

# *Mental account effect in non-cash payment of college students: The role of locus of control*

Yiwen Han<sup>#</sup>, Ying Guo<sup>#</sup>, Shengtao Sun<sup>\*</sup>

*College of Psychology, Shanghai Normal University, Shanghai, 200000, China*

*<sup>\*</sup>Corresponding author*

*<sup>#</sup>Co-first author*

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**Abstract:** The "grab-big, abandon-small" effect in the mental account effect refers to that people classify them into different mental accounts for the "change" and "whole note" in the banknote, and tend to maintain the "whole note". In order to investigate the influence of locus of control and mental account effect on non-cash payment, 113 college students were tested by questionnaire and experiment by simulating shopping situation experiment. The results showed that the non-cash participants spent more money than the cash participants. In the case of non-cash payment, the participants did not tend to control the consumption of large amount of money. Locus of control can predict the non-cash payment behavior of college students. In the mental account effect, "grab-big, abandon-small" effect can enhance the influence of locus of control on payment behavior, which makes the internal control personality spend less than the external control personality.

## 1. Introduction

With the development of the payment field, the integration of non-cash payment into daily life is an inevitable trend, leading to increased attention on people's non-cash consumption status. Halim et al. <sup>[1]</sup> found that using credit cards can increase people's consumption behavior, partially explaining how non-cash payment can lead to excessive spending, although factors such as forward consumption cannot be ruled out. In China, non-cash payment methods like Alipay and WeChat Pay are becoming the primary means of consumption. College students primarily rely on financial assistance provided by their parents, but most of them have more generous disposable living expenses, and their consumption are relatively flexible. College students have strong consumption needs, but limited economic resources and their consumption patterns are at a turning point in their lives. Therefore, we should place greater importance on understanding the payment behavior of college students.

As money gradually becomes viewed as a tool for individuals to maintain and enhance their quality of life, it is more or less influenced by self-control beliefs. In 1954, Rotter first introduced the term 'locus of control' in 'Social Learning and Clinical Psychology,' defining it as a relatively stable cognitive pattern of an individual's perception of the relationship between their personality, actions, and resulting outcomes<sup>[2]</sup>. Rotter categorized locus of control into internal and external orientations, considering an individual's locus of control tendency as a relatively stable personality trait that does

not easily change. Individuals with an internal locus of control associate outcomes with their own actions, showing a greater sense of initiative and control. On the other hand, those with an external locus of control tend to believe that outcomes are caused by external uncontrollable factors, leading to a lower sense of control. Previous studies have found that locus of control significantly predicted individuals' attitudes towards their disposable income. Internally oriented individuals are more likely to plan and budget their finances before allocation, while externally oriented individuals are more concerned with the social attributes of money and tend to equate possessing money with having power<sup>[3]</sup>. College students demonstrate a similar psychological approach in managing time and money resources, i.e., they plan their budgets in advance and set maximum and minimum budgets in their minds when using both types of resources<sup>[4]</sup>. Zhang's<sup>[5]</sup> research demonstrated a negative correlation between college students' locus of control scores and their time management tendencies, indicating that students with a stronger internal locus of control are more inclined to plan and manage their time, whereas those with a stronger external locus of control exhibit fewer time management tendencies. Therefore, this study speculated that there was a certain relationship between locus of control and non-cash payment behavior.

For explaining payment behavior, Professor Thaler introduced the concept of 'Mental Accounting' in 1980, pointing out in 'Mental Accounting and Consumer Choice' that individuals tend to establish various mental accounts in their minds for the disposable income they possess. These accounts have different methods of accounting, calculation rules, and control strategies. These strategies for money management often go unnoticed by people<sup>[6]</sup>. Previous research has shown that people hold different attitudes toward 'change' and 'whole note' in their cash and classify them into different mental accounts. Maintaining 'whole note' is considered one way to reduce expenses, known as the 'grab-big, abandon-small' effect<sup>[7]</sup>. When making cash payment, people are accustomed to using different mental accounts for their payment behavior. However, when making non-cash payment, the money they can use is no longer physical but presented in a numerical form. Previous research on WeChat Pay found that individuals show no significant difference in their payment behavior between small and large amount of money, suggesting a lack of psychological motivation to maintain larger amounts<sup>[8]</sup>. People's locus of control affects their financial planning, and therefore, it can be inferred that there is a certain relationship between the mental account and locus of control in the field of non-cash payment.

This study used Alipay as an example to design a simulated payment experiment. Firstly, it validated the differences brought by method of payment and the influence of the mental account effect on payment methods. Hypothesis 1 was proposed: participants using non-cash payment may spend more money than those using cash payment, and in the case of non-cash payment, participants would not tend to control their spending on large amounts. Subsequently, research was conducted on the locus of control and payment behavior in non-cash payment, and Hypothesis 2 was proposed: locus of control could predict payment behavior in non-cash payment, with higher scores in the participants' locus of control leading to more payment behavior in the experimental context. Finally, the discussion explored how the mental account effect operated on the influence of locus of control on payment behavior in non-cash payment situations, and Hypothesis 3 was proposed: the 'grab-big, abandon-small' in the locus of control could enhance its influence on non-cash payment behavior.

## 2. Methods

Through experiments simulating shopping scenarios, we collected data on people's payment behavior (usage amount) when using different method of payment (cash and non-cash) and in different amount size (large amount group and small amount group). We examined the impact of different method of payment and different amount size on payment behavior. Additionally, this study

used the 'The Internal-External Locus of Control Scale' to measure the participants' levels of locus of control and explored the relationship between locus of control and mental account effect under non-cash payment methods and their impact on payment behavior.

## 2.1 Participants

This study selected college students from several universities in Shanghai as participants. We conducted a simulated payment experiment with a random stratified sampling method. Additionally, we used a questionnaire to measure their locus of control. A total of 115 sets of data were collected, resulting in a 100% response rate. After excluding outliers, we obtained 113 valid data sets, with an effective rate of 98.26%. Among the participants, there were 29 males and 84 females, with an average age of  $21.14 \pm 1.39$  years. The participants were randomly divided into four groups: non-cash payment with a large amount ( $n=32$ ), non-cash payment with a small amount ( $n=29$ ), cash payment with a large amount ( $n=31$ ), and cash payment with a small amount ( $n=21$ ).

## 2.2 Measures

### *Locus of control*

The Internal-External Locus of Control Scale revised by Wang<sup>[9]</sup>, was used to measure the participants' locus of control. The scale comprised 19 items, each consisting of a statement representing internal locus of control and a statement representing external locus of control. Participants were scored based on their choice of external control statements (e.g., choosing 'If there are no suitable opportunities, a person cannot become an excellent leader' scores 1 point). The total score was calculated, ranging from 0 to 19 points, with lower scores indicating a stronger internal locus of control and higher scores indicating a stronger external locus of control. In this study, Cronbach's  $\alpha$  for this scale was 0.72.

### *Preliminary experiment*

Based on Li et al.'s<sup>[10]</sup> definitions of utilitarian and hedonic products, we administered the 'Product Attribute Evaluation Questionnaire' through Sojump to control variables. Participants were asked to evaluate the listed products according to the definitions and their real-life experiences. A lower 9-point score for an individual product indicates a higher level of functionality, while a higher score indicates a greater degree of hedonism. In this experiment, we selected the top 10 and bottom 10 items as experimental materials, which were as follows: Utilitarian products: toilet paper ( $2.16 \pm 2.01$ ), toothpaste ( $2.36 \pm 2.27$ ), shampoo ( $2.38 \pm 2.01$ ), and so on. Hedonic products: game credits ( $7.33 \pm 2.54$ ), comics ( $7.19 \pm 2.23$ ), KTV vouchers ( $7.17 \pm 2.41$ ), and so on. There was no significant difference in gender regarding the experimental materials ( $p < 0.01$ ).

We conducted a questionnaire survey using Sojump and asked the question: 'At what balance in your electronic wallet (e.g., Alipay, WeChat Wallet) would you initiate a withdrawal?' We collected the most frequently chosen amount as the large, round sum in the participants' electronic payment psychological accounts. In total, we collected 108 questionnaires and ultimately selected 100 yuan as the large, round sum in electronic payment ( $n=64$ ).

### *Formal Experiment*

In our study, the participants were randomly divided into four groups: cash payment with a large amount, cash payment with a small amount, non-cash payment with a large amount, and non-cash payment with a small amount.

There were a total of four simulated buying rounds in this experiment. Before the experiment began, the cash payment with a large amount group received 100 yuan in cash from the experimenter as simulated purchasing funds, and no further funds were given. The cash payment with a small amount group received pre-prepared purchasing funds (10 yuan, 20 yuan, 30 yuan, 40 yuan, totaling

100 yuan) before each simulated purchase round. The non-cash payment participants used their own smartphones to log in to the Alipay account provided by the experimenter. For the large amount group, the experimenter reminded the participants that their purchasing funds were 100 yuan and displayed the Alipay balance page. For the small amount group, the 100 yuan was divided into 10 yuan, 20 yuan, 30 yuan, and 40 yuan, and transferred to the participants' Alipay wallet according to the purchase rounds.

During the experiment, in each round, the participants were shown 5 items priced between 4 and 100 yuan, with both hedonic and utilitarian items randomly appearing at each price point. If a participant chose to make a purchase, they pressed the corresponding letter key for the item shown on the screen and paid the experimental fee to the experimenter for the cash group or scanned the QR code displayed on the screen for the electronic payment group. If a participant chose not to make a purchase or completed their purchases, they proceeded with the 'End Purchase' option to enter the next round or end the experiment. For the small amount group, the highest price of the items shown in each simulated purchase round was lower than the purchasing funds they received for that round.

### 2.3 Statistical analysis

The experimenter recorded the usage amount of the participants under different experimental conditions in the simulated payment scenario and calculated the total score of the participants on the locus of control scale. Subsequently, the experimental data were processed using SPSS 25.0.

## 3. Results

### 3.1 Descriptive statistics and correlation analysis

The locus of control and payment behavior of college student are presented in Table 1.

Table 1: Descriptive statistics of locus of control and payment behavior of college students

	<i>Min</i>	<i>Max</i>	<i>M</i>	<i>SD</i>	<i>r</i>
locus of control	4	19	11.14	3.42	0.46***
payment behavior	10	100	57.64	25.68	

Note: N = 113; \* $p < 0.05$ , \*\* $p < 0.01$ , \*\*\* $p < 0.001$ .

The descriptive statistics for the locus of control of the college student show a mean value of 11.14. The payment behavior of the college student subjects in the experimental context indicate an average usage amount of 57.68 yuan. We converted the psychological control source and usage amount into Z-scores for statistical analysis.

### 3.2 The impact of method of payment and mental account effect on payment behavior

A 2 (Method of Payment: Cash Payment, Non-Cash Payment)  $\times$  2 (Amount Size: Large Amount Group, Small Amount Group) analysis of variance was conducted on payment behavior, and the results revealed that the main effect of payment methods on payment behavior was significant ( $F = 32.60$ ,  $p < 0.001$ ,  $\eta^2 = 0.23$ ). The usage amount in the non-cash payment group was significantly higher than in the cash payment group. The main effect of amount size was significant ( $F = 5.09$ ,  $p < 0.05$ ,  $\eta^2 = 0.05$ ), with the usage amount in the small amount group significantly higher than in the large amount group. There was a significant interaction effect between method of payment and amount size ( $F = 14.81$ ,  $p < 0.001$ ,  $\eta^2 = 0.29$ ), see table 2. Simple effects analysis revealed that under the condition of cash payment, there was a significant difference in means between the two levels of

amount size ( $p < 0.05$ ). Under the condition of non-cash payment, there was no significant difference in means between the two levels of amount size ( $p > 0.05$ ).

Table 2: Analysis of the interaction between method of payment and amount size

Method of payment	Amount size		Payment behavior	
			<i>F</i>	<i>p</i>
Cash Payment	Large Amount Group	Small Amount Group	6.65**	0.01
Non-Cash Payment	Large Amount Group	Small Amount Group	0.26	0.61

### 3.3 The impact of locus of control and mental account effect on payment behavior in Non-Cash Payment Context

Moderation analysis was conducted using the Process macro<sup>[11]</sup> in SPSS. The usage amount Z-scores in the experimental context were used as the dependent variable, and amount size grouping and locus of control score Z-scores were respectively used as independent and moderating variables. The analysis examined the moderating effect of mental account effect on the influence of locus of control on college students' payment behavior in a non-cash payment context. The results are presented in the table below (Table 3).

Table 3: Moderating effects of amount size on the relationship between locus of control and payment behavior

	<i>coeff</i>	<i>SE</i>	<i>t</i>	LLCI	ULCI
Locus of control	1.67	0.34	4.84***	0.98	2.36
Amount size	0.05	0.20	0.24	-0.36	0.46
Locus of control × Amount size	-0.73	0.21	-3.51***	-1.15	-0.31

From Table 3, it can be observed that the amount size moderates the path between locus of control and payment behavior ( $\beta = -0.73$ ,  $p < 0.001$ , 95% CI [-1.15, -0.31]). Simple slope tests reveal that in the large amount group, the predictive effect of locus of control on non-cash payment behavior is significant ( $\beta = 0.94$ ,  $p < 0.001$ , 95% CI [0.62, 1.25]); in the small amount group, the predictive effect of locus of control on non-cash payment behavior is not significant ( $\beta = 0.21$ ,  $p > 0.5$ , 95% CI [-0.07, 0.48]). This indicates that individuals with an internal locus of control exhibit the 'grasp the large and let go of the small effect' in non-cash payment (see Figure 1).

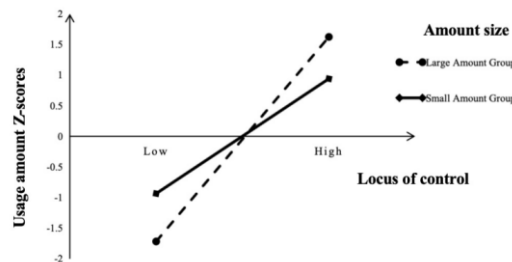


Figure 1: Mental account effects in locus of control and payment behavior

## 4. Discussion

### 4.1 The impact of payment methods and mental account effect on payment behavior

In this study, we first examined the differences in usage amount between non-cash payment and cash payment. We compared Alipay payment in non-cash transactions with cash payment, and the results indicated that the non-cash payment group spent significantly more experimental funds



compared to the cash payment group, confirming our Hypothesis 1: non-cash payment led to higher consumption by university students. Soman<sup>[12]</sup> studied the impact of the transparency of different payment methods on mental budgeting and found that the higher the transparency of the payment method, the more inclined the participants were to deduct the amount used from their mental budget, resulting in less consumption behavior. In this study, cash payment had higher transparency compared to Alipay payment. Participants in the cash payment group often paid attention to their balance, while participants in the non-cash payment group rarely checked their mobile phone balances, with some participants not checking their account balance at all. Furthermore, for participants making cash payment, there was a 'change-making' process after each payment, which served as a reminder of the amount they had on hand. Such a prompt did not exist in non-cash payment. Therefore, it can be inferred that the vividness and transparency of cash lead to less consumption behavior compared to non-cash payment.

According to the dual-process mental account model proposed by Loewenstein, the pain of spending money when purchasing items is diminished by the pleasure derived from acquiring the consumed item<sup>[13]</sup>. In the simulated payment context of this study, subjects did not receive physical items corresponding to the payment amount. Under the same control conditions, participants in the cash payment group may experience more pain due to the physical reduction of cash from their hands, resulting in less pleasure compared to participants in the non-cash payment group, leading to reduced payment behavior.

Furthermore, this study demonstrated the absence of the 'grab-big, abandon-small' mental account effect in non-cash payment, consistent with previous research. Mishra et al.<sup>[14]</sup> suggested that people process high-denomination cash more fluently, which leads to the formation of positive emotions and an overestimation of the value of high-denomination cash, reducing the tendency to spend it. For the cash payment group, the visible denomination size and the frictional sensation felt by individuals make them more aware of cash loss, prompting them to prioritize the integrity of cash and lean towards making small-value purchases. In contrast, for the non-cash payment group, the balance becomes a virtual number, and the real-time visibility of money's integrity is no longer present. Consumers cannot make differential spending decisions promptly based on varying amounts, reducing the 'grab-big, abandon-small' mental account effect, causing users to spend more than expected.

## **4.2 The predictive role of locus of control on payment behavior in non-cash payment context**

The results of this study indicate that the locus of control significantly predicts payment behavior in non-cash payment. In other words, the higher the score on the psychological control source scale, the more university students spend on non-cash payment in the simulated payment experiment. According to Rotter's theory of locus of control<sup>[2]</sup>, individuals with an internal locus of control often have firm core beliefs and clear self-awareness. They believe more in their ability to control their behavior to achieve desired goals, make efforts to determine the course of events, and create opportunities favorable to themselves. Based on this, individuals with an internal locus of control are better at managing money, can plan reasonably within a limited budget, and exhibit greater restraint against impulsive spending, thus demonstrating stronger financial control. On the other hand, individuals with an external locus of control tend to neglect self-control and attribute the causes of events or outcomes to uncontrollable factors such as others, the environment, and time. This can lead to a lack of courage in facing difficulties and persistence, resulting in learned helplessness. They struggle to manage their money effectively due to this inability to plan and control themselves, often falling into a chaotic state of financial management due to internal reasons.

Liang and Chang's<sup>[15]</sup> study on college students showed that those with external control beliefs lacked confidence in planning and managing their finances. They were prone to attributing failure to external, chance factors, and were overly concerned about risks and uncertainties in consumption or investment, leading to hesitancy and doubt in handling money. External control participants

experienced higher levels of mistrust and anxiety about money. Their lack of confidence in their economic decision-making abilities and the sense of control over their own actions or the external environment resulted in excessive spending behavior."

#### **4.3 The moderating role of the mental account effect in non-cash payment context**

In this study, the mental accounting effect can moderate the influence of the locus of control on payment behavior. Specifically, compared to external locus of control college students, internal locus of control college student participants were more easily influenced by the 'grab-big, abandon-small' effect within the locus of control and exhibit less payment behavior in non-cash payment.

The mental account theory posits that individuals establish different mental accounts to categorize and budget various forms of money, imparting them with different roles and functions. They use these accounts to plan their expenditure based on their existing financial budget. Mental account, as a psychological cognitive rule, is influenced by an individual's self-control beliefs, which are considered to be a finite resource that temporarily depletes after use according to the Strength Model of Self-control<sup>[16]</sup>. Dou et al.'s<sup>[17]</sup> study found that self-depletion makes individuals more impulsive in decision-making and less able to resist immediate gratification. Non-cash payment result in a weaker perception of money, and inhibiting spending behavior may consume more self-control resources. Internal locus of control personalities exhibit more proactivity and a greater sense of control<sup>[2]</sup>, thus displaying less payment behavior in non-cash payment.

According to the Expectancy-Value Model proposed by Rotter, the likelihood of choosing a behavior depends on the actor's perception of the size of the outcome's reward (reinforcement value) and their belief in the likelihood of that outcome occurring as a result of performing the behavior (expectancy). Behavior is determined by the internal cognitive processes of the organism and external reinforcement. For individuals with an internal locus of control, they have a clear understanding of whether reinforcement will occur as a result of their behavior. In contrast, individuals with an external locus of control do not perceive reinforcement as clearly as those with an internal locus of control. They often believe that the occurrence of reinforcement depends on external factors beyond their control. As a result, individuals with an internal locus of control exhibit higher reinforcement expectations.

In the simulated payment context, the reinforcement value for college student participants remains constant. Therefore, the likelihood of a behavior occurring increased with higher reinforcement expectations. For individuals with an internal locus of control, they demonstrated more control over money. Consequently, individuals with an internal locus of control in non-cash payment tended to exhibit a psychological account effect similar to cash payment, leading to reduced payment behavior.

#### **4.4 Limitations and Prospects**

As evident from the preceding discussion, the researcher has explored the differences in payment behavior among college students using different payment methods from the perspectives of the mental account effect and psychological control source. Given that non-cash payment is a research topic of significant social relevance, based on the existing research content, future studies can further expand in the following directions:

Although this study has incorporated the impact of the mental account effect and locus of control on non-cash payment behavior based on a literature review, there are still many variables affecting non-cash payment behavior that remain unknown. Du et al.'s<sup>[18]</sup> research indicated that Chinese college students' money attitudes can be categorized into four types: money indifference, money worship, money tolerance, and money rejection. Different money attitude types may correspond to different psychological aspects of non-cash payment among college students.

Finally, this study used simulated payment scenarios to test hypotheses, which may not fully uncover the underlying psychological mechanisms of the mental account. In the future, more diverse

research methods can be employed, such as designing field experiments to collect data that closely resemble real-life situations and applying cognitive neuroscience techniques to further investigate brain activity. These approaches would enhance the scientific rigor and real-life applicability of mental account research.

## 5. Conclusion

(1) Non-cash payment participants spent more money than cash payment participants.

(2) There was a significant interaction effect between the psychological accounting effect and the payment method. In the case of non-cash payment, participants did not tend to control their payment on large amounts.

(3) The locus of control could predict payment behavior in non-cash payment. The 'grab-big, abandon-small' effect in the mental account effect enhances the influence of the locus of control on payment behavior.

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