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Social Security Expenditure, Demographic Structural Changes, and Urban–Rural Income Gap in China: Evidence from the Provincial Data

Hao JIN[1], Yaxin HE[2], Changheng ZHAO[3]

Abstract

The continuously expanding urban–rural income gap is an indisputable fact during the rapid economic development in China. Accordingly, narrowing the urban–rural income gap is an important topic and considerable concern in the academic circles and practical field. To explore the causes of the urban–rural income gap, the influential effects of social security expenditure, demographic structural changes, and urban–rural income gap were analyzed using the fixed effect model of the cluster-robust standard errors and the provincial data of 341 samples which covered 31 provincial areas in Mainland China from 2006 to 2016. Results demonstrate that the growth of social security expenditure narrows the urban–rural income gap, and such effect has evident regional differences. The growth of social security expenditure in Western China further expands the urban–rural income gap owing to the urban bias of fiscal expenditure. In addition, the population aging expands the urban–rural income gap. The urbanization level has significantly negative effect in regulating the relationship between demographic structure and urban–rural income gap. In regions with low urbanization level, the population aging decreases the total social demands and increases the unemployment rate in rural areas, thereby further expanding the urban–rural income gap. The urban bias of social security expenditure further intensifies the urban–rural income gap. On the contrary, regions with high urbanization level have weak dual economic structure that weakens the positive impact of population aging on the urban–rural income gap. The obtained conclusions provide decision-making references for formulating social security and population intervention policy.

Keywords: income gap, social security expenditure, demographic structure, aging.

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Introduction

Appropriate income gap is an inexorable outcome of normal competition in economic society and it is conducive to the reasonable allocation of urban–rural resources. However, the continuous expansion of the urban–rural income gap highlights the problem of social equity, has attracted extensive social attention, and is a critical problem that must be solved urgently during the rapid economic development in China. Data from the National Bureau of Statistics of China indicate that the difference value between the disposable personal income (DPI) of China's urban residents and per capita net income of rural residents increased from 8,172.5 RMB in 2006 to 21,252.84 RMB in 2016. Moreover, the DPI of urban residents has been approximately thrice the per capita net income of rural residents. The government of China has implemented many policies, such as the system of subsistence allowances for rural residents, removal of agricultural tax, rural cooperative medical services, and urban and rural integrated construction, among others, to support and benefit agriculture, thereby solving the urban–rural income gap. However, data released by the World Bank showed that the Gini coefficient of resident income in China has been maintained above 0.46, thereby exceeding the international danger level of 0.4 for the gap between the rich and the poor. It reflects that the urban–rural income gap in China remains at a high level and narrowing the urban–rural income gap is evidently an arduous task. Hence, exploring the causes of the urban–rural income gap has important practical significance in promoting coordinated and balanced economic and social development.

The expanding urban–rural income gap has many causes. Despite the regional objective heterogeneous factors, the expansion of such income gap is mainly affected by subjective and institutional factors. Theoretical studies reported that social security expenditure, which is an important income distribution mean, has immense influence on the production of the urban–rural income gap. Given the differences of research perspectives, methods, and data, existing studies still have apparent disagreements on the relationship between social security expenditure and urban–rural income gap. On the one hand, financial investments in the Chinese economy dominated by government investment are often "benefit seeking" and "short-sighted" owing to an imperfect social security system, household registration system of urban–rural segmentation, discriminatory employment and living policies, and local government considerations to local benefits and political promotion. However, such investments neglect the weak fields of "agriculture, rural areas, and rural residents," thereby resulting in serious urban bias of social security expenditures. Hence, social security expenditures have a "retro regulation" effect on urban–rural allocations. The growth of social security level expands the urban–rural income gap (Aaron & McGuire, 1970; Blejer & Guerrero, 1990). On the other hand, the promotion of new urbanization and upgrade of an industrial structure and the growth of social security level can narrow the urban–rural income gap (Dodge, 1975; Samanta & Cerf, 2009). The social security expenditure and

urban–rural income gap show a nonlinear "U-shaped" relationship (Lv, 2017). Nevertheless, exiting studies failed to consider the current practical background of the demographic structure in China and overlooked the effects of population aging on urban and rural incomes. Data from the National Bureau of Statistics of China indicate that the old-age dependency ratio in China was maintained at over 11% in the previous 10 years and accompanied with an increasing trend. By contrast, the child dependency ratio generally declined continuously from 27.3% in 2006 to 22.1% in 2011. The implementation of the comprehensive "two-child" policy has limited effects on demographic structure. The proportion of the aged (i.e., >65 years old) accounts for over 10% of the total population, which is higher than the United Nations' (UN) statistical standards on population aging. A few provinces in China have even entered the deep aging society. Moreover, the acceleration of urbanization and industrialization is accompanied by the increase in the number of migration workers in cities and the left-behind elderly in rural areas. The reduction of the proportion of the labor population in rural areas and the increase of the old-age dependency ratio also intensify the urban–rural income gap.

The entry of China in the "moderate income" stage has necessitated the urgency of studying the relationship among population aging, social security expenditure level, and urban–rural income gap to provide decision references for formulating intervention policies that will narrow the urban–rural income gap and perfect the fundamental system of social security in the country. Accordingly, this study explores the relationship and effects of social security expenditure, demographic structural changes, and urban–rural income gap. Among the problems analyzed in the study are as follows: (1) whether China's social security expenditure narrows the urban–rural income gap, (2) whether population aging intensifies the urban–rural income gap, and (3) whether the effects of social security expenditure and population aging on the urban–rural income gap have urbanization-level and regional differences.

The remainder of this study is organized as follows. Section 2 presents the literature review, which is used to propose the research hypotheses. Section 3 introduces the model, data, and research variables, including the construction of the research model and explanation of the variables. This section likewise performs a descriptive statistical analysis on the sample data. Section 4 describes and analyzes the empirical study results, including the model selection, robustness test, and sub-sample regression analysis. Section 5 further discusses the empirical study results. Lastly, Section 6 presents the conclusions.

Literature Review and Research Hypotheses

Social security expenditures and urban–rural income gap

Extensive theoretical and empirical discussions on the relationship between social security expenditure and urban–rural income gap have been reported recently. The extensive re-allocation function of social security expenditure has resulted in the urban–rural difference in the social security expenditure affecting the formation of an urban–rural income gap. However, no agreement on the specific effect of such influence has yet to be reached. Three major opinions have been formed. First, social security expenditure has negative effects on the urban–rural income gap. That is, the growth of social security expenditure can narrow the urban–rural income gap. Dodge (1975) and Samanta, et al. (2009) argued that the income reallocation of the social security expenditure could substantially solve the income inequality. Mahler & Jesuit (2004) discovered that social security contributed approximately 15% to the reduction of the Gini coefficient in Latin American countries and that social security expenditure could substantially reduce the Gini coefficient of developed countries. He & Sato (2013) estimated that the national social security contributed a 74.6% reduction in the Gini coefficient. Peng & Wang (2013) conducted an empirical study and determined that social security expenditure could significantly and effectively narrow the income gap of residents. Yang & Shen (2016) considered that the increase of government's social security expenditure was beneficial in increasing welfare to low-income groups and narrowed the income gap of society. Second, social security expenditure and urban–rural income gap have a positive relationship. That is, increasing the social security expenditure expands the urban–rural income gap. Blejer & Guerrero (1990) determined that the social security expenditure of the government further highlighted the uneven income allocation. Xuan (2011) reported that the long-term implementation of "urban-biased" allocation of fiscal expenditure restricted the benefit scope of social security expenditure within cities and considerably expanded the urban–rural income gap. Hu, Liu & Liu (2011), Yu & Liu (2014), Yang & Shen (2016), and Wu & Wang (2016) used various measurement models and methods as bases to provide relatively consistent conclusions from empirical studies with time series or panel data. These studies deemed that the social security system in China was still imperfect and the re-allocation function of social security expenditure had not been developed effectively. Moreover, the social security system expands rather than narrows the urban–rural income gap, thereby resulting in the evident "retro regulation" effect in the income allocation of urban residents. Considerable urban bias in social security expenditure is the root cause of this problem. Third, social security expenditure and urban–rural income gap, which is mainly manifested by time difference and regional difference, have a nonlinear relationship. Huang, He & Li (2014) determined that the improvement of the social

security level could narrow the urban–rural income gap in the short term, but the long-term span would change the acting path and may expand such income gap. Wang & Cai (2010) proved through an empirical study that the effect of social security expenditure on the urban–rural income gap had regional differences. Social security expenditure narrowed the urban–rural income gap in Central China but expanded such income gap in Western China. Lv (2017) further considered a nonlinear "U-shaped" relationship between social security expenditure and urban–rural income gap.

The preceding analysis indicates that social security expenditure can significantly influence the urban–rural income gap. However, such effect is sensitive to fiscal distribution mechanism, temporal, and regional differences, thereby showing differential effects. Therefore, this study believes that the income re-allocation function of the social security expenditure should not be overlooked and the income allocation adjustment can narrow the urban–rural income gap. However, the city bias of fiscal expenditure brings significant regional differences in the effects of the social security expenditure on the urban–rural income gap. Therefore, the following two hypotheses are proposed:

Hypothesis 1: Social security expenditure has a negative influence on the urban–rural income gap. The increase of social security expenditure can narrow the urban–rural income gap.

Hypothesis 2: The influence of the social security expenditure on the urban–rural income gap has regional differences because of regional heterogeneity.

Demographic structure and income inequality

Paglin (1977) conducted a study on the relationship between demographic structure and income inequality and interpreted the effect of demographic structural change on income equality by innovatively using the decomposition method. Accordingly, subsequent studies have extensively discussed the influencing mechanism of demographic structure on income inequality through empirical analyses. Furthermore, three major research opinions have been formed. First, a majority of scholars deemed that population aging considerably expanded income inequality. Deaton & Paxson (1994) performed a quantitative analysis based on household consumption data in the US, the UK, and Taiwan (China) and concluded that population aging further intensified the income inequality of residents. Zhong (2011) used the provincial data in Mainland China and proved that population aging further expanded the urban–rural income gap by decomposing the intra-group and inter-group effects of income inequality. Dong, Wei & Tang (2012) and Wen & Xie (2017) used provincial panel data. Lan, Wei & Wu (2014) used trans-national panel data, while Liu (2014) applied the survey data of farmers' microscopic living. These researchers performed empirical studies using various perspectives and concluded that population aging could significantly intensify

income inequality. Second, a few scholars argued that population aging could slightly influence income inequality. Those who advocated this opinion discovered that the influence of population aging on income inequality had small inter-group and intra-group effects. Schultz (1997) and Cameron (2000) analyzed the effects of population aging on income inequality in Taiwan (China) and Java Island in Indonesia. Accordingly, they considered that population aging could slightly influence income inequality. Qu & Zhao (2008) used the framework of life cycle theory as basis to analyze the inter-group inequality, intra-group inequality, and population aging using the variance decomposition and regression decomposition methods. These researchers determined a minimal effect of population aging on income inequality. Liu, Feng & Wang (2014) used the data of the China Health and Nutrition Survey and determined that the aging effect in China mainly came from the inter-age effect. Consequently, the intra-age effect could be disregarded. However, disregarding the aging effect did not alter the continuous growth of the Gini coefficient in China. Liu (2014) studied microscopic household survey data and determined that population aging caused by a weak inter-age effect could slightly influence income inequality. Third, a few scholars deemed that population aging and income inequality had an uncertain relationship. Karunaratne (2000) reported that population aging and income inequality in Sri Lanka had an "inverted U-shaped" relationship by using time series data. Antón (2012) used the microscopic simulation technique as basis to report that the development of higher education in Mexico has resulted in population aging relieving income inequality. Vandenbroucke (2016) determined that the influence of population aging on income inequality was uncertain with the changes in the expected life of the people and growth rate of the population.

In addition, only a few studies explored the effects of demographic structural changes on the urban-rural income gap. These studies generally reported that population aging intensified the urban-rural income gap. Higgins & Williamson (1997) discovered that the urban–rural dual social security system with significant imbalance in China caused higher population dependency ratio in rural areas than that in urban areas. This result increased the family burden in rural areas and expanded the urban–rural income gap. Sun & Yan (2015) and Ji (2016) performed an empirical study by establishing a dynamic panel data model and determined that the reduction of the proportion of the labor population and growth of the dependency ratio considerably intensified the urban-rural income gap with the strengthened labor mobility between the urban and rural areas. Wang, Feng & Wang (2017) further believed that the influence of population aging on the urban–rural income gap had regional differences and that the aging effect was considerably apparent in developed regions. Consequently, the current study believes that demographic structure has important effects on the urban–rural income gap. The aging of population expands the urban-rural income gap. However, the regional difference in urbanization level determines the different effects of population aging on the urban–rural income gap. Hence, the following two hypotheses are proposed:

Hypothesis 3*: Dependency ratio and population aging have positive effects on the urban–rural income gap. The growth of dependency ratio and population aging can expand the urban–rural income gap.*

Hypothesis 4*: Urbanization level has a negative regulation effect on the relationship between population aging and the urban-rural income gap. The positive effect of population aging on the urban–rural income gap is intensified in regions with low urbanization level.*

Model, Variables, and Data

Model settings

To analyze the effects of social security expenditure and demographic structural changes on the urban–rural income gap, the following measurement model is constructed for an empirical test based on the preceding theoretical analysis and proposed research hypotheses:

$$\mathrm{Gap}_{i,t} = \beta_1 Sse_{i,t} + \beta_2 Odr_{i,t} + \beta_3 Cdr_{i,t} + \lambda_i \sum Control_{i,t} + u_i + \varepsilon_{i,t} \quad (1)$$

where $\mathrm{Gap}_{i,t}$ is the explained variable urban–rural income gap; *i, t* (*i*=1,…,31; *t*=2006,…,2016) is the urban–rural income gap of province *i* (i.e., autonomous region and direct-controlled municipalities, hereinafter the same) at *t*; Sse, Odr, and Cdr are explanatory variables that represent social security expenditure, old-age dependency ratio, and child dependency ratio, respectively; Odr and Cdr are the principal proxy variables of the demographic structural changes; β_1, β_2, and β_3 are the marginal effects of the social security expenditure, old-age dependency ratio, and child dependency ratio, respectively, on the urban–rural income gap. They represent that every one unit change of Sse, Odr, and Cdr will cause β_1, β_2, and β_3 units of changes in the urban–rural income gap (Gap). $\sum Control_{i,t}$ is the control variable group, including the urbanization level (Urb), industrialization level (Ind), government intervention degree (Gov), degree of economic openness ($Open$), and architectural development degree (Dcb). u_i is the random effect of different provinces which is unobservable and is used to control the fixed effect of individuals. $\varepsilon_{i,t}$ is the random disturbance term that changes with individuals and time. Given the heterogeneity of the different provinces, $\varepsilon_{i,t}$ reflects the effects of other random unobservable factors of provinces on the urban–rural income gap. Hence, this study hypothesizes that

$\varepsilon_{i,t}$ is independent, identically distributed, and unrelated with u_i, thereby meeting the standards of the *iid* spheroidal disturbing term.

Definitions of the variables

Urban–rural income gap (*Gap*): Three major methods are used to measure the urban–rural income gap in existing studies (Wan, 2007). (1) Difference value method: the difference between per capita disposable income in urban areas and per capita net income in rural areas. The difference value is positively related with the urban–rural income gap. (2) Ratio method: the ratio between the per capita disposable income in urban areas and per capita net income in rural areas. The ratio is positively related with the urban–rural income gap. (3) Teil index method: the urban–rural income gap is measured through comprehensive consideration of the demographic structural changes in the urban and rural areas during urbanization. However, the use of different indexes may lead to different conclusions because of the complexity of the index statistics. This study uses the strictness of scientific studies as basis to apply the difference value method (logarithmic values) for regression analysis in empirical study and uses the Teil index method for robustness test (Theil, 1967). The income gap is expressed by the logarithmic values during regression analysis based on the difference value method.

Social security expenditure (*Sse*): Existing studies mainly measure social security expenditure by two methods: per capita (Xu & Li, 2012) and gravimetric (Zhu & Dong, 2017) methods. The former refers to the ratio between total social security expenditures and the total population, while the latter refers to the proportion of the total social security expenditures in the total fiscal expenditures. This study applies the gravimetric method, that is, the ratio of social security expenditure (*Sser*), to measure the social security levels in different provinces.

Demographic structural changes are manifested in the changes in the dependency ratio and proportion of the labor population. This changes can be measured using the old-age dependency ratio (*Odr*), child dependency ratio (*Cdr*), and proportion of the labor population (*Lab*). The old-age dependency ratio refers to the proportion of the age group over 65 years old in the age group of 15–65. The child dependency ratio refers to the proportion of the age group within 0–14 in the age group of 15–65. The proportion of laboring population refers to the proportion of the age group of 15–65 in total population. The total dependency ratio (*Tdr*) is the sum of the old-age dependency ratio (*Odr*) and child dependency ratio (*Cdr*): $Tdr = Odr + Cdr$. Demographic structural changes in China are manifested in two aspects, namely, reduction of proportion of laboring population and growth of total dependency ratio. Three indexes have a relationship of $Lab(1 + Odr + Cdr) = 1$. To avoid multicollinearity, the old-age dependency ratio (*Odr*) and child dependency ratio (*Cdr*) in *China Statistical Yearbook, Statistical Yearbook of*

Regions, and *China Statistical Yearbook on Population and Employment* are used as the explanatory variables in modeling or the total dependency ratio (*Tdr*) is used as the alternative variable of the preceding variables.

Control variables are selected with references to processing methods in existing studies (Zhu & Dong, 2017). Urbanization level, industrialization level, government intervention, degree of openness, and architectural development degree are chosen as the control variables of the model.

Urbanization level (*Urb*): Urbanization is a process, in which the urbanization level increases gradually. The urbanization level can be measured by urbanization rate, which is the ratio between total permanent resident population of a city and the population gross of the city. Hence, promoting the new urbanization construction positively is the only way to break the long-term household registration system of urban–rural segmentation and solidified urban–rural dual economic structure in China. Urbanization accelerates the free mobility of the urban–rural labor population and diversification of employment and living, thereby influencing the urban–rural income gap. According to the classification standards of urbanization level in *China's New National Urbanization Planning* (2014–2020), samples with urbanization rate exceeding 60% are classified into the high urbanization level cluster. The remainder of the samples are classified into low urbanization level cluster.

Industrialization level (*Ind*): Industrialization level is positively correlated with local economic development level. High industrialization level causes high local economic development level and high rate of return on investment in urban areas, thereby facilitating rural population to urban areas and causing positive effects on rural "equilibrium" income. The local industrialization level is expressed by the proportion of industrialization rate (or the industrial added value of provinces) in gross domestic product (GDP).

Degree of economic openness (*Open*): Economic openness can restrict government functions, reduce rent-seeking activities and resource waste, and significantly and positively affects the efficiency of government expenditure (Adam, Delis & Kammas, 2014). Therefore, the degree of economic openness can effectively facilitate social security expenditure to adjust urban–rural income gap. The degree of economic openness in different regions (destinations and source of supply) in this study is reflected by the proportions of the total export–import volume (calculated according to exchange rate of the current year) in GDP of the year.

Government intervention (*Gov*): Government intervention is expressed by the proportion of the total fiscal expenditures in different regions in the local GDP. High proportion reflects the strong government intervention and more fiscal expenditures for production and investment activities. The strengthened

government control over economy will certainly influence resident income levels in urban and rural areas.

Architectural development degree (*Dcb*): The rapid development of the architectural industry can increase the income level of rural residents because of the high proportion of the architectural employment population in the rural area. The degree of architectural development can be expressed by the ratio between per capita architectural industrial output in a city and the national per capita architectural industrial output. Furthermore, the architectural development degree is introduced as a control variable. The rapid development of the architectural industry can increase rural resident income level because of the high proportion of rural population architectural employment population.

Data source

In this study, provincial data of 341 samples that cover 31 provincial areas in Mainland China except Hong Kong, Macao, and Taiwan from 2006 to 2016 are collected. All data come from the *China Statistical Yearbook*, *China Statistical Yearbook on Population and Employment*, and *Finance Year Book of China* from 2007 to 2017. China adjusted the statistical caliber on fiscal expenditures in 2007. In this study, the social security expenditure in 2006 covers the sum of "per capita pension and subsidies for social welfare," "per capita retirement funds for administrative institutions," and "per capita subsides for social security." The social security expenditure from 2007–2016 is chosen as the "per capita social security and employment expenditures" in *China Statistical Yearbook* and yearbooks of different provinces. In addition, a clustering analysis on Eastern, Central, and Western China is performed based on universal standards with consideration to regional heterogeneity to control the regional difference.

Descriptive statistical analysis

Table 1 lists the statistical results of the major variables. For the mean of the absolute income level, the per capita disposable income in urban areas is 2.7 times (21,145.34/7,856.28) that of the per capita net income in rural areas. For the dispersion degree of income, the dispersion degree of per capita net income in rural areas (0.55) is substantially higher than that of the per capita disposable income in urban areas (0.42). Such difference indicates that the per capita disposable income in urban areas is relatively more concentrated than the per capita net income in rural areas. With respect to the income gap, the urban–rural per capita income ratio is 2.9, while the per capita disposable income in urban areas is nearly twice higher than the per capita net income in rural areas. The urban–rural income gap in China is larger than that in other countries in view of the absolute values of income in urban and rural areas, income gap, income ratio, or Teil entropy. A considerable urban–rural income gap exists in China.

Table 1. Descriptive statistics on major variables

Variables	Name	Sample size	Mean	SD	Min	Max
Cpdi	Per capita disposable income in urban areas	341	21145.34	8771.47	8871.27	57691.67
Updi	Per capita net income in rural areas	341	7856.28	4291.17	1984.62	25520.40
*Gap*1	Income gap (difference)	341	13289.05	4772.07	5629.88	34965.79
*Gap*2	Income gap (ratio)	341	2.90	0.56	1.83	4.59
*Gap*3	Income gap (Teil entropy)	341	0.28	0.10	0.06	0.53
Psse	Per capita social security expenditure	341	1032.43	735.24	135.18	6298.19
Sser	Proportion of social security expenditure	341	12.57	3.44	4.00	25.49
Tdr	Total dependency ratio	341	35.93	6.56	19.30	55.10
Odr	Old age dependency ratio	341	12.63	2.60	6.70	20.00
Cdr	Child dependency ratio	341	23.30	6.70	9.60	42.20
Urb	Urbanization level	341	52.01	14.53	21.05	89.61
Indu	Industrialization level	341	41.37	17.93	6.81	150.04
Gov	Government intervention	341	0.25	0.19	0.08	1.38
Dcb	Architectural development degree	341	1.04	0.85	0.17	4.28
Open	Degree of economic openness	341	0.31	0.38	0.03	1.74

Source: Data are calculated by the authors.

The total social security expenditures in China have recently increased annually, but the per capita social security expenditure considerably differs in different provinces. The proportions of the social security expenditure of the different provinces in the total fiscal expenditures of local government also differ and substantially fluctuate. In demographic structural changes, the average total dependency ratio of the different provinces in China is 35.96%. The mean old age dependency ratio is 12.63%, which is higher than the standard of the UN (7%). This result reflects the intensifying population aging in China. The industrialization, urbanization, and population aging in China lead to the following critical question:

How will changes in the demographic structure and social security expenditure influence the urban–rural income gap? Therefore, an empirical analysis of the panel data of 31 provincial areas in Mainland China is conducted.

Results Analysis

Model setting and tests

The panel data analysis models include mixed effect model (ME model), fixed effect model (FE model), and random effect model (RE model). All models must be tested to evaluate the specific forms of model settings. Table 2 lists the test results. ME model and FE model are verified by the F test, thereby yielding that the F value = 64.82 is significant at the 1% level. This result implies that FE model is superior to ME model. Furthermore, the models are investigated using the least squares dummy variables and determined that individual dummy variables of the majority of the provinces are significant, thereby verifying the accuracy of the preceding conclusions. Moreover, the Lagrange multiplier (LM) test, which was developed by Breusch & Pagan (1980), is used. The statistical value is 443.13 and is significant at the 1% level, thereby indicating that all provinces have individual effect. Hence, ME model shall be denied. Hence, the maximum likelihood estimation (MLE) of RE model is further performance, determines that MLE of the statistical data is 485.19, and is also significant at the 1% level. This result completely proves the existence of the individual effect of the different provinces. Hence, ME model shall be denied. Lastly, the Hausman and Overidentification tests show the two test methods recommend choosing FE model.

Table 2. Test results of the model settings

Test methods	Test contents	Original hypothesis	Statistical value	P value	Test results
F test	Comparison between ME model and FE model	ME model is the best	F(30,302) = 64.82***	0.000	Choose FE model
LM test	Comparison between ME model and RE model	ME model is the best	chibar2(01) = 443.13***	0.000	Choose RE model
Hausman test	Comparison between FE model and RE model	RE model is the best	chi2(9) = 149.95***	0.000	Choose FE model
Overidentification test			Chi-sq(8) = 266.883***	0.000	Choose FE model

*Note: *** represents significance at the 1% level.*

The preceding test results indicate that FE model was chosen for analysis in this study. Robust standard error was applied in the regression analysis (see Table 3) because of possible heteroscedasticity problems. Table 3 shows that social security expenditure and demographic structure are closely related with the urban–rural income gap and both have significant effects on such income gap. After the other variables are controlled for, the social security expenditure has significant negative effects on the urban–rural income gap. Every 1% growth of the social security expenditure can cause a 1.7% reduction on the urban–rural income gap. This result conforms to the actual development in China in the past 10 years. Hence, Hypothesis 1 is verified. China has been perfecting the basic framework of the entire social security system, integrating and connecting the urban–rural social security projects, and promoting the equitable access to basic public services since 2007, thereby increasing the social security level in rural areas and constructing the nationwide moderate social security system. These actions can significantly narrow the urban–rural income gap. In view of the demographic structural changes, the old-age dependency ratio is significantly positive at the 5% level after other variables are fixed, thereby indicating the positive correlation between population aging and urban–rural income gap. Population aging considerably expands the urban–rural income gap and the 1% growth of this population line can contribute 1.1% growth of the urban–rural income gap. Therefore, Hypothesis 3 is verified. However, child dependency ratio is significantly and negatively correlated with the urban–rural income gap, thereby indicating that children and teenagers are the future reserve resources for economic development. They can extensively affect income levels in the urban and rural areas while promoting the economic development and can significantly narrow the urban–rural income gap. In addition, the constant term that represents the national individual effect is equal to 7.184 and is significant at the 1% level, thereby completely proving the real existence of the urban–rural income gap in practical economic society.

Table 3. Statistics on estimations of urban–rural income gap: FE model

Var	*Sser*	*Odr*	*Cdr*	_cons	Control	N	F	R-Square
Coef	−0.017**	0.011**	−0.009**	7.184***	Yes	341	180.567	0.927
Se	−0.007	−0.006	−0.004	−0.21				

*Notes: *, **, and *** represent significance on the 10%, 5%, and 1% level, respectively. Coef is coefficient. _cons is the constant term. Yes reflects that other variables are controlled in the analysis. Control reflects control variables Urb , Indu , Gov , Dcb , and Open in the model.*

Endogenous problems

Model setting may miss a few unobservable variables, thereby presenting the endogenous problems between social security expenditure and urban–rural income gap. This study introduced the lagged variables of social security expenditure and government intervention as their instrumental variables. The social security expenditure level and government intervention of the current stage must be clearly affected by those of the previous stage. The social security expenditure level and government intervention between two stages are considerably correlated. However, the social security expenditure level and government intervention in the lagged stage have evolved into visible predetermined variables and are uncorrelated with the random disturbing term of the current stage. The social security expenditure level and government intervention in the lagged stage meet two basic conditions of instrumental variables. Therefore, they can be used as the relatively ideal instrumental variables of the model. Table 4 shows the regression results of the two instrumental variables.

Table 4. Regression results of the instrumental tools

	Government intervention lagged	Social security expenditure lagged
Sser	−0.014*** (0.003)	−0.042*** (0.008)
Odr	0.010** (0.004)	0.017*** (0.005)
Cdr	−0.006* (0.003)	−0.003 (0.004)
Control	Yes	Yes
_cons	7.208 (0.157)	7.677*** (0.217)
N	310	310

*Notes: *, **, and *** represents significance at the 10%, 5%, and 1% level, respectively, and the number in the brackets is the standard error (Se).*

Table 4 shows that the regression results after the instrumental variables are involved are completely consistent with the regression results in Table 3. Thus, Hypotheses 1 and 3 are again verified. Social security expenditure is significantly negative at the 1% level, thereby indicating that the increasing social security expenditure can considerably narrow the urban–rural income gap. After the lagged variable of social security expenditure is introduced in as the instrumental variable, the coefficient of old-age dependency ratio is significant at the 1% level. After the lagged variable of government intervention is introduced in as the instrumental variable, the coefficient of old-age dependency ratio is significant at the 5% level. Moreover, the old age dependency ratio is positive in these two situations, thereby

indicating that population aging expands the urban–rural income gap. Although the significance level of child dependency ratio is not extremely high, it has negative effects on the urban–rural income gap.

Robustness test

The robustness of models is tested based on four considerations. (1) The dynamic effect of the urban–rural income gap is considered. The previous value of the urban–rural income gap may influence the current value owing to the existence of economic inertia. Hence, the first-lagged value of the urban–rural income gap is introduced into the model to construct a dynamic panel regression model. (2) The measurement indexes of the urban–rural income gap have differences in value, ratio, and Teil entropy. In the robustness test, Teil entropy is used to replace the difference value. (3) Given the linear relationship of total dependency ratio with Odr and Cdr ($Tdr = Odr + Cdr$), the demographic structural variables (Odr and Cdr) are replaced by the total dependency ratio (Tdr) to investigate the robustness of the regression model. (4) Auto-correlation is generated in the dynamic panel model because the explained variables cover lagged variables of the explained variable. The first-lagged value of the urban–rural income gap ($\mathrm{Gap}_{i,\,t-1}$) is correlated with the random disturbing term ($\varepsilon_{i,t}$) because such income gap is substantially sensitive to a few unobservable heterogeneous features of the provinces, thereby generating an endogenous problem. Moreover, the control variables in the model may have bidirectional causality, thereby generating simultaneous endogenous problems. To address these problems, the dynamic generalized matrix estimation of the difference urban–rural income gap (Gap) and Teil entropy ($\mathrm{Gap\,3}$) are performed in the robustness test by using the difference generalized method of moments (GMM) proposed by Arellano & Bond (1991) and system GMM proposed by Blundell & Bond (1998), respectively. Hence, the following measurement models are constructed:

$$\mathrm{Gap}_{i,\,t} = \pi\,\mathrm{Gap}_{i,\,t-1} + \beta_1 Sse_{i,t} + \beta_2 Tdr_{i,t} + \lambda_i \sum Control_{i,t} + u_i + \varepsilon_{i,t} \qquad (2)$$

$$\mathrm{Gap\,3}_{i,\,t} = \pi\,\mathrm{Gap\,3}_{i,\,t-1} + \beta_1 Sse_{i,t} + \beta_2 Tdr_{i,t} + \lambda_i \sum Control_{i,t} + u_i + \varepsilon_{i,t} \qquad (3)$$

The explained variable (Gap) in model (2) refers to the difference in the urban–rural income gap, and is estimated by the system GMM and difference GMM, respectively. The explained variable ($\mathrm{Gap\,3}$) in model (3) refers to the Teil entropy urban–rural income gap and is estimated by the system GMM.

The calculation formula of Gap3 is as follows:

$$\text{Gap3}_{i,t} = \sum_{j=1}^{2}\left(\frac{I_{ij,t}}{I_{i,t}}\right) \times Ln\left(\frac{I_{ij,t}}{I_{i,t}} / \frac{Z_{ij,t}}{Z_{i,t}}\right) \tag{4}$$

where the subscripts i and t are the regions and time, respectively; j = 1, 2 reflects the urban and rural areas, respectively; $I_{ij,t}$ is the total income (i.e., product of the corresponding population and per capita income) in urban areas (j = 1) or rural areas (j = 2); $I_{i,t}$ is the total income of region i during period t; $Z_{ij,t}$ is the urban (j = 1) or rural (j = 2) population of region i during period t; and $Z_{i,t}$ is the total population of region i during period t. The value of Gap3 is positively related to the urban–rural income gap.

The robustness test is accomplished by the preceding theoretical analyses and models (2) and (3). Table 5 shows the results.

Table 5. Robustness test of the urban–rural income gap

	Different value-type System GMM	Different value-type Difference GMM	Teil entropy System GMM
Sser	−0.008*** (0.002)	−0.012*** (0.003)	−0.001*** (0.000)
Tdr	0.003** (0.001)	0.003** (0.002)	0.001*** (0.000)
L.Gap	0.831*** (0.026)	0.711*** (0.051)	
L.Gap3			0.768*** (0.049)
Control	Yes	Yes	Yes
_cons	1.412*** (0.212)	2.237*** (0.367)	0.135*** (0.042)
N	310	279	310

*Notes: *, **, and *** represent significance at the 10%, 5%, and 1% level, respectively, and the number in the brackets is the standard error (Se). L.Gap is the difference urban–rural income gap of the first lag period. L.Gap3 is the Teil entropy urban–rural income gap of the first lag period.*

Table 5 shows that L.Gap and L.Gap3 are significant at the 1% level after the introduction for the dynamic generalized matrix estimation GMM model. This result reflects that adding L.Gap and L.Gap3 into the model is reasonable. Social security expenditure has significantly negative effects on the urban–rural income gap except for minimal differences in effects. This result reveals that increasing the social security expenditure can significantly relieve the urban–rural income gap and effectively facilitate social fairness. *Tdr* is significantly positive at the 1% or

5% level, thereby indicating that the total dependency ratio considerably expands the urban–rural income gap. Slowing down population aging by increasing the labor supply is urgent to cope with the aging problem. Accordingly, the government is gradually relaxing its childbearing policy from the policy of "two-child for parents who are the only child in their family" to the comprehensive "two-child" policy. However, the child-bearing willingness of a couple remains low with the continuous increase in the cost of rearing children. Given the further intensification of population aging, the vigorous promotion of urbanization and increase in the number of left-behind elderly in rural areas even expand the urban–rural income gap. Population aging, particularly in rural areas, intensifies the urban–rural income gap. This result completely conforms to the preceding FE model and regression results of the instrumental variables. Moreover, this result completely proves the robustness of the preceding estimation results and verifies the validity of Hypotheses 1 and 3.

Sub-sample regression analysis

To further verify whether the effects of social security expenditure and demographic structural changes on the urban–rural income gap differ under the heterogeneous features in geological positions, economic development, urbanization level, industrialization level, degree of economic openness, government intervention, and architectural development degree, samples were classified based on geological regions and urbanization level for the sake of comparative analysis.

(1) Sub-sample regression based on geological locations

To control for the regional heterogeneous features, this study divided China into Eastern, Central, and Western China based on universal standards. Eastern China covers Beijing, Tianjin, Hebei, Liaoning, Shanghai, Jiangsu, Zhejiang, Fujian, Shandong, Guangdong, and Hainan. Central China includes Heilongjiang, Jilin, Shanxi, Anhui, Jiangxi, Henan, Hubei, and Hunan. Western China includes Sichuan, Chongqing, Guizhou, Yunnan, Tibet, Shanxi, Gansu, Qinghai, Ningxia, Xinjiang, Guangxi, and Inner Mongolia. Gap3 is used as the explained variable for the system GMM estimation according to the sample classification based on geological locations. Table 6 shows the regression results.

Table 6. Regression of the urban–rural income gap in different provinces

	Eastern China	Central China	Western China
Sser	−0.002** (0.001)	−0.003* (0.001)	0.002** (0.001)
Odr	0.002*** (0.001)	0.003** (0.001)	0.002* (0.001)
Cdr	−0.000 (0.001)	−0.000 (0.001)	−0.001 (0.001)
Control	Yes	Yes	Yes
_cons	0.438*** (0.001)	0.276** (0.001)	0.968*** (0.001)
N	110	80	120

*Notes: *, **, and *** represent significance at the 10%, 5%, and 1% level, respectively, and the number in the brackets is the standard error (Se).*

The regression results of the urban–rural income gap in different provinces after other control variables are fixed indicate that (1) intensifying population aging may cause a significant negative effect on the urban–rural income gap in any province. However, the degree of effect and significance level differ slightly in different provinces. This result verifies Hypotheses 2 and 4. (2) In Eastern and Central China, social security expenditure is negatively correlated with the urban–rural income gap. That is, increasing (decreasing) social security expenditures can narrow (expand) the urban–rural income gap. In Western China, social security expenditure is positively correlated with the urban–rural income gap, thereby indicating that increasing social security expenditure in Western China intensifies rather than narrows the urban–rural income gap. In the background of urban–rural dual economic structure, the government's successful pursuit of economic growth and rapid urbanization may result in fiscal expenditures having distinctive urban bias in Western China. In this circumstance, the proportion of social security expenditure in local fiscal expenditures increases and rural areas can gain only a few benefits from fiscal expenditures. The urban bias policy of fiscal expenditure leads to the inadequate growth of social security expenditure to improve the urban–rural income gap. However, such policy further expands the urban–rural income gap.

Urbanization rate is widely accepted by scholars as an important index to measure urbanization level. The National Bureau of Statistics of China indicates that urbanization rate refers to the ratio between urban population and permanent resident population. The classification standards of *China's New National Urbanization Planning* (2014–2020) indicate that samples with below 60% urbanization rate are classified into the cluster of low urbanization level. The rest of the samples are classified into the cluster of high urbanization level. In sub-

sample regression, *Gap* is used as the explained variable for the common OLS regression and system GMM regression to measure the effects of social security expenditure and demographic structure on the urban–rural income gap. Table 7 lists the regression results of the samples based on the urbanization level.

Table 7. Regression results Gap based on the urbanization level

	Common OLS regression		System GMM regression	
	Low urbanization level	High urbanization level	Low urbanization level	High urbanization level
Sser	−0.047*** (0.013)	−0.044*** (0.005)	−0.006*** (0.002)	0.004 (0.005)
Odr	0.048*** (0.005)	−0.005 (0.011)	0.011*** (0.003)	−0.003 (0.005)
Cdr	0.006* (0.003)	0.006 (0.012)	0.008*** (0.002)	0.000 (0.006)
Control	Yes	Yes	Yes	Yes
_cons	7.712*** (0.211)	9.915*** (0.641)	0.859*** (0.183)	0.263 (0.572)
N	266	75	239	71

*Notes: *, **, and *** represent significance at the 10%, 5%, and 1% level, respectively, and the number in the brackets is the standard error (Se).*

Table 7 shows that 266 samples fail to reach the goal of 60% urbanization rate, thereby indicating the overall low urbanization level in China. In the common OLS regression model, social security expenditure has significant negative effect on the urban–rural income gap under any urbanization level, which remains the same after the hysteresis effect of the urban–rural income gap is introduced into the system GMM regression model. Although the effect of social security expenditure on the urban–rural income gap is positive in provinces with high urbanization level in the system GMM model, such effect is not significant. In the common OLS and system GMM model, the effects of demographic structural changes on the urban–rural income gap are significantly positive in provinces with low urbanization level, thereby indicating that the aging of population can substantially expand the urban–rural income gap in provinces with low urbanization level. However, such effect is not significant in provinces with high urbanization level. Therefore, Hypothesis 4 is verified. Given the continuous population aging, the total social demands decrease continuously and the economic growth lacks internal impetus, thereby resulting in the growth of unemployment rate, particularly in rural areas.

The majority of the provinces have urban bias in fiscal expenditures, thereby further expanding the urban–rural income gap. This result is extremely apparent in provinces with low urbanization level. For provinces with high urbanization level, high urbanization level means weak urban–rural dual structure. Accordingly, the promotion of urbanization substantially improves the urban–rural income distribution layout.

Discussions

The preceding empirical results indicate that social security expenditure and demographic changes can considerably influence the urban–rural income gap. Such effects vary in different provinces owing to heterogeneous properties.

First, the analysis results in *Tables 3, 4,* and *5* prove that social security expenditure has significant negative effect on the urban–rural income gap, while population aging has significantly positive effects on the urban–rural income gap. These results have been proven by the robustness test after the FE model using panel data, the model to solve endogenous problems by introducing the instrumental variables, and GMMs (system GMM and difference GMM). In entire China, every 1% growth of social security expenditure can cause a 1.7% reduction in the national urban–rural income gap. In economic and social development, narrowing the urban–rural income gap is an important premise in facilitating social fairness and harmonious stable development. The central and local governments must attach high attention to increasing the fiscal expenditure level and efficiency, continue to facilitate equalization of urban–rural public services, increase urban–rural equilibrium configurations of public resources, and accelerate to improve the rural public service system. By contrast, the government initiates to promote the comprehensive implementation of the "two-child" policy in the entire country, increases subsidies to child-bearing insurance, strengthens the monitoring on important indexes (e.g., number of births, natural growth rate, and coincidence rate of birth policy) by constructing and perfecting the birth alarming mechanism, maximizes the monitoring result, advocates married couples to assume the responsibility of child raising and have children as planned, relieves the aging of population, improves the demographic structure, and increases economic growth impetus.

Second, the analysis results in Table 6 show that different provinces and regions have heterogeneous features in geological location, economic development level, urbanization level, industrialization level, degree of economic openness, architectural development degree, and government intervention. Government at all levels should focus on such difference and formulate reasonable and appropriate policies based on local conditions and narrow the urban–rural income gap. Moreover, government at all levels, particularly government sectors in regions with substantial urban–rural income gap, should strive to implement the comprehensive

"two-child" and "multiple-child" policies, improve local demographic structure, and reserve human capitals for local continuous economic growth. Despite increasing the fiscal expenditure level and efficiency, governments should focus on correcting urban bias of social security expenditure; enlisting migrant workers into the urban social security system of medicine, pension, and employment injury insurance; and establishing medical insurance, pension insurance, and even a system of subsistence allowances in rural areas.

Third, the analysis results in *Table 7* show that the effects of social security expenditure and demographic structure on the urban–rural income gap in regions with low urbanization level are considerably higher than those in regions with high urbanization level. Compared with regions with high urbanization level, increasing social security expenditure and decreasing the aging of population in regions with low urbanization level can significantly narrow the urban–rural income gap and vice versa. Therefore, the central and local government should considerably focus on the urban–rural integrated development in middle and small-sized cities and small towns, develop production elements assembling and integrating functions of towns, and drive the coordinate development in surrounding rural regions. Further eliminating household register, urban–rural, and regional discrimination, full-coverage and equalized basic public services must be provided, and equal basic public services must be given to both permanent and rural residents. These actions are conducive to intervening and solving the urban–rural income gap.

Conclusion

To discuss relationships among social security expenditure, demographic structural changes, and urban–rural income gap, a measurement test is conducted by using the panel data of 31 provincial areas in Mainland China from 2006 to 2016 and the FE model. The effects of the social security expenditure and demographic structural changes on the urban–rural income gap are investigated. The following major research conclusions are drawn.

(1) In China, social security expenditure and demographic structural changes have significant effects on the urban–rural income gap. Social security expenditure is negatively correlated with the urban–rural income gap, whereas aging of population is positively correlated with the urban–rural income gap. This result reflects that increasing social security expenditure and relieving population aging can significantly inhibit the expansion of the urban–rural income gap. However, reducing the social security expenditure and intensifying population aging can considerably expand the urban–rural income gap.

(2) In the background of the urban–rural dual economic development and rapid expansion of urbanization, government sectors that excessively pursue economic growth have evident urban bias in fiscal expenditures, particularly in provinces with low urbanization level. Such urban bias of fiscal expenditure further determines

that rural areas can gain only a few benefits from fiscal expenditure under a high social security expenditure level. The growth of social security expenditure intensifies the expansion of the urban–rural income gap.

(3) The influence of demographic structure on the urban–rural income gap in provinces with low urbanization level is considerably higher than that in provinces with high urbanization level. The reason is that the continuous population aging decreases consumption and leads to inadequate total social demands, thereby increasing the unemployment rate. However, the urban bias of social security expenditure is considerably evident in provinces with low urbanization level, thereby expanding the urban–rural income gap. Provinces with high urbanization level have weak dual economic structure and substantial changes in the urban–rural income allocation layout have taken place. The influence of demographic structure on the urban–rural income gap is relieved accordingly.

The empirical results of this study prove the gradual expansion of the urban–rural income gap in China. The influencing factors of the urban–rural income gap are likewise recognized. The present research results can provide theoretical references for the formulation and implementation of policies that will inhibit urban–rural income gap based on local conditions. Nevertheless, this study also has certain limitations. For example, other unobservable factors may influence the urban–rural income gap.

References

Aaron, H., & McGuire, M. (1970). Public goods and income distribution. *Econometrica: Journal of the Econometric Society*, *38*(6), 907-920.

Adam, A., Delis, M. D., & Kammas, P. (2014). Fiscal decentralization and public sector efficiency: evidence from OECD countries. *Economics of Governance*, *15*(1), 17-49.

Antón, J. I. (2012). Ageing, Inequality and Social Security in Mexico. A Micro-Simulation Approach. *Economía Mexicana. Nueva Época*, *21*(2), 277-296.

Arellano, M., & Bond, S. (1991). Some tests of specification for panel data: Monte Carlo evidence and an application to employment equations. *The review of economic studies*, *58*(2), 277-297.

Blejer, M. I., & Guerrero, I. (1990). The impact of macroeconomic policies on income distribution: an empirical study of the Philippines. *The Review of Economics and Statistics*, 72(3):414-423.

Blundell, R., & Bond, S. (1998). Initial conditions and moment restrictions in dynamic panel data models. *Journal of econometrics*, *87*(1), 115-143.

Breusch, T. S., & Pagan, A. R. (1980). The Lagrange multiplier test and its applications to model specification in econometrics. *The Review of Economic Studies*, *47*(1), 239-253.

Cameron, L. A. (2000). Poverty and inequality in Java: examining the impact of the changing age, educational and industrial structure. *Journal of Development Economics*, *62*(1), 149-180.

Deaton, A., & Paxson, C. (1994). Intertemporal choice and inequality. *Journal of political economy*, *102*(3), 437-467.

Dodge, D. A. (1975). Impact of tax, transfer, and expenditure policies of government on the distribution of personal income in Canada. *Review of Income and Wealth*, *21*(1), 1-52.

Dong, Z., Wei, X., & Tang, C. (2012). Does Population Ageing Aggravate Income Inequality? Evidence from China 1996–2009. *Population Research*, *36*(5), 94-103.

He, L., & Sato, H. (2013). Income Redistribution in Urban China by Social Security System - an Empirical Analysis Based on Annual and Lifetime Income. *Contemporary Economic Policy*, *31*(2), 314-331.

Higgins, M., & Williamson, J. G. (1997). Age structure dynamics in Asia and dependence on foreign capital. *Population and Development Review*, 261-293.

Hu, B., Liu, W., & Liu, X. (2011). Social Security Expenditure and Urban-Rural Income Gap: Empirical Evidence from China (1978-2008). *Journal of Jiangxi University of Finance and Economics*, 2, 49-54.

Huang, W., He, Y., & Li, H. (2014). An empirical study on the moderating effect of social security on the urban-rural income gap. *Reform of Economic System*, 6, 19-22.

Mahler, V., & Jesuit, D. (2004). *State redistribution in comparative perspective: A cross-national analysis of the developed countries* (No. 392). LIS Working paper series, 1145-1149.

Ji, X. X. (2016). Population Aging, House Prices and Regional Urban-Rural Income Gap-Empirical Research Based on Inter-provincial Panel Data from China. *Finance & Economics*, *8*, 102-112.

Karunaratne, H. D. (2000). Age as a factor determining income inequality in Sri Lanka. *The Developing Economies*, *38*(2), 211-242.

Lan, J., Wei, X. H., & Wu, C. L. (2014). The Effect of Population Ageing on Income Inequality: Evidence from 76 Countries, 1970-2011. *Population Research*, *38*(05), 87-106.

Liu, H. (2014). Does Aging Population Aggravate Income Inequality? *The Journal of Quantitative & Technical Economics*, *31*(04):99-112.

Liu, J., Feng, J., & Wang, S. (2014). Did the Aging Effect Really Worsen Income Inequality in China? *Collected Essays on Finance and Economics*, 5, 16-23.

Lv, C. (2017). Does social security expenditure narrow the urban-rural income gap in China? - a dynamic panel model based on scale and structure. *Journal of Agrotechnical Economics*, 5, 98-110.

Paglin, M. (1977). The measurement and trend of inequality: Reply. *The American Economic Review*, *67*(3), 520-531.

Peng, D., & Wang, L. (2013). Fiscal adjustment, welfare equalization and regional income disparity: An Empirical Analysis Based on Theil index. *Economist*, 5, 21-28.

Qu, Z., & Zhao, Z. (2008). The effect of population aging on consumption and income inequality in rural China. *Economic Research Journal*, *12*, 85-99.

Schultz, T. P. (1997). *Income inequality in Taiwan 1976-1995: Changing family composition, aging, and female labor force participation* (No. 778). Center Discussion Paper.

Samanta, S. K., & Cerf, G. (2009). Income distribution and the effectiveness of fiscal policy: evidence from some transitional economies. *Journal of Economics and Business*, 1, 29-45.

Sun, Y., & Yan, Y. (2015). A study of industrial upgrading, demographic structure and urban-rural income gap. *Journal of Yunnan Nationalities University (Social Sciences Edition)*, *32*(5), 107-114.

Theil, H. (1967). *Economics and Information Theory*. Amsterdam: North-Holland.

Vandenbroucke, G. (2016). Aging and Wealth Inequality in a Neoclassical Growth Model. *Federal Reserve Bank of St. Louis Review*, *98*(1), 61-80.

Wan, G. (2007). Understanding regional poverty and inequality trends in China: methodological issues and empirical findings. *Review of Income and Wealth*, *53*(1), 25-34.

Wang, J., Feng, B., & Wang, S. (2017). Does Aging Worsen the Urban-Rural Income Inequality? - Evidence from 30 Provinces of China. *Modern Economic Science*, *39*(4), 69-78.

Wang, Y. M., & Cai, X. (2010). Fiscal Expenditure Structure and The Income Gap Between Urban and Rural Residents: Empirically Analyse Based on Provincial Panel Data of Eastern, Central and Western Regions in China. *Journal of Shanghai University of Finance and Economics*, 5, 49-57.

Wen, J., & Xie, C. (2017). The Impact of Population Aging on Income Inequality: A Spatial Econometric Analysis Based on Provincial Data. *Journal of Nanjing Audit University*, *14*(4), 12-23.

Wu, S., & Wang, X. (2016). Rural-urban Income Gap, Social Security and Crime Control Cost: An Empirical Analysis Based on Dynamic Spatial Panel Data Model. *Collected Essays on Finance and Economics*, 1, 105-112.

Xu, Q., & Li, F. (2012). Finance Social Security Expenditure and Income Gap between Urban and Rural—Theoretical Analysis and Econometric Test. *Shanghai Journal of Economics*, *24*(11), 81-88.

Xuan, D. (2011). Effects of Level and Composition of Public Spending on Urban and Rural Income Inequality: The Empirical Study from Provincial Panel Data in China. *Economic Review*, 4, 63-69.

Yang, F., & Shen, M. (2016). The relationship between social security level and urban-rural income gap. *Macroeconomics*, 5, 61-72.

Yu, J., & Liu, X. (2014). An Empirical Study on Urban-Rural Income Gap, Urbanization and Social Security Expenditure in China. *Economic Geography*, *34*(03), 79-84.

Zhong, H. (2011). The impact of population aging on income inequality in developing countries: Evidence from rural China. *China Economic Review*, *22*(1):98-107.

Zhu, D., & Dong, Y. (2017). The impact of financial social security expenditure on the urban-rural income gap. *Macroeconomics*, 1, 74-81.