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# Insufficient Consumption Demand of Chinese Urban Residents: An Explanation of the Consumption Structure Effect from Income Distribution Change

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**Abstract:** China's consumption rate has continued to decline since 2000, which has retarded the sustainable growth of China's economy. The dramatic changes in China's income distribution have been very significant social characteristics, and they are also a very important factor for consumption. Therefore, this study analyzes the problem of insufficient domestic demand from the perspective of the effects of the income distribution changes on the consumption structure. The Almost Ideal Demand System model is improved by relaxing its assumption that expenditure equals income and giving it a dynamic form that includes the three characteristics of the income distribution evolution (the mean, variance, and residual effects) and measuring these. The results show that the mean effect is the largest one, and it basically determines the size and direction of the total effect. The variance effect is much smaller, but it may have some positive effects on the individual markets. The residual effect is the smallest and has a certain randomness. The income gap is not the main cause of the insufficient domestic demand. It is more likely to be caused by the decline of the mean effect, and the main driver of this is the irrationality of the supply side and excessive housing prices.

**Keywords:** insufficient demand; income distribution change; demand structure effects; AIDS model; counterfactual decomposition

## 1. Introduction

Since the reform in 1978, China's economy has experienced nearly 30 years of rapid growth. According to the data from the National Bureau of Statistics of China [1], China's per capita GDP growth rate was 8.4% from 1978 to 1999, and per capita GDP reached \$840 in 1999, marking the entry of middle and lower income countries. From 2000 to 2010, the average annual growth rate of per capita GDP was 9.7%, and per capita GDP rose to \$4240, successfully ranking among the upper and middle income countries. But since 2011 the previous investment and external trade-oriented development pattern seems to have reached its limitation. Similar to the typical stagnant growth countries in Latin America and emerging economies in Southeast Asia, such as Malaysia, the Philippines, and Thailand, which is known as the "middle income trap" [2]. China's economic growth has also slowed down. From 2011 to 2018, GDP growth rates were 9.5%, 7.8%, 7.7%, 7.3%, 6.9%, 6.7%, 6.9%, and 6.6%, respectively. Therefore, the Chinese government announces that China's economy has shifted from high-speed growth to a "new normal" dominated by medium- and high-speed growth, and scholars become more concerned about the future trend of China's economy and its sustainability. The core

issue is whether the Chinese economy will further decline and when it can successfully cross the “middle income trap”.

In fact, one of the fundamental reasons for being trapped in the “middle income trap” is that, after a country has completed rapid development from a low-income level to a middle-income level, the internal structure of its economic system has not been optimized autonomously with the improvement of production levels, making endogenous growth factors unable to support economic development to a higher level. Therefore, the essence of the “middle income trap” is a problem of the transformation of economic growth mode. The key to crossing the “middle income trap” is to find new combinations of economic growth factors and improve the structural quality of the economic system. As the ultimate goal of social production, consumer demand plays an exceptional role in the process of transformation [3].

Firstly, after reaching the middle income level, labor factor as one of the three basic factors is the key to optimize the combination of factors and ultimately improve the efficiency and quality of economic growth. The improvement of consumption level reflecting the living standard of residents can improve the overall quality of labor force from many aspects. The corresponding technological innovation will also increase with the improvement of the quality of labor force, which will produce a qualitative leap in the productivity of input factors, effectively promote supply-side reform, and provide a source of power for economic growth. Secondly, the continuous upgrading of industrial structure is an important part of the transformation process of economic growth mode. The improvement of consumption level puts forward higher requirements for product quality and supply structure, which can play a guiding role in the optimization and upgrading of industrial structure and improve the quality of economic growth. Finally, the consumption-oriented mode can guide the optimal allocation of resources, improve the level of marketization, make social distribution more equitable and reasonable, and ultimately promote the sustained and healthy growth of the economy.

Moreover, the international experience of economic development has also fully affirmed the role of consumer demand in driving economic growth. Saito [4] and Horioka [5] studied the causes of Japan’s economic slowdown, and found that insufficient consumption was an important factor in slowing down economic growth. At the same time, from the economic performance of developing countries after 1956, the degree of attention to consumption largely determined the economic development speed of each country. Munir and Mansur [6] theoretically proved that the improvement of consumption level, as one of the driving forces of GDP growth, can promote the growth of a country’s economy. Using international data starting in 1957, Eichengreen et al. [2] construct a sample of cases where fast-growing economies slow down. Their results suggest that a low consumption share of GDP is positively associated with the probability of a slowdown, although there is no iron law of slowdowns. Liu and Wang [7] based on 32 samples from developed and developing countries, using panel smoothing transfer regression model, obtained a consumption rate of 68.12% which is most conducive to promoting economic growth.

Chinese government is also gradually realizing the importance of consumption to long-term sustainable economic growth [8], with the emergence of overcapacity, a slowdown in growth, and a series of other developmental problems. Unfortunately, China is also facing a big consumption problem, that is, insufficient domestic demand. According to the World Bank’s World Development Indicators [9], China’s final consumption rate reached 63.6% in 2000, close to Liu’s optimal level [7], but then continued to decline to 48.1% in 2010. Although it has improved since 2011, it has only increased to 52.6% by 2017, which is far below the theoretical optimum level. Excluding government consumption, the resident consumption rate has also continued to decline since 2000 from 46.7% to its lowest point of 35.6% in 2010, although the recent rate has rebounded but only minimally. The Chinese government has called for rebalancing the economy towards greater reliance on consumption as the driver of growth and implemented a series of positive policies to expand domestic demand, but so far

these have had little effect. So, the main purpose of this paper is to analyze the internal mechanism of why China's consumption demand has not fully promoted economic growth.

Further, in sharp contrast to the lack of consumer demand, there has been a series of consumer booms in single markets, such as real estate, cars, Apple mobile phones, and other high-tech digital products, and Chinese consumers have been eager to purchase some goods that are booming overseas, so inadequate domestic demand is not the whole question; Chinese residents still have a strong consumer potential. We see a "lack of overall demand but strong local demand" coexistence phenomenon. So, we believe that there are certainly deeper reasons for the special economic operation phenomenon caused by the accumulation of deep-seated flaws in China's economic growth.

The most direct way to stimulate consumption is to increase residents' income, but the unequal promotion will widen the income gap and is not conducive to consumption. The drastic change in income distribution of billions of people is a significant special factor that distinguishes China from other countries. The income distribution here refers not only to the income gap that can be expressed by variances but also to the whole income distribution curve characteristics such as mean, skewness, and kurtosis. Moreover, the successful experience of Korea and Japan in crossing the "middle income trap" tells us that the formation of stable, reasonable and strong consumer demand is inseparable from the sustained growth of household income and reasonable income distribution [5,10]. Therefore, the final specific research objective is to study the impact of income distribution changes on the consumption structure.

Based on the perspective of the income distribution change, this study holds that the above-mentioned "lack of overall demand, but strong local demand" that coexists with the consumption structure problem is mainly caused by the imbalance between the demand structure and the supply structure, and the rapid evolution of the demand structure is the dominant factor in this contradiction. The effects of the three dynamic characteristics of the income distribution on the consumption demand structure are called the mean effect, variance effect, and residual effect, respectively. The mean effect mainly reflects the effect of the overall income level on the whole consumption structure. The variance effect and the residual effect collectively reflect the effect of the income gap on the consumption demand. However, the residual effect reflects a symmetry heterogeneity effect that is caused by the differences of region and human capital. This study calls them "the demand effects of residents' income distribution change."

In the perspective of income distribution changes, the question of how to expand the domestic demand and realize the transformation of economic growth driven by consumption is transformed into the question of how to form a reasonable consumption structure, which is, of course, affected by the change in the income distribution. Accordingly, once the relationship between the income distribution and consumption structure is sorted out, the problem of insufficient demand can be solved at the source, which is of great significance to the structural reform and sustainable growth of China's economy.

The rest of this paper is as follows. The second section is about review of literature. The third section is the derivation of the AIDS dynamic expansion model. The fourth section is the description of the data and construction of the indicators; the consumption and income data related to the urban residents in the Chinese Statistical Yearbook are selected. The fifth section is the empirical test, where the influence of income changes on the consumption demand structure is measured and discussed. The sixth Section gives the conclusions and the consequent policy recommendations.

## 2. Review of Literature

There are many explanations for the root causes of China's insufficient domestic demand, and one of these is the mainstream view that says the problem can be attributed to the Chinese residents' high and rising savings. The research [11–13] on this explanation suggests that China's economic structure is in rapid change, and the urban and rural social security system is not perfect, so there is uncertainty about personal future income and expenditure thereby causing residents to require precautionary

savings. But Aziz and Cui [14] suggest that the increase in saving alone explains only a small fraction of the decline in the consumption share; in their view a much larger cause of the problem has been the role of the declining share of household income in the national income.

Another popular view is that the insufficient domestic demand is due to the increasing income disparity between residents, which is actually more a reference to foreign scholars' related research [15,16]. For example, based on a cointegration and error correction model, Chen [17] found that the urban Gini coefficient, rural Gini coefficient, and urban and rural income ratio are all Granger reasons for the decline in the consumption rate. Zhang and Chen [18] used the Theil index to discuss the relationship between income distribution and expanding domestic demand, and they believe that the widening income gap is the fundamental factor hindering China's expansion of domestic demand and the transformation of economic growth. However, Zhu et al. [19] pointed out that this view is based solely on the measurement results and lacks sufficient theoretical support, which still needs further discussion. In recent years some empirical results have also come to the opposite conclusion: Li [20] studied the relationship between the income gap and consumption demand of urban residents in China and found that the widening income gap could not be the main cause of the inadequate domestic demand; Qiao and Kong [21] argued that the impact of the income gap on the consumption propensity is related to the level of economic development; Su and Sun [22], by depicting the "U" non-linear characteristics of Chinese residents' consumption demand with income changes, further argued that the income gap may not be the main reason for the insufficient domestic demand. From the current empirical results, this view reflects a certain degree of controversy.

Theoretically, the view of the income distribution affecting consumption is derived from Keynes [23], who proposed the rule of the "marginal propensity to decline." If a social income distribution gap widens, income will be concentrated in the hands of a small number of people, and the marginal propensity to consume will lead to a decline in consumer demand. However, this hypothesis focuses on short-term analysis and does not give sufficient attention to the long-term relationship between income distribution and consumption demand. In response to this deficiency, Modigliani proposed a life-cycle hypothesis [24], which argues that consumption depends on the permanent income not the current income. In the generalized life cycle hypothesis, he also believes that a widening income gap will lead to a lack of consumer demand through the bequest effect. Post-Keynesians believe that income distribution is a determinant of consumer demand. They have established a persuasive theoretical model [25,26] trying to reveal the relationship between income distribution and consumer demand, and the conclusion is that a widening income gap leads to insufficient demand.

In fact, these theories do not show a clear relationship between income distribution or the income gap and social aggregate demand, because they have all adopted a simplified way of using "the representative agent" to deal with the problem of aggregation, that is, the transition from the individual level to macro data. Stokes [27] confirms that the form and coefficient of the macroscopic consumption function depend not only on the form and coefficient of the microscopic function but also depend on the characteristics of the social income distribution. Campbell and Mankiw [28] then broke this homogeneity constraint and put forward the " $\lambda$  hypothesis." This hypothesis holds that a class of consumers in society chooses to consume based on their permanent income, whereas the other consumers base their consumption on their current income. If you choose to spend based on your permanent income, the widening income gap will result in a reduction in consumption through bequests; if the current income is arranged to be consumed, the widening income gap will result in a reduction in consumption through a reduction in the consumption propensity.

In addition to the above two points of view, there are still aspects related to the population age structure and infrastructure that need to be considered [29,30], and it clear that there is no perfect explanation for the issue of insufficient domestic demand. Although there is little doubt that these factors could be important in explaining the insufficient domestic demand, it is less convincing that

these are the main reasons because of the incompetence facing the phenomenon of the strong demand in a single market.

Therefore, China's domestic demand problem is not just a matter of level, but it is also a structural problem. There are many explanations for it, but, as we all know, the dramatic changes in the income distribution have been one of the most significant social characteristics in China [31], and the impact of income distribution is very important to consumption. Therefore, the idea of analyzing the impact of changes in income distribution on the evolution of consumption structure arose. Fitting income distribution is a traditional economic problem, especially in the field of labor economics. Recently, scholars have paid more attention to the decomposition of income distribution changes in order to dig deeper information of income changes. Using counterfactual analysis the income distribution can be decomposed into three parts: the mean change, variance change, and residual (skewness, kurtosis, and other high-order moments) change [32,33]. This study will also use this method to decompose the income distribution of Chinese residents. The counterfactual method was first proposed by Fogel [34]. He used it to measure the contribution of the railway to the economic growth of the United States in the 19th century, refuting the mainstream view that the large-scale railway investment was the main reason for the rapid growth of the US economy at that time. Today it is still widely used in the impact assessment of events or policies [35].

Although it is a new attempt to explain the demand of urban residents in China from the perspective of the income distribution change, the existing research on the consumption structure has laid a solid foundation for the work in this study. The study of consumption structure began in the 1950s. Subsequently, different models have been proposed one after another. The more famous models are the linear expenditure system (LES) proposed by Stone [36], the extended linear expenditure system (ELES) model proposed by Lluch [37], and the approximate ideal demand system (AIDS) model proposed by Deaton [38]. Among them, AIDS model is the most widely used. Based on this model, Ray [39] used household expenditure survey data to analyze the consumption structure of Indian residents, while Blanciforti and Green [40], Chesher and Rees [41] studied the food consumption situation of American and British residents respectively. Filippini [42] measured the various elasticities of Swiss household consumption. However, there is a non-linear relationship between the share of commodity expenditure and the price and expenditure in the AIDS benchmark model. Therefore, only the non-linear method can be used in the estimation, which makes the actual estimation not very convenient. Deaton [38] proposed that when the prices of various consumer goods have strong multi-collinearity, they can be approximated by linear relationship (LA-AIDS). Subsequently, the expansion of AIDS has gradually enriched, such as inverse AIDS, quadratic AIDS, two-stage linear expenditure system-approximate ideal demand system LES-AIDS, etc [43–48].

In addition, more and more scholars begin to add some other variables to traditional AIDS or LA-AIDS models, such as demographic characteristics, seasonal variables, time trend variables, structural change paths, and other external disturbances, to characterize the impact of these factors on budget share and consumption structure [40,49]. These studies make the AIDS model more perfect and convenient. Therefore, this paper also chooses AIDS model as the basic model to integrate the factors of income distribution changes.

However, numerous existing AIDS models are all based on the assumption that the expenditure is equal to the income; the expenditure is allocated among the different commodities, and then the expenditure structure is used to approximate the demand structure. Foreign economic development tends to be stable, because the residents' income is already at a high level, and the credit and social security systems are perfect. In these circumstances the residents have the courage to advance their consumption, and the expenditure structure can then better reflect the demand structure.

China's economy is operating at a rapid speed, the residents' income changes violently, and the rapid and significant change in income of hundreds of millions of people has a strong impact on consumer demand, which is rarely encountered in the development of other countries. Coupled with the lack of social security and the consumption habit of "base one's expenditures upon one's income"

and other reasons, a considerable part of the residents’ income is saved, so their expenditure is not equal to their income, and then the expenditure and demand structures are inconsistent. Therefore, to study China’s consumption structure problem, following the existing foreign models will require some deviations.

In order to achieve the research objectives, this study will make two improvements to the AIDS model. One of these is to relax the hypothesis that the expenditure is equal to the income through the introduction of income items in the model to make it more in line with the concept of consumption of China’s residents. The second improvement to the AIDS model is based on counterfactual analysis, whereby the three dynamic features of the income distribution change are introduced into the model.

### 3. Construction of the Model Used

In order to study the imbalance of the consumption structure from the perspective of the income distribution, we need to expand the AIDS model. The AIDS model is to achieve the established utility level by minimizing the expenditure, and the Hicks demand function is obtained. By solving the duality problem of the AIDS model, the Marshallian demand function is solved according to the utility maximization principle under the budget constraint condition so the model contains the revenue items that can reflect the characteristics of the Chinese residents’ consumption. The dynamic characteristics of the changes in the income distribution of the residents are then quantified; this part mainly draws on the research of Jenkins and Van Kerm [33]. After completing the decomposition of the change in the income distribution, the income distribution characteristic is introduced into the model by means of an anti-fact process.

#### 3.1. The Duality Problem of the AIDS Model

The AIDS model assumes that the consumer behavior satisfies the price indifferent generalized logarithmic preference hypothesis, so the expenditure function is

$$\ln(C(u, p)) = (1 - u) \ln(a(p)) + u \ln(b(p)), \tag{1}$$

where  $u(0 \leq u \leq 1)$  is the utility index,  $u = 0$  only to maintain the basic physiological needs of the utility, and  $u = 1$  for the utility to achieve its maximum.  $a(p)$  and  $b(p)$  denote the minimum expenditure required by the consumers to meet their basic physiological needs and obtain the maximum utility, and the form is as follows:

$$\begin{cases} \ln(a(p)) = a_0 + \sum_{i=1}^n a_i \ln(p_i) + \frac{1}{2} \sum_{i=1}^n \sum_{j=1}^n r_{ij} \ln(p_i) \ln(p_j), \\ \ln(b(p)) = \ln(a(p)) + b_0 \prod_{i=1}^n p_i^{b_i} \end{cases}, \tag{2}$$

According to the principle of duality, the expenditure function and indirect utility function are inverse functions, so the indirect utility function corresponding to the expenditure function is

$$v(p, m) = (\ln m - \ln a(p)) / (\ln b(p) - \ln a(p)), \tag{3}$$

As obtained from the Roy equation, the Marshallian demand function for the commodity  $i$  is

$$x_i(p, m) = -[\partial v(p, m) / \partial p_i] / [\partial v(p, m) / \partial m] = (m / p_i) (a_i + \sum_{j=1}^n r_{ij}^* \ln(p_j) + b_i \ln(m / a(p))), \tag{4}$$

where  $r_{ij}^* = (r_{ij} + r_{ji})/2$ . Given  $\mu_i = p_i x_i(p, m)/m$  represents the ratio of the expenditure to income for commodity  $i$ , we get an expanded version of the AIDS model with income  $m$  as follows:

$$\mu_i = a_i + \sum_{j=1}^n r_{ij}^* \ln(p_j) + b_i \ln(m/a(p)), \tag{5}$$

If we take the difference between the income and expenditure as savings, this can be seen as a special commodity that buys a certain amount of vouchers for future consumption. Let the discount rate  $1/(1+r)$  be the price of the savings, where  $r$  is the real interest rate. To preserve the aggregation properties of AIDS, this is  $\sum_{i=1}^n a_i = 1, \sum_{i=1}^n r_{ij}^* = 0, \sum_{i=1}^n b_i = 0$ . Furthermore,  $a(p)$  can be understood as a price index, so it can be set to  $a(p) \approx \theta P$ , where  $P$  is the total price index. We take it into the Equation (5), then

$$\mu_i = a_i^* + \sum_{j=1}^n r_{ij}^* \ln(p_j) + b_i \ln(m/P), \tag{6}$$

where  $a_i^* = a_i - b_i \ln \theta$ , and it also satisfies the aggregation property. Moreover, Equation (6) also satisfies the homogeneity  $\sum_{j=1}^n r_{ij}^* = 0$  and the symmetry  $r_{ij}^* = r_{ji}^*$ .

### 3.2. Counterfactual Decomposition of Income Distribution

Before the AIDS model is dynamically expanded, we should complete the measurement of the income distribution changes. For the decomposing method of the income distribution, by using a counterfactual analysis method, Jenkins and Van Kerm [33] successfully decomposed the income distribution change into three parts, which reflect the mean, variance, and residual changes. In fact, the residual change reflects the skewness, kurtosis, and other high-order moments changes of the income distribution. Counterfactual analysis can be understood as an application of comparative static analysis, a qualitative research method in economics. The difference is that counterfactual analysis is a quantitative analysis method. It constructs a counterfactual situation in which only one factor changes but other factors remain unchanged relative to a basic fact. And it evaluates the impact of a single factor by comparing the results of counterfactual and factual situations based on specific regression models or statistical methods., so we will use the counterfactual decomposition method of Jenkins and Van Kermin in this study.

Suppose that we have  $y_2$  for two years of the income survey data, assuming we temporarily disregard the price factors and they follow the same distribution,  $y_1 \sim F(\mu_1, \sigma_1^2)$  and  $y_2 \sim F(\mu_2, \sigma_2^2)$ , then the decomposition process can be illustrated below:

$$y_1(\mu_1, \sigma_1^2) \xrightarrow{\text{meanchange}} \xi_1 \sim F(\mu_2, \sigma_1^2) \xrightarrow{\text{variancechange}} \xi_2 \sim F(\mu_2, \sigma_2^2) \xrightarrow{\text{residualchange}} y_2(\mu_2, \sigma_2^2), \tag{7}$$

Assuming there is only a change in the mean between the two income samples, and then the underlying income  $\xi_1$  relative to the base period  $y_1$  can be denoted by

$$\xi_1 = y_1 + \Delta y = y_1 + (\mu_2 - \mu_1), \tag{8}$$

The variance change reflects the polarization of the income between the individuals around the mean. Based on the counterfactual analysis, we keep the mean of the counterfactual income  $\xi_1$  and  $\xi_2$  equal and only allow their variance changes. According to the statistical knowledge it is easy to see that

$$(\xi_1 - \mu_2)/\sigma_1 = (\xi_2 - \mu_2)/\sigma_2 \sim F(0, 1). \tag{9}$$

So we get

$$\xi_2 = \mu_2 + \sigma_2(\xi_1 - \mu_2)/\sigma_1. \tag{10}$$

The difference between  $\xi_2$  and  $y_2$  is the residual change.

### 3.3. Dynamic Expansion of AIDS Model

Equation (6) is a static model, but the change in the income distribution is a dynamic process, so the combination of the two will also be a dynamic system. Based on model (6), the expenditure share  $\mu_i$  of the commodity  $i$  can be regarded as a function of the income  $m$  and the price vector  $p$ , which is  $\mu_i(m, p)$ ; if  $p$  is kept constant,  $\mu_i(m, p)$  is similar to the Engel equation of commodity  $i$ . Taking the two periods as an example, the evolution of the consumption structure caused by the income changes can be decomposed as follows:

$$\left\{ \begin{array}{l} \mu_{i1}(y_1, p_1) \xrightarrow{\text{price effect}} \eta_{i1} = \mu_i(y_1, p_2) \\ \eta_{i1} = \mu_i(y_1, p_2) \xrightarrow{\text{mean effect}} \eta_{i2} = \mu_i(\xi_1, p_2) \xrightarrow{\text{variance effect}} \eta_{i3} = \mu_i(\xi_2, p_2) \xrightarrow{\text{residual effect}} \mu_{i2}(y_2, p_2) \end{array} \right. \quad (11)$$

The above process is clearly also a counterfactual decomposition process and its first step is to eliminate the impact of the price change. The mean, variance, and residual effects of the evolution of the consumption structure caused by income distribution change are then denoted by  $\Delta_1$ ,  $\Delta_2$ , and  $\Delta_3$ , respectively. So,

$$\begin{aligned} \Delta_1 &= \eta_{i2} - \eta_{i1} = \alpha_i \ln(\xi_1 / y_1) \\ \Delta_2 &= \eta_{i3} - \eta_{i2} = \beta_i \ln(\xi_2 / \xi_1) \\ \Delta_3 &= \mu_{i2} - \eta_{i3} = \theta_i \ln(y_2 / \xi_2) \end{aligned} \quad (12)$$

Then, the dynamic expansion model of AIDS can be obtained as follows:

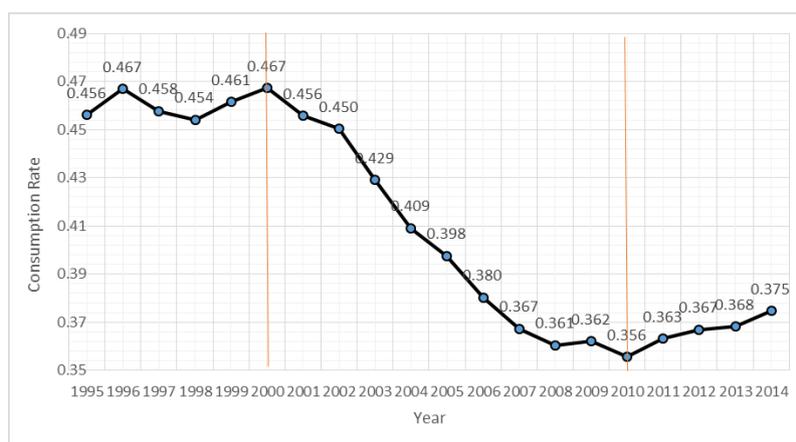
$$\begin{aligned} \mu_{i2} &= \eta_{i1} + \Delta_1 + \Delta_2 + \Delta_3 \\ &= a_i^* + \sum_{j=1}^n r_{ij}^* \ln(p_{j2}) + b_i \ln(y_1 / p_2) + \alpha_i \ln(\xi_1 / y_1) + \beta_i \ln(\xi_2 / \xi_1) + \theta_i \ln(y_2 / \xi_2) \end{aligned} \quad (13)$$

Equation (13) is the dynamic expansion of the AIDS model, which includes the factors of the income distribution change. The dependent variable is the consumption share of each commodity in the second period, and the independent variable contains two kinds of price factors and income distribution factors:  $\sum_{j=1}^n r_{ij}^* \ln(p_{j2})$  denotes the impact of its own price and the interactive price, and  $\ln(y_1 / p_2)$  represents the change in real income due to the price changes. These factors measure the effect of the price on various expenditures together, as the nominal income remains constant. Obviously, the three items  $\ln(\xi_1 / y_1)$ ,  $\ln(\xi_2 / \xi_1)$ , and  $\ln(y_2 / \xi_2)$  indicate the impact of the changes in the income distribution, which is the focus of this study.

## 4. Data Preparation and Regression Equation Setting

### 4.1. Data Preparation

The focus of this study is to examine the issue of China’s domestic demand, not the dynamic evolution trend of the consumption structure. As can be seen from the consumption rate curve in Figure 1 (source: [1]), the significant decline in consumption rate occurred between 2000 and 2010 is what we want to explain from the structural level. In addition, as China’s economy enters a new normal, the statistical caliber of urban residents’ income has also changed since 2012. After 2010, only two years of data are available. For the robustness of the results, the empirical discussion focuses on the provincial panel data from 2000 to 2010.



**Figure 1.** Consumption Rate of Chinese Urban Residents during 1995–2014.

The data used are mainly from the National Statistical Yearbook 2000–2010 data in respect of the urban residents in the provinces. The indicators used include the expenditure data for eight categories of goods, the disposable income data, the classified consumer price index, and the annual nominal interest rate data. The eight categories of goods are food, clothing, residence, household facilities, medical care, transportation and communications, entertainment and education, and other miscellaneous expenses and services. The nominal interest rate used is a 1-year time deposit rate, which is actually the average annual interest rate. Because the government only announces the corresponding interest rate of the adjustment day, if there are multiple interest rates in a given year, this study will average the different interest rates by the number of days. In addition, we still need to construct some new indicators based on the available data.

For the income indexes, which are the last three income items in model (13), the structure of the two potential income variables  $\zeta_1$  and  $\zeta_2$  are relative to the income of the previous year, so the change in the income distribution is measured between the adjacent two years. The standard deviation will be used when we calculate  $\zeta_2$ ; the income data of the yearbook are derived from the same household survey data, so the standard deviation is calculated by using the data of seven income levels in each year, and the proportion of the population in each group is 0.1, 0.1, 0.2, 0.2, 0.2, 0.1, and 0.1, respectively (see Table 1).

**Table 1.** Disposable Income of Chinese Residents by Group.

Year	Per Capita Income	Lowest	Low	Lower Middle	Middle	Upper Middle	High	Highest	Standard Deviation
2000	6280.0	2653.0	3633.5	4623.5	5897.9	7487.4	9434.2	13,311.0	1122.7
2001	6859.6	2802.8	3319.7	4946.6	6366.2	8164.2	12,662.6	15,114.9	1424.4
2002	7702.8	2408.6	3032.1	4932.0	6656.8	8869.5	15,459.5	18,995.9	1919.1
2003	8472.2	2590.2	3295.4	5377.3	7278.8	9763.4	17,471.8	21,837.3	2224.4
2004	9421.6	2862.4	3642.2	6024.1	8166.5	11,050.9	20,101.6	25,377.2	2609.4
2005	10,493.0	3134.9	4017.3	6710.6	9190.1	12,603.4	22,902.3	28,773.1	2988.4
2006	11,759.5	3568.7	4567.1	7554.2	10,269.7	14,049.2	25,410.8	31,967.3	3303.3
2007	13,785.8	4210.1	6504.6	8900.5	12,042.3	16,385.8	22,233.6	36,784.5	3406.6
2008	15,780.8	4753.6	7363.3	10,195.6	13,984.2	19,254.1	26,250.1	43,613.8	4087.8
2009	17,174.7	5253.2	8162.1	11,243.6	15,399.9	21,018.0	28,386.5	46,826.1	4366.2
2010	19,109.4	5948.1	9285.3	12,702.1	17,224.0	23,188.9	31,044.0	51,431.6	4750.0

Note: The per capita income data are not calculated and are the original data in the China Statistical Yearbook. All data were converted using 2000 as the base year.

For the price indicators we use the 2000–2010 consumer price indices for the various commodities based on 2000. We take the discount rate  $1/(1+r)$  as the price of the savings, where the real interest rate  $r$  is obtained by using the annual nominal interest rate minus the total consumer price index.

In order to maintain the order of magnitude consistent with the other commodity price indices, the savings price is also converted at the 2000 base price. The total price index also needs to be reconstructed assuming that the share of savings is  $s$ , then the “total price index =  $(1 - s) \times$  total expenditure price index +  $s \times$  savings price index.”

#### 4.2. Regression Equation Setting

With the rapid economic growth, residents’ living standards have undergone great changes, so the consumer spending structure is bound to change significantly as a consequence of this. Therefore, the problem of structural mutation must be considered when we estimate the model. In order to avoid the estimated error caused by the artificial set of abrupt points, this study chooses to use Hansen’s threshold method to find the abrupt points [50–52], which is completely determined by the data, so we introduce dummy variables in model (13) as Hansen did. The equation for setting a single mutation point is as follows:

$$\mu_{it} = \sum_{j=1}^n r_{ij}^* \ln(p_{jt}) + b_i \ln(y_{t-1}/p_t) + [a_{i1}^* + \alpha_{i1} \ln(\xi_{1t}/y_{t-1}) + \beta_{i1} \ln(\xi_{2t}/\xi_{1t}) + \theta_{i1} \ln(y_t/\xi_{2t})] \cdot h_1(t < T) + [a_{i2}^* + \alpha_{i2} \ln(\xi_{1t}/y_{t-1}) + \beta_{i2} \ln(\xi_{2t}/\xi_{1t}) + \theta_{i2} \ln(y_t/\xi_{2t})] \cdot h_2(t \geq T) \tag{14}$$

where  $T$  is the structural break point,  $h_1(t < T)$  and  $h_2(t \geq T)$  are both indicator functions. If  $t < T$ , then  $h_1 = 1$ , and  $h_2$  has a similar definition. This study only adds the dummy variable to the intercept term and the income change factor; the price variable is not the focus, so we take it as the control variable. Because of the use of the panel data, the equation intercept also introduces province dummy variables to remove the impact of the individual effects, which is not reflected in the equation.

When the structural mutation is not considered, the degree of freedom of the system is 92, so in order to ensure the robustness of the estimation results, the time interval span set in this study is not less than three years. The sample point for each year is 31, which ensures that there are no less than 93 data observations per interval. Therefore, the potential mutation points considered in this study are in the 2003–2007 range. In addition, Hansen chooses the residual squared sum as the criterion of fitting and then determines the mutation point, and this study chooses the logarithmic maximum likelihood statistic in the regression result. The larger the likelihood value, the more likely that the corresponding potential mutation year is real.

From the above results (Table 2), the corresponding logarithmic likelihood is largest in 2004, and the results of the likelihood ratio test show that the original hypothesis of structural change is rejected at the significance level of 1%, so the structural mutation point  $T$  is 2004. So far, the final regression equation used in this study has been obtained.

**Table 2.** (a, b) Determination of the Point of Structural Change.

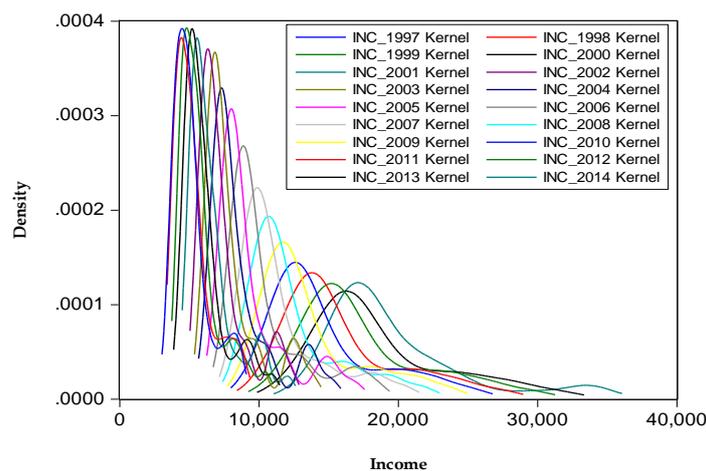
<b>(a)</b>						
Mutation Point	2003	2004	2005	2006	2007	
Likelihood Value	9033.876	9035.975 *	9035.189	9001.732	8980.904	
<b>(b)</b>						
Likelihood-ratio Test	Test Statistic	df	Probability	Critical value		
				1%	5%	10%
Assumption: No Structural Change	250.20	32	0.000	53.486	46.194	42.585

Note: (a) Tests of potential mutation years, (b) Nonlinear test with 2004 as the mutation year. \* indicates that the value is the largest. The “df” is the degree of freedom and the likelihood-ratio test is based on the results of Table 2(a).

## 5. Empirical Results and Discussion

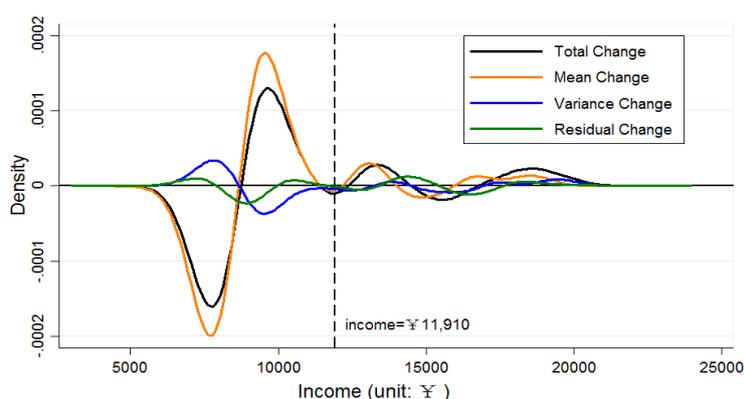
### 5.1. The Counter-factual Decomposition of Income Distribution

From the non-parametric kernel density estimation results of the residents' income distribution (Figure 2, source: [1]), we can see that the income level and the income gap have both changed significantly, and the domestic scholars Sun and Su [31] show that the growth in the income level is dominant. Therefore, if we do not consider the growth in income when discussing the lack of demand, it is bound to exaggerate the negative impact of the income gap and thereby add fuel to the controversy mentioned earlier.



**Figure 2.** Non-parametric Kernel Density Estimation Results of Income Distribution.

Based on the counter-factual decomposition method of Jenkins and Van Kerm [33], the non-parametric kernel density decomposition is estimated for the per capita disposable income of the urban residents in 30 provinces. The results of the decomposition of the income distribution between the other two years are consistent, so we only take the 2005–2006 group in the middle of the study period as an example (Figure 3). The graph is in the form of a probability density curve, which is fitted according to the counter-factual income variables of each province.



**Figure 3.** Decomposition of Income Distribution Changes during 2005–2006.

From the results we can see that the mean change is the dominant effect, the variance change is the second-most dominant effect, and the residual change is the smallest. Furthermore, the mean change is basically always consistent with the total change, whereas the variance and the residual change are opposite to the mean change before income 11910, then consistent with the mean change, and the residual change is slightly ahead of the variance change. It can be speculated that if the shortage of

domestic demand is indeed caused by the income factors, focusing only on the income gap may not be comprehensive, because it is not the main feature of the income distribution changes. Therefore, it is necessary to rethink the problem from the whole feature of the change in the income distribution.

### 5.2. Model Estimation Results and Analysis

The model we used is a system, and each equation does not contain endogenous explanatory variables. If we ignore the correlation between the disturbance terms of the different equations, the ordinary least squares estimate for each equation is consistent but not the most efficient. There is likely to be a period correlation between the residents' different expenditures, so it is efficient to use the Seemingly Unrelated Regression (SUR) to estimate the entire system at the same time. In addition, since the dependent variable of each equation is the proportion of "consumption expenditure/income," the sum is 1. In order to avoid over-recognition of the model estimation, one equation must be removed. Theoretically, randomly removing any one does not affect the result, and the parameters of the removed equation can be calculated through the constraints. But the purpose of this study is mainly to examine the impact of the income distribution changes on the consumption structure, and savings exists more as a tool variable, so choosing to remove the savings equation and its estimated results will not be given. For the parameter estimates, only the coefficient estimates of  $\ln(\xi_1/\gamma_1)$ ,  $\ln(\xi_2/\xi_1)$  and  $\ln(\gamma_2/\xi_2)$  representing the income distribution change are given.

From the estimation results (Table 3), the model is well fitted, the Root Mean Square Error (RMSE) of each equation is small, and all R-square values are greater than 0.97. Furthermore, the correlation between the perturbations of the equations have also been tested by the Breusch-Pagan test, and the last line of Table 3 shows that the p-value of the "no-period correlation" is 0, so the original hypothesis of "the disturbance term is independent" can be rejected at a significance level of 1%. Therefore, the use of SUR for the systematic estimation can improve the estimation efficiency.

**Table 3.** The Estimation of the Impact of Income Distribution on the Consumption Structure.

Period	Effects	(u1)	(u2)	(u3)	(u4)	(u5)	(u6)	(u7)	(u8)
2000–2004	Mean	0.219** (2.52)	−0.00415 (−0.80)	0.00676 (0.11)	−0.333*** (−6.75)	0.113*** (2.76)	0.306*** (3.90)	0.278*** (4.56)	−0.418*** (−11.68)
	Variance	0.266*** (4.02)	−0.0576 (−1.46)	−0.0357 (−0.73)	−0.0626* (−1.66)	0.108*** (3.43)	0.0536 (0.89)	0.142*** (3.00)	−0.138*** (−5.23)
	Residual	−0.0321 (0.90)	−0.0838*** (−3.92)	−0.0465* (−1.76)	0.0166 (0.83)	0.0380** (2.25)	0.0101 (0.31)	0.0135 (0.53)	−0.00973 (−0.66)
2005–2010	Mean	−0.106*** (−3.28)	−0.0274 (−1.37)	−0.0400 (−1.59)	−0.0142 (0.74)	−0.0350** (−2.17)	−0.0504* (−1.65)	−0.0100 (−0.42)	0.0203 (−1.55)
	Variance	−0.125** (−1.98)	0.0128 (0.35)	−0.125*** (−2.67)	0.0318 (0.91)	−0.0508* (−1.70)	0.0308 (0.55)	0.0946** (2.14)	0.0966*** (3.94)
	Residual	−0.0626* (−1.76)	0.0378* (1.79)	−0.0522** (−2.00)	0.00428 (0.22)	−0.0111 (−0.66)	0.0234 (0.73)	0.0353 (1.41)	0.0319** (2.17)
	RMSE	0.0105	0.0061	0.0075	0.0057	0.0047	0.0094	0.0071	0.0042
	"R-sq."	0.9986	0.9946	0.9905	0.9858	0.9928	0.9887	0.9948	0.9795
Breusch-Pagan test of independence: $\chi^2(28) = 174.237$ , Pr = 0.0000									

Note: The t statistics are in parentheses. The symbols and thresholds are \* for  $p < 0.1$ , \*\* for  $p < 0.05$ , and \*\*\* for  $p < 0.01$ . "R-sq" represents R-squared statistics. (u1)–(u8) represent eight categories of goods: (u1) food, (u2) clothing, (u3) residence, (u4) household facilities, (u5) medical care, (u6) transportation and communications, (u7) entertainment and education, and (u8) other miscellaneous expenses and services.

For the period 2000–2004, the impact of the mean effect on clothing and residential consumption is not statistically significant. Among the consumption items that are significantly affected by the change in the mean of the income distribution, there is a positive impact on the consumption of food, medical care, transportation, entertainment, and education, and a negative impact on consumption of household equipment and miscellaneous services. We know that the demand for basic living expenses for food, clothing, and household equipment in China had been basically met by the year 2000 as a result of the rapid increase in the overall income level of the residents. According to the

data in the 2001 China Statistical Yearbook, by the end of 2000 the three sets of traditional home appliances, TV sets, washing machines, and refrigerators, had reached a high level of 116.56 units, 90.52 units, and 80.13 units per 100 urban residents. Therefore, during this period the proportion of household consumption expenditure on household equipment decreased with the increase of income, thereby reflecting the “Engel Law” trend. The positive effect of the mean change on food expenditure shows that the dietary structure of Chinese residents in this period was further optimized; people not only took “eat full” as a standard, more and more chose to pursue the “eat good” policy with an improvement in their food quality, and the proportion of spending on dining outside the home also increased. The trend with clothing expenditure is just between the middle of the two types of goods. The proportion of the expenditure on clothing is not sensitive to the growth of the income level, indicating that the residents’ basic needs have been met, but the pursuit of quality has not yet been reflected. During this period, residents mainly focused on the three “core consumption” categories, which are health care, transportation and communications, and entertainment and education. This consumption structure represents a transition from a basic one to a development-centric one, but the enjoyment-centric consumption represented by the “other miscellaneous expenses and services” had not yet attracted the attention of the urban residents in the short term; they chose to reduce the basic type of consumption and transfer their focus onto the development-centric consumption.

China’s income distribution is obviously right-sided, with the high-income groups growing rapidly, so the variance effect and residual effect mainly represent changes in the consumption choices of the high-income earners. The variance effect for the period 2000–2004 has a significant positive effect on the consumption of food, medical care, culture, and education, whereas it has a significant inhibitory effect on household facilities and miscellaneous services and has no significant effect on other items. This indicates that the high-income group will further increase their share of expenditure on food, medical care, and cultural education. As their income grows at a relatively faster pace, more income will be used to enjoy higher quality food and health care services and to receive better quality education, which may enhance their individual heterogeneity advantages and help them to stay in the forefront in terms of income distribution. However, the expenditures on household equipment, tourism, and other miscellaneous services have also been reduced, which may have been caused by a lack of innovation in the home appliance industry and the immaturity of the tertiary industry at that time.

The residual effect reflects the choice of the consumers with the most heterogeneous advantage, whose position in the income distribution levels was relatively higher. During 2000–2004 the residual effect had no significant effect on the other items except that there was a significant negative impact on the consumption of clothing and housing and a positive effect on the consumption of health care. As they are the group with the fastest growing income, they are most concerned about medical expenses and may even sacrifice some short-term clothing and residential consumption to meet their medical expenses. The difficult problem of seeing a doctor was always the focus of the society’s attention in this period.

During 2005–2010 the mean effect had a significant negative effect on food, health care, and transportation, but the impact on the other categories of consumption was not significant. Therefore, compared with 2000–2004, the positive pull impact of the mean effect on the consumption rate disappeared, which perhaps just reflects the problem of the continuing decline of China’s consumption rate with the mean effect reflecting the consumption dynamics of the main body of society. Fortunately, the variance and residual effects reflect some positive effects on individual markets, such as the variance effects on the expenditure on cultural and educational activities and miscellaneous services, and the residual effects on clothing and other services, even though their negative impacts on certain markets still exist. Based on the results, first, the second round of household food consumption has been completed, so the three effects of the income distribution are negative. Second, thanks to the deepening of the health care reform since 2005, which was defined as “The Year of Hospital Management” by the government, the medical expenses proportion of income has been reduced significantly. Finally,

the trend of further escalation of the consumption structure is beginning to emerge, which shows that families with faster income growth tend to increase their spending on education and services. In addition, the attitudes towards apparel consumption have changed with people beginning to focus more on the quality and brand of clothing.

Considering the importance and centrality of real estate to China's economy, the issue of residential consumption will be discussed separately here. The results of Table 3 show that the mean effect of the two periods both had no significant effect on the residential consumption. The variance effect was not significant before 2004 but began to show a significant negative effect after 2004, while the residual effect reflects the negative impact on the consumption devoted to living expenses in the two periods. It is easy to understand why the mean effect is not significant, and this is because since 1998 the implementation of housing distribution monetization replaced the previous housing in-kind distribution. China's housing prices began to rise, especially in 2000–2010, which is known as the "Golden Decade" of the real estate market. Under the continued rising expectations, the housing bubble continued to expand, and according to the statistics of the Chinese Academy of Social Sciences in 2004, in Beijing and Shanghai the overall household debt ratio, which reached 155% and 122%, respectively, was higher than the ratio for European and American families. Therefore, with the investment attributes of the house becoming stronger, the residential market has gradually moved out of line with the income levels, and the mean effect has lost its role.

It is contrary to our intuition that the residual effect in the first period and the variance and residual effects in the second period have shown a negative impact on residential consumption, because most people would think that high-income people are characterized by residual and variance changes and should have increased their living expenses. To understand the statistical content of the Chinese Bureau of Statistics in respect of the consumption on living expenses, we find that most of the statistics use costs for the items including housing and decoration materials, rent, mortgage payments, daily energy consumption, and maintenance, but the expected income from that investment that should be taken into consideration is not included. For example, renovation costs that are incurred are included in the statistics reported, and generally Chinese families that are home owners choose to decorate the house they live in, but they do not decorate it for speculative reasons. Therefore, in the context of the increasing investment demand for houses, the complementarity between the usage cost and the housing expenditure is gradually weakened, and the substitution characteristics are gradually reflected. A few high-income families characterized by residual change chose speculative living expenses in 2001–2004, while in 2005–2010 the majority of high-income groups characterized by the variance effect were also involved, thereby strengthening the negative impacts of residual and variance effects on residential consumption.

In summary, the above model estimates are statistically significant, and they are consistent with the actual situation that prevailed in China over that time. The consumption effect of the income distribution in the two periods is obviously different. The mean effect is the theme during 2001–2004, and the change of the consumption structure from a survival mode to a development mode is the mainstream. However, the mean effect during 2005–2010 is no longer significant with the overall consumption being weak. Fortunately, in the individual markets, with regard to the high-income groups, the variance and residual effects reflect their positive side, which strengthened the individual market demand, and the consumption structure also shows signs of further escalation.

### 5.3. Quantitative Counterfactual Estimation of the Effects

The preceding analysis is qualitative, but as is customary in studies of the consumption structure, quantitative elastic analysis is still needed. However, after introducing the income distribution variables into the AIDS model, the economic meaning of the variables that this study is concerned with becomes difficult to define when performing elasticity analysis, especially the interpretation of the variance and residual terms. Therefore, we have decided to abandon the elasticity analysis and directly use the previous counterfactual analysis framework and the model's estimation results to

quantitatively measure the impact of the three factors of the income distribution on the consumption demand structure of the different commodities. We are then able to complete the interpretation of why China's household consumption rate continued to decline.

The essence of the simulation is based on the counterfactual sample constructed to predict the expenditure-income ratio for each category of goods. In the simulation process the coefficient estimates and variables in the sample other than the income factor remain unchanged. We are only assuming that the income distribution variables are changed according to the following three counterfactual cases. We still take two periods as an example, and the change in income is subject to Equation (7). Assuming that the income in the first period is  $y_1$ , which we already know,  $u_{i2} = u_{i2}(\zeta_1, \zeta_2, y_2)$  can be determined by model (14), whose coefficients have already been estimated. If, for example, we assume no change in the income distribution, then we get the predicted value  $\hat{u}_{i2}(y_1, y_1, y_1)$ , but if only the mean change occurs, its predicted value is  $\hat{u}_{i2}(\zeta_1, \zeta_1, \zeta_1)$ , and so on. Finally, the following results are obtained:

- Total effect:  $\hat{u}_{i2}(\zeta_1, \zeta_2, y_2) - \hat{u}_{i2}(y_1, y_1, y_1)$
- Mean effect:  $\hat{u}_{i2}(\zeta_1, \zeta_1, \zeta_1) - \hat{u}_{i2}(y_1, y_1, y_1)$
- Variance effect:  $\hat{u}_{i2}(\zeta_1, \zeta_2, \zeta_2) - \hat{u}_{i2}(\zeta_1, \zeta_1, \zeta_1)$
- Residual effect:  $\hat{u}_{i2}(\zeta_1, \zeta_2, y_2) - \hat{u}_{i2}(\zeta_1, \zeta_2, \zeta_2)$

By the above process, every two years' demand effects of the income distribution change on different commodities in each province are obtained.

The estimated results for each effect by the year group are given in Figure 4, which is obtained by averaging the provincial data. The results show that the mean effect is the largest effect in all kinds of consumption and from it the size and direction of the total effect is basically determined, but its role is to reduce the consumption rate in a comprehensive view. For home equipment the mean effect is changed from a negative effect before 2004 to a positive effect after 2004, but the positive effect is very small. As the industry has been in a very mature stage, most of the consumption is to meet the needs of family equipment updates, so there is little room for further improvement in the proportion of the expenditure in the future. The impact of the mean effect on miscellaneous consumption and service items is developing in a positive direction, and there is a potential for further improvement, but it is still in a negative stage in the figure. The mean effect on the consumption of clothing has always reflected the inhibitory effect, and the effects of the mean on the other five categories all change from positive to negative and show a downward trend.

The variance effect and the residual effect are relatively small, so in order to show the results more clearly, Table 4 gives the yearly average of the effects of the two phases. Among the three effects, the residual effect is the smallest, and has a certain individual randomness, so no further analysis is warranted. For the variance effect the expansion of the income variance had a negative effect on consumption before 2004. This was mainly because it hindered the upgrading of the consumption structure of the medical, transportation, and cultural and educational consumption, but at the same time it played a positive role in the clothing, living, and home equipment categories, especially in service consumption, which represents the main direction for the further upgrading of the consumption structure. In the second stage the promotion effect of the variance on the food, living, and medical care categories was a rare bright spot when the mean effect was almost entirely negative. On the whole, the effect of the variance was much smaller than that of the mean and did not affect the overall trend of the total effect, but the variance of the income distribution still had a positive effect on the individual markets.



Figure 4. Counterfactual Decomposition of the Income Distribution's Consumption Effects.

**Table 4.** Annual Average Estimate of the Income Distribution's Consumption Effects.

Period	Effects	(u1)	(u2)	(u3)	(u4)	(u5)	(u6)	(u7)	(u8)
2000–2004	Total	0.01995 (100)	−0.00378 (100)	0.00116 (100)	−0.03490 (100)	0.01070 (100)	0.03216 (100)	0.02795 (100)	−0.04304 (100)
	Mean	0.02355 (118.04)	−0.00447 (118.25)	0.00073 (62.51)	−0.03578 (102.52)	0.01213 (113.36)	0.03288 (102.25)	0.02987 (106.90)	−0.04492 (104.37)
	Variance	−0.00364 (−18.25)	0.00079 (−20.82)	0.00049 (41.96)	0.00086 (−2.46)	−0.00147 (−13.74)	−0.00073 (−2.27)	−0.00194 (−6.94)	0.00189 (−4.39)
	Residual	0.00004 (0.18)	−0.00010 (2.51)	−0.00005 (−4.56)	0.00002 (−0.05)	0.00004 (0.40)	0.00001 (0.04)	0.00002 (0.05)	−0.00001 (0.03)
2005–2010	Total	−0.01205 (100)	−0.00389 (100)	−0.00364 (100)	0.00150 (100)	−0.00396 (100)	−0.00691 (100)	−0.00239 (100)	−0.00370 (100)
	Mean	−0.01362 (113.03)	−0.00352 (90.49)	−0.00514 (141.21)	0.00182 (121.32)	−0.00450 (113.64)	−0.00648 (93.78)	−0.00129 (53.97)	−0.00261 (70.39)
	Variance	0.00115 (−9.54)	−0.00012 (3.08)	0.00115 (−31.54)	−0.00029 (−19.32)	0.00047 (−11.74)	−0.00028 (4.05)	−0.00087 (36.40)	−0.00088 (23.88)
	Residual	0.00042 (−3.46)	−0.00025 (6.43)	0.00035 (−9.56)	−0.00003 (−1.87)	0.00007 (−1.87)	−0.00016 (2.32)	−0.00023 (9.62)	−0.00021 (5.73)

Note: The numerical values in brackets indicate the percentage of contributions corresponding to each effect; the total effect is 100.

#### 5.4. Discussion on China's Insufficient Domestic Demand

The impacts of the changes in the income distribution on the consumption structure have been adequately analyzed. On this basis, this section discusses the problem of insufficient domestic demand in China. It is easy to judge from the previous analysis that the main reason for the decline in the consumption rate may not be the expansion of the income gap, it is likely to be caused by the recession of the incentive effect on the consumption demand made by the increasing income level. In other words, the mean effect of the income distribution change has not been fully released in the markets. Therefore, we now discuss why the mean effect is weakened.

Based on the previous results, we further summarize the influence direction of the mean and variance effects on a fixed commodity when the different groups from high to low income levels pass through a fixed commodity market (Table 5). For simplicity, assume that there are only low, medium, and high income groups, the income distribution changes as shown in Figure 2, both the income mean and the variance increase, and there are the following four cases:

- Case 1: Suppose this is a new commodity, and its price is relatively high, so its market initially is only the high-income families. It is easy to judge that the increase in income levels will promote its demand growth, while the widening income gap will make high-income residents enter the market faster, which will also increase the demand, so the two effects are both positive.
- Case 2: When the main body of the population, the middle-income group, begins to pay attention to the goods, the increase in the income levels will still drive demand growth. However, the larger variance will cause the income distribution to polarize and the distribution curve to become flat, so the size of the middle income groups will be reduced, which may inhibit the growth of demand. Therefore, the mean effect is positive and the variance effect is negative at this time.
- Case 3: When the middle income group leaves the market, only the demand from the low-income families is not met. The increase in income levels will lead to more people's needs being met and cause them leave the market, but the expansion of the variance will increase the size of the low-income group and delay the decline in demand. Therefore, the mean effect is negative and the variance effect is positive.
- Case 4: When all the families have the ability to buy the goods, the goods become popular. This causes the upgraded goods to be effectively a new commodity, and at this point the increase in the mean and variance of the income will lead to a reduction in the demand for the commodity, so the two effects are both negative.

**Table 5.** The Influence Direction of the Mean and Variance Effects on a Fixed Commodity.

	Effects	Case 1	Case 2	Case 3	Case 4
<b>Income Distribution Change</b>	<i>Mean</i>	+	+	−	−
	<i>Variance</i>	+	−	+	−

Note: The symbol “+” indicates a positive effect, and “−” indicates a negative effect.

We use the summary in Table 5, combined with the information in Figure 4 and Table 4, to help us give the reasons below for the diminishing mean effect.

First, it can be seen from Table 4 that many of the expenditure items are in Case 3 and Case 4 in Table 5; that is, most commodities are no longer the core consumer choice of the middle and above income families, and their market demand has begun to decline. This reflects the irrationality of the supply-side structure, whereby there is an excess supply of low-end products but a shortage caused by the targeted consumption that cannot be met in a timely manner. Therefore, the mean effect is weakened and the market demand cannot be fully released.

Second, the rapid rise in house prices after 2000 may have inhibited the release of the mean effect. Campbell and Cocco [53] believed that housing prices may make some residents “save for buying a house” and thereby reduce their consumption. Figure 4 shows that the effect of the variance on the living consumption is positive and has a tendency to strengthen. Table 4 further confirms this result. At the same time the mean effect on the living consumption is changed from positive to negative, but it should be noted that this is not the corresponding case 3 in Table 5, which reflects the plight that the middle-income people face when entering the housing market. After the reform of the real estate market in 1998, the increase in the mean and variance of the income in the first stage played a catalytic role in helping high-income families to own one house, and the real estate market soon became overheated. Due to the speculative properties of housing, some high-income people changed from being consumers to becoming speculators, which led to the emergence of a real estate bubble. In this environment house prices are rising at a speed far faster than the improving speed of the average income, and the threshold of residential consumption continues to increase. Middle-income families are trapped in residential consumption, which greatly hurts their enthusiasm for consumption. They have to passively save in order to buy a house, so ultimately the mean effect is suppressed, not only in respect of residential consumption but also in respect of other consumption.

Finally, the decline in the mean effect may also be related to the macroeconomic system, such as the price system, industrial policy, financial policy, and other factors ignored by the model. These factors all need to be considered in the next step to expand domestic demand.

The results of this study can also explain the phenomenon of why some individual market demand appears hot in turns. As the mean effect is in a state of inhibition, the potential consumption capacity of the residents has not been fully released, and China’s research and development ability for new products is weak, so the consumer structure often reflects “passive” upgrade characteristics when its development has reached a certain level. Once a new product meets the needs of the market, the mean effect and variance effect both will immediately promote the rapid growth of demand and lead to the phenomenon of a local hot market. Furthermore, it is then easier for enterprises to form unified short-term expectations, which will lead to investment “wave phenomena” [54] and overcapacity.

## 6. Conclusions and Policy Implications

Inadequate domestic demand in recent years has always retarded the sustainable growth of China’s economy, but the emergence of a series of local hot markets shows that it is essentially a structural problem, so it is necessary to analyze the problem of insufficient domestic demand from the perspective of the consumption demand structure. The dramatic changes in the income distribution of the residents can be said to be one of the most significant social characteristics in China since the reform, and it is also a very important factor for consumption. Therefore, this study analyzes the problem of insufficient domestic demand in China from the perspective of the effect of the income

distribution on the change of the consumption structure. The main contributions of this study are summarized as follows:

First, according to the characteristics of the consumption behavior of the Chinese residents, combined with the process of anti-fact analysis of the income distribution changes, the AIDS model is extended, and the income distribution and consumption structure are placed in a model, which provides a new idea about how to study the transformation of the demand structure. The empirical results of this study are in full compliance with China's economic development practice, by which the reliability of the model is proved.

Second, the results show that the mean effect is the largest effect in all kinds of consumption, by which the size and direction of the total effect is basically determined. The variance effect is much smaller than that of the mean, but it still has some positive effects on the individual markets, such as the promotion of the demand for services, which represents the future trend of the demand structure. The residual effect is the smallest and has a certain individual randomness.

Finally, the discussion is more rational and comprehensive. In contrast to the view that the income gap leads to the insufficient domestic demand, this study argues that the income gap is not the main reason for the lack of domestic demand since 2000, but is likely to be caused by the decline of the mean effect made by the income distribution change on the market demand. There are two reasons for the failure of the mean effect: on the one hand there is the irrationality of the supply side, and on the other hand there are excessive house prices that inhibit the full release of the mean effect, which leaves most of the middle class facing a housing consumption dilemma.

Furthermore, the results of this study can also explain the phenomenon of the local hot market. As the mean effect is in a state of inhibition and China's research ability for new products is weak, the consumer structure reflects "passive" upgrade characteristics, which lead to strong consumer synchronization. Once a new product meets the needs of the market, the mean effect and variance effect will both immediately promote the rapid growth of demand and lead to the phenomenon of a local hot market.

Therefore, in the process of expanding the domestic demand, the following points should be noted. (1) In the early stages of the formation of a new consumption structure, it can be helpful to objectively treat the expansion of the income variance and control and maintain the appropriate income gap so that the positive role played by the variance effect and residual effect of the income distribution change can be fully exploited. (2) Due to the relative hysteresis of the supply structure, taking into account the imperfection of the market, entirely relying on the market mechanism to reduce the supply of surplus products is not realistic. There is still a need for the government to correct and improve the market exit mechanism in the short term in order to avoid unnecessary production [8]. Improving the innovation ability can not only make the economy realize a consumption-driven transformation, thereby fundamentally solving the problem of insufficient domestic demand, but it can also alleviate the excess capacity caused by the "investment boom." (3) The excessive growth of house prices should be controlled to avoid its weakening impact on the mean effect. This should be accomplished by emphasizing the consumption characteristics of housing, curbing speculative demand, and improving the financial credit system to help the middle class to overcome the current consumption dilemma. (4) Advocating moderate consumption. The results of this study show that the current expansion of income variance has a positive effect on consumption, which is likely to lead to the aggravation of consumption inequality. Therefore, we should guard against irrational overconsumption, which is also not conducive to the sustainability of the economy. Experience shows that Latin American countries caught in the middle-income trap are not under-consuming, but over-consuming. So is it possible for China to have "insufficient overall consumption and excessive consumption of high-income groups" in the future? This maybe a more difficult problem related to the sustainability of economic growth. To solve this problem, we may need not only the guidance of economics, but also other fields, such as psychology, to help forming a reasonable consumption concept in Chinese society.

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