Push or Resistance-A Game Analysis of Consumer Behavioral Decisions under Policy Stimulus

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Abstract. With the deep popularization of Internet technology and the accelerated transformation of the economic structure, online consumption has broken through the time and space constraints of traditional business models and become the core engine driving the growth of domestic demand. In order to release the consumption potential, the government has successively launched composite policy tools such as digital consumption vouchers, tax credits, and platform subsidies. Based on evolutionary game theory, this paper constructs a model of consumer behavioral choices under the consumption stimulus policy, analyzes the dynamic impact of the policy on consumption behavior through replicating dynamic equations and numerical simulation, and explores the game relationship between policy "thrust" and consumption "resistance". From the analysis of the game model, it can be seen that the effectiveness of the policy not only depends on the benefit design of the policy itself, but also is closely related to the consumer's expectations, consumption habits and market environment. In this regard, corresponding policy optimization suggestions are put forward to ultimately achieve a virtuous cycle of short-term stimulation and long-term cultivation of consumption capacity.

Keywords: Consumption incentives, consumer behavioral decisions, evolutionary games, replication of dynamic equations.

1. Introduction

In the modern economic system, consumption as one of the “troikas” driving economic growth, its importance is self-evident. Especially in the critical period of economic downward pressure or structural adjustment, stimulating consumption has become an important focus of government policy [1]. Although the government has introduced a series of consumption stimulation policies, such as tax cuts and fee reductions, the issuance of consumption vouchers, and subsidies to specific consumption areas, the actual effects of the policies are often significantly influenced by consumer behavioral decisions. Consumers may respond positively to the policies and increase consumption expenditure, but they may also choose to maintain their original consumption habits or even reduce consumption for various reasons. This game relationship between policy "push" and consumer "resistance" not only affects the effectiveness of policies but also determines the degree of activity in the consumer market and the speed of economic recovery.

Game theory, as a theoretical tool for analyzing the interaction between decision-making subjects, is widely used in various fields of economics, including consumer policy research. In the game of consumer stimulus policy and consumer behavioral decision-making, the government and consumers, as the two sides of the game, have different strategy choices. The government's strategy is to implement or not to implement the consumption stimulus policy, while the consumers' strategy is to respond or not to respond to the policy. By analyzing the strategy choices of both sides and their interactions, the research can reveal the effectiveness of the policy and the internal laws of consumer behavior.

From the perspective of game theory, the relationship between consumption stimulus policies and consumer behavioral decisions can be viewed as a complex dynamic game process. The government wants to guide consumers to increase consumption through policy instruments, while consumers make decisions based on the principle of maximizing their own interests. This game not only involves the strategic choices of both parties, but is also influenced by a variety of external factors, such as the

economic environment, market expectations, income levels, consumption habits, etc. Therefore, an in-depth analysis of the game relationship between consumption stimulation policies and consumer behavioral decisions is of great theoretical and practical significance for optimizing policy design, improving policy effects and promoting sustainable economic development.

2. Literature Review

In many empirical studies on consumption characteristics and their determinants at home and abroad, consumption can usually be broadly categorized into two types: low and high consumption goods. At present, the academic community has reached some general consensus on the relationship between these two types of consumption: firstly, compared with high consumer goods, low consumer goods are more sensitive to changes in interest rates, and under the influence of interest rate policy regulation, the consumption of high consumer goods and low consumer goods will show the characteristics of synergistic fluctuations; the amplitude of fluctuation of low consumer goods is greater than that of high consumer goods [2-4].

In addition to examining the statistical characteristics of these two types of consumption, scholars have also examined in depth the factors that influence consumption. At the level of aggregate consumption, much of the literature does not make a careful distinction between the types of consumer goods, but directly explores the role of factors such as income and uncertainty on consumption [5]. In terms of the difference in the impact of different factors on the consumption of the two types of goods, scholars have found that there is a significant difference in the impact of factors other than the common disposable or permanent income on the consumption of these two types of goods. Specifically, inflation has a more significant impact on high consumption goods; the wealth effect of risky assets is more prominent on low consumption goods, while the wealth effect of risk-free assets is more pronounced on high consumption goods; and the impact of income risk on the two types of consumption is also different, with an increase in income risk having a greater impact on low than on high consumption goods.

Focusing on the role of consumption stimulus policies, many scholars have conducted research with the help of actual data in China, revealing that China's fiscal expenditure has a significant impact on residents' consumption. The impact of consumption stimulus policies is not only limited to the level of total consumption, but also shows significant heterogeneity among different consumer groups. Li and Zhong 's study pointed out that there are differences in the impact of fiscal expenditure policies on the marginal propensity to consume of rural and urban residents, and that rural residents are relatively more sensitive to changes in fiscal expenditure, which may be closely related to the structure of the source of income of rural residents as well as the characteristics of the consumption environment [6]. The research of Xu and Chen, on the other hand, shows that the impact of personal income tax reform on different types of households is differentiated, for example, the implementation of tax cuts for low- and middle-income households can significantly increase their disposable income and thus stimulate consumption growth [7]. The study of Zhang et al further reveals that the impact of indirect taxes on the consumption of different groups has different manifestations, and the reduction of the tax burden is more favorable to the low-income group, which helps to improve its consumption level [8].

Currently, many studies have been conducted on the impact of consumer stimulus policies on consumer behavior, but there are still the following key limitations: (1) research object fragmentation: existing research either focuses on consumer expectations, or focuses on the differences in the attributes of consumer goods (e.g., necessities and luxuries), but few studies have included the two into a unified analytical framework, to explore the strategic choice behavior of consumers among different types of commodities; (2) methodological flaws: Most mainstream studies use empirical regression models to portray the effects of policies, but lack game theory analysis based on the strategic interaction of micro subjects, which makes it difficult to reveal the dynamic game equilibrium of consumers under policy shocks.

In view of this, this paper constructs an evolutionary game model between consumption stimulus policy and consumption behavior, systematically analyzes how consumption stimulus policy affects consumption decision-making, and gives some policy suggestions.

3. Game Model Construction

3.1. Strategy Setting

Suppose that consumers have two strategies to choose from under a consumer stimulus policy:

Strategy A: Respond to policies to increase spending (e.g., use of coupons, participation in promotional activities, etc.).

Strategy B: Do not respond to the policy and keep the original consumption habits.

3.2. Calculation of Adaptation

Consumers' adaptation consists of two components: the additional benefit from the policy and their own consumption utility [9]. Suppose the consumer's fitness function is shown as follows.

$$fA = \alpha \cdot \text{policy benefits} + \beta \cdot \text{consumption utility} \tag{1}$$

$$fB = \beta \cdot \text{consumption utility} \tag{2}$$

Where α and β denote the weights of policy benefits and consumption utility in the adaptation scale, respectively, and $\alpha + \beta = 1$.

3.3. Replication of Dynamic Equations

According to the definition of replication dynamic equation, the dynamic change equation of consumer choice strategy A can be obtained as follows.

$$dx/dt = x(1-x)(fA - fB) \tag{3}$$

Where x is the proportion of consumers in the group who choose strategy A.

3.4. Stabilization Equilibrium Analysis

In order to find the stable equilibrium of the system, a solution for dt/dx=0 is required. The solution is obtained.

$$x=0 \text{ or } x=1 \text{ or } fA = fB \tag{4}$$

When fA > fB, x=1 is a stable equilibrium, i.e., all consumers will choose to respond to the policy; When fA>fB, x=1 is a stable equilibrium, i.e., all consumers will choose to respond to the policy; when fA<fB, x=0 is a stable equilibrium, i.e., all consumers will not respond to the policy; when fA = fB, the system is in a neutral stable state, and the proportion of consumers' policy choices remains unchanged.

4. Model Analysis and Discussion

4.1. Trade-offs between Policy Gains and Consumption Utility

In the above model, the consumer's adaptation functions fA and fB reflect the combined benefits when responding and not responding to the policy, respectively. Where the values of α and β determine the relative importance of policy gains and consumption utility in adaptation [10]. If the policy benefits are high and consumers place relatively low importance on consumption utility (i.e., $\alpha > \beta$), then consumers are more likely to choose to respond to the policy (Strategy A). Conversely, if the weight of consumption utility in the adaptation scale is high, or if the policy benefits are not

sufficient to compensate for the cost of changing consumers' consumption habits, consumers are more likely to choose to maintain their old consumption habits (Strategy B).

4.2. Dynamic Changes in Consumer Behavior

By replicating the dynamic equation dt/dx=x(1-x) (fA-fB), the dynamic process of consumer behavior can be analyzed [11]. When fA>fB, the proportion x of consumers choosing policy A gradually increases over time and eventually converges to 1, i.e., all consumers choose to respond to the policy. This suggests that when the policy benefits are high enough, consumer behavior will gradually evolve in the direction of responding to the policy. On the contrary, when fA < fB, the proportion of consumers choosing policy A decreases and eventually tends to 0, i.e., all consumers will not respond to the policy. This indicates that if the policy benefits are not enough to attract consumers to change their behavior, consumers' behavior will remain unchanged.

4.3. Significance of Stabilizing the Equilibrium Point

The analysis of stable equilibrium point reveals the result of the game between policy "push" and consumption "resistance". When fA>fB, the system tends to the stable equilibrium point of x=1, indicating that the policy "thrust" successfully overcomes the consumption "resistance", consumers generally respond to the policy, the consumer market is active, and the policy objective is realized. Consumers generally respond to the policy, the consumer market is active, and the policy objective can be realized. When fA=fB, the system is in a neutral and stable state, and the proportion of consumers' strategy choices remains unchanged, indicating that the policy "push" and consumption "resistance" have reached a kind of dynamic equilibrium. This indicates that the policy "push" and consumer "resistance" have reached a dynamic equilibrium, and the effect of the policy depends on the initial distribution of consumer behavior.

4.4. Implications for Policy Development

From the analysis of the game model, it can be seen that the effectiveness of the policy not only depends on the design of the benefits of the policy itself, but is also closely related to the expectations of consumers, consumption habits and the market environment. Therefore, when designing consumption stimulus policies, policy makers need to fully consider the consumer's fitness function to ensure that policy gains can effectively attract consumers to change their behavior. Policymakers should also improve consumers' consumption utility through various means, such as optimizing the consumption environment, improving product quality and strengthening market regulation, so as to reduce the cost of changing consumers' consumption habits and enhance the attractiveness of the policy.

5. Conclusion

In the context of the digital economy, online consumption, as a new type of economic growth pole, plays a strategic role in the expansion of domestic demand and structural upgrading by reconfiguring the time and space boundaries of traditional commerce. In order to activate the potential of the consumer market, the government has made innovative use of a diversified combination of policies such as digital consumption vouchers, tax incentives and platform incentives. The study shows that the effectiveness of the policies is not only directly affected by the benefit distribution mechanism in the policy design, but also subject to the triple constraints of the expectation formation mechanism of the consumer group, the solidified characteristics of the consumer behavior, and the dynamic evolution of the market environment. The study not only provides a theoretical basis for the targeted design of consumption incentive policies, but also provides a practical paradigm for realizing the synergistic development of short-term stimulus effects and long-term consumption momentum cultivation, which is of reference value for the construction of a new type of consumption system under the double-cycle pattern.

The future policy design should follow the logic of "technology empowerment - mechanism innovation - ecological reconstruction", strengthen the policy reach efficiency through digital infrastructure, reconstruct the government-platform-consumer triad governance model with the help of collaborative governance theory, and ultimately form a high-level dynamic balance of demand-driven supply and supply-created demand. This will not only help release the double dividend of "scale effect + quality effect" of the consumer market but also provide China's paradigm experience in global digital consumption governance.

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