# Game Study on Third-party Payment Platform and Bank

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**ABSTRACT**

With the popularity of mobile payment, there are more and more third-party payment platforms. People's payment methods are gradually separated from the traditional banking business and choose more convenient third-party payment platforms. As a result, these platforms pose a significant threat to banks, both business and capital. In addition, due to the unequal interests of both sides in the cooperation process, the willingness of banks to cooperate is also declining. The former cooperative relationship between the two has been transformed into a co-existence of cooperation and competition. Therefore, this paper chooses the third-party payment platform and bank as the research object. According to the benefits under different circumstances, three-game models are constructed for specific analysis. Through the analysis of the equilibrium solution, it is concluded that even though the third-party platform is in a dominant position, through continuous development and the constant game between the two sides, only cooperation can maximize the benefits and achieve a win-win situation.

*Keywords: Third-party payment platforms, Bank, Three-game models, Equilibrium*

## 1. INTRODUCTION

According to Akamai's State of the Internet report, as the impact of the COVID-19 epidemic spreads, people in all countries and regions are moving into "stay-at-home" mode, shifting most of their work and entertainment from offline to online causes global Internet traffic to surge by 30% compared to previous years. This increase will be the norm throughout 2020, which is the average for the year. The Internet is a growing part of social life and has penetrated every aspect of productive life, making a massive difference to people's economic lives.

The integration and innovation of the Internet with traditional industries have brought new development opportunities to all sectors. Internet finance has dramatically impacted the conventional financial sector based on the power of the Internet and technology and the progress and innovation of technology. Third-party internet payment platforms, an important symbol of internet finance, have developed along with e-commerce. In China, as shown in figure 1, the report shows that the Chinese online shopping market reached 3.2 trillion yuan in transactions in the fourth quarter of 2019, up 38,5% YoY and 26.9% YoY. In the first

quarter of 2020, it is expected to reach 2.1 trillion yuan, down 33.3% YoY and 1.2% YoY. However, the overall transaction scale was more stable throughout the epidemic, which means that third-party platforms gradually became the mainstream payment method.



**Figure 1**. China Online Shopping Market Transaction Size, 2018 Q1- 2020 Q1 [1]

With the continuous improvement of technology, mobile payment is becoming more and more popular [2]. There are more and more third-party payment platforms in the market. Guo & Bouwman specifically studied Alipay, a third-party payment platform with 350 million users, which processes 80 million transactions every day [3]. Meanwhile, Guo et al. proposed a

feasible mobile payment business model suitable for China's national conditions [4]. Zhang and Yang discussed the bank as cooperation participants with upstream and downstream participants as the new third-party payment platform such as Alipay's uncooperative attitude [5]. Because in the prisoner's dilemma, even if the two companies established a union, who cannot abide by the contract because of the best "free" policy. Price competition is inevitable [6]. However, as Alipay currently has contractual relationships with more than half of the banks in China, this means that 99.99% of cardholders and funds are covered [7]. Yin & Wu also further explained that because third-party platforms play a fair and safe role, banks and third-party platforms form an interdependent relationship, further stimulating the economy. Third-party platforms must cooperate with banks to obtain authorization for capital flow, and banks must collaborate with third-party platforms to expand banking business [8] to achieve win-win goals [9]. In addition, it is worth noting that the research may be one-sided. Due to global and local problems, the research results may not be universal [10].

Although third-party payment platforms have great potential and prospects, they face many problems which cannot avoid. The expansion of their business has impacted the company and capital of banks to a certain extent. It is essential to study the game and cooperation between the two and hope to find a win-win solution for both given the current situation.

## 2. ANALYSIS OF THE COMPETING RELATIONSHIP BETWEEN ALIPAY AND BANKS

### 2.1. Business competition

As the Central Bank granted the most famous representative of third-party payment in China, Alipay a third-party payment business permit in 2011, which includes: Internet payment, mobile phone payment, prepaid card issuance and acceptance, and bank card acquiring. Alipay completes mobile payment mainly relying on mobile phone clients and mobile Internet. According to the data of Ariadne Consulting, the market share of Alipay and Cai Paid Tong in the mobile payment market has remained stable since 2019. 2020 Q2 market share is 55.6% and 38.8%, respectively; in

the Internet payment market, Alipay, Cai Paid Tong, and UnionPay Business in 2019 is 35.5%, 13.5%, 18.2%, respectively.
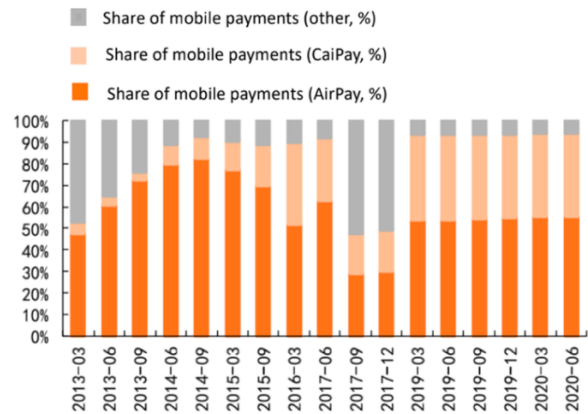


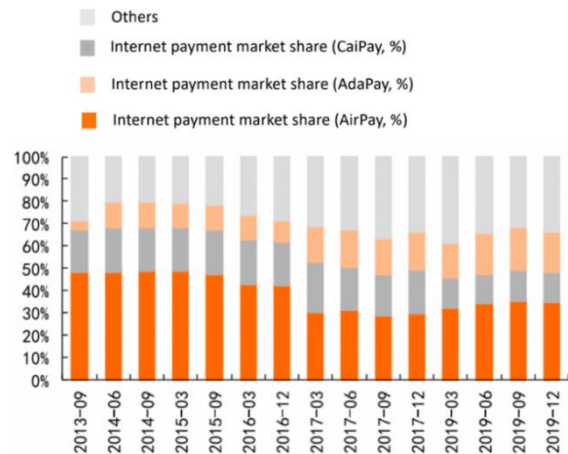**Figure 2.** Mobile Payments Market Share [11]



**Figure 3**. Internet Payments Market Share [11]

### 2.2. Promotion of money transfer business

To meet the demand for "anytime, anywhere" payments on mobile phones, Alipay changed its transfer rules from 4 December 2013 to provide a faster and more convenient way of transferring funds. From Table 1 below, the biggest attraction of Alipay is that the service fee is waived for users who transfer funds from the mobile client.

**Table 1.** Charging standards for transfer between Alipay accounts [12]

| Payment Terminals | User Type | Account Type | Free Transaction Traffic | Excess Amount Service Rate | Service Fee Cap | Service Fee Floor |
| --- | --- | --- | --- | --- | --- | --- |
| Wireless | All Users | All Types | No Service Charge | No Service | None | None |

| | | | Charge | | | |
|---|---|---|---|---|---|---|
| | Taobao sellers, Alipay merchants who have not signed up for in-site transfers | Authenticated Users | 20,000 for a single month | 0.50% | 25 for a single transaction | 1 for a single transaction |
| | | Non-Uniformed Users | 1000 for a single month | 0.50% | 25 for a single transaction | 1 for a single transaction |
| PC Side | Regular users (except the above types) | All Types | No free traffic (all subject to charges) | 0.10% | 10 for a single transaction | 0.5 for a single transaction |
| | Alipay merchants who have signed up for the Alipay Station Transfer product | Charge at the contracted rate, no free traffic between linked accounts | | | | |

Alipay also performs much better in inter-bank transfers. Compared to the 0.25%-0.5% transfer fees associated with inter-bank and off-site transfers, Alipay's policy is more attractive, with multiple Alipay real-name accounts under the same ID card enjoying a basic free quota of 20,000 yuan (including transfers to bank cards and account balance withdrawals) from 12 October 2016. A service fee of 0.1% on the excess amount after the quota is exceeded, with a minimum of 0.1 yuan per transaction. There is currently no basic free limit for non-real-name accounts and a service charge of 0.1% on the amount transferred to the card, subject to a minimum of 0.1 yuan per transaction. At the same time, an additional activity such as using the essential free credit is added; real-name users can use Alipay points on mobile Alipay to redeem the free credit. Alipay has also proven to be a hit with the public, which has led to a certain degree of diversion for banks.

According to Alipay Group's prospectus for 2020, Alipay has over 1 billion users and over 80 million merchants serving the application. In the 12 months ended 30 June 2020, Alipay Group's monthly active users increased from 499 million in December 2017 to 711 million in June 2020. As of 30 June 2020, Alipay has become the most prominent commercial app in the world. For the 12 months ended 30 June 2020, the Company's domestic users completed a combined RMB 118 trillion in payment transactions on the platform. Merchants and financial institution partners go through the Alipay platform to increase the number of customers and drive revenue growth.

## 2.3 The popularity of fast mobile payments

Mobile Express Payment is a more secure, simple, and fast payment method for all mobile phone users, relying on Alipay accounts as the basis. The update of modern electronic products is mainly reflected in two-dimensional code payment, mobile phone face payment, and fingerprint payment. In the first quarter of 2021, China's third-party mobile payment transaction scale grew to 74.0 trillion yuan, up 39.1% year-on-year. In the second quarter of 2021, China's third-party mobile payment transaction scale is expected to grow to 74.2 trillion yuan, up 24.1% yearly.
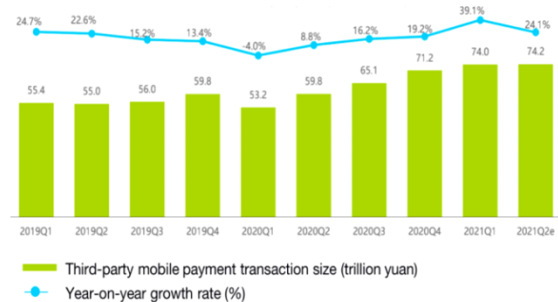


**Figure 4.** Third-party mobile payment transaction size in China, 2019 Q1- 2021 Q2 [13]

## 2.4 Competition for funds

Funding is fundamental to a bank's existence. The primary source of funds for banks is to take deposits. However, the current third-party platforms have a remarkable ability to absorb money to a certain extent. Their income from funds is divided into two main parts. The first part is in the interval between the shopper transferring the cash to Alipay and completing the

transaction, which can generally be a maximum of 7-15 days. The second part refers to the new project currently launched by Alipay, Yu Ebao, which can spend and pay and transfer money out at any time without any commission fees. At the same time, a fund company will confirm the share and issue the income. The highlight of this product is that the yield is more attractive than bank financial products and provides a more convenient way for users to pay for their purchases.

According to the 2018 annual report recently disclosed by Tianhong Yu Ebao, by the end of 2018, the size of Tianhong Yu Ebao was 1.13 trillion yuan, earning a total of 50.9 billion yuan for investors, earning an average of 139 million yuan per day, with 588 million holder households. In 2018, after a series of active regulations by the Tianhong Fund with limits and restrictions on purchases, the stabilization effect was remarkable, and the size of Tianhong gradually fell back. At the same time, the number of clients of Tianhong Yu Ebao after the diversion and regulation showed a faster growth trend, with 114 million new clients, an increase of 24%, compared with 2017. The overall number of clients reached 588 million, the fund with the most significant number of clients globally. In addition, from the data disclosed in the 2018 annual report, the share held by individual investors of Tianhong Yu Ebao has risen to 99.97% from 99.94% at the end of 2017, while the average share held by households has dropped from 3,329.57 to 1,924.83, making the inclusive financial attributes of small and decentralized amount more obvious. With residents in third and fourth-tier cities gradually establishing an economic mindset and awareness, Tianhong Yu Ebao has reached customers in many provinces across China, with more than 100 million of them coming from rural areas.

The continued significant growth in the number of accounts held by Tianhong Yu Ebao is mainly related to the popularity of mobile payment and financial management concepts. With the rise of the mobile Internet, Tianhong Yu Ebao has become the product of choice for most people's cash management as it is very convenient to subscribe, redeem and pay.

## 3. COMPETITION STRATEGY

Method: The optimal cooperative strategy is analyzed in two ways by building a game model: a static game with perfect information and a dynamic game with perfect information.

Basic Assumption:

Set of participants: The only two players in this game model are the third-party platform and the bank, defined as $I = \{1,2\}$, where $i = 1$ for the third-party

payment platform and $i = 2$ for the bank. In addition, assume that both are rational.

The set of strategies: there are two types of strategies: one is cooperative and the other is dominant. Define $J = \{1,2\}$, where $j = 1$ denotes cooperation and $j = 2$ denotes dominance. Defined as $S_{ij}$, where $i$ denotes participant and $j$ denotes strategy。

Utility function: If the bank and the third-party platform cooperate, then the market is shared, and the payoffs are both a.

If one party dominates and the other cooperates, then the dominant party has a relatively high payoff, assumed to be b, and the cooperating party has a payoff of c, $c < b$. If both parties choose to dominate, then the third-party payment platform is constrained to have a payoff of 0 and the bank has a payoff of d, and $d < a, d < b, d < c$.

Thus, the utility function of the third-party payment platform is:

$$U_1 = (S_{11}, S_{21}) = a \qquad (1)$$

$$U_1 = (S_{11}, S_{22}) = c \qquad (2)$$

$$U_1 = (S_{12}, S_{21}) = b \qquad (3)$$

$$U_1 = (S_{12}, S_{22}) = 0 \qquad (4)$$

The utility function of bank is:

$$U_2 = (S_{11}, S_{21}) = a \qquad (5)$$

$$U_2 = (S_{11}, S_{22}) = b \qquad (6)$$

$$U_2 = (S_{12}, S_{21}) = c \qquad (7)$$

$$U_2 = (S_{12}, S_{22}) = d \qquad (8)$$

### 3.1 Complete information static game model

A static game with complete information is one in which both players make decisions simultaneously. All players are fully aware of the strategies in various situations.

Table 2. Static game matrix with complete information:

| (Third-party payment platform, bank) | Cooperation | Dominance |
|---|---|---|
| Cooperation | (a, a) | (c, b) |
| Dominance | (b, c) | (0, d) |

Under the assumptions $b > c > d$ and $a > d$, if $a > b$, then choosing to cooperate is the optimal strategy for both parties, so there is a strictly preferred strategy combination for complete information static game is (a, a); if $a < b$, then the utility of the dominant party will be greater than the utility of the cooperating parties, so

there is no strictly good strategy combination. Then the Nash equilibrium is (c, b) or (b, c).

### 3.2 Complete information dynamic game model

Complete information dynamic game refers to the game in which the information is complete. However, there is a sequence of actions. Actors can change their strategies according to the activities of the forerunner.

According to the analysis of the actual situation, the third-party payment platform is in the vanguard position in terms of action. Assuming b > c > d and a > b, if a > b, then there will be two situations arise. If a < b, if the third-party payment platform chooses to cooperate first, then the bank's rational choice is to cooperate, and the equilibrium between the two is (a, a); if a<b, the dominant party will gain greater profit than cooperation, so the third-party payment platform will choose to dominate, and the bank's optimal choice is to cooperate to maintain its utility, so the equilibrium solution is (b, c).
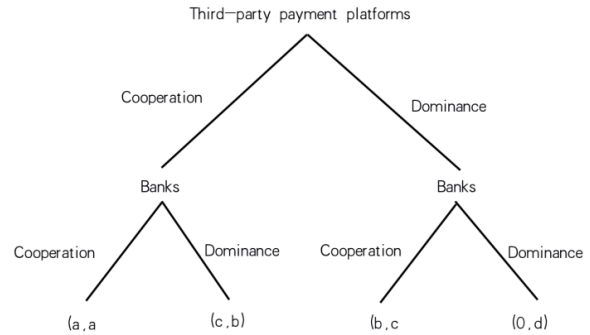


**Figure 5.** Complete information static game tree

### 3.3 Incomplete information static game model

A static game with incomplete information is one in which players choose to act simultaneously. In contrast, incomplete information means that players do not have accurate information about the strategies and preferences of all other players.

The probability of each participant's choice needs to be added to the previous model assumptions:

**Table 3.** The probability of each participant's choice

| (Third-party payment platform, Bank) | Cooperation | Dominance |
|---|---|---|
| Cooperation | (q, p) | (1-q, p) |
| Dominance | (q, 1-p) | (1-q, 1-p) |

$$U_2 = pqa + (1-p)qb + p(1-q)c + (1-p)(1-q)d = p[(a-b-c+d)q + (c-d)] + [(b-d)q+d] \quad (9)$$

If $(a-b-c+d)q + (c-d) > 0$, for bank, the bigger the p, the bigger the return. If $(a-b-c+d)q + (c-d) < 0$, for bank, the smaller the p, the bigger the return. If $(a-b-c+d)q + (c-d) = 0$, the bank's return is fixed.

$$U_1 = pqa + (1-p)qc + p(1-q)b + 0 = q[(a-b-c)p + c] + pd \quad (10)$$

Similarly, if $(a-b-c)p + c > 0$, for a third-party payment platform, the bigger the q, the bigger the return. If $(a-b-c)p + c < 0$, for a third-party payment platform, the smaller the q, the bigger the return. If $(a-b-c+d)q + (c-d) = 0$, the third-party payment platform's return is fixed.

When $U_1 = U_2$, the equilibrium Pareto optimum is reached, so:

$$p[(a-b-c+d)q + (c-d)] + [(b-d)q+d] = q[(a-b-c)p + c] + pd \quad (11)$$

$$p = 1 - \frac{(b-c)(1-q)}{(b-c)+d(1-q)} \quad (12)$$

when q = 0,

$$p = \frac{1}{\frac{b-c}{d}+1} \quad (13)$$

In general, as third-party platforms dominate the mobile industry's development, the more significant the gap between dominant payoff b and cooperation payoff c will cause the smaller p, which means banks are less willing to cooperate. Therefore, when developing the mobile payment industry dominated by third-party platforms, there should not be too broad a profit gap, which is not conducive to the development of the whole industry.

### 4. CONCLUSION

From the static game with complete information, it can be found that if one party chooses to dominate and the other party chooses to cooperate, the benefit of the dominant party is greater than that of the cooperative parties. Therefore, the equilibrium solution of this game must be dominated by one side. However, with the

development of mobile payment in society, cooperation would become inevitable if the utility obtained from the association is more significant than that dominated by one party.

Given that the dynamic game of complete information can be found, the situation is closer to the second. The third-party platform in the mobile payment market is in a more advantageous position, which also means that it occupies the dominant class, obtain more profits. The bank only chooses cooperation can be received more profit.

At the same time, based on the analysis of the current market situation, the business development of the third-party payment platform has begun to threaten banks' profits, and the profit gap between the two is getting bigger and bigger. Therefore, banks are dissatisfied and begin to cancel the support for some platforms and expand their own online business. Under such circumstances, both sides need to find new development strategies and make continuous adjustments until the profit distribution of both sides reaches a relatively balanced state, which means that the industry is gradually becoming mature.

Through the discussion of the above three-game models, the following three points can be concluded. Firstly, in the case of immature mobile payment, the current development mode of both parties is dominated by one party while the other party cooperates. Second, as far as third-party payment and banks are concerned, the platform has absolute advantages and is leading. However, the relationship between them develops in every game. The two sides influence each other and adjust to each other constantly. Finally, they will reach the equilibrium point and achieve a relatively balanced state of interest distribution. Third, the cooperation between the two sides is the overall trend of the future. It also needs the government to enact more sound laws and develop a more stable and secure system to ensure the regular operation of the market environment so that mobile payment can achieve better development.

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