Evaluating Chinese Household Consumption Potential, Their Export Replacement Capacity and Pulling Effect on Chinese Economic System amid the 2008 World Financial Crisis

Xiuli Liu*

MADIS, Academy of Mathematics and Systems Science, Chinese Academy of Sciences,

Zhongguancun East Road No.55, Beijing, China, 100190

Abstract: An expansion of household consumption has been considered as a key role of China for responding to the recent world economic and financial crisis since 2008. In this paper, a model framework based on China 1992 and 2007 input-output tables is introduced, which initially forecasts household consumption value to evaluate the household consumption potential and its export substitute capacity of each sector. Secondly, the pulling effect of household consumption potential on the GDP and its consumption multiplier are estimated. Finally, it is addressed that an expansion of household consumption from the industrial level may be an appropriate policy remedy to respond the recent world economic and financial crisis.

Keywords: Household Consumption; Input-output Analysis; Pulling Effect; Financial Crisis

Introduction

It has been a great concern in many countries including China that how to overcome financial crisis which occurred since 2008 and to maintain sustainable economic growth and development (Zhao, 2008). For a long time, economic growth

* Corresponding Author: Xiuli Liu, E-mail: xiuli.liu@amss.ac.cn

in China has been mainly driven by exports and investments. Chinese household consumption as a share of GDP is much smaller than that of other countries. In 2005, this accounted for only 38% of GDP compared to, for instance, 70% in the US or 61% in India. The phenomenon of higher savings, higher investment and lower consumption in China has been a certain anxiety for decision-makers and economists all these years (Yang, 2005; Pu, 2005; Fan, 2006; Luo, 2004; Ruiping et al., 2008; Andrew et al., 2009). In late 2004, the government formally altered the country's growth strategy from investment and export-led development to one relying more on domestic consumption (Zhang & S.Song; Kuijs, 2005; Qi, 2007; Lv, 2008). The recent eruption of the world economic and financial crisis enhanced this transformation pressure. It was shown by the several relevant literatures that the lower rural household consumption is the main reason of lower household consumption across the nation in China (Mei, 2007; Yang, 2005; Li, 2008; Zeng & Hu, 2006; Fan, 2001; Zhimin, 2003; Junqi, 1990). As shown in Fig.1, Chinese household consumption as a share of GDP is increasing from 38% to 52% during 2005-2009 as a result of expansion of household consumption by regulations such as subsidies, taxes, fiscal, credit, and other factors. In 2010, this is a prominent development strategy promulgated by Chinese government (Yu, 2008; Liu et al., 2009).

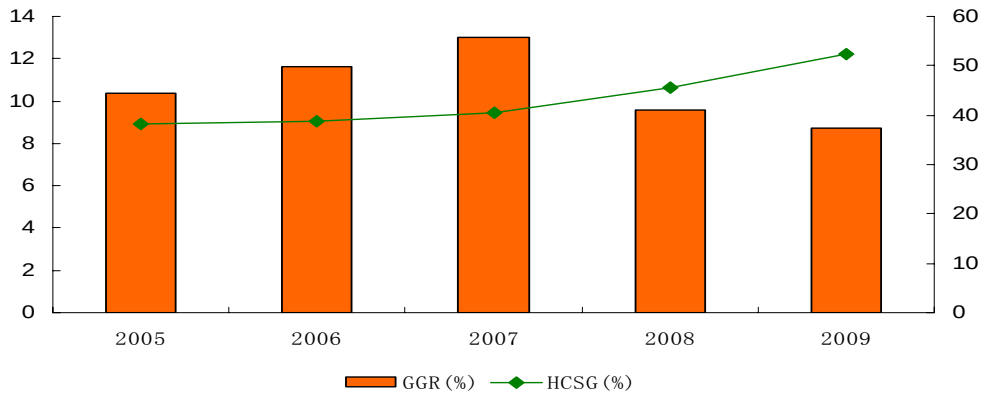

Fig. 1. Chinese household consumption as a share of GDP (HSCG) and GDP growth rate (GGR) from 2005 to 2009

A couple of questions can be raised here in Chinese economy in 2010; namely, how large will be the household consumption value and its potential of each sector in Chinese economic system? Also, how much amount of the export replacement capacity can bring it out, and of the pulling effect of the household consumption on GDP will be?

The concern is now given to make reasonable measurement of increasing household income, which has far-reach meaning in sufficient reduction of the negative impact of the world's economic and financial crisis on China's exports and promoting the development of steady and rapid economy growth in China.

Large amount of literatures concerned with environmental impacts and environmental load of household consumption (Duarte Rosa et al.,2010; Huppes Gjalt et al., 2006; Kerkhof Annemarie C. et al., 2009; Kok Rixt, 2006; Lareau Thomas J. and Darmstadter Joel,1982; Parikh Jyoti K. et al., 1997; Wier M. et al., 2003), we found little literatures presented detailed household consumption potential, its export replacement capacity for each sector and their pulling effect on the whole Economic System.

In contrast to the usual rough estimation, we present a model to simulate and evaluate the household consumption potential and their export replacement capacity of each sector, to evaluate the pulling effect of household consumption potential on the GDP and the consumption multiplier. Section 2 analyzes household consumption structure. Section 3 presents the model, Section 4 concerns with data source and parameters estimation. Section 5 provides evaluation results[1]. Section 6 is policy suggestions and concluding remarks.

Household Consumption Structure Analysis

[1] All value data are used price index in 2007.

In order to compare the consumption structure of urban and rural residents in terms of industrial level, indexes RCB (the proportion of rural household consumption among industries), UCB (the proportion of urban household consumption among industries) are used. Based on the 2007 Chinese input-output table with 42 sectors (see Attachment 1), these indexes can be calculated as:

$$RCB_j = RC_j / \sum_{j=1}^{n} RC_j \quad (1)$$

$$UCB_j = UC_j / \sum_{j=1}^{n} UC_j \quad (2)$$

where, RC_j is rural household consumption of sector j, UC_j is urban household consumption of sector j, RCB_j is the proportion of rural household consumption of sector j, UCB_j is the proportion of urban household consumption of sector j. These explanations are also given in Fig. 2.

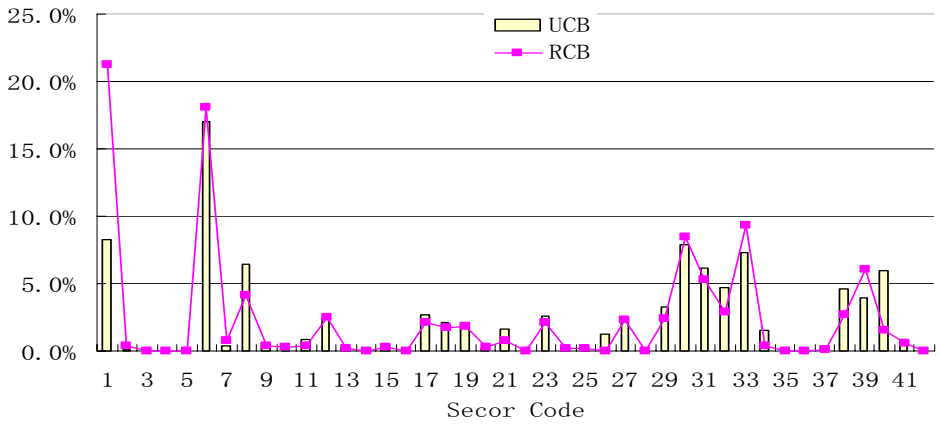

Fig. 2. The Consumption Structure of Rural and Urban Residents Among 42 Sectors in China in 2007

Fig. 2 shows that the consumption of rural residents in 2007 is mainly distributed in agriculture (RCB_1 = 21.2%), which is followed by manufacture of food products and tobacco processing (RCB_6=18.1%), and real estate (RCB_{33} = 9.3%). The consumption ratio of rural residents in these three sectors is 48.6%. This shows that the survival

consumption pattern of rural residents is still evident in 2007. While food, clothing and housing consumption can be referred to essential factors for fundamental economic activity, they have little affordability for medical care, education and other related consumptions.

In 2007, the consumption of urban residents in China are mainly distributed in manufacture of food products and tobacco processing (UCB_6 = 17%), which is followed by agriculture (UCB_1 = 8.3%), wholesale and retail trade (UCB_{30} = 7.9%), real estate (UCB_{33} = 7.3%), clothing, leather, furs, down and related products (UCB_8 = 6.4%), and accommodation and catering (UCB_{31} = 6.2%). In short, the consumption ratio of urban residents in these six sectors is 53.1%. These show for most urban residents that the consumption pattern of urban residents has begun to transform into development and entertainment in addition to food, clothing and housing such basic consumption needs, medical care, and education are the most important parts of their consumption.

The correlation coefficients of RCB, UCB between two adjacent years among 1992, 1997, 2002, 2005 and 2007 are almost larger than 0.95. This implies that the consumption structures of rural and urban residents among industries in China have a very high continuity between 1992 and 2007. If there were no apparent consumption policy impact, RCB and UCB will have little change in a short term.

Table1 The correlation coefficients of RCB, UCB between two year among 1992, 1997, 2002, 2005 and 2007

	1992 and 1997	1997 and 2002	2002 and 2005	2005 and 2007
RCB	0.982	0.974	0.982	0.964
UCB	0.966	0.872	0.962	0.942

In addition to the above findings, the established literature shows that the input-output coefficient is stable for three to five years (see Sevaldson, 1970;

Nijhowne, Gribble et al., 1985; Leontief, 1989; Liu, 2004). As a result, this analysis will assume that the input-output coefficients of China in 2007 are valid through 2010.

The Model

It has been shown in the existing literature that the main factors, which affect Chinese household consumption were household income, consumption rate and rural and urban population structure (see Fan, 2006; Mei, 2007; Fan, 2001; Junqi, 1990; Qi, 2007). With the household income, the consumption rate and rural and urban population as independent variable, the rural and urban household consumption potential for each sector can be calculated by Eqs. 3 and 4. Similarly, with the export volume for each sector at time t, the coefficient of rural and urban household consumption potential substitute capacity for export of each sector at time t+k are calculated by Eqs. 5 and 6. Moreover, with the improved partial closed input-output model, the pulling effect of household consumption potential on GDP at time t+k is evaluated by Eqs. 7 to 11. Also, the consumption multiplier of the household consumption potential is evaluated with Eq. 12.

$$RCP_{j,t+k} = RP_{t+k} * RE_t * (1+\alpha_{t+1}) * (1+\alpha_{t+2}) \cdots (1+\alpha_{t+k}) * \beta_{t+k} * RCB_{j,t} \quad (3)$$

$$UCP_{j,t+k} = UP_{t+k} * UE_t * (1+\gamma_{t+1}) * (1+\gamma_{t+2}) \cdots (1+\gamma_{t+k}) * \rho_{t+k} * UCB_{j,t} \quad (4)$$

$$RRP_{j,t+k} = RCP_{j,t+k} / EX_{j,0} \quad (5)$$

$$URP_{j,t+k} = UCP_{j,t+k} / EX_{j,0} \quad (6)$$

$$HCP_{j,t+k} = (RCP_{j,t+k} + UCP_{j,t+k}) / EX_{j,0} \quad (7)$$

$$\Delta X_{t+k} = (I - A^*)_t^{-1} * (RCP_{t+k} + UCP_{t+k}) \quad (8)$$

$$A^* = \begin{pmatrix} a_{11} & \cdots & a_{1n} & | & a_{1,n+1} \\ \cdots & \cdots & \cdots & | & \cdots \\ a_{n1} & \cdots & a_{nn} & | & a_{n,n+1} \\ - & - & - & - & - \\ a_{n+1,1} & \cdots & a_{n+1,n} & | & a_{n+1,n+1} \end{pmatrix} = \begin{pmatrix} A & H_c \\ H_r & h \end{pmatrix} \quad (9)$$

$$AV_{j,t+k} = av_{j,t} * \Delta X_{j,t+k} \quad (10)$$

$$DGDP_{t+k} = \sum_{j=1}^{n} AV_{j,t+k} \quad (11)$$

$$MHCP_{t+k} = DGDP_{t+k} / \sum_{j=1}^{n} (RCP_{j,t+k} + UCP_{j,t+k}) \qquad (k<5) \quad (12)$$

Where, RP_{t+k} = rural population at time t+k,

UP_{t+k} = urban population at time t+k,

RE_t =per capita cash income of rural residents at time t,

UE_t =per capita disposable income of urban residents at time t,

α_{t+k} =the actual annual growth rate of per capita cash income of rural residents at time t+k,

β_{t+k} =the consumption rate of rural residents at time t+k,

γ_{t+k} = the actual growth rate of per capita disposable income of urban residents at time t+k,

ρ_{t+k} =the consumption rate of urban residents at time t+k,

$RCP_{j,t+k}$ =the rural household consumption potential of sector j at time t+k,

$EX_{j,0}$ = the volume of exports for sector j at time 0,

$RRP_{j,t+k}$ =the coefficient of rural household consumption potential substitute capacity for export of sector j at time t+k,

$UCP_{j,t+k}$ =the urban household consumption potential of sector j at time t+k,

$URP_{j,t+k}$ =the coefficient of urban household consumption potential substitute capacity for export of sector j at time t+k,

$HCP_{j,t+k}$ =the coefficient of household consumption potential substitute capacity for export of sector j at time t+k,

A= the direct consumption coefficient matrix,

H_r =the row vector of labor award coefficient,

H_c = the column vector of the direct household consumption coefficient,

h= pay coefficient from residents to residents,

A^* =the partial closed direct consumption coefficient matrix,

$av_{j,t}$ =the value added coefficient of sector j at time t,

ΔX_{t+k} = the change of total output at time t+k,

$AV_{j,t+k}$ =the change of value added of sector j when the household consumption potential realised at time t+k,

$DGDP_{t+k}$ =the change of GDP when the household consumption potential realised at time t+k,

$MHCP_{t+k}$ =the consumption multiplier of the household consumption potential at time t+k.

Data Source and Parameters Estimation

The year 2009 is defined as time t, and the year 2010 will be the target time, so k=1. Data of the per capita cash income of rural residents (RE_t) and per capita disposable income of urban residents (UE_t) at 2009 are referred to China Statistical Bulletin 2009[2]. Because at year 2007, the financial crisis had little impact on China economy, especially on China export in that year. We can assume the volume of exports for each sector at 2007 China input-output table were expected value under normal circumstances. So the volume of exports for sector j at time 0 ($EX_{j,0}$) are quoted from 2007 China input-output table. By setting the year 2010 as time t+1, first, the model forecasts the values of RP_{t+1}, UP_{t+1}, α_{t+1}, β_{t+1}, γ_{t+1}, ρ_{t+1} at year 2010 (see Table 2).

Table 2 Values set for Parameters in the model

Parameters	RP_{t+1}	UP_{t+1}	α_{t+1}	β_{t+1}	γ_{t+1}	ρ_{t+1}
Value	700 million	640 million	8.4%	90%	10.1%	70%

Evaluation Results

With the model, evaluation results for household consumption, household consumption potential, household consumption substitute capacity for export coefficient, pulling effect are listed. All value data are used price index in 2007.

[2] http://news.xinhuanet.com/politics/2010-02/25/content_13047677_4.htm

Household Consumption

The results show that the rural household consumption is 3248000 million CNY in 2010 and real annual increase rate is 8.5%, which has its greatest values in the following four industries: farming, forestry, animal husbandry and fishery (689100 million CNY), food manufacturing and tobacco processing (587900 million CNY), real estate (302800 million CNY), and wholesale and retail (275200 million CNY).

The urban household consumption is 9657800 million CNY and annual real increase rate is 10.9%, which has its greatest values in the following four industries: food manufacturing and tobacco processing (1642700 million CNY), farming, forestry, animal husbandry and fishery (801800 million CNY), wholesale and retail (760400 million CNY) and real estate (708300 million CNY) as shown in Fig. 3.

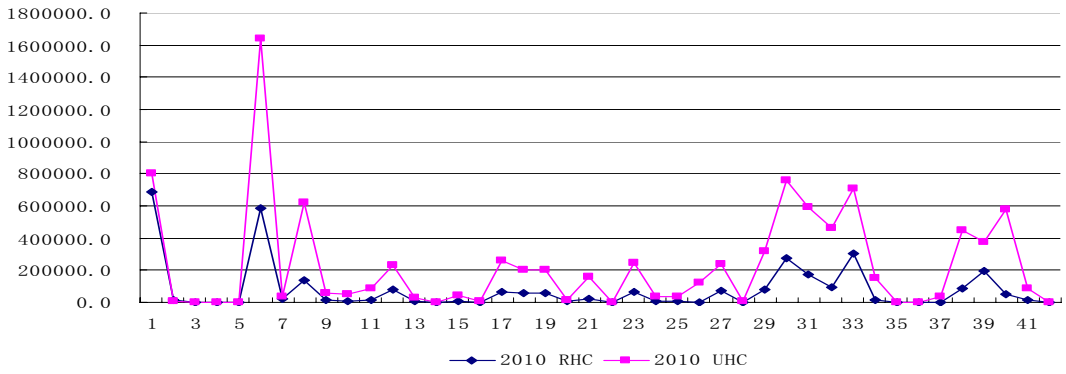

Fig.3. 2010 rural household consumption (RHC) and urban household consumption (UHC) forecasted results in China (Unit: million CNY) Household Consumption Potential

The rural household consumption potential is 254449 million CNY, which has its greatest potentials in the following four industries: farming, forestry, animal husbandry and fishery (54000 million CNY) food manufacturing and tobacco processing (46100 million CNY), real estate (23700 million CNY) and wholesale and retail (21600 million CNY).

The urban household consumption potential is 756600 million CNY, which has its greatest potentials in the following four industries: food manufacturing and tobacco

processing (128700 million CNY), farming, forestry, animal husbandry and fishery (62800 million CNY), wholesale and retail (59600 million CNY) and real estate (55500 million CNY) as illustrated in Fig. 4.

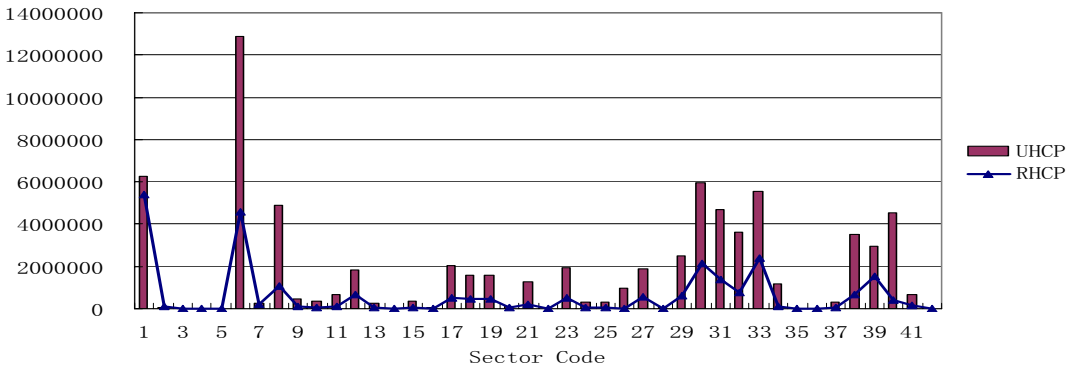

Fig. 4. 2010 rural household consumption potential (RHCP) and urban household consumption potential (UHCP) in China

Household Consumption Substitute Capacity for Export Coefficient

Sectors which rural household consumption substitute capacity for export coefficient that are in top 5 are education (5.97), health, social security and social welfare services (0.91), financial service (0.86), electricity, heat production and supply (0.82) and farming, forestry, animal husbandry and fishery (0.81).

Sectors which urban household consumption substitute capacity for export coefficient that is more than 1 in 2010 are education (11.4), health, social security and social welfare services (10.7), financial service (4.7), electricity, heat production and supply (2.97) and resident services and other services (1.23).

Sectors which household consumption substitutes capacity for export coefficient that is more than 1 in 2010 are education (17.4), health, social security and social welfare services (11.6), financial service (5.0), electricity, heat production and supply (3.8), farming, forestry, animal husbandry and fishery (1.8) and resident services and other services (1.5).

Sectors which household consumption substitutes capacity for export coefficient that is smaller than 0.01 in 2010 are metal smelting and rolling processing industry (0.01), communications equipment, computers and other electronic equipment manufacturing (0.01), instruments, metres, cultural and office machinery (0.01), textiles (0.01) and general, special equipment manufacturing industry(0.001).

Pulling Effect

As shown in Fig. 5, the value added of 42 sectors will be increased in different degrees. The top 5 industries that have the largest increase of the value added and their values are as follows; agriculture (324117.9 million CNY), real estate (136769.1 million CNY), wholesale and retail trade (132884.9 million CNY), manufacture of food products and tobacco processing (129790.6 million CNY) and finance and insurance (113084.1 million CNY).

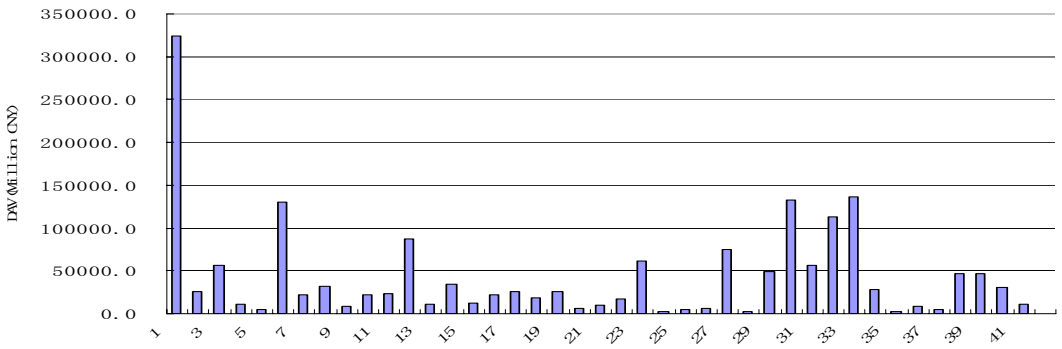

Fig. 5. The change of value added of 42 sectors in 2010 (At 2007 current price)

In the standpoint of the whole economic system, the multiplier of household consumption potentials would be 1.73, and the contribution of household consumption to GDP growth would be 4.0-4.2 percent in 2010.

Policy Suggestions and Concluding Remarks

First, finance and insurance industry (32 sectors) in China can be developed mainly by expanding the domestic household consumption. In 2010, the household consumption substitute capacity for export coefficient is 5.0, which is much larger

than 1, ranked third in 42 sectors. Since Chinese commercial banks have relatively small proportions of foreign currency assets, securities companies generally have no overseas investments. The direct and indirect investments of domestic insurance companies in overseas are in a small scale. The world economic and financial crisis since 2008 had a relatively small impact on finance and insurance industry in China[3]. It can be stated that an enhancement of rural and urban financial services should be the main methods for finance and insurance industries in China for responding to the financial crisis.

Secondly, in a short term, textiles, clothing, leather, furs, down and other related products cannot be expected as significant roles of expanding domestic demand to meet the shortfall of their export. The textile and garment products are China's main export trade varieties for a long time. In 2002, the textile exports accounts for 30.8% of the total exports, and the ratio increase to 37.4% in 2005[4]. From January to August in 2008, China's total exports of textile and apparel to the U.S. declined by 26.52 %, compared with that in the same period in the previous year[5]. However, a restriction by the household consumption power, the export replacement capacity of the household consumption of textiles, clothing, leather, furs, down and other related products is only 0.01 and 0.1 in 2010. Therefore, in addition to developing the domestic market, textiles, clothing, leather, furs, down and other related products (sectors 7 and 8) also need to focus on opening up some new export markets, by increasing the level of technical research and enhancing scientific and technological content of products and their international competitiveness.

Thirdly, the scientific research, comprehensive technical service, public administration and social organizations are government consumption industries in

[3] Referred to http://insurance.fivip.com/express/expgeneral/200810/14-310786.html
[4] Referred to http://www.gdchain.com.cn/News/NewsView.asp?NewsID=93510&page=1
[5] Referred to http://www.efu.com.cn/data/2008/2008-11-19/255013.shtml

China. If there has no remarkable change in management system, the consumption of rural residents on these sectors will still be 0.

China's reform and opening up 30 years, and gradually expand the reformation of monopoly industries, some have been or are gradually breaking the monopoly structure. But compared to other areas of reformation, the promotion of reforming monopoly industries is relatively slow and the range is still relatively narrow, as well as the level is still relatively low. The standardized access system has not yet been formed. Many small and medium enterprises that survive in the cracks in the monopoly situation have not been fundamentally changed, which lead to low income of workers in small and medium enterprises. The monopolies should be broken by reducing the access threshold so that the private capital can play a greater role, and the small and medium enterprises may have more development opportunity.

Fourthly, through financial or tax the means to adjust the proportion of income among state, enterprises and residents, to make the residents income growth and macro-economic growth to match.

From 1996 to 2007, the proportion of household disposable income declined rapidly from 69.5% to 57.5%, which is a decrease of 12.0 percentage points and down 1.1 percentage points each year. One reason can be considered by the reduction of the proportion of the initial distribution of income. The other reason is that the proportion of household net current transfers declined rapidly, which is mainly due to the rapid increase in the level of income and residents personal income tax increase substantially more than growth rate of social benefits and other income.

The distribution of income among government, enterprises, and residents should be adjusted reasonably. Enterprises should increase compensation, dividend for workers; the government should increase social welfare spending, So that the

proportion of household income in the initial distribution and redistribution increase reasonably.

Finally, an enhancement of rural education especially in rural vocational education should be the most fundamental way to increase the income of rural residents, which can improve their professional quality, and encourage the ability to create more revenue. In 2008, 7.8% of the rural labor force was illiteracy, 30.9% of them have primary education, 42.3% of them have junior high school education, and only 13.5% of them have high school education. In addition, 45.3% of rural labor has never received any professional training. In rural areas, through vocational skills training, farmers are encouraged to develop aquaculture, flowers, horticultural and other high-quality and high-efficiency agricultural methods. In urban areas, through vocational skills training, promote rural labor force to transfer from the physical and low value-added industries to technology-based and high value-added industries.

These proposals are adopted by the central and local governments since the end of 2008. Newly released statistics data showed a great contribution of these proposals to maintain and promote prosperity of urban and rural consumption markets. For example, in the first half year of 2009, the rural household expenditure reached RMB 16.2 billion, which is growing faster than the urban expenditure. This also achieved more than 6 million cars sales, which made China as the largest automobile consumption market. In 2009, household consumption contributes to economy growth by 4.6 %, making it a main motive to fuel China's economy growth.

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Attachment 1. Sector code and its corresponding name of China 2007 input-output table with 42 sectors

Sector Code	Sector Name	Sector Code	Sector Name
1	Agriculture	22	Scrap and waste
2	Coal mining and washing	23	electricity, heat production and supply
3	Oil and gas exploration industry	24	Gas production and supply
4	Metal ore mining	25	Water production and supply
5	Non-ferrous mineral mining	26	Construction
6	Manufacture of food products and tobacco processing	27	Freight transport and warehousing

7	Textiles	28	Post and telecommunications
8	Clothing, leather, furs, down and related products	29	Information transmission, computer services and software
9	Sawmills and furniture	30	Wholesale and retail trade
10	Paper, printing and cultural goods industry	31	Accommodation and catering
11	Petroleum processing, coking and nuclear fuel processing	32	Finance and insurance
12	Chemical Industry	33	Real estate
13	Non-metallic mineral products industry	34	Rental and business services
14	Metal smelting and rolling processing industry	35	Scientific research
15	Fabricated metal products	36	Comprehensive technical service
16	General, special equipment manufacturing industry	37	Water conservancy, environment and Public facilities management industry
17	Transportation equipment manufacturing industry	38	Residents services and other services
18	Electrical, machinery and equipment manufacturing industry	39	Education
19	Communications equipment, computers, and other electronic equipment manufacturing	40	Health, social security and Social welfare services
20	Instruments, meters, cultural and office machinery	41	Culture and arts, sports, entertainment
21	Other manufacturing industry	42	Public administration and social organizations