The findings suggested that OTT services substitute traditional TV service.

Wellmann (2019) studied the relationship between OTT messaging service and mobile telecommunication using data of telecommunication usage in Norway from 2006 to 2015. The paper employed the quantity of services rather than price in estimating demand of telecommunication service. The method used was first difference instrument variable model (FD-IV) using lag variables as instruments. The findings suggested complimentary relationship between OTT messaging and mobile telecommunication services.

In the context of Thailand, Jirakasem and Mitomo (2019) provided an empirical result on the relationship between OTT communications and traditional telecommunications services. The paper used cross sectional data from survey collected in 2019 and analysed with probit analysis. The analysis unveiled that perception of OTT communications services differs according to payment scheme adopted by consumers. Flat rate payment consumers viewed OTT communications as a complimentary service to traditional telecommunications services while use-dependent payment consumers viewed OTT communications as a substitute to traditional telecommunications services.

Literature covers the demand relationship between telecommunications services employ several econometrics models. Some of the notably examples which applied to panel data are as following. Basalisco (2012) explored demand in traditional text messaging with two-stage least square model with fixed effects. Barth and Heimeshoff (2014) utilized dynamic fixed effect panel model in order to determine relationship between fixed and mobile call. Lange and Saric (2016) studied fixed, mobile, and voice over IP telephony substitution using difference GMM model.

There are researches conducted on the OTT services. However, most of the researches we found are on OTT video service. Some focused on industry conduct and performance. The closest work about the demand relationship between OTT communications and traditional telecommunications, to the best of our knowledge, are from Wellmann (2019) and Jirakasem and Mitomo (2019). Wellmann (2019) was based on Norwegian consumers behavior from 2006 to 2015 and Jirakasem and Mitomo (2019) was based on a cross sectional survey data before the pandemic. Therefore, our work would hopefully contribute as a refinement to the precedent researches, shedding light to demand relationship of the services in Thailand’s post-pandemic society.

3. Methodology

3.1. Data

We sourced our data from the NBTC online application data collector, which recruited samples based on geographical demographics and the market share of the telecommunication sector. The data spans three

intervals, each lasting 7 months, corresponding to the years 2019, 2021, and 2023. In 2019, we collected data from 4550 samples, followed by 2813 samples in 2021, and 2695 samples in 2023.

The dataset includes various metrics related to both incoming and outgoing voice calls, messaging (SMS and MMS), and data consumption, with units such as number of calls, minutes, number of messages, and megabytes. The frequency of the data is daily.

OTT communication service, in the scope of this work, are over-the-top applications which provide service equivalent to traditional telecommunication service in terms of user experience. Specifically, they provide voice calling and text messaging service. From the data, OTT communication service are listed in table 1.

Table 1: List of OTT communication applications

| OTT communication applications | | |
|--------------------------------|-----------------|----------------------------|
| Cisco Webex | LINE | Telegram |
| Discord | Messenger | The Messenger for Messages |
| Facebook | Messenger Kids | Twitter |
| Google Classroom | Messenger Lite | VK |
| Google Meet | Microsoft Teams | WhatsApp Messenger |
| Instagram | Skype | Zoom |

The sample which reported no usage in both traditional voice call and OTT communication applications are excluded from the data. The data are then aggregated in a weekly basis by sum of daily consumption. Observations after treatment are presented in table 2.

Table 2: Observations before and after treatment

| Category | Phase 1 | | Phase 2 | | Phase 3 | |
|--------------|---------|--------|---------|--------|---------|--------|
| | Before | After | Before | After | Before | After |
| Observations | 821,730 | 59,058 | 598,264 | 85,622 | 421,260 | 51,240 |
| Individual | 3,822 | 3,474 | 2,822 | 2,762 | 2,006 | 1,708 |
| Time | 215 | 17 | 212 | 31 | 210 | 30 |

3.2. Empirical analysis

We used services traffic data as proxies to OTT communication and traditional voice call quantity. We followed analysis model of Basalisco (2012), Lange and Saric (2016), and Wellmann (2019) with a change in independent variables, namely price, since OTT communication services are free. Employing a dynamic

panel model, we aimed to estimate the impact of OTT communication traffic on outgoing traditional voice call and the impact of traditional voice call incoming traffic on Over-the-Top (OTT) communication traffic, considering other explanatory variables for instance, text messaging or sms service.

Econometric model specification followed Wellmann (2019). However, we adapted the model with our characteristic of our data. Precisely, we included $Q_{subs,i,t}^{in}$ since we have the data of incoming potential substitute service. However, we exclude day and holiday dummy since the data we have is in weekly. We specify the demand for traditional voice call for individual i at time t as follows:

$$Q_{c,i,t}^{out} = Q_{c,i,t-1}^{out} + Q_{c,i,t}^{in} + \sum_{subs} Q_{subs,i,t}^{in} + \sum_{subs} Q_{subs,i,t}^{out} + \epsilon_{i,t} \quad (1)$$

where $Q_{c,i,t}$ is the quantity of interested telecommunication channel c , in this case, traditional voice call, of individual i at time t . $Q_{subs,i,t}$ is the quantity of the potential substitute telecommunication service. $subs$ are a set of potential substitute services which are all other telecommunication channel except c , namely, sms service and OTT communication service. Q represents quantity of service. For traditional voice call and sms service, Q is indicated by number of call/sms made/received while for OTT communication service, Q is represented by upload and download traffic data of OTT communication applications as the outgoing and incoming OTT communication respectively. Our assumption is that incoming communication from any channel may trigger an outgoing communication and when one outgoing communication channel is chosen, other would not be used. This means we assume only a single outgoing communication channel made by all individual.

Our assumption and model specification subject to endogeneity. Since incoming and outgoing communication channel may influenced each other simultaneously. To counter the problems, we exploit time attribute of our data to create GMM instrument variable and normal instrument variables in which has no correlation with the disturbance term. Thus, estimation equations become:

$$\begin{aligned} Q_{c,i,t}^{out} &= Q_{c,i,t-1}^{out} + Q_{c,i,t}^{in} + \sum_{subs} Q_{subs,i,t}^{in} + \sum_{subs} Q_{subs,i,t}^{out} + \epsilon_{i,t} \\ \Delta Q_{c,i,t}^{out} &= \Delta Q_{c,i,t-1}^{out} + \Delta Q_{c,i,t}^{in} + \Delta \sum_{subs} Q_{subs,i,t}^{in} + \Delta \sum_{subs} Q_{subs,i,t}^{out} + \Delta \epsilon_{i,t} \end{aligned} \quad (2)$$

We anticipate that in the case of substitution between traditional voice call and OTT communication, the coefficient for $Q_{apps,i,t}^{out}$ should be negative and significant. In the case of complimentary, the coefficient of the stated variable should be positive and significant. Finally, in the case of different service, the coefficient should be non-significant or zero.

4. Empirical Results

Each phase of data collection has a different usage pattern across all telecommunication services. Data from phase 1 is collected from before Covid-19 hit Thailand. Data from phase 2 is collected from the period

Figure 1: Average amount of calls

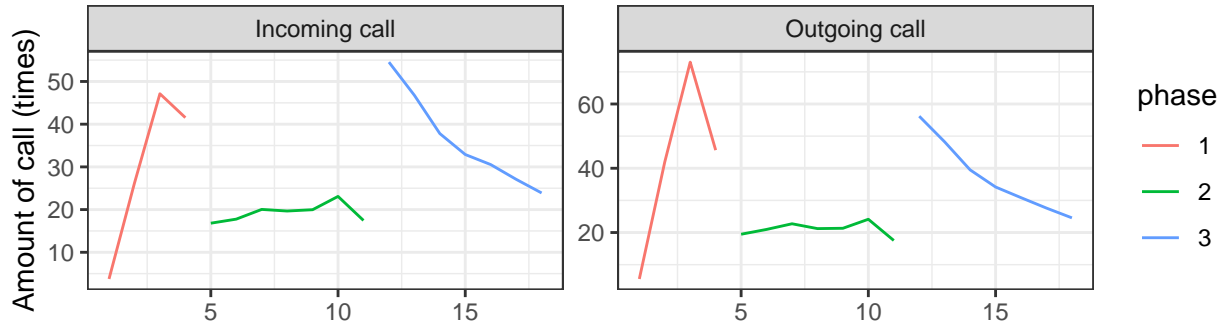
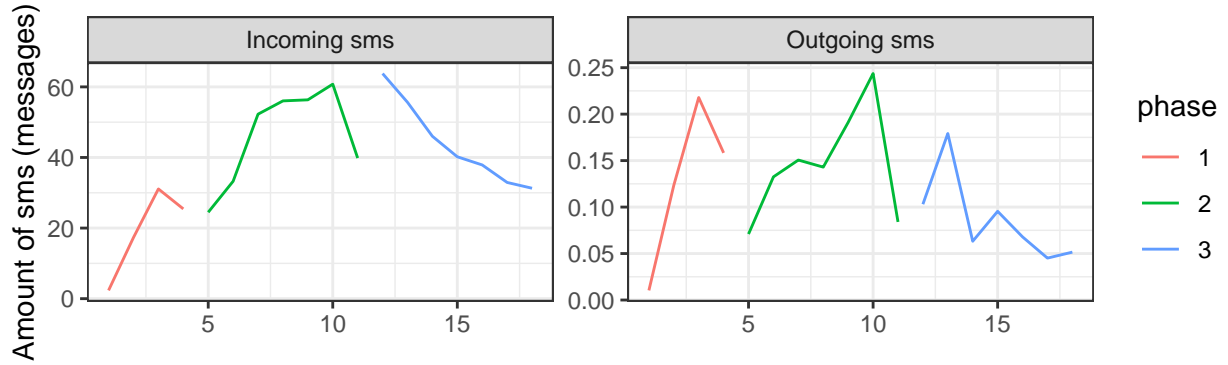


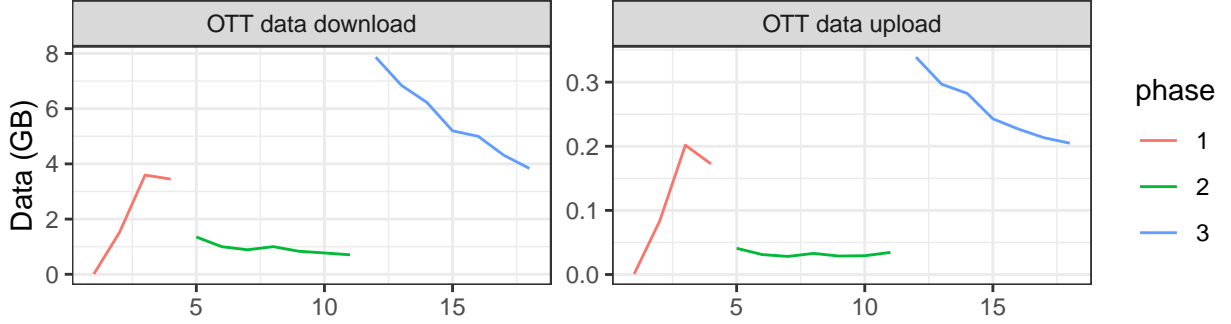
Figure 2: Average amount of SMS



when Thailand was affected by Covid-19. Lastly, data from phase 3 is collected after the pandemic. From figure 1, we can see that during the pandemic, the amount of both outgoing and incoming calls differ from other 2 periods.

Figure 2 shows volume in sms service. The amount of incoming sms depicts a sharp increase before and during the pandemic but declined heavily after the pandemic. Outgoing sms fluctuated across all the period however, the level of service usage is extremely low relative to other services.

Figure 3: Average OTT data traffic



In OTT communication service, the usage pattern is similar to traditional voice call service. The activity rose before the pandemic, plummeted and not fluctuate much during the pandemic, then spiked and explicated a downward trend as shown in figure 3.

From the data, we employ the model on the data from each phase separately, rather than analyzing all data at once as we see that the usage pattern between each period differs. The data structure of each phase are as table 3.

To model the demand relationship, first, we used fixed effects model to estimate the demand relationship. However, the error shows serial correlation. After modelling with dynamic term pooled OLS, dynamic term fixed effects, and difference GMM model, according to Bond et al. (2001), the coefficient of the dynamic term suggest system GMM. We employed system GMM model to estimate the relationship between traditional voice call and OTT communication service as in equations (2).

From the estimation in table 4, the dynamic term is significant across all phase and aligned with the theory. Our interested service, OTT communication represented by OTT upload data, is insignificant across all the models on all data phase. The coefficients of OTT communication in all data phase are extremely small. The important statistical tests of the model are sargan-hansen J test for valid instruments (p value > 0.25), Arellano-Bond test of serial correlation at lag 2 (AR(2), p value > 0.05), and Wald test for significant of the model (p value < 0.05). Sargan-Hansen test reported that our instrument variables in phase 1 and 3 model are invalid. However, instrument variables in phase 2 model is valid. Arellano-Bond test reported no serial correlation across all models. Finally, Wald test reported that the models are significant.

Table 3: Summary statistic of data by week

| Phase | Service | Unit | min | mean | max | sd |
|-------|-------------------|------------|-----|-----------|-------------|-----------|
| 1 | Outgoing call | times | 0 | 9.775 | 465.000 | 21.615 |
| 1 | Incoming call | times | 0 | 6.977 | 226.000 | 13.995 |
| 1 | Outgoing sms | messages | 0 | 0.030 | 48.000 | 0.411 |
| 1 | Incoming sms | messages | 0 | 4.482 | 1,333.000 | 11.838 |
| 1 | OTT data upload | Mega Bytes | 0 | 27.639 | 36,842.690 | 267.016 |
| 1 | OTT data download | Mega Bytes | 0 | 516.065 | 196,870.163 | 3,093.086 |
| 2 | Outgoing call | times | 0 | 4.754 | 1,462.000 | 19.172 |
| 2 | Incoming call | times | 0 | 4.348 | 992.000 | 16.787 |
| 2 | Outgoing sms | messages | 0 | 0.033 | 154.000 | 0.981 |
| 2 | Incoming sms | messages | 0 | 10.419 | 2,775.000 | 46.006 |
| 2 | OTT data upload | Mega Bytes | 0 | 7.457 | 5,853.424 | 61.963 |
| 2 | OTT data download | Mega Bytes | 0 | 216.377 | 50,599.217 | 730.451 |
| 3 | Outgoing call | times | 0 | 8.703 | 417.000 | 16.924 |
| 3 | Incoming call | times | 0 | 8.450 | 177.000 | 12.979 |
| 3 | Outgoing sms | messages | 0 | 0.020 | 98.000 | 0.601 |
| 3 | Incoming sms | messages | 0 | 10.257 | 235.000 | 15.638 |
| 3 | OTT data upload | Mega Bytes | 0 | 61.638 | 13,382.219 | 243.314 |
| 3 | OTT data download | Mega Bytes | 0 | 1,340.814 | 202,645.249 | 3,301.283 |

Table 4: Estimation results

| | Outgoing call | | |
|--|-----------------------|-----------------------|------------------------|
| | Phase 1 | Phase 2 | Phase 3 |
| Outgoing call at t-1 | 0.316*** (0.021) | 0.803*** (0.027) | 0.381*** (0.023) |
| Incoming call | 0.842*** (0.041) | 0.038* (0.020) | 0.627*** (0.027) |
| Outgoing sms | 0.015 (0.042) | 0.024*** (0.005) | 0.001 (0.010) |
| Incoming sms | 1.581*** (0.347) | 0.172 (0.147) | 0.150 (0.119) |
| OTT download | -0.00004 (0.00003) | -0.00001 (0.00004) | -0.0001** (0.00002) |
| OTT upload | 0.0001 (0.0003) | -0.0003 (0.001) | 0.0003 (0.0002) |
| n | 3474 | 2762 | 1708 |
| T | 17 | 31 | 30 |
| Robust Sargan-Hansen J | 3.244e-35 | 8.944e-01 | 1.601e-10 |
| Arellano-Bond AR(2) | 0.333 | 0.137 | 0.055 |
| Wald test-coef | <2.22e-16 | <2.22e-16 | <2.22e-16 |
| Wald test-time | <2.22e-16 | <2.22e-16 | 5.01e-15 |
| Observations | 3,474 | 2,762 | 1,708 |
| <i>Note:</i> *p<0.1; **p<0.05; ***p<0.01 | | | |

5. Discussion and Policy Implication

From the estimation results, we can see that the relationship between OTT communication represented by OTT upload and the dependent variable, traditional voice call is extremely small across all data phase and insignificant in the first and second phase. This results imply that there is little to no connection between the two services in all interval. Therefore, the pandemic did not change consumers' distinctive perception toward OTT communication services and traditional voice call.

Another interesting remark is that the traffic of OTT communication applications dropped during the pandemic. After mapping the timeline of the pandemic in Thailand and the time of data collected, we found that the timing of data collection spanned a period slightly after the government relaxed their first pandemic countermeasures. Therefore, the low amount of OTT communication usage may be the result of people switching to offline gathering after a prolonged periods of lockdown. The estimation results further reveal that the positive impact factors prompting individual to make a traditional voice call is incoming call of the same channel and calling habits which represented by the lag term.

However, the validity of the specification of the models for phase 1 and 3 data is not undisputable due to the result of Sargan-Hansen test of overidentification of the instrument variables. This matter is subjected to serious consideration. Hence, in light of this, we are reviewing the process, especially on the specification of the models. Other than this, the statistic tests reports present theoretically consistent results.

NBTC (Thai regulatory authority) has been monitoring OTT services yet still indecisive on the matter. The result of disassociation between traditional voice call and OTT communication helps establish policy and stance of NBTC on the subject of market definition and OTT regulation. The study suggests that regulatory authority should not regulate OTT communication services in the same market as traditional voice services as the substitution effect between two services is not present.

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