Payroll Tax and Household Consumption

Chongen Bai and Binzhen Wu*

School of Economics and Management, Tsinghua University

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Abstract

Using the Urban Household Survey Data of 9 provinces during 2002-2006, this study examines the effect of the payroll tax rate on household consumption and savings. Theoretically, when there are simultaneously target-saving motives and credit constraints, the increase in the payroll tax for the social security in the current period could have a negative effect on consumption due to the fact that it reduces the current disposable income. Empirically, we exploit the changes in the payroll tax rate and coverage rate for social security over time and the variation of the changes across cities to construct the instrumental variables for the payroll tax rate to address the problem of the omitted variables.

The results show that after controlling for the wage before contribution, the payroll tax has a significantly negative effect on household consumption. When the payroll tax rate increases by 1 percentage point, household consumption declines by about 3.3 percent. This negative effect is stronger on poorer households, but does not depend on the potential benefit of social security in the future. The effect of payroll tax rate on saving rate is positive but not significant. Moreover, our data show that the increase in the payroll tax may not result in an increase in social security benefit for the old. At the same time, the propensity to consume of the elderly is lower than that of the young. As a result, raising payroll tax may actually reduce aggregate consumption.

Key words：Payroll tax；Social security benefit；Social security；Household consumption；Household saving

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*Correspondent author: wubzh@sem.tsinghua.edu.cn，8610-62772371, We want to thank our colleagues at Tsinghua University for their valuable comments in the seminar. Any remaining errors are ours alone.

1 Introduction

Chinese high and rising household saving rate has attracted a lot international attention. High savings are said to be a main contributor to the global financial crisis, and stimulating Chinese consumption is widely recognized to be crucial to addres the financial crisis. It is also seen as the key to sustain high economic growth in China. However, how to simulate consumption most efficiently is still a problem that is under hot debating.

A popular explanation for the high saving rate in China is related to the lack of a generous safety net in China. Particularly, people need to save for old age, large medical expenses, children's education, and etc. While empirical studies have not reached a consensus on how important this type of saving motive is, the government has tried to improve the social security system to boost consumption. For example, within the stimulus package to address the financial crisis, increasing the generosity and expanding the coverage rate of the social security system is listed as the top priority.

However, a more generous social security system eventually tends to increase the tax burden on enterprises or residents, and further squeeze the disposable income of residents in the current period. When there are credit constraints, lower current disposable income results in lower current consumption. This is worrisome as the current payroll tax of social security has already been very high. For example, in Beijing, a firm and a work pay respectively 20% and 8% of the worker's gross wage for the social security, 10.8% (0.8% for maternity insurance) and 2% for the health insurance, 1.5% and 0.5% for the unemployment insurance. All together, it accounts for 42.8% of the worker's gross wage. If further taking into account the housing fund, the total payment of the firm and the workers ranges from 52.8% to 66.8% of the average wage[1]. Although there are variations on the rate across provinces, most cities have similar schedules after 2005. Economic theory tells us that under some reasonable assumptions, the tax burden on the firms may mostly be shifted to the workers by the reduction in the wage offer. This tax burden greatly exceeds the corresponding rate in the U.S. and many developed countries that are famous for their generous welfare.

Therefore, a fundamental question for the debate is how the increase in the payroll tax affects people's saving and consumption behavior. As the social security is the main element of the social insurance system in China, we focus on payroll tax for social security, and call it as social security contribution. Theoretical analysis indicates that the answer depends on the relationship between the contribution and benefit of the payroll tax, the status of borrowing constraints, the saving motive, and other characteristics of social security system. More specifically, most of the studies in the literature assume that the impact of payroll tax and benefit works through the lifetime budget constraint, and

[1] Sourse: http://www.btophr.com/viewcontent/insurance_city.asp; http://en.wikipedia.org/wiki/Tax_rates_around_the_world

hence focus on the impact of net pension wealth (the discounted present value of all benefits minus the discounted value of all payments) on consumption and savings. However, when the households face credit constraints, they cannot borrow from the future social security benefit to smooth consumption, which necessitates distinguishing the effect of the payroll tax from the effect of the social security benefit. The scenario is particularly of interest in China because the underdevelopment of Chinese capital market and the already very high payroll tax rate.

Using China's urban household survey data of nine provinces during the year of 2002-2006, we examine the composite impact of current payroll tax rate on household consumption, taking into account that the rising payroll tax may imply more social security revenue in the future. In addition, we study how the effect differs across different subgroups in the population. The main challenge of the relevant empirical studies is that the payroll tax rate is usually correlated with the unobservable characteristics of the jobs. To address this omitted variable problem, we exploit the policy variation among cities and the change of the variations over time to create instrument variables for the payroll tax rate.

The results show that after controlling for the wage before tax, current payroll tax has a significantly negative impact on household consumption. A one-percentage increase in payroll tax rate reduces consumption by about 3.3%. This negative effect is stronger on poorer families. It does not vary significantly with the expected benefit of social security in the future. The effect of the payroll tax on saving rate is positive but not significant. Moreover, the data indicate the increase in the social security contribution does not necessarily lead to more generous benefit for the retiree. This finding, along with the finding that the propensity to consume of the elderly is lower than that of the young, implies that the increase of the payroll tax tends to reduce aggregate consumption.

This paper is structured as following: Section 2 reviews the literature and describes the characteristics of China's social security system. Section 3 gives a simple theoretical model, which shows that credit constraint together with the target saving motive may lead to a negative effect of current payroll tax on consumption. Section 4 describes our econometric model. Section 5 describes the data and gives the statistical description. Section 6 delivers the empirical results and conducts some robustness tests. Section 7 discusses the implication of the estimates on the effect of social security contribution on the aggregate consumption and saving. Section 8 concludes.

2 Literature and Background

According to the theoretical model in the literature, the relationship between pension and consumption and savings are quite complex. If we consider a simple life cycle model without borrowing constraints and uncertainty, pension payment could substitute private savings. When the costs and benefits of pension payment are equal, the current consumption would not be affected by the

payment, and private savings and social security payment have the full 1-1 substitution, which means that the reduction in private savings exactly equals to the amount of social security payment. Private savings rate (defined as savings / disposable income) would decrease. If the benefits are greater than its costs, social security payment would increase consumption and reduce private savings more than the amount of the payment. But when the costs is greater than benefits, which would happen when the return rate of pension is lower than that of private saving, current consumption will decline, while the effect on private saving rates are rather blurred (Feldstein and Liebman, 2002). In reality, many facts cause the effect of pension payment on private savings to be more ambiguous. For example, Hubbard and Judd (1987) and Cifuentes and Valdes-Prieto (1997) points out that the existence of borrowing constraints would reduce the negative effect of pension payment on household saving rate significantly, and may even make saving rate rise. They also pointed out that pension contributions can be seen as insurance for longevity risk, thereby reducing the precautionary savings for old age. But on the other hand, because of the need for some other precautionary savings, such as the saving for large medical expenses, the pension payment will not reduce private savings to a large extent. Samwick (1995, 1998) further suggests that this precautionary saving motive or other reasons may lead to the target saving behavior, or buffer-stock saving behavior, which make cause consumers reluctant to reduce savings, resulting in the fact that pension contribution may decrease consumption and increase savings. Thaler (1990) and Bernheim (1994) indicates that mental saving account, short-sight or a lack of intuition of economics may also lead to the positive effect of pension contributions on household savings rate. Pension contributions may also stimulate saving rate by affecting employment, for example, pension system may encourage early retirement (Feldstein, 1974). Finally, the pension system is likely to be associated with intra-and intergenerational income redistribution. This effect, along with the fact that different income groups and different generations have different marginal propensity to consume, and that the older generation has bequest motives, lead to the ambiguous effect of pension system on overall saving rate (Feldstein and Liebman, 2002).

Most previous empirical researches assume that pension system would affect current savings and consumption through its influence on lifetime budget constraint, therefore they focus on the impact of net pension wealth (the discounted present value of all benefits minus all payment) on consumer savings. There are three main methods in the empirical research. The first one is represented by Feldstein (1974, 1995), which uses time series data to analyze the effect on net pension wealth on current consumption. He found that pension payment squeezed out about 30% -50% of personal savings. However, such methods are questioned a lot. The second method is to exploit the cross-sectional difference of net pension wealth, and directly inspect the crowding-out effect of net pension wealth on private savings (stocks). Most of these studies find that the substitution rate between net pension wealth and private savings is far less than 100 percent. But there is large discrepancy on the estimated substitution rate. Using the data from Canadian pension system,

Dicks-Mireaux and King (1984) indicates that pension wealth substitutes around 25% of the private savings. Diamond and Hausman (1984), Hubbard (1986) and Samwick (1997) study the pension system in America and find the substitution rate to be 20% or even less. Feldstein and Pellechio (1979) and Gale (1998) get higher substitution rate, respectively 100% and 39%-82%. But there are researches show that this is no significant substitution (Kotlikoff, 1979). Some other papers study the substitution relationship between private pension and private wealth and the results are mixed (Munnell, 1976; Gustman and Steinmeier, 1999). The major problem of using the cross-sectional difference is that the difference in the pension contribution rate usually represents the difference in other aspects, such as job characteristics and family demographic structure. Since it is unable to control all these factors, it is difficult to completely isolate the impact of pension contribution. The latest research use the third method, which is exploit the exogenous policy change as natural experiment, such and the reform of pension system in Italy or Britain (Attanasio and Brugiavini, 2003; Attanasio and Rohwedder, 2004; Bottazzi et al., 2006). The first two papers study the effect of net pension wealth on saving rate (flow), the last one focuses on the effect on private wealth (stock). They get similar results with Gale (1998).

In addition, many studies have noted the impact of pension wealth on savings have a strong heterogeneity. For example, some studies have emphasized the different impact of pension benefits on different age groups. Gale (1998) points out that the impact of pension differs widely among people with different educational level and the different credit constraints. Kotlikoff (1979) finds that if the family owns a house, the negative effect on wealth is almost zero, which is consistent with the existence of borrowing constraints target saving motive.

There are lots of studies attempting to analyze the reasons for high savings rates of Chinese residents, but very few empirical researches focus on the effect of pension system. Chamon and Prasad (2008) study household saving rate and the demographic characteristics and find that inadequate social security is a leading cause of high savings rate. He et al. (2008) exploit the pension reform in China during 1995 – 1997 and find that the increase of pension wealth causes the household saving rate to reduce 30%-40% on average, but this effect is only significant on those households with 35-49 year-old heads.

Few studies have directly investigated the impact of current pension contributions on current consumption and savings. Most studies assume that current contribution is equivalent to the discounted future contribution and only examine effect of the net pension wealth on savings and consumption[2]. This assumption is reasonable in the absence of credit constraint, for the consumer can borrow from the future to smooth consumption. Pension payments and benefits would only change the

[2] Kotlikoff(1979) notes the distinction between contributions and pension wealth. He finds that although the pension payment would reduce the accumulation of wealth, but it cannot be proved that the compulsory pension contribution substitutes personal savings, because the negative impact of current contribution on savings is similar with that of general tax.

life time budget constraint. But if there are credit constraints, current payment and future payment is no longer equivalent, hence the net pension wealth does not fully reflect the impact of current payment.

Few of the foreign researches study the effect of pension payment itself also because that foreign pension policies are mostly unified on the country level, and it is difficult to find exogenous differences. But in China, the pension policy is basically unified on the city level before 2007[3]. And in order to encourage policy innovation based on local conditions, the local governments are enforced the power to select the specific implementation of the pension program, therefore the pension policies are quite different among different regions. Even with the same contribution rate, the different regulatory enforcement[4] and different standard base payment will still lead to difference in the actual burden.

Though the difference of pension payment burden between regions and firms is not exogenous, as they may be correlated with many other unobservable characteristics of the area or the business, the Chinese pension policy changes over time provides us with good time-varying cross-sectional differences. Prior to 1997, with the exception of the pilot areas, employees do not need to pay the pension contribution. On July 16, 1997 the State Council issued the "on the decision of the establishment of a unified basic old-age insurance system for enterprise employees" required that "in 1997 the proportion of individual contributions must be not less than 4% of the wage. After 1998, the individual contribution rate should increase 1% in every two years, and ultimately reach 8% of wages. The regions with good conditions and fast wage growth should increase the proportion of individual contributions at a faster speed." This policy leads to the different contribution rate growth among regions, which also contributed to the issue of a document in 2003 requiring all the regions to adjust the individual contribution rate to 8% as soon as possible by the Ministry of Labor and Social Security[5]. Therefore, after controlling for the regional and year fixed effect, the policy change provides us with the exogenous change of contribution rates among regions and over time. The statistical description shows that the average contribution of the head and his\her spouse in the household is 5.9% (if they contribute) and the variation is 3%. The growth is 0.3% per year and the

[3] Back in 1998, the State Council required all provinces to gradually introduce pension system at the provincial level. However, the progress rates were uneven. Until 2007, the whole country, apart from a few regions like Beijing and Shanghai, still remains in the city and county-level co-ordination. Specific examples can be seen: http://cnss.cn/xwzx/jdxw/200709/t20070929_161190.html。

[4] Many enterprises and workers try to evade pension payment by under-reporting the base wage payment. During the first half of 2005, the total under-reporting amount was found to be 12.684 billion yuan around the country, the social security evasion was 1.575 billion yuan. http://news.xinhuanet.com/newscenter/2005-08/04/content_3309758.htm。

[5]For example in 2004, most of the city has achieved an 8% contribution rate of individual workers, but it is still practiced in many cities the 7% contribution rate (such as Jinan, Wuhan, Yantai, etc.), and some cities are even implementing a 5% payment rate (Xiamen). On December 2005, the State Council issued "On improving the basic pension system", which required that the individual pays the unified contribution rate of 8% after January 2006.

variation of the growth is 0.3%[6], which provides us with the good opportunity to study the direct effect of current contribution on consumption and savings.

3 A Simple Theoretical Model

In order to offer a theoretical framework to support our empirical study, we build a simple life-cycle model in this section. In building this model, this study takes three reasonable assumptions into consideration: 1) economic agent makes contribution to the pension system before retirement, and gets pension payment after retirement; 2) economic agent faces budget constraint; 3) there is a demand for target saving to purchase of bulk stock or other unexpected large payment.

In literature, target saving, or buffer-stock saving, is considered to be the precautionary saving for the uncertainties in the future. However, it is difficult to get the explicit solution to the problem if we introduce uncertainties into this model[7]. Instead, this theoretical model has introduced another factor into this model, which is the large payment for house purchases or other commodities. The consumers, in facing of budget constraints, would have motive for target savings and buffer-stock savings.

We take the purchase of house as an example to illustrate this problem. Suppose economic agent has to make a three period decision, in each period of time, they have to make decision on whether to buy the house or not. Due to the credit constraint, only when the personal saving reaches the required amount of this purchase, economic agent is able to buy this house. Given the fact that consumption of housing is important to the welfare of representative agent, people would save a lot and reduce the current consumption to buy the house. In detail, the following maximization problem well illustrated the inter-temporal choice:

$$
\begin{aligned}
&Max_{C_1,C_2,C_3,H_1,H_2,H_3,A_1,A_2} \quad U(C_1,H_1)+\beta U(C_2,H_2)+\beta^2 U(C_3,H_3)\\
&\quad s.t.\ \ C_t+P(H_t-H_{t-1})+A_t=(1-t_w-t_{ss})W_t+(1+r)A_{t-1} \qquad for\ \mathrm{t}=1,2\\
&\qquad C_3+P(H_3-H_2)=(1+r)A_2+b*B \qquad for\ \mathrm{t}=3\\
&\qquad B=t_{ss}(1+r)^2(W_1+W_2/(1+r))\\
&\qquad C_t\geq 0, A_t\geq 0, H_t\in\{0,1\}, A_0 given,
\end{aligned}
$$

U(.) is the utility function, β is the discounted rate, C_t is the consumption in period t, H_t is the 0-1 variable representing the state of owning a house, P is the price of house, A_{t-1} is the saving at the beginning of period t, the interest rate is r. A_0 is the initial saving. W_t is the wage in period t. The representative agent works in first two periods, is supposed to retire at the third period, and die at the fourth period. The income tax rate is t_w and the social security contribution rate is t_{ss}. B is the total pension contribution, which includes the interest revenue while b is the return rate of the contribution.

[6] We drop the outlier in which the contribution rate is larger than 0.15, otherwise the variation would be larger.

[7] The only way to get explicit solution is to restrict the consumer's preference by assuming the quadratic utility function. But this form of utility function excludes the possibility of precautionary saving in this model.

If b=1, the pension contribution shares the same rate of return as the investment in the capital market; b>1 means that the pension contribution has a higher return than the capital market and the vice versa. To simplify this model, we assume that b is a constant. It is assumed that $\beta=1/(1+r)$.

Suppose the house price is enough high so that the initial income is insufficient to buy the house, mathematically, $P>(1-t_w-t_{ss})W_2$, $P>(1-t_w-t_{ss})W_1$ and $P>b*B$. Thus, the budget constraint means that the representative agent must save to buy house if he/she wants to buy a house in the second period, or $P>A_0(1+r)^2$. In order to solve this maximization problem, we would find the optimal choice by comparing the utility delivered by different choices of $\{C_j, A_j\}_{j=1,2,3}$. We would focus on the optimal choice of purchasing house in the second period, which is $H_1=0$, $H_2=1$, and $H_3=1$. Given this choice, we could find the best response of $\{C_j, A_j\}_{j=1,2,3}$. Appendix A gives the detailed explicit solution. Here, we illustrate the economic intuition of the results as following.

First, if the budget constraint is not binding in the second period, we have $A_2>0$. In this traditional inter-temporal problem, the consumption is determined by the change of lifetime wealth and thus determined by the return of pension contribution before retirement. If the return from the pension contribution is higher than the return in the capital market, or b>1, then the consumption would increase with the contribution rate in the pension system. Suppose we take the housing purchase as household saving, and define the saving rate as the saving divided by the disposable income exclusive of the pension payment, the increase of consumption in facing of a high rate of return in the pension system would reduce the current saving rate.[8]

However, if the return inside the pension system is enough high, the representative agent would borrow in the third period to buy a house in the second period. Under this assumption, the budget constraint in the second period will be binding and the net saving would be 0. The representative agent would not smooth his/her consumption among three periods, but instead among the first two periods. The consumption in the third period is paid by the pension payment. Thus, the return in the pension system could not affect the consumption in the first two periods. Obviously, when the contribution rate is increasing, the net income in first two periods would decrease and so were the consumption before retirement. Since the consumption and disposable income both decrease because of the high contribution rate, it is uncertain whether the saving rate would increase or not, which is determined by the relation between P and $A_0(1+r)^2$. If $P>A_0(1+r)^2$， saving rate go up with the increase of contribution rate. This condition means that the representative agent needs to save in the first period in order to buy a house, which coincides the fact that the down payment of house purchase is high.

In this analysis, we didn't consider for the change of the pension policy in China. If there was

[8] In literature, saving rate is usually defined as saving/disposable income before contribution (S_u), while in our definition, saving rate = $S_u \times Y_b/Y_a+1-Y_b/Y_a$, where Y_a is income after contribution; Y_b is income before contribution. It can be easily deducted that the negative effect of pension contribution is weaker on S_u than on the saving rate defined in this paper.

some adjustment in the pension system after the individual made contribution to it, then the rational agent would make the optimal decision again based on the new policies. Thus, the effect of the pension policies depends on how many periods he/she consider for, or the age of the representative agent.

4 Model Specification

Based on the above analysis, we would focus on the direct effect of current pension contribution on employees' consumption and savings. Since we only have household consumption data, the regression is based on household level and the pension contribution variable is calculated based on the head's and spouse's contribution.

The baseline model is set as follows：

$$\ln(C)=\alpha_1*pension+\beta*\ln(Y)+\lambda*Dpension+\gamma*X+\varepsilon \quad (1).$$

C is the household's living expenditure, and *pension* represents the household's pension contribution burden. We mainly consider the effect of contribution rate, and use contribution level as robust check. We use the average contribution rate of the head and spouse in the baseline regression. If only one of them contributes, we use the individual's contribution rate instead.

Y reflects the household's income before pension contribution. Since we have to control for the total wage income of the family, which would reflect the job characters and is strongly correlated with pension contribution, we choose to control for household wage income and other income in the baseline regression.[9] Therefore, α_1 represents the effect of contribution rate on consumption, given income before contribution. Since the jobs that provide pension are very different from those that do not, we add the dummy variable "whether contributes" (*Dpension*) to control the linear effect of these job characteristics on consumption. Thus, α_1 reflects the difference of consumption between household with heavy and light contribution burden, given that they all contribute.

What is different from the literature is that we do no directly control for net pension benefits. Because of the lack of enterprise payment data, the calculated pension wealth might be greatly biased.[10] However, pension benefits also have strong correlation with individual contribution, there α_1 reflects both the positive effect of pension benefits on consumption and the negative effect resulted from credit constraints, which is the combined effect of current pension contribution. Though we are able to avoid the bias from the calculation of net pension wealth, we cannot separate these two effects.

[9] We also tried to control for gross income before contribution and wage income, and the results are quite similar with that of the base model. But adding these two variables at the same time might cause collinearity problem.

[10] Most related literature study the pension systems in developed countries, which usually have no personal accounts. They calculate the net pension wealth by assuming the growth rate of wages, family pension contribution rate and the calculation formulas in the policy. However, due to fact that the difference between China's individual pension benefits mainly comes from the enterprise contribution part, we do not have enough data to use this kind of estimation.

In addition, we control for the city and year fixed effect, and the interaction of province dummies and year to allow for the different linear trend of consumption in different regions.[11]。

Pension contribution is correlated with lots of job characters, such as wage, industry and the stability of the job. These characters would be very likely to directly affect consumption. We try to control these factors, including the wage quintile group dummies of head and spouse (5 groups), age of head, age group dummies (6 groups), education level dummies (9 groups), work experience and its square, industry dummies (16 groups), occupation dummies (8 groups)， and the enterprise character (state-owned, urban collective, private, others), sex of head, race and "hu kou". Thus we have controlled the nonlinear effect of wage and age. We also control for the demographic characters, including the number of child under 18, and the number of people older than 60.

After controlling for these characters, the difference of pension contribution results from the nonlinear change when the wage reaches the upper bound or lower bound of contribution base. The common policy is that if the wage if less than 60% of the local average wage, the employee should use the 60% of the average wage as contribution base; if the wage is higher than 300% of the local average wage, the employee should use 300% of the average wage as contribution base. Our data shows that there are 44.1% of the households with head's or spouse's wage lower than the lower bound, and there are 1.9% of the households with head's or spouse's wage higher than the upper bound. Thus the control of wage and wage quintile dummies cannot fully control for this nonlinear effect. Also, because we have controlled for the wage and wage quintile dummies, it would not directly affect consumption and savings whether the wage level is out of the bound.

Apart from these factors, pension contribution is correlated with other social security items, such as medical insurance, housing funds and other items. If these items would directly affect consumption, the positive correlation between pension contribution and other contribution would cause the estimation of the effect of pension contribution to be overvalued. Thus we consider controlling for the contribution of other social security item to check whether there is overvaluation.

Though we have tried to control for the job characters to an large extent, there are still some unobservable factors correlated with job characters and would affect consumption as well. For example, the enterprise with high pension contribution rate are usually large and well developed enterprises. There could also be self-selection problems, for people who are risk averse and prefer to save more would be more likely to choose jobs that provide good security. Therefore we need to use instrument variables to deal with the endogeneity problems

We use the average contribution rate in each city as the instrument variable for individual contribution rate. As mentioned before, after the year 1997, each city should raise the individual contribution rate from 4% to 8%. But the growth pace could be adjusted by the local government.

[11] We also tried to control for the city linear trend, and the results are quite similar.

Thus, the average contribution rate of a city reflects the city's pension policy of that year, which would largely affect the individual contribution. Since we have already controlled for the city and year fixed effect and the provincial linear trend, we are actually exploiting the difference of change of contribution rate over years in different cities. Besides, though the different growth rate of pension burden could reflect the difference of institutional environment among cities, these differences would have been controlled by the city fixed effect and the regional trend if they are not changing nonlinearly over time. Therefore, the city average contribution rate could only affect household consumption through its effect on individual pension contribution burden, and thereby being a efficient instrument variable. Also, for the "whether contributes" dummy, we use the participation rate of each city as its instrument variable.

Finally, in order to study the heterogeneity of the effect of pension contribution, we add into the baseline model the interaction of pension contribution and group dummies:

$$\ln(C)=\alpha_1*ssc+\alpha_2*Group+\alpha_3*Group*ssc+\beta*\ln(Y)+\lambda*Dpension+\gamma*X+\varepsilon \quad (2).$$

α_3 reflects how the effect of pension contribution changes among different groups. We focus on the difference between different age groups, the groups with different expected benefit and different credit constraint, which would be discussed in detail in the second part of section 6.

5 Data Description

The data come from the annual Urban Household Survey (UHS) conducted by the National Bureau of Statistics in China. The UHS covers all provinces in China, and uses a probabilistic sampling and stratified multistage method to select households. It is a rotating panel in which one-third of the sample is replaced each year and the full sample is changed every three years. The sampled households are asked to keep detailed records of incomes and expenditures every day. The survey yields demographic and income information for every member of the family, but unfortunately, has no information on assets.

We have access to data stemming from 1997 to 2006 and concerning the nine Chinese provinces of Beijing, Liaoning, Zhejiang, Anhui, Hubei, Guangdong, Sichuan, Shanxi, and Gansu, which represent different regions and economic conditions. The mean values and the trends of the most important variables are quite comparable between our sample and the national sample. The statistics are available to interested readers on request.

Since there is no information on each member's expenditure, our analysis is based on consumption of the whole family. We drop families whose head is under the age of 25 or above the age of 75, because we cannot find enough families in these age groups to get reliable estimates of inequality measures. Finally, we exclude outliers with annual disposable income of less than 100 RMB, the ten families with the highest income (annual disposable income of more than 500,000 RMB),

families whose living expenditure is either 5 times larger than their income or 2 times larger than the income but larger than 200,000 RMB, and families whose family size is larger than 10.

The main contributor of the household may not be the head or spouse, but the head makes all the important saving and consumption decisions. So we drop those samples in which the head or spouse contributes less than 80% of the families total pension contribution[12]. We also drop the households in which the head is retired or over 60 years old, or is self-employed or have no job. Besides, since the public sector (shi ye dan wei) implements another pension system, we drop those households with the head works for the public sector. Finally, our sample includes 101 cities and 30,670 families in total.

Our data is composed of two parts, containing individual and family information respectively. We use the individual part to describe the contribution rate and participation rate. We drop the individuals who have no work, or work for the public sector, or is self-employed, and we have around 84,000 samples left. We also drop the outliers in which the pension contribution is larger than 15%. Table 5.1 reflects the change of pension coverage rate on employees over time. The coverage rate stays over 70%, and the calculated coverage rate in our data is quite close to the official data, which is 76%. However, the coverage rate is declining over time.

We also calculated the average pension contribution level and contribution rate, which are both rising from 2002-2006. The average contribution rate has reached 6.4% in 2006, but it is still less than the 8% required by the central government. The total social security contribution rate, including pension, medical insurance, unemployment insurance and housing funds, has the same trend with pension contribution rate. However, it is noted that the difference of contribution rate is large among different regions (Graph 5.1), and the trends are not the same.

Pension benefit is strongly correlated with the replacement rate (pension income of the retired employees and the local average wage). Table 5.2 shows that though the replacement rate is declining during the five year, it's still very high and has reached 70% of the average wage[13].

In the absence of enterprise payment data, we cannot calculate the return rate of total pension contribution. Here we give the ratio of pension income of the elderly and the contribution of employees, which is very high. Finally, we calculate the change in pension dependency ratio. Since there is not enough information in our data to distinguish between pensioners and retired employees from the public sector, we assume that the proportion of public sector employees to maintain consistency among all ages, which means that the proportion of retired public sector employees in all the people who receive retirement payments and the proportion public stuff in all the workers are equal. We use the number of pensioners and pensionees to calculate dependency ratio. Table 5.2 shows

[12] We also try the samples in which the head himself contributes more than 80% of the household's pension contribution, and the results are quite similar.

[13] Because we do not have enough information to distinguish between the participants of pension scheme and the retired employees from public sector, our calculation of the average pension income may be positively biased.

that pension dependency ratio is rising rapidly during the five year, from 43% to 49%. The Chinese pension system is facing increasing pressure.

Finally, we use the family data, which is used in our regression, to analyze the correlation between contribution and income. In Table 5.3, we divide the households into five groups according to their income rank in the province and calculate the average income and contribution rate of different groups. Because wage income is strongly correlated with disposable income, the result based on wage groups is quite similar. As expected, pension contribution rate and the total social security contribution rate have strong correlation. We also find that pension contribution rate have correlates inversely with income levels and wage levels, because low-income families are more likely to be under the lower bound of contribution base. Compared with other groups, the contribution rate of the highest income group has a very substantial decline, which could mean that they are over the upper bound and the amount of payment will not be in proportion with the increase in wages. However, the participation rate of pension increases as the rise of income.

For the descriptive statistics of main variables used in the regressions, see Appendix Table B.1. Appendix Table B.2 reports the result of first stage regressions of the instrument variables.

6 The effect of pension contribution on consumption

6.1 Average effect

Table 6.1 reports the effect of pension contribution rate on household consumption. The first five columns report the result of instrument variable regression, using the city average contribution rate as instrument. In the second column controls for the dummy “whether contributes”, and use the city coverage rate as instrument. The results indicate that pension contribution have negative impact on the current household consumption. Given disposable income before contribution and given that the household contributes, a 1% rise of contribution rate would cause household consumption to drop about 3.3%. Since we have already controlled for the wage of head and the wage quintiles, the restrain effect of pension contribution cannot be resulted from the negative correlation of wage and contribution rate. Appendix Table B.2 reports the result of first stage regressions of the instrument variables. These two instruments both have significant influence on contribution rate and “whether contributes” dummy. In addition, we add the instrument variables into the baseline model, and the results show that they would not affect consumption directly. Therefore the instruments are proved to be efficient. In the last three columns, the OLS results of the base model are given as comparison. Contribution rate shows significant impact on consumption in the OLS regressions, but there only slight effect, which is quite different from the result given by the IV regressions. It might be the

endogeneity of contribution rate that cause the positive bias of OLS estimation.

In the third column the interactions of high income family (the top 20% highest) and low income family (the low 40% lowest) with income are added to allow for the heterogeneous marginal propensity to consume. In the fourth column, we add the contribution rate of other social security items in case that the estimation of pension contribution would contain the effect of other social security items. We also use city average contribution rate as their instruments to deal with endogeneity. These items are combined to be one variable "other social security contribution" in the fifth column to avoid collinearality. The results do not change much in all of these specifications.

We control for the income other than wage, not gross income, to avoid the collinearality caused by the strong correlation between wage and gross income. The first part of Table 6.2 reports the results of the regressions controlling for the gross income

In the second part of Table 6.2, the expenditure on durable goods, education and health are excluded from consumption. Because of the low elasticity of these expenditures, household may not re strain these expenditures because of target saving or other motives. Also the medical field are also experiencing policy changes during the same time, which may cause unnecessary noise in the regression. The results show that the negative effect of pension contribution declined slightly, which is consistent to the fact that we find pension contribution have no significant on education and health expenditures.[14]

The last part of Table 6.2 shows the impact pension payment level on consumption. As high payment level does not necessarily correspond to the high pay rate, we expect the effect to be negative, but to a different extent. Regression results show that given disposable income before contribution, an 1% rise in the pension contribution level would reduce consumption by 0.3%.

In Table 6.3, we report the effect of contribution rate on saving rate. We use two definition of the saving rate. The first one is savings/ disposable income after contribution (SR1) and the second one is savings/ disposable income before contribution (SR2), which is commonly used in the literature. The results show that, as expected, pension contribution has positive but not significant effect on saving rate. In the presence of credit constraints, contribution would cause the saving rate to rise only when $P > A_0(1+r)^2$, which may not be hold for some households. Also, the positive effect on SR1 is stronger than that on SR2, as we have predicted in our model.

6.2 The heterogeneous effect on different groups

In this sub-section we will consider the heterogeneous impact of pension payment between

[14] We do not report this result in the paper, and the interested readers may obtain a copy of the author. This result is not consistent with the finding of He et al. (2008), who find that health and education spending is more sensitive to the change pension wealth.

different groups. Our basic measurement model concerns about the combined effects of current pension contribution on current consumption. We hope that by comparing the different effect of pension payment on groups with different expected future benefit and different credit constraints, we can distinguish between the positive effects from benefit correlated with contribution and the negative effect resulted from credit constraints. First, we look at whether different expected pension benefits will lead to different level of inhibition effect of contribution.

As the demographic structure changes, pension dependency coefficient has been rising and pressure on the future pension system could be very large. One might expect future policy adjustments and the expect pension benefit to decline. Therefore, there is difference of pension benefits between different age groups, and we can expect that younger people would get lower yield after their retirement. Table 6.4 reports the different effect of pension contribution on different age groups. The result shows that the negative effect is weakened on the groups with 40-50 year old heads and 50-60 year old heads.

Besides, before 2006, the marginal return of enterprise contribution was 0, for that the pension benefit was not based on enterprise contribution. After 2006, pension benefit started to correlate with enterprise contribution so that the return rate of participation was raised. We study the difference of the effect of pension contribution before and after 2006 (second column of Table 6.4), and find that the restrain effect decline after 2006.

Though the directions of these estimations are as expected, the estimations are not significant. There is no strong evidence that the restrain effect of pension contribution would change as the benefits change. The illustrative model in this paper indicates that the benefit would be influential only when the household has no credit constraint. Thus, the influence of credit constraints dominates.

Next, we examine the influence of credit constraints on the effect of pension contribution. We use two measures of credit constraints. The first one is income and the second one is whether the household has debts. If the family has debt, they might be facing credit constraint. However, the second measure might be problematic in that those who face the strongest credit constraint may not be able to get money. Actually, credit constraint might be well measured by the household's wealth, but we do not have information on household savings (stock) and other wealth.

Table 6.5 reports the corresponding results. In Column 1, the negative effects on the high income group (20% highest income) and middle income group (the next 40%) are significantly weaker. The high income group faces the lowest restrain, followed by the middle income families, and the poor group (bottom 40%) is receiving the largest negative impact. This result confirms the hypothesis that pension contribution would restrain household consumption in the presence of credit constraint and the households with stronger credit constraint would face stronger negative impact. The second result shows that the households with debts are more likely to reduce consumption when the contribution rate rises. Yet the estimation is not significant, which may be due to the defect of this measure.

We also consider the effect of housing. If the household owns a house, their target saving motive would be weaker. But if they have debt at the same time, most probably housing loan, they are still facing credit constraint. If they are not facing credit constraint, then pension contribution might have positive effect on their consumption. The third column of Table 6.5 gives the result concerning housing. The base group is the households owning housing and without debt. The households with no house and with debt are facing the strongest restrain effect. However, the households without housing or debt are facing weakest restrain, which is unexpected. Being 15% of the whole sample, these households might have no demand for housing.

6.3 Robust Check

The results in our baseline model show that pension contribution has significant restrain effect on household consumption, and it may also cause the saving rate to rise. The mechanism lies in the credit constraints of Chinese families and their target saving motive. This mechanism should also work when it comes to other kind of tax that would reduce current disposable income, such as income tax. Since income tax would not bring any direct benefit, its restrain effect might be stronger.

Table 6.6 reports the result of the regressions using income tax rate as independent variable and setting the instrument variables according to the nine-scale tax rate form (column 2) and the city average tax rate (column 3). The negative impact is significant in the IV regressions. Since tax rate might be correlated job characters, thus affecting the estimation of the impact of pension contribution, we add tax rate into our baseline model (column 4). The result shows that the estimation of pension contribution is not affected.

In addition, we try different samples. Table 6.7 reports the results from the sample in which only the head is the main contributor in the household, and the results are quite similar.

7 Payroll Tax and Aggregate Savings

The above analysis considered only the effect of pension contributions on the consumption of pensionees. But a more important issue is the overall impact of pension payment on consumer savings. Although the increasing pension payment inhibit the consumption of pensionees, but if the pensioners get better benefits, thus leading to their increased consumption, then there is no need to worry about the inhibition of pension payment on overall consumption. Although there is no official announcement that the payment of workers have strong correlation with the current level of the benefits for the elderly, but some cases suggest that the city with more surplus in the pension funds tend to enhance the pension benefits. Therefore it is necessary to analyze the relationship between average contribution rate of a city and the consumption of the elderly.

In our sample, 69.8% of the women over 50 or men over 55 years receive pension benefits (here we cannot distinguish between the retired worker from public or private sectors). 79.9% of the people over 60 receive pension benefits. There are 23 064 families in which at least of the head or spouse receive pension benefits, and there are 16 880 households in which the head receive pension benefits. We use both these two types of sample in our analysis and the results are very similar. The following report is based on the first type of sample.

The first part of Table 7.1 reports the effect of city average payment burden on pension benefits. The results show that after controlling for the city and year fixed effects, the average city pension contributions rates have no significant impact on the average pension benefit. Therefore, on average, the increased contribution rate has not leaded to the increase of the current pension benefits. The second part of shows that after controlling for the city and year fixed effects, the rise of average city pension contributions rates would not lead to the rise of average propensity of the elderly, and it may even cause the APC to decline. In the third part of Table 7.1, a comparison is made between the propensity to consume of the elderly (pensioners) and the labor force. We found that the elderly tend to consume less, which have been verified in different regression settings.

These results indicate that there is no evidence that the rising contribution burden of pensionees will bring the increase of current pension benefits. Even if the pension benefit is increased, due to the low propensity to consume of the elderly, total consumption would not rise. Therefore, the effect of pension contribution on gross consumption and savings should be quite close to that on the pensionees, as we have estimated.

8 Conclusion

Using the Urban Household Survey Data of 9 provinces during 2002-2006, we study the effect of pension contribution on the consumption and saving behavior of pensionees. We exploit the change of pension contribution rate and participation rate over time and the discrepancy of that among different regions to set the Instrument Variable for household pension contribution, so as to deal with the endogenous problem.

The results show that after controlling for the wage before contribution, pension contribution has a significantly negative impact on household consumption. A one percent rise of pension contribution rate would cause the consumption to decline about 3.3%. We also find that this negative effect would be stronger on poorer families, but has no strong correlation with future pension benefit. The effect of pension contribution rate on saving rate is positive but not significant. Moreover, our simplified analysis shows that the rise of pension contribution does not necessarily lead to the rise of pension benefit for the old. This finding, along with the fact that the consumption propensity of elderly people is lower that the young, show that the rise of pension contribution would restrain aggregate

consumption.

The results indicate that while promoting of pension by expanding the coverage rate and benefit rate to reduce precautionary savings and stimulate consumption, attention should be paid to the channels to achieve these policy objectives. If they are achieved by increasing the contribution rate of employees, which will cause the drop of their current disposable income, the it is likely to curb consumption, rather than stimulate it, in the presence of imperfect credit market.

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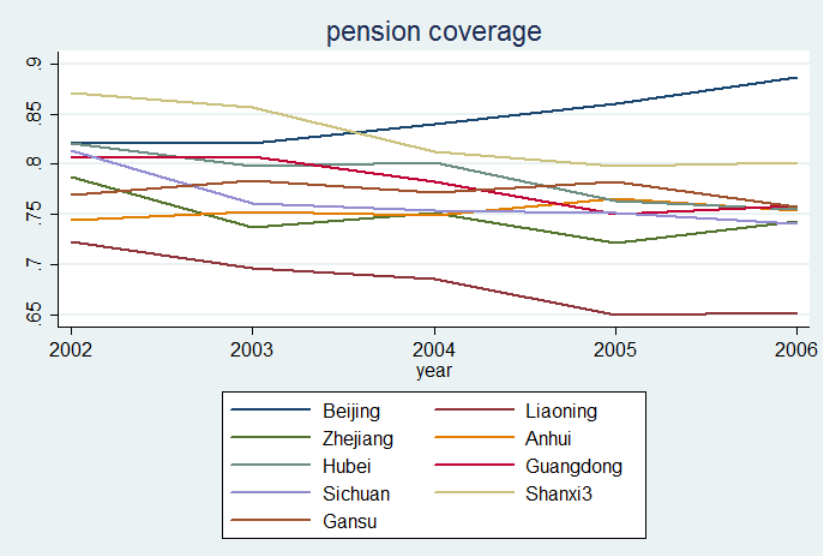
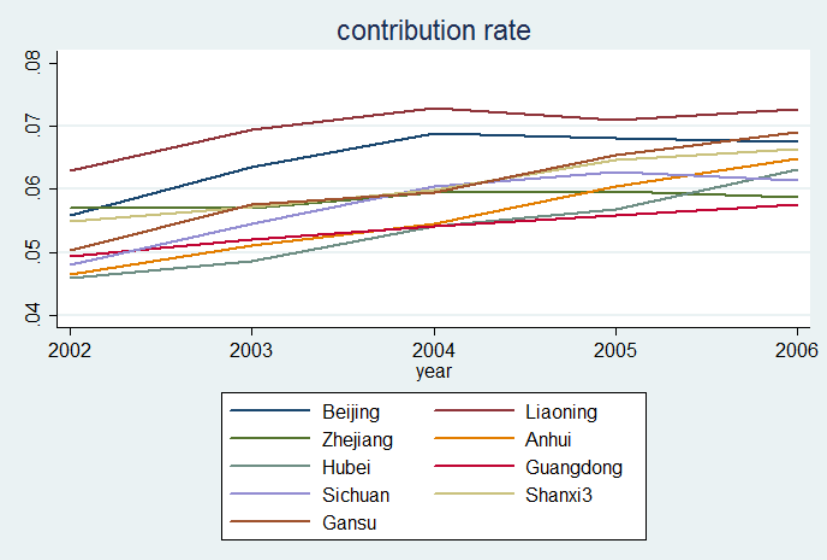
Graph 5.1 (a) Coverage rates in different provinces over time



(b) Contribution rates in different provinces over time



Appendix A

Suppose the utility function is: $U(C)=\frac{C^{1-\gamma}}{1-\gamma}$, and define $d \equiv \beta^{1/\gamma} r^{(1-\gamma)/\gamma}$.

When the budget constraint is not binding, or $A_2>0$, we have the traditional inter-temporal problem:

$Y_t=(1-t_w-t_{ss})W_t$, $w_t=(1-t_w)W_t$, the life time budget constraint is:

$$C_1+\frac{C_2}{1+r}+\frac{C_3}{(1+r)^2}=A_0(1+r)+Y_1+\frac{Y_2-P}{1+r}+\frac{bB}{(1+r)^2}=A_0(1+r)+w_1+\frac{w_2-P}{1+r}+\frac{NSS}{(1+r)^2}$$

$$\text{NSS net wealth}=(b-1)t_{ss}(W_1+\frac{W_2}{1+r})(1+r)^2$$

The optimal solution:

$$C_1=\frac{1}{1+d+d^2}[A_0(1+r)+Y_1+\frac{Y_2-P}{1+r}+\frac{bB}{(1+r)^2}];$$

$$C_2=d(1+r)C_1=\frac{1}{1+d}[A_1(1+r)+Y_2-P+\frac{bB}{(1+r)}];$$

$$C_3=d(1+r)C_2=d^2(1+r)^2C_1=[A_2(1+r)+bB];$$

$$s_1\equiv\frac{Y_1-C_1}{Y_1}=1-\frac{1}{1+d+d^2}[1+\frac{W_2}{(1+r)W_1}+\frac{1}{Y_1}(A_0(1+r)-\frac{P}{1+r})+\frac{bt_{ss}}{Y_1}(W_1+\frac{W_2}{1+r})]$$

$$s_2\equiv\frac{Y_2-C_2}{Y_2}=1-\frac{d(1+r)}{1+d+d^2}[\frac{W_1}{W_2}+\frac{1}{(1+r)}+\frac{1}{Y_2}(A_0(1+r)-\frac{P}{1+r})+\frac{bt_{ss}}{Y_2}(W_1+\frac{W_2}{1+r})]$$

Thus,

$$\frac{\partial C_1}{\partial t_{ss}}=\frac{1}{1+d+d^2}(b-1)(W_1+\frac{W_2}{1+r})$$

$\frac{\partial C_1}{\partial t_{ss}}$ is determined by b - 1。

$$\frac{\partial s_1}{\partial t_{ss}}=-\frac{1}{(1+d+d^2)(1-t_w-t_{ss})^2W_1}[A_0(1+r)-\frac{P}{1+r}+b(1-t_w)(W_1+\frac{W_2}{1+r})]$$

$$\frac{\partial s_2}{\partial t_{ss}}=d(1+r)*\frac{W_1}{W_2}*\frac{\partial s_1}{\partial t_{ss}}$$

Hence, $\frac{\partial s_1}{\partial t_{ss}}\le(\ge)0, \frac{\partial s_2}{\partial t_{ss}}\le(\ge)0$ *if* and only if $b\ge(\le)\frac{\frac{P}{1+r}-A_0(1+r)}{(1-t_w)(W_1+\frac{W_2}{1+r})}$.

$$\frac{P}{1+r}>A_0(1+r)+(1-t_w-t_{ss})(W_1+\frac{W_2}{1+r}),$$

Thus, $\frac{\frac{P}{1+r}-A_0(1+r)}{(1-t_w)(W_1+\frac{W_2}{1+r})}<1$, only if $b>1$, we have $\frac{\partial s_1}{\partial t_{ss}}\le 0$

When the budget constraint is binding, which means A_2=0, the optimal solution is:

$$C_1 = \frac{1}{1+d}[A_0(1+r) + Y_1 + \frac{Y_2 - P}{1+r}]; C_2 = d(1+r)C_1 = [A_1(1+r) + Y_2 - P]; C_3 = b * B$$

$$A_1 = \frac{d}{1+d}[A_0(1+r) + Y_1 - \frac{Y_2 - P}{\beta(1+r)}]$$

$$s_1 \equiv \frac{Y_1 - C_1}{Y_1} = \frac{A_1 - A_0(1+r)}{Y_1} = 1 - \frac{1}{1+d}[1 + \frac{W_2}{(1+r)W_1} + \frac{1}{Y_1}(A_0(1+r) - \frac{P}{1+r})]$$

$$s_2 \equiv \frac{Y_2 - C_2}{Y_2} = 1 - \frac{d(1+r)}{1+d}[\frac{W_1}{W_2} + \frac{1}{(1+r)} + \frac{1}{Y_2}(A_0(1+r) - \frac{P}{1+r})]$$

$$s_2{}^H \equiv \frac{Y_2 - C_2 - P}{Y_2} = 1 - \frac{d(1+r)}{1+d}[\frac{W_1}{W_2} + \frac{1}{(1+r)} + \frac{1}{Y_2}(A_0(1+r) + \frac{P}{\beta(1+r)})]$$

Thus,

$$\frac{\partial C_1}{\partial t_{ss}} = -\frac{1}{1+d}(W_1 + \frac{W_2}{1+r})$$

$$\frac{\partial s_1}{\partial t_{ss}} = -\frac{1}{(1+d)(1-t_w - t_{ss})^2 W_1}(A_0(1+r) - \frac{P}{1+r});$$

$$\frac{\partial s_2}{\partial t_{ss}} = d(1+r) * \frac{W_1}{W_2} * \frac{\partial s_1}{\partial t_{ss}};$$

$$Hence \frac{\partial C_1}{\partial t_{ss}} < 0;$$

When $P > A_0(1+r)^2$, saving rate s_1 and s_2 are increasing with t_{ss}.

Table 5.1 Descriptive Statistics on Pension Contribution (Individual Data)

Year	Obs.	Coverage rate	Average contribution	Average contribution rate	Average social security contribution rate
2002	14428	79%	677.60	5.2%	8.7%
2003	16172	77%	822.25	5.6%	9.3%
2004	17364	77%	1008.99	6.0%	9.9%
2005	18062	76%	1166.46	6.2%	10.0%
2006	18412	76%	1332.86	6.4%	10.4%
Total	84438	77%	1015.56	5.9%	9.7%

Table 5.2 Pension Benefits and Dependency Ratio (Individual Data)

Year	Replacement rate	Benefit/contribution	Dependency ratio
2002	78.69%	1532.31%	42.75%
2003	74.15%	1306.13%	42.34%
2004	71.90%	1142.83%	43.69%
2005	70.83%	1087.81%	48.68%
2006	69.69%	1020.61%	48.94%
Total	72.74%	1199.92%	45.53%

Table 5.3 Pension contribution of difference income groups (household data)

Income group	Contribution rate	Contribution level	Participation rate	Social security contribution rate	Disposable income	Wage income	Tax rate
1	7.08%	991.59	64.53%	10.17%	13277.82	11601.69	1.24%
2	6.43%	1214.77	82.28%	9.96%	20496.06	19069.66	1.09%
3	5.99%	1480.12	88.25%	9.89%	26543.07	25279.70	1.35%
4	5.64%	1769.74	91.87%	9.89%	34577.25	33568.21	1.48%
5	4.89%	2301.75	94.18%	9.28%	57198.28	53651.96	2.06%
Total	5.89%	1613.93	83.82%	9.79%	30148.45	28357.39	1.60%

Table 6.1 The effect of pension contribution rate on ln(consumption)

	Dependent variable: ln(consumption)							
	IV					OLS		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Contribution rate	-3.346**	-3.328*	-3.374*	-3.278*	-3.464*	-0.309***	-0.675***	-0.668***
	(1.690)	(1.776)	(1.756)	(1.880)	(1.829)	(0.091)	(0.114)	(0.114)
Whether contributes		0.057	0.054	0.032	0.068		0.077***	0.078***
		(0.149)	(0.148)	(0.151)	(0.154)		(0.014)	(0.014)
Housing fund				2.857				
				(3.093)				
Medical insurance				-1.449				
				(3.331)				
Other item				-0.136				
				(2.872)				
All items other than pension					1.633			-0.103
					(1.858)			(0.094)
Obs.	30670	30670	30670	30670	30670	30670	30670	30670
R-squared	0.63	0.64	0.64	0.62	0.63	0.65	0.65	0.65

Notes: Robust standard errors in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%. We control for ln(family wage income), ln(income other than wage), the wage quintile group dummies of head and spouse (5 groups), age of head, age group dummies (6 groups), education level dummies (9 groups), work experience and its square, industry dummies (16 groups), occupation dummies (8 groups)， and the enterprise character (state-owned, urban collective, private, others), sex of head, race and “hu kou”. In addition, we control for the city and year fixed effect, and the interaction of province dummies and year. The first five columns report the result of instrument variable regression, using the city average contribution rate as instrument. In the second column controls for the dummy “whether contributes”, and use the city coverage rate as instrument. In the third column the interactions of high income family (the top 20% highest) and low income family (the low 40% lowest) with income are added. The last three columns use OLS regression.

Table 6.2 The effect of pension contribution on ln(consumption)

	Dep. Var.: ln(consumption), controlling for gross income			
	(1)	(2)	(3)	(4)
Contribution rate	-3.075**	-3.142**	-3.243**	-3.350**
	(1.498)	(1.562)	(1.567)	(1.632)
Whether contributes		0.101	0.109	0.126
		(0.132)	(0.132)	(0.140)
All items other than pension				3.103*
				(1.680)
Obs.	30663	30663	30663	30663
R^2	0.70	0.70	0.70	0.69

	Dep. Var.: ln(consumption), excluding education and health expenditure			
	(1)	(2)	(3)	(4)
Contribution rate	-3.150**	-3.164*	-3.189*	-3.315*
	(1.567)	(1.653)	(1.638)	(1.706)
Whether contributes		0.059	0.056	0.073
		(0.145)	(0.143)	(0.150)
All items other than pension				2.019
				(1.705)
Obs.	30670	30670	30670	30670
R2	0.65	0.65	0.66	0.65

	Dep. Var.: ln(consumption)			
	(1)	(2)	(3)	(4)
Contribution level	-0.621	-0.320*	-0.300*	-0.293
	(0.998)	(0.193)	(0.181)	(0.181)
Whether contributes		2.076	1.940	1.876
		(1.322)	(1.246)	(1.236)
All items other than pension				0.045
				(0.041)
Obs.	30670	30670	30670	30670
R^2	0.12	0.55	0.57	0.51

Notes: Robust standard errors in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%. The control variables are the same as in Table 6.1. All the regressions use the city average contribution rate as instrument. In the second column controls for the dummy “whether contributes”, and use the city coverage rate as instrument. In the third column the interactions of high income family (the top 20% highest) and low income family (the low 40% lowest) with income are added.

Table 6.3 The effect of pension contribution rate on saving rate

	Dep. Var.: SR1			
	(1)	(2)	(3)	(4)
Contribution rate	2.052	2.024	2.094	2.254
	(1.886)	(1.941)	(1.969)	(2.035)
Whether contributes		0.049	0.049	0.019
		(0.147)	(0.147)	(0.153)
All items other than pension				-3.932**
				(1.973)
Obs.	30663	30663	30663	30663
R^2	0.03	0.02	0.03	

	Dep. Var.: SR2			
	(1)	(2)	(3)	(4)
Contribution rate	1.358	1.363	1.414	1.497
	(1.551)	(1.624)	(1.635)	(1.692)
Whether contributes		-0.009	-0.007	-0.025
		(0.133)	(0.132)	(0.139)
All items other than pension				-3.580**
				(1.590)
Obs.	30577	30577	30577	30577
R^2	0.05	0.05	0.06	

Notes: Robust standard errors in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%. The control variables are the same as in Table 6.1. All the regressions use the city average contribution rate as instrument. In the second column controls for the dummy "whether contributes", and use the city coverage rate as instrument. In the third column the interactions of high income family (the top 20% highest) and low income family (the low 40% lowest) with income are added.

Table 6.4 The heterogeneous effect of pension contribution on ln(consumption): groups with different expected benefit

	Dep. Var.: ln(consumption)	
	(1)	(2)
Contribution rate	-3.558**	-3.437*
	(1.719)	(1.832)
Age between 40-50 *contribution rate	0.386	
	(0.310)	
Age between 50-60 *contribution rate	0.173	
	(0.533)	
After 2006 *contribution rate		0.175
		(2.861)
Obs.	30670	30670
R^2	0.64	0.64

Notes: Robust standard errors in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%. The control variables are the same as in Table 6.1. All the regressions use the city average contribution rate and city coverage rate as instruments.

Table 6.5 The heterogeneous effect of pension contribution on ln(consumption): groups with different credit constraint

	Dep. Var.: ln(consumption)		
	(1)	(2)	(3)
Contribution rate	-5.296***	-3.065*	-3.559
	(1.643)	(1.836)	(2.420)
High income *contribution rate	5.044***		
	(0.549)		
Middle income *contribution rate	2.599***		
	(0.241)		
Have debt *contribution rate		-6.978	
		(6.288)	
House & debt * contribution rate			-6.266
			(6.881)
No House & no debt * contribution rate			3.243**
			(1.633)
No House & debt * contribution rate			-9.706
			(44.846)
Obs.	30670	30670	30670
R^2	0.64	0.63	0.62

Notes: Robust standard errors in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%. The control variables are the same as in Table 6.1. All the regressions use the city average contribution rate and city coverage rate as instruments.

Table 6.6 Robust Check：The effect of income tax rate on ln(consumption)

	Dep. Var.: ln(consumption)			
	OLS	IV		
	(1)	(2)	(3)	(4)
Income tax rate	0.502**	-3.231***	-2.603***	-2.547
	(0.195)	(0.946)	(0.825)	(1.606)
Pension contribution rate				-3.593**
				(1.724)
Obs.	36910	36910	36910	30026
R^2	0.71	0.71	0.71	0.71

Notes: Robust standard errors in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%. The control variables are the same as in Table 6.1. All the regressions use the city average tax rate as instruments. In the third column, the city average tax rate is added as instrument.

Table 6.6 Robust Check：Use the sample in which only the head is main contributor

	Dependent variable: ln(consumption)							
	IV					OLS		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Contribution rate	-3.772*	-3.649*	-3.666*	-4.346*	-4.506*	-0.213**	-0.328***	-0.325***
	(2.027)	(1.985)	(1.969)	(2.381)	(2.379)	(0.103)	(0.124)	(0.126)
Whether contributes		0.087	0.088	0.011	0.085		0.023*	0.023*
		(0.173)	(0.172)	(0.186)	(0.181)		(0.014)	(0.014)
Housing fund				8.288				
				(5.599)				
Medical insurance				0.895				
				(4.051)				
Other item				-2.600				
				(3.335)				
All items other than pension					4.077			-0.016
					(2.817)			(0.104)
Obs.	25381	25381	25381	25381	25381	25381	25381	25381
R-squared	0.64	0.65	0.65	0.52	0.62	0.67	0.67	0.67

Notes: Robust standard errors in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%. We control for ln(family wage income), ln(income other than wage), the wage quintile group dummies of head and spouse (5 groups), age of head, age group dummies (6 groups), education level dummies (9 groups), work experience and its square, industry dummies (16 groups), occupation dummies (8 groups)， and the enterprise character (state-owned, urban collective, private, others), sex of head, race and “hu kou”. In addition, we control for the city and year fixed effect, and the interaction of province dummies and year. The first five columns report the result of instrument variable regression, using the city average contribution rate as instrument. In the second column controls for the dummy “whether contributes”, and use the city coverage rate as instrument. In the third column the interactions of high income family (the top 20% highest) and low income family (the low 40% lowest) with income are added. The last three columns use OLS regression.

Table 7.1 Pension contribution on aggregate consumption and savings

Dep. Var.: City average replacement rate			
	(1)	(2)	(3)
City average contribution rate	0.774***	-0.048	0.003
	(0.126)	(0.110)	(0.084)
City dependency ratio			0.194***
			(0.014)
Year and city fixed effect	N	Y	Y
Observations	498	498	496
R-squared	0.13	0.87	0.93

Dep. Var.: Average propensity to consume (the samples with pension benefit)			
	(1)	(2)	(3)
City average contribution rate	0.129	-0.249*	-0.667***
	(0.131)	(0.127)	(0.157)
City dependency ratio			0.034*
			(0.019)
Year and city fixed effect	N	Y	Y
Observations	15969	15969	15946
R-squared	0.00	0.28	0.34

Dependent variable: ln(consumption)						
	Samples with pension benefit			Samples without pension benefit and younger than 55 year old		
	(1)	(2)	(3)	(4)	(5)	(6)
ln(disposable income)	0.748***	0.736***	0.665***	0.810***	0.804***	0.707***
	(0.007)	(0.007)	(0.010)	(0.004)	(0.004)	(0.005)
Family size	N	Y	Y	N	Y	Y
Demographic structure	N	N	Y	N	N	Y
Observations	15967	15967	15967	53144	53144	53144
R-squared	0.58	0.59	0.62	0.69	0.69	0.71

Notes: Robust standard errors in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%.

Appendix Table B.1 Descriptive Statistics (Household Data)

Variable	Obs	Mean	SD	Min	Max
Social security contribution					
Pension	31237	1360.787	1379.208	0	15676.32
Medical insurance	31237	326.5821	354.6443	0	9900
Housing fund	31237	1003.66	1309.449	0	22224
Other items	31237	163.7576	318.9047	0	4262.15
Total security contribution	31237	1298.748	1451.286	0	27775.7
Tax expenditure	36919	326.4455	1206.529	0	35770
Contribution rate					
Pension	31237	.0496195	.034634	0	.149996
Medical insurance	31237	.0183965	.0180751	0	.1497242
Housing fund	31237	.0437218	.0361938	0	.1499201
Other items	31237	.0096927	.0153156	0	.1467763
Total security contribution	36919	.0058741	.0150082	0	.4679814
Consumption and Savings					
Household consumption	31237	24191.66	21035.68	1247.5	548791.1
Disposable income before contribution	31237	31477.46	24336.17	569.8	702828
APC	31237	.8794118	.843195	.0794156	126.1702
Saving rate 1	31237	.1622203	.2783149	-.9994286	.9205844
Saving rate 2	31237	.1543567	.2614134	-.9983779	.8794612
Wage income	31237	28349.65	23692.12	0	568932
Proportion of samples over upper bound	31237	.0191663	.137111	0	1
Proportion of samples under lower bound	31237	.4400788	.4964031	0	1
House value	31237	115574.9	143245.8	0	6000000
Whether owns house	31237	.8291274	.3764026	0	1
debt	31237	1385.489	16183.42	0	1260000
Whether have debt	31237	.1015546	.3020657	0	1

Appendix Table B.2 First Stage Result

	(1)	(2)
Dep. Var.	Contribution rate	Whether contributes
City average contribution rate	0.198***	0.433
	(0.030)	(0.273)
City coverage rate	0.026***	0.533***
	(0.005)	(0.042)
ln(disposable income before contribution)	0.000	0.002***
	(0.000)	(0.001)
ln（wage income）	0.002***	0.018***
	(0.001)	(0.009)
2rd wage quintile	-0.001	0.080***
	(0.002)	(0.017)
3rd wage quintile	0.002	0.160***
	(0.002)	(0.018)
4rd wage quintile	-0.001	0.169***
	(0.002)	(0.019)
5rd wage quintile	-0.008***	0.158***
	(0.002)	(0.020)
Num of members under 18	-0.002	-0.014***
	(0.003)	(0.004)
Num of members over 55	-0.001	-0.005
	(0.000)	(0.004)
Age of head	-0.000	-0.003**
	(0.000)	(0.001)
Base: under 35		
Age 35-39	0.002*	0.054**
	(0.001)	(0.021)
Age 40-44	0.002	0.063**
	(0.002)	(0.026)
Age 45-59	0.001	0.070**
	(0.002)	(0.030)
Age 50-60	0.001	0.074**
	(0.003)	(0.034)
Female head	0.002***	0.007
	(0.001)	(0.005)
Base: Illiteracy		
Literacy course	0.005	-0.025
	(0.011)	(0.113)
Elementary school	0.016**	0.140*
	(0.007)	(0.074)
Middle school	0.017**	0.177**
	(0.007)	(0.073)

High school	0.018***	0.181**
	(0.007)	(0.073)
Technical school	0.019***	0.198***
	(0.007)	(0.073)
Vocational Education	0.018***	0.191***
	(0.007)	(0.073)
college	0.017**	0.188***
	(0.007)	(0.073)
graduate	0.016**	0.186**
	(0.007)	(0.074)
tenure	0.000**	0.005**
	(0.000)	(0.002)
Square of tenure	0.000	-0.000
	(0.000)	(0.000)
Base：Urban, this city		
Rural, this city	-0.009***	-0.205***
	(0.003)	(0.033)
Urban, other city	-0.010***	-0.161***
	(0.003)	(0.032)
Rural, other city	-0.019***	-0.242***
	(0.002)	(0.038)
Base: Technician		
Administrator	-0.000	0.002
	(0.001)	(0.006)
Secretary	0.000	0.004
	(0.001)	(0.005)
Merchandiser	0.001	0.004
	(0.002)	(0.015)
Service	-0.000	-0.005
	(0.001)	(0.010)
Agriculture	0.005	-0.114**
	(0.005)	(0.045)
Manufactory	0.003***	0.002
	(0.001)	(0.006)
Others	-0.001	-0.057**
	(0.002)	(0.024)
Base: Agriculture		
Mining	0.015***	0.032**
	(0.002)	(0.013)
Manufactory	0.015***	0.035***
	(0.002)	(0.011)
Energy	0.019***	0.030**
	(0.002)	(0.012)
Architecture	0.014***	-0.006

	(0.002)	(0.016)
Geology	0.004	0.025
	(0.006)	(0.017)
Transport and Post	0.013***	0.003
	(0.002)	(0.012)
Sales	0.013***	0.005
	(0.002)	(0.014)
Finance	0.016***	0.022
	(0.002)	(0.014)
Real Estate	0.010***	0.024
	(0.003)	(0.019)
Public Service	0.007***	0.006
	(0.002)	(0.014)
Health and Sports	0.002	0.004
	(0.002)	(0.012)
Education and Culture	0.003	0.005
	(0.002)	(0.012)
R & D	0.006**	0.008
	(0.002)	(0.014)
Others	0.000	-0.001
	(0.002)	(0.035)
Base: State Owned		
Collective	-0.014***	-0.217***
	(0.001)	(0.010)
Joint venture	-0.015***	-0.198***
	(0.001)	(0.007)
Private employees	-0.038***	-0.453***
	(0.001)	(0.012)
Others	-0.035***	-0.449***
	(0.001)	(0.017)
Observations	30724	35315
R-squared	0.28	0.41

Robust standard errors in parentheses

* significant at 10%; ** significant at 5%; *** significant at 1%