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Study on the impact of household adolescent population on household debt risk

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Abstract: *Based on the data of 2019 China Household Finance Survey (CHFS), this paper constructs the family debt risk index by using family asset-liability ratio and family debt-to-income ratio, and empirically studies the impact of family adolescent population ratio on family debt risk. The study found that the household adolescent population ratio significantly increased the household debt risk, and this conclusion remained robust after a series of robustness tests and endogeneity tests. Further research found that the effect of household adolescent population on household debt risk has typical group characteristics, with a greater impact on the debt risk of high debt families and rural families.*

Keywords: *Household debt risk, Adolescent population ratio, Household asset-liability ratio*

1. Introduction

Nowadays, the world is changing at the juncture of profound changes. The continuous rise of Chinese household debt and the deterioration of credit constraints make the risk of household debt gradually surface. According to the NIFD quarterly report, the leverage ratio of China's residential sector climbed from less than 5% in 2000 to 62.2% at the end of 2021. The household sector has the fastest growing leverage among the Chinese sectors of society and is now above Germany and close to Japan. Although the current household debt risk has not caused a serious economic crisis, but the household debt problem has obviously become a major hidden danger to the healthy operation of China's economy.

With the development of economy and society, "fewer children" and "aging" have gradually become the main trend of social and population development. According to the data of the seventh national census, by the end of 2020, China's total population aged 14 and below accounted for 17.95 percent of the country's population, up slightly compared with 16.60 percent in 2010, but the proportion of young people in China is declining compared with the previous census results. Coupled with the rising population aged 65 and above, the family demographic structure of Chinese society has undergone profound changes. Existing studies are focused on the influence of an aging population on social and economic development, few articles can focus on the family youth population of family department and the mechanism of the whole society, but with the three policy, double reduction policy series of the ground, all confirmed teenagers as a reserve force of China's social development has an important role in China's economic development.

Currently, the academic community has not yet unified the definition of household debt risk. Most scholars define the household debt risk from the perspective of family solvency and short-term liquidity; Zhang et al. (2021) [1] Use the leverage ratio index to define the household debt risk. Wang and Yang (2022) [2] added the debt-income ratio index on this basis. Chai (2020) [3] studied the debt repayment pressure of households from the perspective of household expenditure and income to illustrate the household debt risk, and added the asset-liability ratio as an indicator to measure the household debt risk. Mian et al. (2017) [4] used the ratio of household debt to GDP to measure the household debt ratio. The study found that the increase of this index has a strong impact on GDP volatility and sustainability.

Household debt risk is influenced by multiple factors. In terms of family characteristics, the family population size and age structure have a significant impact on the family debt risk, the greater the dependency ratio of the juvenile population and the elderly population in a family, the greater the possibility of the family debt (Chen et al., 2011 [5]; He et al., 2012 [6]). Xie (2018) [7] used the family financial survey data of CHFS (2015) found that young families, high education and high income families have significantly high debt. From the perspective of social and economic characteristics, long-term loan interest rate, GDP growth rate and unemployment impact can affect household debt risk (Guo et al., 2015

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[8]; Lombardi et al., 2022 [9]; Sui et al., 2020 [10]). At the same time, the urbanization level and income inequality are also an important factor in the rise of household debt (Wu and Zhang, 2016) [11]. Many scholars have studied the relationship between housing price and household debt risk, and found that there is a significant positive correlation between the rise of housing price and the rise of household debt risk, mainly because of the expansion of the scale of household mortgage loan, resulting in the continuous increase of total Chinese household debt in recent years (Guo et al., 2014 [12]; Gan Li et al., 2013 [13]). On this basis, Cumming and Hubert (2022) [14] and Jorda et al. (2015) [15] studied the relationship between monetary policy and household debt, and found that the rise in household debt and housing prices was related to the government's long-term loose monetary policy. From the perspective of other characteristics of society, natural disasters, the perfection of national legal system and enforcement efficiency can have an impact on household debt risk (Zhang et al., 2022 [16]; Massimo et al., 2014 [17]). Tseng et al. (2022) [18] found that an increase in household debt in China was associated with the sense of security and happiness of residents.

In conclusion, there are few studies on the family adolescent population and family debt risk, most of the family research areas still focus on population aging and family age structure, few studies have been able to focus on the impact of the family's adolescent population ratio on the family operating mechanisms and even less on family debt risk. Therefore, this paper focuses on the study of household adolescent population versus household debt risk. Based on the micro data of 2019 China Family Finance Survey (CHFS) as samples, this paper constructs a measurement model of family youth population ratio and family debt risk to explore the impact of the family youth population on household debt risk. The marginal contribution of this paper lies in the following aspects: First, using the CHFS micro data, to construct the index system to measure the household debt risk, which provides a new economic explanation for the household debt risk. Second, an empirical analysis of differently characterized groups using a econommetric model distinguishes the heterogeneous effects of the household adolescent population on household debt risk.

2. Data sources and study design

2.1 Data sources

This paper data from 2019 China Household finance survey (CHFS) data, its samples covering 29 provinces , 343 counties, 1360 village (house) committee, finally collected 34643 families, 107008 family members information, data has the national and provincial representative. The data provide reliable data support for studying the relationship between household adolescent population and household debt risk. In the process of data processing, this paper takes the age of 16 years as the boundary, and only the number of family members aged less than or equal to 16 years was retained, and the main variables were missing, and each database was merged. The final database contains 6339 samples. To avoid bias caused by outliers, the variables were winsorized at the 1% level.

2.2 Empirical method

In order to explore the influence of adolescent population on family debt risk, this paper constructs the benchmark measurement regression formula of family adolescent population ratio and family debt risk (1):

$$Debts_i = \beta_0 + \beta_1 poy_i + \beta_2 Controls_i + \varepsilon_i \quad (1)$$

In $Debts_i$, the household debt risk index consists of household asset-liability ratio and household debt-to-income, which is the main explained variable. According to the existing research, this paper defines the household debt risk as the solvency of the family, uses the asset-liability ratio (ALR) to measure the long-term solvency of the family, and uses the debt income (DTR) ratio to reflect the short-term solvency of the family. Among them, the asset-liability ratio, also known as the total liability ratio, which is the ratio of total liabilities to total assets. The greater the value of the asset-liability ratio, the weaker the family's ability to repay the debt, and the higher the risk of household debt. The debt-to-income ratio is the ratio of household debt expenditure to disposable income. The higher the debt-to-income ratio, the higher the debt risk that the family faces. Since the household debt risk covers both long-term and short-term indicators, the two indexes are weighted by 50% to constitute the household debt risk index.

The poy_i on the right of the equation indicates the adolescent population ratio in the family and is the

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main explanatory variable. Individuals aged 16 years and younger were classified as an adolescent population as divided at the time of the CHFS survey. The adolescent population ratio is the proportion of the adolescent population in the family in the total family population.

The $Controls_i$ on the right side of the equation represents a series of control variables. This paper selects the control variables of household head and family. At the level of householder, the head of the household in the CHFS questionnaire is not necessarily the head on the property ownership certificate, but the person playing its decisive role in family decision-making, mainly including four control variables: the age of the head, the ratio of age squared to 100, gender and educational background. At the family level, there are three control variables: physical condition of family members, family size and family disposable income.

The explanations of the relevant variables and data are shown in Table 1, and the descriptive statistical results of the variables are shown in Table 2.

Table 1: Variable and data description

Variables	Variable name	Variable declaration
Dependent variable	Asset-liability ratio(ALR)	Ratio of total household liabilities to total assets
	Debt-to-income ratio(DTR)	The ratio of household debt expenditure to disposable income
Independent variables	Household youth population ratio(POY)	The ratio of the adolescent population to the total number of family members
Intervening variable	Family income	The last disposable income the family
Control variables	Age	The age of the householder
	Age2	The ratio of the square of the age of the household head to 100
	gender	The gender of the head of the household
	Education	Education Educational level of the head of the household
	Physical condition of family members	Physical condition of the family members
	Family scale	Number of members of the family

Table 2: Descriptive statistical results

Variable	Obs	Mean	Std. dev.	Min	Max
ALR	6,277	0.146	0.320	0	3.611
DTR	6,213	1.889	5.732	-3.829	75.11
POY	6,257	0.354	0.116	0.167	0.667
gender	6,339	1.166	0.372	1	2
age	6,233	49.56	12.07	29	78
age2	6,233	26.02	12.59	8.410	60.84
education	6,312	3.579	1.697	1	8
physical	6,317	1.924	0.752	1	4
fscale	6,231	4.936	1.429	3	10
total income	6,213	94264	103250	-47562	747555

Based on this article, the following assumptions are made:

Hypothesis 1: The family adolescent population directly leads to the expansion of family debt, boosting the risk of household debt.

Hypothesis 2: There is heterogeneity in the impact of the adolescent population on household debt risk.

3. Empirical analysis

3.1 Benchmark regression results

Table 3 shows the benchmark regression results of formula (1), where column (1) is the regression results of family adolescent population ratio and family debt risk without control variables, and column

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(2) is the regression results of whole variables. As can be seen from Table 3, the β coefficient of the adolescent population ratio is 1.009 and is significant at the statistical level of 1%, so the family adolescent population will significantly increase the family debt risk. Under the results of full variable regression, every 1% increase in the household youth population ratio will result in a 100.9% increase in household debt risk. Therefore, this article assumes that 1 holds.

Table 3: Benchmark regression results

VARIABLES	(1)	(2)
	debts	debts
poy	1.901***	1.009***
	(0.343)	(0.369)
Controls	No	Yes
Observations	6,137	5,888
R-squared	0.005	0.017

3.2 Endogeneity test

In order to avoid endogenous problems and ensure the reliability of the research conclusions. This article refers to the practice of Chai and Zhang (2022) [19], and selected the number of staff per 10,000 as the tool variable of the youth population ratio. On the one hand, the educational resources of the provinces can attract the inflow of people and affect the adolescent population ratio of local families. On the other hand, the educational resources of the provinces will not directly affect the debt behavior and household debt risk of the provincial families. Therefore, the number of teachers per 10,000 employees IV meets the relevance and exogenous requirements.

Table 4 shows the results of the two-stage regression of the instrumental variable 2 SLS model. It can be seen that in the first regression, the hypothesis of F value is much higher than 10; in the second regression, the coefficient is 22.97, which is significant at the 5% statistical level, meeting the results of the benchmark regression, which proves the positive effect of the family adolescent population on the family debt risk and further proves the robustness of the conclusion of this paper.

Table 4: The endogenicity test

VARIABLES	First-stage	Second-stage
	poy	debts
poy		22.97**
		(11.53)
pteachers	0.000676***	
	(0.000238)	
Controls	Control	Control
Observations	6,000	5,888

3.3 Robustness test

To test the robustness of the empirical results, this paper tests by replacing the independent and dependent variables. First, the dependent variables were replaced, and the dependent variables were divided into household asset-liability ratio and household debt-to-income ratio respectively. Secondly, by replacing the independent variable, for the adolescent population ratio index, we tried more stringent age criteria to define the adolescent population as the number of people aged 14 years and below, and reconstructed the sample library for regression. The final results are shown in Table 5.

Table 5: Robustness test

VARIABLES	Replace dependent variables		Replace independent variables	
	ALR(1)	DTR(2)	Debts(3)	Debts(4)
poy	0.139***	1.540**	1.870***	0.793**
	(0.0380)	(0.695)	(0.358)	(0.392)
Controls	YES	YES	NO	YES
Observations	5,819	5,774	5,186	4,864
R-squared	0.015	0.027	0.005	0.028

As shown in Table 5, the family adolescent population ratio and family asset-liability ratio and family

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debt income ratio are positive significant relationship, and family adolescent population ratio and 1% at the statistical level of assets, and family debt income ratio at the statistical level of 5%. Therefore, the increase in the proportion of the household adolescent population will significantly increase the risk of household debt.

As shown in Table 5, column (3) is the regression result of the household adolescent population ratio and the household debt risk without adding the control variables, and column (4) is the regression result of the whole variable. It can be seen that after strict independent variables, there is still a positive and significant relationship with the family debt risk, which is consistent with the previous results. The conclusion confirming that the adolescent population ratio significantly increases the household debt risk is robust and reliable.

3.4 Analysis of heterogeneity

Considering that the different characteristics of the groups have different effects on the household debt risk, this paper tests the heterogeneity of the two characteristics of household debt and urban-rural difference. As shown in Table 6, quantile regression by total household liabilities was divided into low debt households (50% and below), medium debt households (50% to 75%) and high debt households (above 75%). The empirical results show that the adolescent population has a stronger promoting effect on the debt risk level of high-debt families, followed by middle-debt families, and has little impact on low-debt families.

From the results of the regression of urban and rural grouping can be seen that the adolescent population than the rural family debt risk, and positive, that the increase of youth population than will significantly improve the rural family debt risk, but for urban families, family adolescent population than the family debt risk there is no significant impact.

Table 6: Analysis of the heterogeneity

VARIABLES	Debt groups			Urban and rural groups	
	Low debt	Medium debt	High debt	cities and towns	countryside
poy	-0.0201	1.076***	2.055*	-0.180	2.216***
	(0.0674)	(0.368)	(1.144)	(0.474)	(0.624)
Controls	control	control	control	control	control
Observations	2,992	5,913	1,550	3,786	1,990
R-squared	0.002	0.012	0.007	0.028	0.042

4. Conclusion and suggestion

Based on the data of the 2019 China Household Finance Survey (CHFS), this paper empirically examines the impact of the family adolescent population on the Chinese family debt risk and the difference among different groups. The results found that, first, the rise in the population ratio of household adolescents can significantly boost the risk of household debt, and the conclusion of this paper is robust and reliable by the robustness test and the instrument variable 2 SLS estimation. Second, through the heterogeneity analysis of total household debt and urban and rural household registration, it can be seen that the adolescent population has a stronger role in promoting the debt risk level of high-debt families, followed by middle-debt families and has little impact on low-debt families. At the same time, the increase of the adolescent population ratio will significantly increase the debt risk of rural families, and have little effect on the debt risk of urban families. Based on the above research conclusions and combined with China's basic national conditions, the following policy suggestions are drawn:

First, we will actively implement the policy of double reduction measures. That is to further reduce the burden of homework and after-school training for students in compulsory education. The double reduction policy can not only reduce the academic burden of teenagers, but also reduce the training burden of families, and to some extent restrain the educational chaos such as school district housing and sky-high training fees. Through the implementation of the double reduction policy to reduce the family education debt and even housing debt, so that more families can enter the low debt level, reduce the risk of household debt.

Second, we should continue to promote urbanization and narrow the differences between urban and rural areas. In order to solve the difference of family debt risk between urban and rural areas, it is

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necessary to reduce the debt risk of rural families and provide a more comprehensive risk protection. Specifically, it can increase the investment degree of educational resources in rural areas and conduct joint training with urban colleges and universities.

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