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Effect of Social Security System on Consumption through Income and Uncertainty: Evidence from China

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Abstract: In our paper, we test how the social security system affects citizens' consumption behavior through narrowing the income gap between residents with different social status and decreasing the uncertainty of income and cost. In the theoretical part, we firstly extend the model of Keynes to test the income distribution hypothesis; then, we use the coefficient of absolute risk aversion (CARA) model and a two-period model to test the uncertainty hypothesis. Empirically, (1) we use China's data (2003–2012) to test the theoretical results, and find that the social security system has a positive effect on consumption by reducing the income gap; (2) according to a 10-year panel data (2003–2012), we find that reducing income uncertainty can increase consumption. Besides, medical insurance and endowment insurance have a positive impact on consumption by reducing citizens' cost uncertainty, but to different extents.

Keywords: social security system; consumption; uncertainty; income distribution

1. Introduction

Social security plays an important role in social stability and sustainable development in a country. The social security system contains social insurance, social relief, social welfare, preferential treatment, etc., and it's a major tool of reallocation for the government to adjust wealth distribution and assist people with inadequate or no income [1]. The system can narrow the income gap, which contributes to social equality, and reduces uncertainty in the future, which contributes to human happiness [2]. What's more, it can even stimulate consumption, through which the development of economics could be more vigorous and sustainable [3]. From the viewpoint that balancing income distribution can increase consumption, the social security system is established based on the consumption function proposed by Keynes. This viewpoint holds that families with different incomes have different marginal propensities to consume. Families with low incomes have higher marginal propensities to consume, while those with high incomes have lower marginal propensities to consume, so to transfer wealth from high-income families to low-income families by means of income distribution can increase consumption on the whole [4]. On the other hand, the social security system can reduce residents' perception of future uncertainty, including income and expenditure uncertainty, and it thus can increase the current consumption, since the consumer is less likely to need to save money for future accidents [5].

The effect of social security on consumption would be very meaningful to China. China's per capita gross national income has risen steadily since 2000, reaching \$7940 by 2015, which was nearly nine times that of 2000; however, China's resident consumption rate has been declining since 2000, gradually from 46.2% to 37.1% in the past 15 years [6]. This consumption rate is not only lower than

that of such developed countries as the United States (68.1%) and Japan (56.6%), but also lower than that of developing countries such as India (59.1%) and Brazil (63.8%) in the same period. How to improve the resident consumption ratio has become an urgent problem to be solved for stimulating domestic demand in China, so it is very important to find the factors affecting the consumption intentions of residents. Meanwhile, China's social security system is still in the period of reform for system imperfectness, and has changed from "enterprise insurance" to "social insurance" after it has undergone several periods of reform. Since 2000, the urban social security system has included pilot schemes for further improvement, and in 2006, it was proposed to establish a social security system covering the whole population by 2020 [7]. By the end of 2015, the number of old-age insurance participants in China had reached 859 million, and the number of medical insurance participants had exceeded 1.4 billion, both of which had reached a record high, with the net expenditure constantly rising on the social security system [7]. In terms of the strength and coverage of the reform, China's social security system is ceaselessly advancing in the process of exploration. Similar reforms of social security have also been taken in many other emerging countries [8]. Thus, exploring the influence of social security has not only contributed to China's economy, but also has a great meaning to emerging markets. According to this, in this context, we need to not only know that the social security system has increased social security for residents, but also to accurately understand whether the social security system has a positive effect on residents' consumption. Moreover, social insurance is the major part of social security, especially medical insurance and endowment insurance [9]. Therefore, it's important to find out whether different kinds of social insurance have different effects on residents' consumption, which will guide our social security system to play a more effective role.

Previous studies have mostly found that the social security system has a positive impact on residents' consumption, but such studies by scholars are simply based on empirical data and insufficient in theoretical deduction. At the same time, previous scholars have also studied the impact of endowment or medical insurance on consumption independently, or qualitatively studied the relationship between them from the perspective of the whole social security system, but seldom systematically examined the effect of the social security system on consumption from two aspects such as the adjustment of income distribution and the influence of uncertainty [10–12]. For this purpose, this paper will comprehensively study the impact of the social security system on the consumption of Chinese residents based on theoretical model deduction and empirical data analysis from two aspects: narrowing the income gap and reducing uncertainty in the social security system. By exploring these mechanisms, we can point out an effective and sustainable way to increase the vitality of the economy while enhancing the residents' welfare and happiness.

2. Literature Review

Several studies in the literature have found that the social security system could influence consumption from various aspects, including savings, income, investment behavior, and assets allocation [13–19]. By analyzing the utility function, Caballero [20] leveraged the CARA utility function to find that the larger the range of institutional change, the greater the slope of the optimal consumption path and the larger the preventive savings, thus hindering current consumption. Through a study of household consumption and savings in the United States, this research finds that the rich save more than the poor. Studies from the perspective of the life cycle are listed as follows. Feldstein [21] relied on United States (U.S.) pension data with the method of time series analysis to know that the existence of pensions brought about a 50% decline in household savings, which facilitated consumption. Hubbard and Judd [22] investigated the pension insurance under social security from the perspective of permanent income, and found that it can remarkably reduce residents' uncertainty expectation, thus increasing consumption. Leimer [23] proposed that social security should be adjusted automatically with inflation to maintain residents' consumption after analyzing the data of residents' consumption portfolio according to the life cycle hypothesis from a standpoint of residents' risk adjustment and risk premium to future income.

According to the above literature, including theoretical and empirical studies, we could claim that the social security has a positive effect on consumption. Since social security relates to everyone's welfare, and consumption plays an important role in stimulating the economy, therefore, this positive relation between social security and consumption would contribute to both the residents' long-term happiness and the sustainable economic development of a society [24,25]. In order to show the correlation between sustainable development and the social security system affecting consumption, we would review the literature from the following two aspects: social security increasing consumption could contribute to social equality by narrowing the income gap, and enhance resident's welfare by reducing uncertainty to the future.

The consumption could be enhanced by the effective social security system through reallocating the income. This positive relation between social security and consumption has been found in many Western countries [26–30]. There are some relevant research studies based on regional data. Dollar et al. analyzed the panel data of 117 countries for 40 years, and revealed that the income level of residents has increased as a whole due to social security, which helped stimulate the total consumption in an indirect manner, but the influence on income was larger than that on consumption [31]. Van et al. built an empirical model assuming that social security is a particularly major income for a household, and that the expenditure would be different when changing the social security rules, including tax, pension, and so on [32]. Laitnar and Sliverman tested the correlation between social security reform and consumption by building a life-cycle model, and found that when the households' retirement-age decisions changed, which affected the pension, the expenditure would also be influenced. In the studies of China [33], Xu used the data from Chinese rural areas to find that the income diversification, which can be modified by the social security, has a positive effect on the peasants' consumption, and that the effects are not linear for different income-level households [34]. Sun introduced institutional factors as explanatory variables into the study of the characteristics of Chinese urban residents' consumption behavior, and put forward the idea of studying residents' consumption behavior in stages [35]. Moreover, the panel data method was adopted to expand the sample size for cointegration technical research and establish an error correction model between social security and urban residents' consumption. Sun mentioned as a policy suggestion that social security can improve the residents' marginal propensity to consume, release residents' savings, and stabilize residents' consumption during economic crisis. In fact, the process of the social security system playing its role is also the process of adjusting economic operation and realizing consumption startup. Besides, plenty of studies of China have also found a significant effect of the social security system on consumption through narrowing income inequality [36–41]. Other researchers have investigated the relationship between the social security system and a specific population group [42,43]. Meyer and Mok carried out their study on household data spanning from 1968 to 2005, and found that once becoming incapable, earned income decreases by 68%, and food consumption decreases by about 20% [42]. Therefore, the security system exclusively for this subset of the population can effectively increase household income and consumption. Blundell et al. rolled out research on British women's data with a dynamic model and found that increasing employment security for female employees can significantly affect their long-term savings behavior and ramp up their total consumption [43]. The above series of literature showed that the social security can help narrow the income inequality and finally increase the total current consumption.

The other stream of literature in our paper focused on how social security contributed to consumption by decreasing the uncertainty, which could encourage the current expenditure for the residents. Atanasio made full use of Italian data to discover that excluding the exogenous factor of changes in pension amounts, the decline of pension accumulation urged more families to accumulate household savings, in which the most prominent group was middle-aged consumers [44]. Park and Feigenbaum [45] conducted a study on US consumption data with a four-period model and recognized that social security affects residents' consumption choices in the short and long term, and it has different impacts on different ages. A similar relation has also been identified in the studies on Chinese

data. He [46] introduced the life-cycle function into the macroeconomic system, and concluded that the pension insurance had little or no effect on savings, but could significantly improve residents' consumption. Bai et al. [47] also found that social security can promote residents' consumption from the perspective of pension insurance. Leung and Xu [48] noticed that social security helps reduce the uncertainty of consumers' expectations for future expenditure, thus stimulating residents' short-term consumption; meanwhile, the huge urban–rural differences in China's pension system have led to different decisions between urban and rural residents regarding long-term consumption. Apart from these research studies using macro data, some studies have also used micro data to test the theory. Hofstede [49] came up with the conclusion that countries with high uncertainty aversion tend to have high savings based on his study on micro-perspectives of customer psychology by surveying the International Business Machines Corporation (IBM) employees from over 30 countries and scoring their consumption uncertainty aversion, which indirectly provides a basis for social security to reduce consumer uncertainty, and thus increase consumption. Besides, the above article particularly conducted a psychology survey targeted for Chinese residents and raised long-term and short-term orientations. The survey result shows that Chinese residents have extreme values of long-term orientation with a fairly high savings rate, presenting the cultural characteristics formed under the influence of long-term institutional and cultural instability. The following literature further support this result by extending the survey or exploring new attributions in existing studies [50–55].

Unlike the above literature, of which few have combined a theoretical model and empirical analysis, or considered different mechanisms of social security [56,57], this paper combines theoretical derivation with empirical analysis to make a systematical analysis of how the social security system affects consumption by adjusting income distribution and reducing residents' uncertainty, on the basis of the consumption function of Keynes [58]. It contributes to the present research by extending the function model and considering both income uncertainty and expenditure uncertainty by building a theoretical model. What's more, in the empirical part, this paper uses macro data, including time-series data and panel data, in case individuals underreport their income, and explores the different effects of pension insurance and medical insurance on residents' consumption in the empirical stage.

3. Hypothesis and Theoretical Analysis

3.1. Social Security System Affects Consumption by Reducing the Gap of Residents' Income Distribution

The modern social security system is a means of distributing and redistributing national income. The social security system can affect the fairness of income distribution from two such aspects as follows. On the one hand, the implementation of the social security system needs to raise funds through the higher-income people paying more and the lower-income people paying less. On the other hand, through the redistribution of insurance premiums, the higher-income families will enjoy less social security system treatment, while the lower-income families will enjoy more. Therefore, the income redistribution function of the social security system can narrow the gap between the rich and the poor to a certain extent. By adjusting income distribution, the social security system can balance the current income of all the social strata and also affect residents' expectations of the risk of uncertainty in the future. So, according to the consumption function theory, the social security system can affect residents' consumption and saving behaviors by narrowing the income distribution gap. Next, we will theoretically analyze the impact of income distribution on residents' consumption.

The absolute income hypothesis of Keynes mainly includes such three major points as follows:

- (a) There is a stable functional relationship between actual consumption and disposable income.
- (b) The marginal propensity to consume (MPC) $MPC = \frac{\partial C}{\partial Y}$ is able to satisfy $0 < MPC < 1$, in which C means consumption and Y means income.
- (c) MPC decreases with the increase of income, i.e. the law of diminishing marginal tendency.

Generally, it is assumed that the Keynes model can be represented by such a simplified linear equation as follows:

$$C = C_0 + \alpha Y$$

where C indicates consumption, C_0 means spontaneous consumption, namely, the amount of consumption that must be consumed when disposable income is zero, α indicates marginal propensity to consume, and Y means disposable income.

Next, we'll explore the relationship between income distribution equity and total consumption in accordance with the Keynes model.

Assuming that there are two consumption patterns—a low-income group and a high-income group—and their consumption behaviors conform to the absolute income hypothesis model, then their consumption amounts are respectively as follows

$$C_1 = C_0 + \alpha_1 Y_1 \quad (1)$$

$$C_2 = C_0 + \alpha_2 Y_2 \quad (2)$$

where $Y_1 < Y_2$, and the marginal propensity to consume decreases, namely, $\frac{\partial \alpha}{\partial Y} < 0$.

We assume the total consumption as $C = C_1 + C_2$.

Assuming that the government has transferred the income of high-income groups to low-income groups by means of redistribution, accordingly, their consumption can be expressed as follows:

$$C'_1 = C_0 + \alpha'_1 (Y_1 + \Delta Y) \quad (3)$$

$$C'_2 = C_0 + \alpha'_2 (Y_2 + \Delta Y) \quad (4)$$

The total consumption should be $C' = C'_1 + C'_2$.

The change of the total consumption is $\Delta C = C' - C$, and the following equation can be achieved by substitution after simplification:

$$\Delta C = (\alpha'_1 - \alpha'_2) \Delta Y + (\alpha'_1 - \alpha_1) Y_1 + (\alpha'_2 - \alpha_2) Y_2 \quad (5)$$

Obviously, income redistribution will not make the income of the high-income group lower than that of the low-income group, so $Y_1 + \Delta Y < Y_2 - \Delta Y$ and $\alpha'_1 > \alpha'_2$. Then, let's explore the symbols of the second and third items after assuming that the first item of ΔC is positive.

$$(\alpha'_1 - \alpha_1) Y_1 + (\alpha'_2 - \alpha_2) Y_2 = Y_1 \cdot \int_{Y_1}^{Y_1 + \Delta Y} \frac{\partial \alpha}{\partial Y} dY + Y_2 \cdot \int_{Y_2}^{Y_2 - \Delta Y} \frac{\partial \alpha}{\partial Y} dY \quad (6)$$

According to the integral mean value theorem, it can be inferred as follows:

$$\int_{Y_1}^{Y_1 + \Delta Y} \frac{\partial \alpha}{\partial Y} dY = \Delta Y \cdot \left. \frac{\partial \alpha}{\partial Y} \right|_{Y=Y_1 + \varepsilon_1} \quad (7)$$

$$\int_{Y_2}^{Y_2 - \Delta Y} \frac{\partial \alpha}{\partial Y} dY = -\Delta Y \cdot \left. \frac{\partial \alpha}{\partial Y} \right|_{Y=Y_2 - \varepsilon_2} \quad (8)$$

where $0 < \varepsilon_1 < \Delta Y$, $0 < \varepsilon_2 < \Delta Y$.

ΔY accounts for a tiny proportion of Y , and thus, we can abandon ε_1 and ε_2 , so:

$$(\alpha'_1 - \alpha_1) Y_1 + (\alpha'_2 - \alpha_2) Y_2 = (Y_1 \cdot \left. \frac{\partial \alpha}{\partial Y} \right|_{Y=Y_1} - Y_2 \cdot \left. \frac{\partial \alpha}{\partial Y} \right|_{Y=Y_2}) \cdot \Delta Y \quad (9)$$

Therefore, as long as it is guaranteed that $Y_1 \cdot \frac{\partial \alpha}{\partial Y} \Big|_{Y=Y_1} - Y_2 \cdot \frac{\partial \alpha}{\partial Y} \Big|_{Y=Y_2} > 0$, namely, $Y_1 \cdot \frac{\partial \alpha}{\partial Y} \Big|_{Y=Y_1} > Y_2 \cdot \frac{\partial \alpha}{\partial Y} \Big|_{Y=Y_2}$, $\Delta C > 0$ must be established; furthermore, in order to make the above equation greater than zero in any case of $Y_1 < Y_2$, it must be satisfied that the derivative of $Y \frac{\partial \alpha}{\partial Y}$ to Y is less than zero, that is:

$$1 + Y \frac{\partial^2 \alpha}{\partial Y^2} < 0 \quad (10)$$

Also:

$$\frac{\partial^2 \alpha}{\partial Y^2} < -\frac{1}{Y} \quad (11)$$

In this case, $\Delta C > 0$ always holds.

Thus, we have explained the impact of income distribution on consumption based on the Keynes' absolute income hypothesis model. This impact could be explained as, when some of the fortune transfers from a high-income family to a low-income family by the social security system, the total consumption would increase. Hence, we prove the social security system's positive effect on consumption from the theoretical prospect.

3.2. Social Security System Affects Consumption by Reducing Residents' Uncertainty Expectations

The social security system consists of social insurance, social relief, social security, preferential treatment, etc., among which social insurance is the core content of the social security system. Therefore, the social security system can disperse the risks faced by residents and reduce the uncertainty of their expectations for the future. The uncertainty of residents in China can be divided into income uncertainty and expenditure uncertainty. Income uncertainty refers to the possibility for income lowering due to residents' unemployment, retirement, and other causes in the future, while expenditure uncertainty refers to the possibility for expenditure rising due to residents' huge medical expenses in the future.

According to modern consumption theory, uncertainty has a very important impact on residents' consumption behaviors. Next, we'll try to make a specific theoretical analysis from the perspective of uncertainty of future income and consumption.

3.2.1. Impact of Income Uncertainty on Consumption

We assume an exponential relationship between residents' utility function and consumption [2], namely:

$$U(C) = \left(-\frac{1}{\gamma}\right) \exp(-\gamma C_t) \quad (12)$$

The absolute risk factor of this utility function is $-\frac{U''(C)}{U'(C)} = \gamma$, which is a constant.

Furthermore, consumer behaviors can be expressed as the following expected utility maximization problem:

$$\max E \left[\sum_{t=0}^{T-1} \left(-\frac{1}{\gamma}\right) \exp(-\gamma C_t) \right]$$

Constraints:

$$\begin{aligned} A_{t+1} &= A_t + Y_t - C_t \\ Y_t &= Y_{t-1} - e_t, e_t \sim N(0, \sigma^2) \end{aligned}$$

where $-\frac{U''(C)}{U'(C)} = \gamma$ is the constant absolute risk aversion coefficient, C_t represents residents' consumption in the t period, A_t indicates the assets held by residents in the t period, Y_t shows the disposable income in the t period, and e_t indicates the increment of disposable income in the t period.

Assuming that the living time of residents is T , the discount rate is equal to zero, and the income increment obeys the normal distribution, Caballero obtained the optimal consumption satisfying [3]:

$$C_t = \left(\frac{1}{T-1} \right) A_t + Y_t - \frac{\gamma(T-t-1)\sigma^2}{4} \quad (13)$$

Equation (13) shows that the consumption level is a function of the residents' assets, income, and income uncertainty. If the equation is certain, consumption is given by the first two items, and if it is uncertain, the prudence of residents' consumption is given by the third item; namely, when assets and income remain unchanged, the greater uncertainty of the future income, the more prudent consumers' behaviors.

3.2.2. Impact of Expenditure Uncertainty on Consumption

The social security system, on the one hand, can reduce the uncertainty of residents' future income, and on the other hand, it can also lower the uncertainty of residents' future expenditure. Here, we have introduced a two-period model to explain the impact of future expenditure uncertainty on consumption.

To study a consumer who lives in the two periods of the "present" and "future", we assume that:

- The income of the consumer is y_1 and y_2 , respectively, while the consumption of the consumer is c_1 and c_2 , respectively, in which c_2 is a random variable, and $c_2 \sim N(\mu^e, \sigma^2)$
- The consumer can change the consumption in the two periods through the financial market, the discount rate is β , and the savings are zero at both the beginning and end of the period.
- Consumer preference obeys the utility function $U(\cdot)$, which is a strictly incremental and concave differentiable function.

Thus, this two-period model can be reduced to the expected utility function optimization problem as follows:

$$\begin{aligned} \max EU(c_1, c_2) &= U(c_1) + \beta EU(c_2) \\ \text{s.t. } c_1 + \beta \mu^e &= y_1 + \beta y_2 \end{aligned} \quad (14)$$

By using the Taylor equation to expand Equation (14), and omitting the higher-order term after the second-order term, we can get:

$$EU(c_1, c_2) = U(c_1) + \beta U(\mu^c) + \frac{1}{2} \beta U''(\mu^c) \sigma^2 \quad (15)$$

Then, we obtain

$$\mu^c = \frac{1}{\beta} y_1 + y_2 - \frac{1}{\beta} c_1$$

based on the constraints, substitute it in the utility function, and can get:

$$U(c_1, c_2) = U(c_1) + \beta U\left(\frac{1}{\beta} y_1 + y_2 - \frac{1}{\beta} c_1\right) + \frac{1}{2} \beta U''\left(\frac{1}{\beta} y_1 + y_2 - \frac{1}{\beta} c_1\right) \sigma^2 \quad (16)$$

After finding the partial derivative of c_1 , we let the derivative equal zero, and we can get:

$$U'(c_1) = U'(\mu^c) + \frac{1}{2} U'''(\mu^c) \sigma^2 \quad (17)$$

As shown in this equation, under the conditions that μ^c and c_1 are kept constant, and if $U''' > 0$, the σ^2 increase will have $U'(c_1)$ increase accordingly; moreover, $U(\cdot)$ is assumed to be strictly concave, so $U'(\cdot)$ decreases monotonously. Therefore, in order to have $U'(c_1)$ increase, c_1 will inevitably decrease.

This has explained that when the other conditions remain unchanged, the increase of the future consumption uncertainty can lead to the decrease of the current consumption and the increase of the savings rate.

4. Empirical Analysis

In this section, we will use the data from the Statistical Yearbook 2003–2012 of the National Bureau of Statistics of China [59] for analysis (Supplementary Materials).

4.1. Empirical Analysis of Social Security System Influencing Consumption by Reducing Residents' Income Distribution Gap

4.1.1. Social Security System and Income Distribution Gap

The Gini coefficient is a major index to measure the equality of income. Basically, the Gini coefficient can theoretically range from zero to one, where zero presents complete equality, and one presents complete inequality. According to the above, we claim that the social security system can narrow residents' income distribution gap. We plan to find out the correlation between the Gini coefficient and social security expenditure from 2003 to 2012 in China, so as to prove the impact of the social security system on residents' income distribution gap.

The Gini coefficient is defined mathematically based on the Lorenz curve, and the equation is as the following [60]: if x_i is the income of person i , and there are n persons, then the Gini coefficient G is given by:

$$G = \frac{\sum_{i=1}^n \sum_{j=1}^n |x_i - x_j|}{2n \sum_{i=1}^n x_i} = 1 - \frac{1}{n} \left(2 \sum_{i=1}^{n-1} \sum_{j=1}^i \frac{x_j}{X} + 1 \right),$$

where X is the total income.

However, generally, it is difficult to calculate the Gini coefficient accurately, because we cannot exactly know the income of each person, especially in a large sample or macro data [61]. In this empirical analysis part, we use the unit of the group instead of the individual to calculate the Gini coefficient, since we can only know the group-level data according to the Statistics Yearbook of China.

Thus, here we use an approximate equation to define the Gini coefficient:

$$G = 1 - \frac{1}{n} \left(2 \sum_{i=1}^{n-1} v_i + 1 \right)$$

where G represents the Gini coefficient, v_i indicates the cumulative value of the proportion of each group's income to the total income from Group 1 to Group i after grouped according to incomes, i.e., $v_i = \sum_{j=1}^i \frac{Y_j}{Y}$ (Y_j represents the income of Group j , while Y represents the sum of all the groups' income). The only difference between our definition and the basic Gini coefficient is that we use Y_j instead of X_j to match our macro data.

In the Yearbook 2003–2012, the household is divided into seven levels: minimum income, low income, moderate and lower income, moderate income, moderate and higher income, high income, and maximum income. Based on the data of disposable income per capita of urban residents in China from 2003 to 2012, the Gini coefficient of urban residents in China from 2003 to 2012 has been worked out according to the definition of the Gini coefficient in this paper.

In order to study how the social security system influences consumption by reducing the income gap, we first need to show that the social security does have an impact on reducing the income gap, which means that we need to find out the significant impact of the social security system on the Gini index. So, we use the social security expenditure per unit of gross domestic product (GDP) national finance from 2003 to 2012 to express the level of the social security system, and we can get the following results (see Table 1).

Table 1. Gini coefficient and social security expenditure per unit of gross domestic product (GDP).

Independent Variable: Gini Coefficient		
Dependent Variable	Correlation Coefficient	Regression Coefficient
Social security expenditure per unit GDP	−0.847 *** (0.001)	−2.193 ** (0.002)

Note: * represent $p < 0.05$; ** represent $p < 0.01$; *** represent $p < 0.001$.

As is shown in Table 1, there is a significant negative correlation between social security level and Gini coefficient (-0.847). Moreover, when we use the Gini coefficient as an independent variable and the social security expenditure as a dependent variable, the regression coefficient is also significant and negative ($P = 0.002$); that is to say, the social security can reduce the Gini coefficient. Thus, we can draw the conclusion that the income gap of residents can be narrowed by increasing the social security expenditure.

4.1.2. Empirical Study Based on Keynes Absolute Income Hypothesis

$COM_{it} = C_0 + \alpha_{1it}INCOME_{it} + \alpha_{2it}EMPLOY_{it} + \varepsilon_{it}$ where, COM_{it} shows the consumption expenditure of Group i in the t period, α_{1it} indicates the marginal propensity to consume of Group i in the t period, $INCOME_{it}$ represents the disposable income of Group i in the t period, $EMPLOY_{it}$ represents the family size of group i in the t period. By completing the regression analysis of the time series based on the consumption and incomes classified according to urban Chinese residents' actual incomes from 2003 to 2012, we have achieved the following results (see Table 2) in accordance with the absolute income hypothesis model.

Table 2. Analysis of marginal consumption tendency under Keynes model.

	Independent Variable: COM						
	Minimum Income (households)	Low Income (households)	Moderate and Lower Income (households)	Moderate Income (households)	Moderate and Higher Income (households)	High Income (households)	Maximum Income (households)
C_0	1588.539	2079.677	5043.795	4735.585	5835.149	10467.76	17,021.95
Income	0.850 *** (0.000)	0.713 *** (0.000)	0.666 *** (0.000)	0.632 *** (0.000)	0.609 *** (0.000)	0.605 *** (0.000)	0.537 *** (0.000)
Employ	-879.865 (0.308)	-829.051 (0.144)	-2527.09 (0.415)	-2095.33 * (0.031)	-2664.71 (0.506)	-5588.57 (0.147)	-8492.14 (0.172)
R2	0.998	0.998	0.999	0.999	0.998	0.999	0.998

Note: * represent $p < 0.05$; ** represent $p < 0.01$; *** represent $p < 0.001$.

After regression analysis on the residuals ε_t and ε_{t-1} , we found that there was no significant correlation, so this group of data involves no autocorrelation problem.

From the above table, we can see that the marginal propensity to consume decreases obviously with the increase of the income, so promoting the fairness of social distribution can significantly increase the total consumption of the society.

4.2. Empirical Study on the Impact of Uncertainty Expectations on Chinese Residents' Consumption

4.2.1. Empirical Study on the Impact of Income Uncertainty on Consumption

In this part, we use the panel data of 31 provinces and municipalities in China from 2003 to 2012 to make regression analyses for explaining the impact of income uncertainty and consumption uncertainty on residents' spot consumption.

Here, if we assume that the impact of uneven income distribution on consumption is fixed for each city, the problem of heteroscedasticity incurred can be eliminated by generalized least squares (GLS).

From Keynes's theory, we divide the income into two parts: temporary income and persistent income.

Simultaneously, the temporary income can accurately explain the measurement of income risks: a higher temporary income indicates that residents are less uncertain about their future income, because if income declines, the social security system can make up for the decline to a greater extent.

In the empirical test, it is difficult to estimate temporary income and persistent income. Therefore, we used urban residents' wage income as the substitute variable of persistent income, and used the transferable income as the substitute variable of temporary income.

According to the statistics of our country, residents' income sources are divided into salary income, property income, operating income, and transferable income. As a relatively stable source of income

for urban residents, wage income has a great correlation with persistent income, and can also represent the relatively fixed part of urban residents' income. Transferable income refers to residents' social security relief, price subsidies, and relevant other incomes, which are able to reflect the more uncertain part of income. However, the property and operating income account for a very small proportion in the total income (average of 8% and 2% respectively in 2003 to 2012), so we have ignored such income.

Now, we construct a fixed impact model based on the data of per capita wage and the transferable income of 31 provinces, districts, and municipalities between 2003–2012. We consider the fixed impact model rather than a random impact model, because we can undoubtedly presume that there are natural differences among provinces and cities due to economic and historical reasons (including the differences caused by different fairness of income distribution), while the differences in time-series data are not large enough. Meanwhile, the Hausman test also supports the fixed-effect model ($F = 231.73$, $P < 0.000$). The specific model is as follows:

$$COM_{it} = \alpha_0 + \beta_{1it}TRAN_{it} + \beta_{2it}SALARY_{it} + \beta_{3it}SIZE_{it} + \beta_{4it}CPI_{it} + \varphi_{it} + \varepsilon_{it} \quad (18)$$

where COM_{it} represents the consumption expenditure vector of urban residents, $TRAN_{it}$ represents the transferable income vector, $SALARY_{it}$ represents the salary income vector, $SIZE_{it}$ is the average amount of family member of province i in period t , CPI_{it} is the consumer price index, φ_{it} is a fixed impact vector, and ε_{it} is a random error vector. We use salary to control the individual-level uncertainty and the household size, and consumer price index (CPI) as the non-individual-level uncertainty.

Firstly, the correlation of variables is shown in Table 3.

Table 3. Comparison of coefficients of future income uncertainty.

	COM	TRAN	SALARY	SIZE	CPI
COM	1.000				
TRAN	0.969 *	1.000			
SALARY	0.876 *	0.807 *	1.000		
SIZE	−0.210 *	−0.240 *	−0.201 *	1.000	
CPI	0.098 *	0.084	0.093	−0.073	1.000

Note: * represent $p < 0.05$.

We used generalized least squares estimation (GLS) to solve the problem of heteroscedasticity in the model. The results are shown in Table 4.

Table 4. Impact of future expenditure uncertainty on consumption.

Independent Variable: COM			
	Model 1	Model 2	Model 3
TRAN	2.156 *** (0.000)	0.593 *** (0.000)	0.592 *** (0.000)
SALARY		0.671 *** (0.000)	0.673 *** (0.000)
SIZE			64.586 (0.213)
CPI			4.327 (0.755)
Individual-level control variable	No	Yes	Yes
Other control variables	No	No	Yes
Log-likelihood	−2791.331	−2501.472	−2501.18
Observations	310	310	310

Note: *** represents $p < 0.001$.

Cov (SALARY, TRAN) is smaller than Cov (COM, SALARY) and Cov (COM, TRAN), so the effect of multicollinearity can be ignored.

As is shown in the estimates of the panel data, the transferable and wage income has a significant impact on residents' consumption expenditure, and the regression coefficient of the transferable income is larger than that of the wage income, indicating that the marginal propensity to consume of the temporary income is greater than that of the permanent income, and also indicating that the less sensitive the consumption to the uncertainty of the future income, the higher the spot consumption.

4.2.2. Empirical Study on Impact of Expenditure Uncertainty on Consumption

From the above, it can be seen that spot consumption is negatively correlated with the uncertainty of future consumption, but positively correlated with income, so we use the income as a control variable in following study, and we can construct an econometric model for each micro-subject as follows:

$$COM_{it} = \alpha_0 + \beta_{1it}R_{it} + \beta_{2it}INCOME_{it} + \beta_{3it}SIZE_{it} + \beta_{4it}CPI_{it} + \varphi_{it} + \varepsilon_{it}. \quad (19)$$

where, COM_{it} represents the consumption of Resident i in the t period, R_{it} indicates the uncertainty of Resident i about the future expected consumption in the t period, $INCOME_{it}$ shows the income of Resident i in the t period, $SIZE_{it}$ is the amount of family member of household i in period t , CPI_{it} is the consumption index, and α_0 is a constant.

R is a strongly subjective variable, so we replaced R with two virtual variables, namely, the virtual variable D_1 indicating whether residents have participated in social medical insurance and the virtual variable D_2 indicating whether residents have participated in pension insurance; when they have participated in social security system, $D_{1,2} = 1$; when not, $D_{1,2} = 0$. Assuming that the impact of the social security system is significant on future consumption uncertainty, then the $D_{1,2}$ value is totally correlated negatively with the R value; namely, the consumers who have participated in the social security system is slightly sensitive to uncertainty, but not greatly sensitive to uncertainty, and moreover, the degree of correlation depends on the parameter values of D_1 and D_2 . Thus, the consumption model of each resident is as follows:

$$COM_{it} = \alpha_0 + \beta_{1it}D_{1it} + \beta_{2it}D_{2it} + \beta_{3it}INCOME_{it} + \beta_{4it}SIZE_{it} + \beta_{5it}CPI_{it} + \varphi_{it} + \varepsilon_{it}. \quad (20)$$

The people in the same region may have similar preferences for risks, so we assume that the parameter values are identical for the people in the same region, sum up the consumption functions of this region, and divide it by the total population of this region, thus to get:

$$COM_{jt} = \alpha_0 + \beta_{1jt}PENSION_{jt} + \beta_{2jt}MEDICAL_{jt} + \beta_{3jt}INCOME_{jt} + \beta_{4jt}SIZE_{jt} + \beta_{5jt}CPI_{jt} + \varphi_{jt} + \varepsilon_{jt}. \quad (21)$$

where COM_{jt} represents the per-capita consumption expenditure in the t period in province j , $PENSION_{jt}$ indicates the proportion of social endowment insurance coverage in the t period, $MEDICAL_{jt}$ represents the proportion of social medical insurance coverage in the t period, $INCOME_{jt}$ shows the average per capita disposable income in the t period in province j , $SIZE_{jt}$ is the average amount of family member of household in period t , and CPI_{jt} is the consumption index of province j .

Furthermore, we completed the regression analysis of 31 provinces and municipalities' panel data from 2003 to 2012 based on the fixed impact model and generalized least squares estimation in order to eliminate the autocorrelation.

Firstly, Table 5 shows the correlation between variables.

As is shown in the above results, the medical insurance has a significant positive impact on consumption, that is, the more the medical insurance, the higher the consumption will be. While, when we don't consider the income, the endowment insurance has a much higher impact on consumption compared with medical insurance. However, when we put the income into consideration, the impact of endowment

insurance becomes smaller. According to the result, we can infer that for the zero-income population, they care more about the future endowment expenditure, while the residents who have income may care more about the large medical cost in the future. So, for the policy makers, it's a prospect to take this into consideration and make various insurance policies for residents with different income levels.

Table 5. Comparison of coefficients of future expenditure uncertainty.

	COM	Pension	Medical	Income	Size	CPI
COM	1.000					
Pension	0.744 *	1.000				
Medical	0.848 *	0.817 *	1.000			
Income	0.986 *	0.705 *	0.805 *	1.000		
Size	−0.210 *	−0.183 *	−0.225 *	−0.206 *	1.000	
CPI	0.098 *	−0.027	−0.032	0.109 *	−0.073	1.000

Note: * represent $p < 0.05$.

The analysis results are as follows (see Table 6):

Table 6. Impact of future expenditure uncertainty on consumption.

Independent Variable: COM			
	Model 1	Model 2	Model 3
PENSION	6230.737 *** (0.001)	1982.193 *** (0.000)	1998.497 *** (0.000)
MEDICAL	16,331.83 *** (0.000)	2104.236 *** (0.000)	2164.818 *** (0.000)
INCOME		0.572 *** (0.000)	0.570 *** (0.000)
SIZE			5.656 (0.921)
CPI			14.721 (0.371)
Individual-level control variable	No	Yes	Yes
Other control variables	No	No	Yes
Log-likelihood	−2813.806	−2423.421	−2423.021
Observations	310	310	310

Note: *** represent $p < 0.001$.

5. Conclusions and Suggestions

This paper has carried out a theoretical study and empirical analysis of the correlation between the social security system and urban residents' consumption expenditure in China, as well as studied the mechanism of social security system affecting residents' consumption expenditure based on such theories as absolute income hypothesis, precautionary savings hypothesis, etc. Then, it completed ordinary least squares (OLS) and generalized least squares (GLS) analyses of the panel data from 2003 to 2012 in China and finally drew such conclusions as follows:

1. China's social security system plays a huge role in promoting urban residents' consumption expenditure; therefore, improvement of the social security system can further stimulate domestic demands and further promote the healthy and sustainable development of the economy.

2. The impact of China's social security system on urban residents' consumption expenditure is mainly transmitted through the following two ways: firstly, by narrowing the income distribution gap, and secondly, by reducing uncertainty expectations. Specifically, in terms of the time series,

the improvement of China's social security system is significantly correlated with the narrowing of the distribution gap; the consumption of urban residents in China conforms to the law of diminishing marginal propensity to consume, and the total consumption can be preferably increased by narrowing the income distribution gap. In terms of the panel data, we consider the uncertainty that the more sensitive the urban residents to the uncertainty of the future income and expenditure, the lower their marginal propensity to consume and the lower their marginal savings rate.

According to our finding of the two mechanisms, we can claim that social security can not only maintain social stability by narrowing income inequality, it can also enhance resident's happiness by solving the pension and health-care issues. More meaningfully, the economy can also benefit from a complete and effective social security system.

3. The development of urban medical insurance and endowment insurance has a significant impact on the consumption growth of urban residents in China. When ignoring the income, endowment insurance has a more significant impact, but when we consider the income, the impact becomes smaller. These results are useful when making and carrying out new insurance policies for the government. Moreover, the reform of social security is also taking place in many emerging markets, including China, and these findings would be helpful for them to make reasonable and sustainable social security systems that could enhance residents' happiness, stimulate the economy, and create lasting development for the country.

Innovatively, this paper has deduced the correlation between income distribution and residents' consumption based on an in-depth study of the absolute income model, and simultaneously determined the relationship between uncertainty and consumption by combining the two-period model with the uncertainty theoretical model.

Based on the above-mentioned conclusions, we have proposed some policy suggestions as follows:

1. According to the research in this paper, improving the social security system is an effective way to expand domestic demands. It can not only increase the development of the economy, but can also help share the economic achievement with the residents. Therefore, it is firmly believed that we should continue to expand the social security coverage, increase government expenditures on social security on the current basis, and thus establish a relatively perfect new social security system in line with China's national conditions. It can be extended to other emerging countries as well, since the social security is also still a developing and exploring process in these new systems.

2. The equality of income is also an important part of maintaining the social stability and the healthy development of a nation. The fairness of income distribution has a significant impact on China's total consumption demand, so we should expand the number of middle-income residents while reducing the proportion of the poor, so as to narrow the rich-poor gap and promote consumption growth.

3. Aging and health are two major important issues in the present and future, especially when the aging problem becomes a worldwide tendency and health care becomes an increasing concern. Establishing and improving the endowment insurance system and expanding the coverage of medical insurance should be taken as the key projects for establishing a new social security system. Meanwhile, the government can make different policies for various income-level residents. In this way, residents with different status and preferences could have suitable insurance plans for their circumstances, which could eventually contribute to sustainable social development.

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