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Research on Inequality of Household Consumption and Social Welfare from the Perspective of Household Non-medical Expenditure

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Abstract

Background

In China, income inequality has been growing substantially over the last 40 years, especially after21st century.

Methods

By utilizing the inequality of consumption and social welfare, according to the differences in the composition of household consumption, medical consumption is used as the dividing standard to evaluate the inequality of non-medical consumption.

Results

First,in terms of overall social welfare, the deterioration of consumption distribution has replaced the growth of social welfare caused by economic growth, and the estimated results under non-medical consumption inequality are less different from the overall. Second, the income inequality is the main positive factor affecting consumption inequality, but

participating in medical insurance has a negative impact on the consumption inequality of urban and rural residents.

Conclusion

From the perspective of consumption policy interventions, it is necessary to promote government departments to better safeguard the health maintenance of healthy or sub-healthy people through health management policies.

Keywords: household consumption;inequality;social welfare; economic growth; consumption distribution

1. Background

In China, income inequality has been growing substantially over the last 40 years, especially after21st century.The rising inequality in China has attracted considerable attention in the academic field. There is a lot of growing literature documenting and analyzing the evolution of income, consumption and wealth inequality. It is an important aspect of understanding inequality to measure the degree of inequality and analyze the impact of inequality on the social welfare of residents. Consumption inequality is a better standard to measure economic inequality. Since income inequality reflects the inequality in people's possession of social wealth,consumption inequality reflects people's inequality in having access to social resources, thus consumption inequality is more harmful to the economy and society.

Most of existing research focus on income or wealth inequality, but few on consumption inequality .First, the Gini coefficient is the most important indicator to measure inequality, while China's consumption Gini coefficient is rarely measured. Second, consumption can better reflect social welfare. There is very little research on the impact of social welfare consumption distribution .The main contribution of this research is reflected in these issues:On the one hand, using the micro-household income and expenditure group data, this paper estimates the Gini coefficient of China's household consumption, and decomposes the consumption Gini coefficient according to the urban and rural groups. On the other hand, based on the results of the estimated Gini coefficient consumption, this paper analyzes the impact of consumption distribution on residents' social welfare.The estimation of the consumption Gini coefficient is of great significance in understanding and narrowing

consumption inequality.The social welfare analysis based on the consumption Gini coefficient has policy implications for balancing economic growth and controlling inequality.

In this paper we use a long panel data source to record the salient facts of the distribution of income, consumption and wealth in China. China's rapid economic growth in the last four decades has resulted in impressive income growth by its ‘reform and opening up’ and ‘Urban-rural dual economic system’.At the same time,China has transformed itself from a relatively homogeneous society to one with great variation in the income,consumption,and wealth of its people.

Compared with income inequality, consumption inequality has better characteristics, which can reflect more information and better measure economic inequality. First, there is a higher proportion of invisible income in China. Income does not fully reflect the living standards and welfare levels of residents. Consumption is a better indicator, especially for families with relatively poor resources. Second, according to the permanent income hypothesis and the life cycle hypothesis, residents are used to smoothing their lifetime consumption by their life income. The measure of income inequality generally refers to current income, rather than persistent income, which is highly volatile. Thus, consumption is less volatile and more measurable. Third, the income level does not reflect the accumulation of wealth, uncertainty, and the ability to obtain credit, but these factors can be reflected in consumption. Fourth, consumption can better reflect social welfare (Blundell and Preston, 1998) . The most commonly used Cobb-Douglas utility function is measured by consumption, and the World Bank also defines the poor by consumption level.

A large number of researches have been carried out in the context of China,e.g the internal inequality in China's rural area (Benjamin & Brandt,1999;Morduch & Sicular,2002);the evolution of rural-urban inequality(Kahn & Riskin,1998; Kanbur & Zhang,1999);and the inequality trends in urban area and determining factors behind the trend(Kahn,et al.,1999; Meng 2004;Knight & Li,2006).Second,in terms of research in other countries,for example,over the entire period of 1997 to 2009,consumption inequality increased moderately in Canada (Brzozowski,et al.,2010;Norris& Pendakur,2015).Attanasio et al.(2010). Attanasio et al.(2010),Blundell & Etheridge(2010)based on British, explored the path from income inequality to household consumption inequality, thus establishing a consistent link between microeconomics and macroeconomic analysis of the evolution of inequality.The existing research conclusions mainly focus on the following aspects:First, inequality of disposable income is found to be substantial,consumption inequality is less substantial(Cai,et

al.,2010;Fisher,et al.,2013;Heshmati & Rudolf,2014).Second, the increase in income inequality is related to an increase in the degree of earnings' instability not to the change in the wage structure(Fukushige,1996;Jappelli & Pistaferri,2010;).Third,the measures of consumption inequality are useful in addition to a chain as follows:Wages-Earnings-Income-Consumption-Material Well-being (F.Crossely & Pendakur,2002; Attanasio & Pistaferri,2014;Mark,2015).

In the previous studies,most coclusions have analyzed the evolution of inequality based on empirical research data(Abe & Yamada,2009;Lise et al.,2014).Although there are a number of advantages in the design of these surveys, such as quite detailed information on income sources,covered selected provinces and so on.However, most research data is short-term,the representativeness of the survey sample and the inequality measurement method is biased. Previous studies on inequality have focused primarily on income inequality(Meng 2004;Kaplanoglou and Rapanos,2016;De Nardi & Fella,2017;)[①]. Compared with measuring income, measuring consumption is less affected by under-reporting problems, since under-reporting of income has arguably been a severe challenge for all household surveys in China[②].Moreover, in the existing researches, the influence of social welfare factors is less involved, and welfare changes may be the key to regulating the inequality of household consumption.Thus, to better understand the changes in household welfare over the period 1989~2015 in China, we examine the trends in consumption inequality and empirically analyze the shortcomings of China's social welfare development under the change of consumption inequality.The main marginal contributions of this article are: 1) We have used long panel data to measure changes of consumption inequality in China from 1989 to 2015; 2) We have decomposed consumption inequality and explored the core factors that cause consumption inequality; 3) We have introduced changes of the families' social welfare into the model ,and analyzed its impact on the coefficient of consumption inequality.We try to expand the research from the following points: 1) Systematic estimation from 1989 to 2015 of China's urban and rural overall consumption inequality evolution and social welfare changes; 2) Based on the existing research, according to the classification of medical consumption , this paper estimates the difference of coefficient in non-medical consumption under inequality, revealing the contribution of sickness and basic medical insurance to the current unequal consumption of Chinese households; 3) In the section of expansibility test,

① However, current income may not accurately reflect resources available to families in the long run, and consumption expenditure is a more direct and precise measure of welfare and long-term earnings capacity than current income(*Cutler and Katz 1992; Johnson and Shipp 1997; Blundell and Preston 1998; Pendakur 1998*) .

② Because job-related benefits and "gray" income outside regular jobs are usually not reported.

the empirical test of sickness and basic medical insurance on overall household consumption inequality is conducted through the influence mechanism of panel fixed effects.

2. Methods

2.1 Decomposition of consumption inequality coefficient

The above decomposition of the household consumption inequality only considers the differences between the whole group and the inside of the group. However, due to the current China's urban and rural dual economic system,further decomposition of consumption inequality is of more practical significance in dealing with urban-rural deviation . Using the Gini coefficient decomposition method and the determination method of contribution rate of each part, the overall inequality coefficient can be decomposed by groups, and in this way the contribution rate of urban and rural, urban and rural areas and remaining items etc. to the household consumption inequality coefficient can be obtained. Employing the estimated household consumption inequality coefficient above , the inequality coefficient of the household consumption is decomposed as follows:

$$T = T_{ur} + \delta T_u + \beta T_r + T_0 \quad (1)$$

Among them, T_{ur} indicates the coefficient of inequality in household consumption between urban and rural areas (or Gini coefficient), T_0 indicates the remaining items caused by the overlap of urban families and rural families consumption, and δ and β are respective parameters . The expressions of T_{ur}、δ、β are:

$$T_{ur} = \frac{p_u p_r (c_u - c_r)}{c} \quad (2)$$

$$\delta = p_u{}^2 \left(\frac{c_u}{c} \right) \quad (3)$$

$$\beta = p_r{}^2 \left(\frac{c_r}{c} \right) \quad (4)$$

Among them, p_u represents the urban household share (the sample proportion) and the rural

household share p_r , respectively; c_u 、 c_r 、 c represent the annual average consumption expenditure levels of urban families, rural families, and urban and rural families, respectively. Existing Studies have shown that when the inequality coefficient is decomposed, the inequality coefficient will be underestimated if we ignore the overlap between the rural families with higher consumption and the urban families with lower consumption(Kai-Yuen,1998;Lise & Seitz,2011;Kapeller et al.,2015) .The remaining terms are defined as:

$$T_0 = 2 p_u p_r \frac{\int [1 - F_u(x)] F_r(x) dx}{c} \quad (5)$$

As the urban and rural overall consumption inequality coefficient T , the urban household consumption inequality coefficient T_u and the rural household consumption inequality coefficient T_r have been calculated, the expressions of T_{ur} 、 δ and β can be used to calculate the corresponding values. At last, according to the decomposition formula of the household consumption inequality coefficient, the remaining items of the household inequality coefficient can be further calculated, and the contribution rate of each item is calculated.

3.2 Social welfare implications of consumption inequality coefficient

According to Atkinson's(1970) analysis of social welfare implications under income inequality, the significance of social welfare is more important under consumption inequality .Since the inequality coefficient meets the "Pigou-Dalton Bundle Principle",that is, if the rich transfer their income to the low-income or the poor, although the economic status of wealthy people remains unchanged, the inequality coefficient of the whole society will be reduced (Pigou, 1912; Dalton, 1920;Ohtake & Saito,1998).In this case, the entire social welfare and social inequality have formed a close correlation.In terms of consumption, the introduction of the "Pigou-Dalton Bundle Principle",that is, the shift of consumption from the rich people to the low-income or poor people can also improve social inequality.

According to the Equal distribution of equal income (EDEI) theory (Barreti et al.,2011;Meyer & Sullivan, 2011), we can effectively link the inequality coefficient with the social welfare function.When consumption is used as an indicator to measure household inequality, it can be defined as Equal distribution of equal consumption (EDEC), denoted as

ξ, that is, when all families reach the consumption level ξ, the social welfare is the same as that under the established consumption distribution.Satisfy $W(\xi \bullet \vec{1}) = W(C)$, where consumption distribution is $C=(c_1,c_2,..,c_n)$.Therefore, the inequality coefficient based on the social welfare function can be defined as:

$$I = 1 - \xi / u_c \qquad (6)$$

In the above formula, u_c represents the average household consumption.At the same timsuppose that the social welfare function $W(X)$ is a linear homogeneous function. Take $W(X)$ as:

$$W(X) = \varphi(\sum_{i=1}^{n} (2n - 2i + 1)x_i) \qquad (7)$$

where $\varphi(\bullet)$ is a monotonically increasing function. In this social welfare function the poor families are given greater weight while wealthy families are given a lower weight, but the value of consumption is the same under the condition of average distribution :

$$\xi = (\sum_{i=1}^{n} (2n - 2i + 1)x_i) / n^2 \qquad (8)$$

The inequality coefficient $T = 1 - \xi / u$, and thus the inequality coefficient is an inequality index with social welfare meaning, that is, there is a one-to-one correspondence between the Equal distribution of equal consumption (EDEC) and the social welfare function, that is:

$$W(C) \equiv \xi = u_c(1 - T) \qquad (9)$$

It is assumed that at the time of t_1、t_2 the inequality coefficient, the consumption average, and the social welfare are T_1、u_1、W_1 and T_2、u_2、W_2 respectively, so that the change of social welfare during t_1 - t_2 can be factorized. Here, we consider two aspects of the impacts. On the one hand, we mainly focus on the impact of economic growth on the change of social welfare,which is defined as maintaining the level of household consumption

inequality (consumption distribution), and only considering the welfare variation caused by the change of the average consumption;on the other hand, the impact of consumption distribution on social welfare change is the main factor, defined as keeping the average household consumption sustainable, only considering changes of welfare due to the changes of consumption distribution.Thus, the change of social welfare during t_1 - t_2 can be defined as:

$$\Delta W = W_G + W_D = [u_{c2}(1-T_1) - u_{c1}(1-T_2)] + [u_{c2}(1-T_2) - u_{c2}(1-T_1)] \quad (10)$$

That is:

$$\Delta W = \Delta u(1-T_1) + u_{c2}(-\Delta T) \quad (11)$$

According to the definition above, it is also feasible to carry out another decomposition of social welfare changes:

$$\Delta W = W_G + W_D = [u_{c2}(1-T_2) - u_{c1}(1-T_2)] + [u_{c1}(1-T_2) - u_{c1}(1-T_1)] \quad (12)$$

That is:

$$\Delta W = \Delta u(1-T_2) + u_{c1}(-\Delta T) \quad (13)$$

According to the two results of decomposition , taking the arithmetic mean of the two,we can obtain:

$$\Delta W = W_G + W_D = \frac{1}{2}\Delta u(1-T_1+1-T_2) + \frac{1}{2}(u_{c1}+u_{c2})(-\Delta T) \quad (14)$$

Among them, the first item on the right side of the formula (16) is the growth effect W_G of social welfare,the second item is distribution effect of social welfare W_D .And also we define $\gamma_1 = W_G/\Delta W$, $\gamma_2 = W_D/\Delta W$ and $\gamma_3 = W_D/W_G$, which respectively represent the proportion of growth effects to social welfare changes, the proportion of consumption distribution effects to social welfare changes, and the improvement of consumption distribution .Among them, $\gamma_3 > 0$ indicates that the consumption distribution is improved, and the improvement of consumption distribution additionally increases by $100\gamma_3$% of social welfare that is caused by economic

growth;if γ_3 <0, it means that the distribution of consumption deteriorates, and the deterioration of consumption distribution has offset -100 γ_3 % of the increase of social welfare brought about by the economic growth.

3. Data Resource

The data was extracted from the China Health and Nutrition Survey (CHNS) database.The database covers geographical characteristics, economic development levels, and differences in public resources and health indicators of all provinces in China. Between 1989 and 2015, a total of 10 surveys were conducted ,each of which interviewed approximately 4,400 families, including 19,000 individual samples and some community statistics. From 1989 to 2015, ten survey data were selected for individual tracking studies. In data processing, year, individual ID, household ID and community ID are keywords, and datas were merged in STATA15.0. Finally, valid sample data includes 10 surveys of 12 provinces and municipalities including Beijing, Liaoning, Heilongjiang, Shanghai, Jiangsu, Shandong, Henan, Hunan, Hubei, Guangxi, Guizhou, and Chongqing , etc.. Furthermore, some missing values or invalid values were excluded.

The core variables of the article include household income and household consumption expenditure. Our selection and specific treatment of the two variables are as follows:

Income: includes the total income from businesses, farming or nominal, fishing, gardening , livestock,other sources, and subsidy,retirement, Non-Ret, etc.Each income group is the main source of total income. According to the existing literature, equivalent factors are generally used to eliminate the impact of household economies of scale.However, since there is no uniform equivalence factor in China, we use family size for processing.That is, the total household income category is divided by the family population size to get the per capita value.In addition, the characteristics of the head of the household are used to investigate and reflect the “true” income or consumption welfare of family members at the individual level.

Consumption expenditure: includes two parts of household durable consumption and non-durable consumption.Among them, durable consumer goods mainly include 17 types of home radios and recorders, video recorders, black and white TVs, color TVs, washing machines, air conditioners, sewing machines, etc.And we incorporate the factors of family rent or mortgage into durable consumer goods, and calculate the corresponding stock

consumption value based on their total value.Non-durable consumer goods are divided into medical consumption and non-medical consumption.Medical consumption is composed of three parts: outpatient consumption, inpatient consumption and medical care costs.Non-medical consumption refers to non-durable household consumption other than medical consumption, such as daily living expenses.

The sample distribution and the core variables of income, consumption, and medical consumption are described in Table 1 and Table 2, respectively.

Table 1 Sample Coverage and Distribution

Variable/Year		1989	1991	1993	1997	2000	2004	2006	2009	2011	2015
Total （%）		9594	8456	7539	6192	6611	4273	3349	3331	3137	3189
		11.06	10.28	9.66	10.04	11.01	8.63	8.30	8.49	10.95	11.59
Urban（%）		1710	1318	1074	947	886	530	394	410	442	422
		17.82	15.59	14.25	15.59	13.40	12.40	11.76	12.31	14.09	13.23
Rural（%）		7884	7138	6465	5245	5725	3743	2955	2921	2695	2767
		82.18	84.41	85.75	84.71	86.60	87.60	88.24	87.69	85.91	86.77
Regional sample size（%）											
11	Beijing	-	-	-	-	-	-	-	-	0.73	0.53
21	Liaoning	8.40	9.25	7.19	-	8.17	8.87	7.61	7.30	6.76	6.96
23	Heilongjiang	-	-	-	7.03	7.06	8.33	6.33	7.93	5.99	6.21
31	Shanghai	-	-	-	-	-	-	-	-	2.10	1.38
32	Jiangsu	10.60	10.68	11.39	12.53	12.06	10.79	11.08	10.90	9.12	10.63
37	Shandong	9.14	6.72	7.35	5.28	4.76	4.87	4.06	3.24	2.20	2.45
41	Henan	15.91	15.98	15.31	11.11	10.91	9.57	7.82	9.61	5.39	8.65
42	Hubei	12.43	12.56	13.76	14.50	13.51	10.93	11.65	8.98	5.32	9.28
43	Hunan	11.06	11.44	10.01	8.69	7.44	8.57	10.39	11.62	8.70	10.38
45	Guangxi	17.18	16.39	17.43	19.30	17.15	19.14	19.53	23.66	22.95	20.48
52	Guizhou	15.28	16.99	17.56	21.56	18.94	18.93	21.53	16.78	15.88	10.79
55	Chongqing	-	-	-	-	-	-	-	-	14.85	12.26

Note: The percentage of the overall part is the distribution of samples in each year; the percentage of urban and rural areas is the proportion of sample distribution in this year's urban and rural survey. Among the regional sample sizes, Beijing, Shanghai and Chongqing were added after 2011; Heilongjiang was added after 1997. Among them, the Liaoning sample was missing in 1997.

Table 2 Descriptive Statistics of Income and Consumption by Year

Year	Sample	Income		Consumption		Sample	Medical consumption	
		Mean	S.D.	Mean	S.D.		Mean	S.D.
1989	15721	993.30	842.22	304.39	539.08	989	57.57	191.52
1991	14711	1024.08	759.69	319.17	697.21	1014	148.26	393.65
1993	13771	1445.92	1310.25	428.21	960.02	603	179.33	422.20
1997	14200	2998.31	2551.39	756.19	1200.78	877	268.12	534.55
2000	15471	3742.20	3925.13	777.67	1378.38	1039	468.27	720.00
2004	12142	5378.40	5695.43	1000.54	1410.14	1861	323.64	578.71
2006	11574	6340.93	7031.94	1156.32	1728.79	1589	291.80	532.41
2009	11822	10135.54	9783.44	1427.75	2063.89	1901	399.36	617.74
2011	15369	14637.04	12391.84	1469.03	2154.38	2572	481.06	672.77
2015	15912	20176.46	15833.89	1476.47	2357.45	2442	575.80	733.73

4. Results

4.1 Estimation of consumption inequality coefficient

With the data of 1989~2015 CHNS survey, this paper first make a comparative analysis on the consumption inequality of urban and rural residents and the overall consumption inequality , and ,at the same time,analyzes the income inequality coefficients of urban and rural residents. The results are shown in Table 3.The results in Table 3 show that the inequality coefficient of household income is lower than the inequality coefficient of household consumption in terms of urban, rural, and overall.Among them, from 1989 to 2015 the inequality coefficient of urban-rural consumption shows that the inequality coefficient of urban and rural households is higher than 0.45. After 2006, they were all above the level of 0.55. In 2011 and 2015, the level exceeded the standard of 0.60, belonging to the high gap stage. The consumption inequality coefficient of rural household is higher than 0.40. After 2000, the consumption inequality coefficient of rural household has been higher than 0.50, much higher than the relatively reasonable interval of 0.40.The consumption inequality of urban household is also higher than the level of 0.35,however, the overall variation of consumption inequality is not obvious.

The income inequality is a measure based on the current income, which is reflecting the current income inequality.Wealth inequality pays more attention to the accumulation of

income,which is reflecting the inequality of accumulated income in all phases of the household.Usually, the coefficient of wealth inequality is higher than that of the income inequality. According to the hypothesis of life cycle theory and the permanent income theory, consumption is the smoothing of life income.Therefore, the dispersion degree of consumption will be lower than that of income,so that the coefficient of consumption inequality will be lower than that of the income inequality. However, the results of this study are on the contrary. The reasons are as follows. First,the definition of consumption in this study is different from previous researches. Here, consumption is defined as the overall consumption level of a family. It not only includes the consumption of household members participating in labor distribution, but also includes the purely consuming population children and elderly who are not involved in labor distribution.Therefore, the hypothesis of life cycle theory or permanent income theory is not valid here,both of which only consider the vertical distribution of individuals,but do not consider the horizontal distribution among different groups. Second, the household income statistics are different. Our statistics of household income not only consider the general labor income of the household, but also includes redistributed income,that is to say, it includes the government's transfer income to poor families and low-middle income people , such as direct social assistance funds, old-age subsidiaries etc, which will reduce the income inequality of the household to a certain extent,and policies such as high taxes on high-income families,will also narrow the gap between high-income families and low-income families.In turn, the coefficient of household consumption inequality is higher than that of household income inequality .Third, the coefficient of inequality in household consumption is higher than that in household income, which is also caused by the difference of household wealth. Short-term social assistance or insurance policies cannot fundamentally solve the long-term wealth accumulation differences between families. Consumption is a kind of accumulation behavior of external wealth which directly affects the level of consumption. Poor families or low-income families pay more attention to the accumulation of wealth.They focus on the rigidity of consumption and reduce the ex consumption, which leads to the continuous expansion of inequality of household consumption levels.

Table 3 Consumption Inequality Coefficient and Income Inequality Coefficient

Year	Consumption inequality coefficient			Income inequality coefficient		
	T_r	T_{ur}	T	I_r	I_{ur}	I
1989	0.4703	0.5438	0.4908	0.4029	0.3764	0.4080

1991	0.4469	0.5551	0.4812	0.3699	0.3739	0.3843
1993	0.4957	0.4733	0.5054	0.3932	0.4056	0.4043
1997	0.4797	0.5154	0.4976	0.3859	0.3896	0.3929
2000	0.5311	0.4068	0.5235	0.4012	0.3860	0.4073
2004	0.5027	0.3660	0.4952	0.4106	0.3762	0.4143
2006	0.5645	0.4200	0.5547	0.4302	0.3943	0.4307
2009	0.5665	0.5684	0.5762	0.4300	0.3638	0.4301
2011	0.5542	0.6520	0.6035	0.3952	0.3539	0.3951
2015	0.6307	0.5669	0.6319	0.4462	0.3712	0.4400

Note: Here, the measurement method of the income inequality coefficient is the same as that of the consumption inequality coefficient. The household income inequality is decomposed into opportunity inequality and effort inequality, the obtaining the total income inequality coefficient of the household.

4.2 Decomposition of consumption inequality coefficient

Table 4 shows that overall consumption inequality is caused by the consumption inequality in the rural areas.Secondly, from 1989 to 2015, the consumption inequality coefficient of different regions has changed significantly. Among them, the contribution rate of household consumption inequality coefficient between urban and rural areas increased from 0.29% to 3.54% (average annual value is 4.37%);the contribution rate of household consumption inequality coefficient in urban areas decreased from 3.34% to 1.47% (average annual value of 2.18%);the contribution rate of household consumption inequality coefficient in rural areas increased from 65.38% to 85.58% (average annual value is 73.49%);the rest items' contribution rate of household consumption inequality coefficient reduced from 30.99% to 9.40%(average annual value was 19.97%).

The rural areas consumption inequality coefficient and the remaining consumption inequality coefficient have the highest contribution rate, which suggests that the current consumption imbalance of urban and rural residents in China is shrinking, but the consumption inequality caused by the changes of rural household structure is increasing, and the consumption overlap between urban low-income groups and rural high-income groups is increasing. From the overall trend,the contribution rate of consumption inequality between rural and urban areas and remaining items is decreasing, which indicates that China's urban-rural dual economic system has been alleviated, and the gap between urban and rural consumption is narrowing.At the same time, the consumption gap of urban areas is narrowing, and the overlap of urban low-income groups and rural high-income groups is also shrinking year by

year. However, the contribution rate of consumption inequality coefficient in rural areas is gradually increasing , which indicates the changes of household economic structure in rural areas , and the gap is gradually widening.This consumption deviation and convergence are related to the income level and consumption behavior of urban and rural households. In urban areas, the income level of urban residents is relatively higher, ,and the internal income inequality coefficient is also declining from 1989 to 2015. With the rapid development of economy,, the consumption convergence of urban residents has been increasing, resulting in a lower contribution rate of the consumption inequality coefficient. In rural areas, after China's reform and opening up, the differences of regional economic development levels have propelled more and more rural population to migrate to urban or developed areas for employment. However, due to the restrictions of "hukou"(household registration), the migrated population still belongs to rural "hukou". The actual consumption structure is similar to that of urban residents, which makes the phenomenon of consumption overlap on the rise, and leads to the differentiation of household consumption within the rural areas.

Table 4 Decomposition Results of ConsumptionInequality Coefficient and Contribution Rate of Each Part

Year	Total	Urban and rural		Urban areas		Rural areas		Remaining items	
	T	T_{ur}	Contribution rate（%）	$T_{ur=}$	Contribution rate（%）	T_r	Contribution rate（%）	T_0	Contribution rate（%）
1989	0.4908	0.0014	0.29	0.0164	3.34	0.3209	65.38	0.1521	30.99
1991	0.4812	0.0464	9.64	0.0175	3.64	0.3010	62.55	0.1163	24.17
1993	0.5054	0.0343	6.79	0.0118	2.33	0.3504	69.33	0.1089	21.55
1997	0.4976	0.0279	5.61	0.0142	2.85	0.3331	66.94	0.1224	24.60
2000	0.5235	0.0197	3.76	0.0062	1.18	0.4073	77.80	0.0903	17.25
2004	0.4952	0.0080	1.62	0.0053	1.07	0.3893	78.61	0.0926	18.70
2006	0.5547	0.0118	2.13	0.0073	1.32	0.4992	89.99	0.0364	6.56
2009	0.5762	0.0006	0.10	0.0085	1.48	0.4366	75.77	0.1305	22.65
2011	0.6035	0.0615	10.19	0.0185	3.07	0.3800	62.97	0.1435	23.78
2015	0.6319	0.0224	3.54	0.0093	1.47	0.5408	85.58	0.0594	9.40

4.3 Consumption inequality coefficient and household social welfare

Based on the coefficients of consumption inequality, the household social welfare during 1989 - 2015 can be calculated from formula (9) and Table 1, and the change of social welfare can be decomposed by formula (16). The changes of urban, rural and overall social welfare

are shown in Tables 3, 4 and 5 respectively.

Table 5 shows that deterioration in consumption distribution offsets 62.70% of increment in social welfare brought by the economic growth.Therefore, from 1989 to 2015, economic growth and consumption distribution jointly changed urban social welfare,while economic growth is the dominant force of the overall increment of urban social welfare. In 2000 and 2015, due to the economic downturn and the deterioration of consumption distribution, social welfare of urban families was reduced.

As can be seen from Table 5, the growth effect of social welfare reaches 154.01%, while the distribution effect of social welfare is -665.29, and the proportion of distribution effect of social welfare is -54.01%. The improvement in consumption distribution has increased extra increment of welfare brought by economic growth by 35.07%. Therefore, from 1989 to 2015, with economic growth as the dominant force leading to the overall increment of rural social welfare, economic growth and consumption distribution also together caused the change of rural social welfare. In the year of 1991, 2000, 2011 and 2015, the economic downturn and the deterioration of consumption distribution together led to an overall decline in rural social welfare.

The overall social welfare increased is shown in Table 5. The decomposition of social welfare shows that the growth effect reaches 168.79%. The proportion of social welfare distribution effect is -68.79%. The deterioration in consumption distribution offsets the growth of -40.76% of social welfare caused by economic growth.Therefore, economic growth and consumption distribution caused the changes of social welfare in urban and rural areas, but economic growth was the dominant force causing the overall increment of social welfare.In 2000 and 2015, the economic downturn and deterioration of consumption distribution together led to the overall decline of social welfare.

Table 5 Changes in Urban and Rural Social Welfare and Their Decomposition from 1989 to 2015

	Urban and Rural Social Welfare			Rural Social Welfare			Urban Social Welfare		
Year	γ_1（%）	γ_2（%）	γ_3（%）	γ_1（%）	γ_2（%）	γ_3（%）	γ_1（%）	γ_2（%）	γ_3（%）
1991	93.09	6.91	7.42	152.17	-52.17	-34.28	93.09	6.91	7.42
1993	125.58	-25.58	-20.37	119.46	-19.46	-16.29	125.58	-25.58	-20.37
1997	96.99	3.01	3.10	97.27	2.73	2.81	96.99	3.01	3.10
2000	89.93	10.07	11.20	60.54	39.46	65.18	89.93	10.07	11.20
2004	84.54	15.46	18.29	78.29	21.71	27.73	84.54	15.46	18.29

2006	149.71	-49.71	-33.20	291.99	-191.99	-65.75	149.71	-49.71	-33.20
2009	133.54	-33.54	-25.11	118.83	-18.83	-15.84	133.54	-33.54	-25.11
2011	112.41	-12.41	-11.04	9.96	90.04	904.19	112.41	-12.41	-11.04
2015	93.79	6.21	6.62	68.17	31.83	46.70	93.79	6.21	6.62
1989~2015	268.11	-168.11	-62.70	154.01	-54.01	35.07	268.11	-168.11	-62.70

4.4 Non-medical consumption inequality coefficient and family social welfare

In further analysis, we divided household consumption into medical consumption and non-medical consumption, and estimated the social welfare changes caused by the inequality of non-medical consumption in households.There is no measurement standard for inequality in family medical consumption here, because the incidence of disease risk varies in different types of families, and the high coverage of social medical insurance can alleviate the inequality of ordinary families' medical consumption to a certain extent. The evolution of social welfare caused by inequality of non-medical consumption of households is shown in Table 6.The results show that from 1989 to 2015, the decomposition of social welfare shows that under the condition of non-medical consumption inequality, the growth effect of social welfare is 379.40%, and the distribution effect is -279.40%. The deterioration consumption distribution offsets 73.64% of the increase in social welfare brought about by economic growth. Under the same circumstances, the difference in the welfare distribution characteristics between urban and rural overall consumption is small, indicating that non-medical consumption is the main reason for the inequality of urban and rural overall consumption . This conclusion will be further verified later.The deterioration of non-medical consumption distribution of urban and rural households offset 48.42% and 69.39% of the increase in social welfare brought about by economic growth, which is lower than and higher than the deterioration of consumption distribution under the total consumption sample, indicating that the different areas of consumption difference between urban and rural areas . Under the region, the impact of medical security on household non-medical consumption is different, so there is no consistency in the evolution of social welfare.

Table 6 Changes in Overall Social Welfare and Sub-regions Based on Non-medical Consumption

	Urban and rural general welfare under non-medical consumption			Urban non-medical consumption social welfare			Rural non-medical consumption social welfare		
Year	γ_1 (%)	γ_2 (%)	γ_3 (%)	γ_1 (%)	γ_2 (%)	γ_3 (%)	γ_1 (%)	γ_2 (%)	γ_3 (%)
1991	119.10	-19.10	-16.03	-25.75	125.75	-488.40	9.85	90.15	915.32

1993	209.06	-109.06	-52.17	37.24	62.76	168.56	1338.64	-1238.6	-92.53
1997	69.32	30.68	44.26	60.32	39.68	65.77	76.26	23.74	31.13
2000	13.40	86.60	646.02	979.11	-879.11	-89.79	11.61	88.39	761.15
2004	48.87	51.13	104.65	88.79	11.21	12.62	48.46	51.54	106.36
2006	-149.58	249.58	-166.85	131.66	-31.66	-24.05	-140.30	240.30	-171.28
2009	106.83	-6.83	-6.40	-1.43	101.43	-7071.9	79.12	20.88	26.39
2011	67.76	32.24	47.58	-31.34	131.34	-419.08	80.70	19.30	23.92
2015	18.61	81.39	437.35	-81.56	181.56	-222.61	127.49	87.25	684.40
1991~2015	379.40	-279.40	-73.64	193.89	-93.89	-48.42	326.73	-226.73	-69.39

5. Discussion

5.1 Variable selection and descriptive statistics

In order to test the accuracy of the previous estimation results, we extended the existing conclusions to ensure the reliability of the research conclusions(Garner & Sastre,2003;Qu & Zhao,2008;Chang,2012).First, we assess income inequality and consumption inequality by grouping families together.Secondly, in terms of data selection, we selected income inequality, illness and participation in medical insurance as the core explanatory variables.We control the individual age, age range, work, education, and family size. At the same time, the dummy variables of year, province and urban-rural areas are also controlled in different models. Descriptive statistics of the core variables are shown in Table 7.

Table 7 Descriptive Statistics of Core Variables

Variable	Variable definitions	Mean	S.d.
Income inequality	Theil Index Measurement of Income Inequality by Family Groups	0.40	0.29
Consumption inequality	Theil Index Measurement of Consumer Inequality in Family Groups	0.39	0.29
Inequality in medical consumption	Theil Index Measurement of Medical Consumption Inequality by Family Groups	0.45	0.40
Non-medical Consumption inequality	Theil Index Measurement of Non-medical Consumption Inequality by Family Groups	0.38	0.29
Unequal income growth	Theil Index Measurement of Income Growth Inequality by Family Groups	0.37	0.27
If ill of hh	Head of household:ill = 1, not ill = 0	0.11	0.32
Medical insurance	with medical insurance = 1, no = 0	0.50	0.50
Job of hh	Head of household:Participating in work = 1, not work = 0	0.66	0.47

Age of hh	Head of household:The age of the respondent in survey year	37.06	21.22
Under 18 years of hh age	Head of household:Ages 18 and below are defined as 1, others are 0	0.23	0.42
18 ~ 59 years old of hh	Head of household:Ages 18 to 59 are defined as 1, others are 0	0.60	0.49
Over 60 years old of hh	Head of household:Age 60 and above is defined as 1, others are 0	0.17	0.37
Education level of hh	Head of household:Elementary school and below=1,junior high school=2,high school=3,vocational school=4，college or university=5,master's degree and above=6	1.62	1.38
Family size	Family population	4.16	1.61
Urban and rural	Urban = 1，rural = 0	0.33	0.47

5.2Empirical

5.2.1 Causes of household consumption inequality

The factors of family disease and medical insurance are introduced into the model for testing. The test results are shown in Table 8.The results of mixed OLS test in model (1) ,(2)show that income inequality is the core influencing factor of household consumption inequality.And income inequality directly leads to the aggravation of consumption inequality, and participation in medical insurance and illness significantly reduce household inequality. The significant negative effect of illness here may be partly due to the influence of different parts of the consumption composition, while disease expenditure will reduce household non-medical consumption, which will be further verified later. Models (3),(4) are test on fixed effects. The results show that income inequality is still a significantly positive influencing factor, while participation in medical insurance is no longer significant, and the level of disease variables is significantly reduced.

Table 8 Panel Fixed Effect Test of Household Consumption Inequality

Varible	Mixed OLS test		Panel FE effect test	
	(1)By age	(2)By age group	(3)By age	(4)By age group
Income inequality	0.2340***	0.2340***	0.2150***	0.2140***
	(0.0052)	(0.00521)	(0.0055)	(0.0055)
Age of hh	-0.0001		-0.0001**	
	(0.0001)		(0.0001)	
Education level of hh	0.0115***	0.0113***	0.0119***	0.0117***
	(0.0014)	(0.0014)	(0.0014)	(0.0014)

If job of hh=1	-0.0043	-0.0046	-0.0027	-0.0031
	(0.0038)	(0.0038)	(0.0038)	(0.0038)
Medical insurance=1	-0.0126***	-0.0126***	0.0024	0.0025
	(0.0040)	(0.0040)	(0.0041)	(0.0041)
If ill of hh =1	-0.0135***	-0.0134***	-0.0091*	-0.0090*
	(0.0047)	(0.0047)	(0.0047)	(0.0047)
Family size	0.0018*	0.00193**	0.0003	0.0005
	(0.0009)	(0.0009)	(0.0010)	(0.0010)
18 ~ 59 years old of hh=1		0.0020		0.0020
		(0.0036)		(0.0036)
Over 60 years old of hh=1		-0.0067		-0.0089*
		(0.0052)		(0.0051)
_cons	0.949*	1.001*	1.109**	1.171**
	(0.515)	(0.512)	(0.535)	(0.531)
Year	Yes	Yes	Year	Yes
Urban and rural	Yes	Yes	Urban and rural	Yes
N	32616	32617	32616	32617

Note: Standard deviations in parentheses, * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.The Hausman test results for panel RE and FE show that prob> chi2 = 0.0072, which significantly rejects the null hypothesis of random effects. FE models should be used.

5.2.2 Causes of Consumption Inequality in Urban and Rural Households

On the basis of testing the causes of total consumption inequality, we continue to test the consumption inequality in the urban-rural classified areas. As is shown in Table 9, Model (1) ~ (4) are the test results by age and different age groups.The results show that income inequality is still a significant influencing factor of consumption inequality in urban and rural areas . Participating in medical insurance has a significant negative effect on inequality of consumption in urban households, but the disease is not significant. Participating in medical insurance has a significant positive effect on consumption inequality of rural households, and a significant negative effect on illness.That is, medical security has increased the consumption inequality of rural households, which is verified in models (5) and (6). In the model (5) with medical consumption as the explanatory variable, illness significantly raises the inequality of family medical consumption.And medical insurance has not significantly reduced family medical consumption, that is, adverse selection and moral hazard in real

medical insurance in. The test results of non-medical consumption as the explanatory variable model (6) show that illness reduces household inequality of non-medical consumption, and medical insurance has no significant positive effect.

Due to the endogenous effect of income inequality on household consumption inequality, the first stage test shows that the P value is 0, which means there is an endogenous problem.We take the inequality of household income growth as the instrumental variable of endogenous treatment, and give the results in the model (7).The results of the instrumental variable method show that income inequality still has a significant positive effect on household consumption inequality.

Table 9 Panel Fixed Effect Test and IV Treatment of Inequality in Consumption

Varible	Consumption inequality by Urban-rural				Comparison by Medical Consumption FE		IV treatment
	Urban consumption inequality FE		Rural consumption inequality FE				(7)
	By age (1)	By age group (2)	By age (3)	By age group (4)	Medical (5)	Non-medical (6)	Panel IV-OLS test
Income inequality	0.2030***	0.2030***	0.2150***	0.2140***	0.1800***	0.2150***	0.3770***
	(0.0140)	(0.0140)	(0.0060)	(0.0060)	(0.0281)	(0.0056)	(0.0055)
if ill of hh=1	0.0079	0.0077	-0.0110**	-0.0109**	0.0431**	-0.0113**	-0.0127***
	(0.0113)	(0.0113)	(0.0052)	(0.0052)	(0.0183)	(0.0055)	(0.0048)
Medical insurance=1	-0.0249***	-0.0248***	0.0094**	0.0095**	-0.0213	0.0036	-0.0102**
	(0.0095)	(0.0095)	(0.0046)	(0.0046)	(0.0194)	(0.0042)	(0.0047)
Age of hh	-0.0001		-0.0002**		-0.0003	-0.0001*	-0.0002**
	(0.0002)		(0.0001)		(0.0004)	(0.0001)	(0.0001)
18 ~ 59 years old of hh=1		-0.0080		0.0030			
		(0.0088)		(0.0039)			
Over 60 years old of hh=1		-0.0051		-0.0095*			
		(0.0129)		(0.0056)			
Education level of hh	0.0083**	0.0085***	0.0126***	0.0123***	-0.0039	0.0122***	0.0140***
	(0.0033)	(0.0033)	(0.0016)	(0.0016)	(0.0068)	(0.0014)	(0.0014)
If job of hh=1	-0.0043	-0.0039	-0.0020	-0.0025	-0.0171	-0.0010	-0.0080**
	(0.0088)	(0.0088)	(0.0042)	(0.0042)	(0.0160)	(0.0039)	(0.0038)
Family size	-0.0002	-0.0002	0.0003	0.0005	0.0307***	0.0004	-0.0015

	(0.0024)	(0.0024)	(0.0010)	(0.0010)	(0.0046)	(0.0010)	(0.0010)
_cons	-2.411*	-2.391*	1.931***	2.000***	-0.836	0.973*	0.1100***
	(1.281)	(1.273)	(0.592)	(0.588)	(2.725)	(0.548)	(0.0129)
Year	Yes	Yes	Year	Yes	Year	Yes	Yes
Urban and rural	Yes	Yes	Yes	Yes	Yes	Yes	Yes
First stage Test							F(1,32597) P-value=0
Sargan-Hansen Test							P-value= 0.5142
N	4528	4528	28088	28089	3246	29371	32616

Note: Standard deviations in parentheses, * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. The Hausman test results for panel RE and FE show that prob> chi2 = 0.0072, which significantly rejects the null hypothesis of random effects. FE models should be used.

6.Conclusions

Based on the 10 microscopic survey data of CHNS from 1989 to 2015, this paper measures and decomposes the inequality coefficient of household consumption ,and analyzes the social welfare based on the inequality coefficient of household consumption.The results of this study are as follows: First, regardless of either urban or rural areas, or as a whole, the inequality coefficient of household income is lower than that of household consumption, in which the inequality coefficient of urban and rural household consumption is higher than 0.45; the inequality coefficient of rural household consumption is higher than 0.40; and the inequality coefficient of urban household consumption is also higher than the level of 0.35, but the variation of the inequality coefficient of overall consumption is not significant. Second, the overall consumption inequality is caused by the inequality inside rural areas, followed by the contribution rate of the remaining items.The contribution rate of household consumption inequality coefficient of rural areas increased from 65.38% to 85.58% (73.49% on average), and the contribution rate of remaining consumption inequality decreased from 30.99% to 9.40% (19.97% on average). Third, the results of the extended test show that income inequality is a significantly positive factor leading to household consumption inequality, and the results of instrumental variable test are robust. However, among other factors, participation in medical insurance and illness also have a significant impact on household inequality. Participation in medical insurance has significantly reduced consumption inequality in urban areas and significantly increased consumption inequality in

rural areas. Fourth, through the comparison of medical consumption, diseases increase the inequality of household medical consumption, and at the same time reduce the inequality of household non-medical consumption.

The main conclusions are as follows: First, the government policies must take efficiency and fairness into consideration, and the government's policy orientation should be balanced between the two. According to the view of marginalism, the trade-off between efficiency and fairness should reach the state where the growth of social welfare is improved by efficiency, while the deterioration of consumption distribution must satisfy the principle of equivalence of social welfare loss. The loss of social welfare which is caused by the reduction of efficiency and the improvement of social welfare which is caused by the improvement of consumption distribution should conform to the principle of equivalence.

Second,the meaning of consumption is richer than that of income, and consumption inequality has a richer implication than income inequality. In the context of reducing inequality, consumption inequality has two dimensions: one is the inequality of consequence, and the other is the inequality in the process .In terms of inequality of results, consumption is the result of consumption decisions under conditions of wealth, income, and credit. In terms of inequality in the process, consumption is the process of acquiring social resources, the process of human capital accumulation, and the process of forming income capacity .Therefore, in order to reduce consumption inequality, it is necessary to reduce the consumption inequality of results, and narrow the consumption inequality in the process. To narrow the consumption inequalities of results, the most important thing is to improve the basis of consumption decisions of low-income groups -----the wealth and the income groups. It is essential to involve the rural residents and low-income groups in the benefits of economic opening and marketization process; to raise the minimum wage standard; to establish a wage adjustment system; to strengthen the targeted poverty alleviation, to improve the systems of targeted poverty alleviation, and to optimize the measures of targeted poverty alleviation. To reduce the consumption inequality in the process, the most important thing is to reform the economic and social system to promote equality of opportunities.The consumption inequality in the process will be transformed to the consumption inequality of consequence through a series of ways . Reducing consumption inequality in the process is an important approach to promoting equal opportunities and social equity, which affects social mobility.

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