

An Empirical Study on the Consumption Effect of Income Gap among Industries

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Abstract—On the basis of logic analysis, using macro-statistical data, this paper makes an empirical study on the consumption effect of income gap among industries by some measurement method, such as unit root test, VAR model estimation and Granger causality test and so on. The results show that the income gap among industries has a negative effect on the resident consumption rate. The contribution of the income gap among industries to the change of the resident consumption rate presents the trend of decreasing first and then increasing.

Keywords—income gap among industries; consumption effect; consumption rate

I. LOGICAL ANALYSIS OF THE RELATIONSHIP BETWEEN INCOME GAP AMONG INDUSTRIES AND CONSUMPTION

The consumption and income of the residents interact with each other. The consumption is affected by income, at the same time affects the increase or decrease of the income. Resident consumption refers to all the consumer expenditure of final commodity and service, some related factors such as consumer income and commodity prices are recognized as the consumption determinants. Many economists at home and abroad are studying the theory of consumption, which is the key theory concerned by economics. The Keynes's Hypothesis of Absolute Income is the most representative hypothesis. The Modigliani's Life Cycle Hypothesis is also the most influential hypothesis.

A. The Hypothesis of Absolute Income

In 1936, the absolute income hypothesis consumption function was first put forward by Keynes in *The General Theory of Employment, Interest, and Money*. The center of this assumption is that the consumption is mainly affected by the level of absolute income and the diminishing marginal propensity to consumption. Consumption depends on income, the relationship between consumption and income is called the propensity to consume. Consumption increases with the increase of income, but its growth rate is lower than the growth

of income, the proportion of consumption increment in the income increment decreases, named diminishing marginal propensity to consume. The marginal propensity to consume is less than the average propensity to consume.

B. Life Cycle Hypothesis

Modigliani and Blumberg put forward the life cycle hypothesis in the "utility analysis and consumption function - an explanation of the cross-sectional data". The hypothesis considers that a person will be based on the expected income of life to reasonably arrange the consumption and savings in various period of life, to reach the revenue and expenditure balance, and not according to the current income to determine the current expenditure. The two preconditions of this hypothesis are: consumers are rational, and can be reasonable consumption by according to their own income; utility maximization is the only goal of consumer behavior. The consumption and saving behavior of rational consumers at a certain point of time is determined by their ideal distribution of consumption in each life cycle phase in order to achieve maximize the utility maximization during the whole life.

II. DATA SOURCES AND VARIABLES SETTING

Based on the analysis of the theoretical relationship between the income gap among industries and resident consumption, this paper validate the effect of the income gap among industries on the resident consumption from a quantitative point of view. Therefore, firstly, the definition of the variables is required for quantitative analysis; Secondly, on the premise of theoretic analysis, the data of the relevant variables are collected for quantitative analysis and the VAR model is estimated. Finally, based on the VAR model estimates of the income gap among industries to the resident consumption, this paper further estimate whether there is a causal relationship between the income gap among industries and resident consumption.

TABLE I. VARIABLES

| Variable type | Variable name | Variable meaning |
|----------------------|----------------------------|---|
| Dependent variable | consumption (XFL) | The proportion of consumption in the national economy |
| Independent variable | Geordie coefficient (GINI) | To investigate the status of income inequality in the national economy |
| | Theil index (THEIL) | To investigate the status of income inequality among individuals or regions |

Gini coefficient and Theil index this two indicators measure the industry income gap, in order to more fully reflect the status of income inequality inter -industry. From 1978 to 2002, "China Statistical Yearbook" announced the average wage level in 16 major industries, but from 2003 to 2013, China Statistics Bureau has changed the statistical caliber, the industry is divided into 19 major industries for statistics. Therefore, the Gini coefficient and Theil index of the industry are derived from the calculation of the average wage level of China Statistical Yearbook over the years. In order to ensure the uniformity of the whole study, this part only selected the time series data from 2003 to 2013 as the basic data.

Because the China Statistical Yearbook published the average consumption level of residents, at the same time, the per capita GDP data is easy to obtain, the dependent variable--consumption rate of this part was measured by the ratio of the consumption level of the residents to the per capita GDP. Consumption rate is that the proportion of final consumption in the goods or services produced by country or region in a certain period, it is a very important indicator to measure the proportion of the resident consumption in national economy. Therefore, the consumption rate is selected as dependent variable to measure the resident consumption, it can be better to reflect the growth and changes in resident consumption. The average consumption and per capita GDP data are derived from the "China Statistical Yearbook" of calendar years.

III. QUANTITATIVE ANALYSIS OF THE EFFECT OF INCOME GAP AMONG INDUSTRIES ON CONSUMPTION

In order to eliminate heteroscedasticity and the interference effect of price factor on the measurement results, this paper has taken the logarithm of the selected independent variables and the dependent variables before estimated the vector autoregressive model. Firstly, through unit root test on the income gap among industries and resident consumption, it determined whether the income gap among industries and the resident consumption is suitable for VAR model estimation. Therefore, this paper discussed the ADF unit root test on the Gini coefficient and the Theil index of industry and the resident consumption rate [1]. As shown in Table 2, there may be a long-term co-integration relationship between the Gini coefficient, the Theil index and the resident consumption rate from 2003 to 2013.

Secondly, this paper estimated the VAR model on the income gap among industries to the resident consumption rate, based on independent variables and dependent variables through the unit root test [2]. From the result of VAR model

estimate, we can see that the VAR model has the best lag time when the lag time is 2, and the results show as following:

$$XFL=1.3046*XFL(-1)-0.5212*XFL(-2)-21.4379*GINI(-1)+2.1101*GINI(-2)+1.7006 \quad (1)$$

$$XFL=1.2464*XFL(-1)-0.5341*XFL(-2)-31.9379*THEIL(-1)-33.3811*THEIL(-2)+14.2944 \quad (2)$$

The R2 statistics are both larger than 0.9 when the two equations are estimated by the vector autoregressive model in lag period, this model has better fitting effect. At the same time, the reciprocal mode of the characteristic root of two equations are both less than 1, it indicate that the Gini coefficient and the Theil index of industry and the consumption rate are falling within the unit circle. Therefore, it can be concluded that the VAR model established in this paper has better stability.

TABLE II. THE UNIT ROOT TEST OF INCOME GAP AMONG INDUSTRIES AND RESIDENT CONSUMPTION RATE

| variable | Test types (c, t, p) | ADF Test value | Mackinnon Critical value | results |
|----------|----------------------|----------------|--------------------------|----------------|
| LN XFL | (c, 0, 2) | -1.7715 | -3.7114 | Non-stationary |
| △LN XFL | (c, 0, 2) | -3.8922** | -3.7114 | stationary |
| LN GINI | (c, 0, 0) | -2.4019 | -2.9762 | Non-stationary |
| △LN GINI | (c, 0, 0) | -10.319*** | -3.7114 | stationary |
| LN THEIL | (c, t, 2) | -0.3546 | -3.6998 | Non-stationary |
| △LNTHEIL | (c, t, 0) | -4.8496*** | -3.7114 | stationary |

Note: *, **, *** represent the critical value of Mackinnon significantly at the 10%,5% and 1% level.

Since the equation obtained by VAR model estimates can only reflect the local dynamic relationship between the income gap among industries and the resident consumption rate, not reflect the global dynamic relationship between the income gap among industries and the resident consumption rate. Therefore, it can't analyze this question by using the obtained equation, but other methods such as impulse response function [3], variance decomposition [4] and Granger causality test [5] can be used to reflect comprehensively the effect degree of income gap among industries to resident consumption rate. Therefore, this paper analyzes the effect of the industry income gap on the consumption rate by using some analysis tools such as impulse response function, variance decomposition, Granger causality test and so on.

As shown in Fig. 1., in the impulse response function chart of the y income gap among industries on the consumption rate, the solid line represents the industry income gap impact on the consumption rate of residents, and the curve constituted by the degree of response of the consumption rate to the industry income gap, is the impulse response curve, and the dotted line represents the impulse response curve with two times the standard error. The horizontal axis represents the number of retrospective periods, and the vertical axis represents the degree to which the consumption rate reacts to the impact of the income gap among industries.

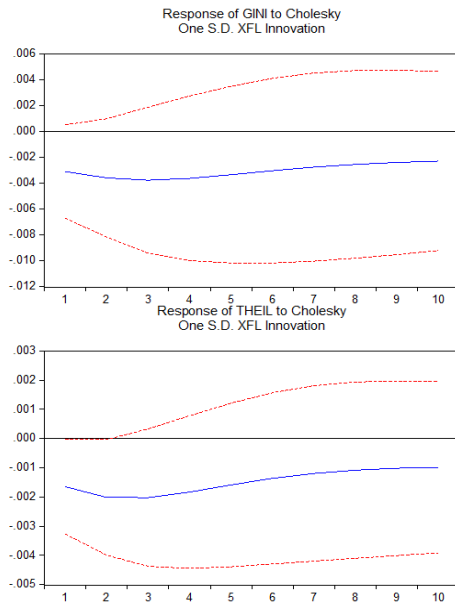


Fig. 1. Effect of income gap among industries on resident consumption

The impulse response function value of the consumption rate to the Gini coefficient of the industry is negative, and the negative effect of the Gini coefficient of the industry on the consumption rate has reached the maximum from the first period to the third period, and in the fourth period, the negative effect of the Gini coefficient of the industry to the consumption rate starts gradually decreasing, and with the increase of the retrospective period, the negative effect of the Gini coefficient on the consumption rate of residents shows a steady decrease trend. The impulse response function value of the consumption rate to the Theil index of the industry is negative, and the negative effect of the Theil index of the industry on the consumption rate has reached the maximum from the first period to the third period, and in the fourth period, the negative effect of the Theil index of the industry to the consumption rate starts to show a steady decline trend. Either the Gini coefficient or the Theil index of industry have a negative effect on the consumption rate, the reason may be that the excessive income gap among the industries will lead to labor income gap among different industries, and this gap may not be able to bring the effective consumption demand. In other words, the industry income gap will lead to the reduction of the effective demand of residents, while the effective demand will slow down the economic growth. So the industry income gap has a negative effect on the consumption rate.

TABLE III. VARIANCE DECOMPOSITION OF INDUSTRY INCOME GAP AND CONSUMPTION RATE

| Period | XFL | GINI | XFL | THEIL |
|--------|---------|---------|---------|---------|
| 1 | 10.7738 | 89.2261 | 14.7298 | 85.2701 |
| 2 | 13.6568 | 86.3432 | 18.6487 | 81.3512 |
| 3 | 15.0889 | 84.9110 | 19.6629 | 80.3370 |
| 4 | 15.5380 | 84.4619 | 19.0307 | 80.9692 |
| 5 | 15.4091 | 84.5908 | 17.7417 | 82.2582 |
| 6 | 15.0029 | 84.9971 | 16.3602 | 83.6397 |
| 7 | 14.5046 | 85.4953 | 15.1325 | 84.8674 |
| 8 | 14.0142 | 85.9857 | 14.1285 | 85.8714 |
| 9 | 13.5772 | 86.4227 | 13.3396 | 86.6603 |
| 10 | 13.2081 | 86.7918 | 12.7305 | 87.2694 |

As shown in Table 3, the results of the variance decomposition of the income gap among industries and the resident consumption rate show that the contribution of the income gap among industries to the resident consumption rate shows a trend of decreasing first and then rising. Which means that the contribution of the income gap among industries present extent of the first decline, and then gradually increasing in the resident consumption rate changing.

TABLE IV. GRANGER CAUSALITY TEST OF INDUSTRY INCOME GAP AND RESIDENTS' CONSUMPTION RATE

| Null Hypothesis | F-Statistic | Prob. |
|----------------------------------|-------------|--------|
| GINI does not Granger Cause XFL | 8.6656 | 0.0071 |
| XFL does not Granger Cause GINI | 6.3909 | 0.0185 |
| THEIL does not Granger Cause XFL | 3.3785 | 0.0534 |
| XFL does not Granger Cause THEIL | 0.4395 | 0.6501 |

Finally, after analyzing the results the impulse response function and the variance decomposition, in order to determine whether there is the causal relationship between the income gap among industries and the resident consumption rate, this paper need to further test the Granger causality relationship. As shown in Table 4, the results of Granger causality test show that the Gini coefficient of industry is the reason for resident consumption rate, which is based on the long-term co-integration relationship between income gap among industries and resident consumption rate. At the same time, the resident consumption rate is also the reason for Gini coefficient of industry; Theil index of industry is the reason for the resident consumption rate, but the resident consumption rate is not the reason for the Theil index of industry, it indicate that the industry income gap is the reason that resident consumption rate dropped.

IV. CONCLUSION

Based on the logical analysis, this paper used the macro statistical data to analyze the impact of the income gap among industries on consumption. Firstly, the unit root test was carried out on the consumption index and the income gap among industries, to determine that whether the independent

variable and the dependent variable are suitable for VAR model. Secondly, through VAR model estimation, it can judge whether there is a long-term co-integration relationship between income gap among industries and consumption. Finally, it used Granger causality test to determine the causal relationship between income gap among industries and consumption.

Research shows that the income gap among industries has a negative effect on the resident consumption rate. Too large gap of the income among industries would reduce the level of consumer spending. The contribution of industry income gap to the change of the resident consumption rate shows the trend of decreasing first and then rising. The increase of the income gap among industries leads to the formation of high-consumption and low-consumption groups, while the marginal propensity to consume of high-income groups declines rapidly with the increasing rapidly of income, while the low-income groups [6]

income growth is slow, which directly inhibits their consumption ability. Therefore, the large income gap among industries is an important factor for curbing consumer spending.

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