香港社會科學學報

HONG KONG JOURNAL OF SOCIAL SCIENCES

最新第 64 期 (2024 年秋/冬季) **Vol. 64 Autumn/Winter 2024**

Available online at www.hkjoss.com

Research article https://doi.org/10.55463/hkjss.issn.1021-3619.64.32

Investigating the Impact of Population Aging on Income Inequality

Siyuan Liu[1*], Saifuzzaman Ibrahim[1], Lee Chin[1, 2]

1 School of Business and Economics, Universiti Putra Malaysia, Serdang, Malaysia

2 Econometrics Department, Tashkent State University of Economics, Tashkent, Uzbekistan

*Correspondence: siyuanliu57@gmail.com

Abstract:

The primary aim of this study was to examine the impact of population aging on income inequality. To achieve this, the Generalized Method of Moments (GMM) model was employed to analyze a decade of data from 143 countries. The findings reveal that population aging contributes to an improvement in income inequality. Furthermore, the study explores the moderating role of education and confirms that education positively influences the relationship between population aging and income inequality. By expanding the scope of the research population compared to previous studies, this study provides empirical evidence supporting the moderating effect of education.

Keywords:
population aging,
income inequality,
education,
general Method of Moments

Article History:

Received: December 12, 2024
Revised: January 3, 2025
Accepted: January 29, 2025
Published: February 28, 2025

调查人口老龄化对收入不平等的影响

摘要:

本研究的主要目的是考察人口老龄化对收入不平等的影响。为此，采用广义矩法 （GMM） 模型分析了来自 143 个国家的十年数据。研究结果表明，人口老龄化有助于改善收入不平等。此外，该研究探讨了教育的调节作用，并证实教育对人口老龄化与收入不平等之间的关系有积极影响。与以前的研究相比，通过扩大研究人群的范围，本研究提供了支持教育调节作用的实证证据。。

关键词：人口老龄化，收入不平等，教育，广义矩估计模型

1. Introduction

In recent years, the global process of population aging has been increasing. By 2022, 124 countries or regions around the world will have entered an aging society. Projections indicate that the global population aged 65 and above is poised to reach 1.6 billion by 2050, constituting over 16% of the world's total population, with the older demographic outpacing the growth rate of the younger population. These data highlight the significant challenges posed by population aging that the world is currently facing. Population aging has caused substantial shifts in both the labor market structure and income distribution, which may have significant implications for income inequality. At the same time, global income inequality is increasingly severe, and the persistent income inequality poses various threats, including dampening investment enthusiasm, restraining economic growth, amplifying social, economic, and political unrest, and increasing the likelihood of crises (Dabla-Norris et al., 2015). In this context, studying the impact of population aging on income inequality is of considerable practical importance. It not only enhances our understanding of the relationship between demographic shifts and income inequality but also provides a theoretical foundation for developing policies to address the challenges posed by an aging society.

Theoretically, population aging may impact income inequality in the following ways. First, the demographic shift toward population aging presents significant challenges for the labor market and health care expenditures (Wei & Zhou, 2020). Aging reduces the labor force and leads to an older workforce structure. This demographic imbalance may prompt employers to raise minimum wage levels to attract younger workers, which could alleviate income inequality issues (Lin & Yun, 2016; Litwin, 2015). Furthermore, population aging can precipitate shifts in productive lifestyles, consumer preferences, and consumption habits. Given the heightened susceptibility of the elderly to health-related issues, there may be an increased emphasis on healthy living and a greater demand for healthcare services, thereby stimulating expansion within the healthcare sector (Khoda & Kröger, 2024). This expansion in the service industry contributes to the optimization and restructuring of the industrial landscape, potentially improving income inequality to some extent (Hong & Zhang, 2021; Zhou & Li, 2021).

Indeed, population aging is widely acknowledged as a significant determinant of income inequality. The study by Dong et al. (2018), Zhang et al. (2021), and Hwang et al. (2021) suggested that population aging will increase income inequality. However, contrast findings by Wang et al. (2016) and Alimi et al. (2018) posit that population aging might actually decrease income inequality. These contrast outcomes underscore the intricate nature of the relationship between population aging and income distribution. Therefore, there is a need for further in-depth research on the specific impact of population aging on income inequality.

This study makes several contributions, which can be outlined across two primary aspects. First, in contrast to the prevailing focus of existing research on specific countries or regions, our study addresses the need for broader generalizability by encompassing data from 143 countries. This expansion surpasses the narrow confines of prior studies, thereby enhancing the applicability of our findings and augmenting the credibility of our conclusions. Second, this study will also analyze the moderating effects of the impact of population aging on income inequality. By exploring the moderating effects, this study sheds more light on the potential factors affecting the relationship between population aging and income inequality.

The rest of this paper is organized into four sections. Section 2 provides a comprehensive review of relevant studies, Section 3 outlines the data and empirical methodology employed in this study, Section 4 delves into the analysis and discussion of the empirical results,

and finally, Section 5 presents the concluding remarks. The research flowchart is shown in Figure 1.

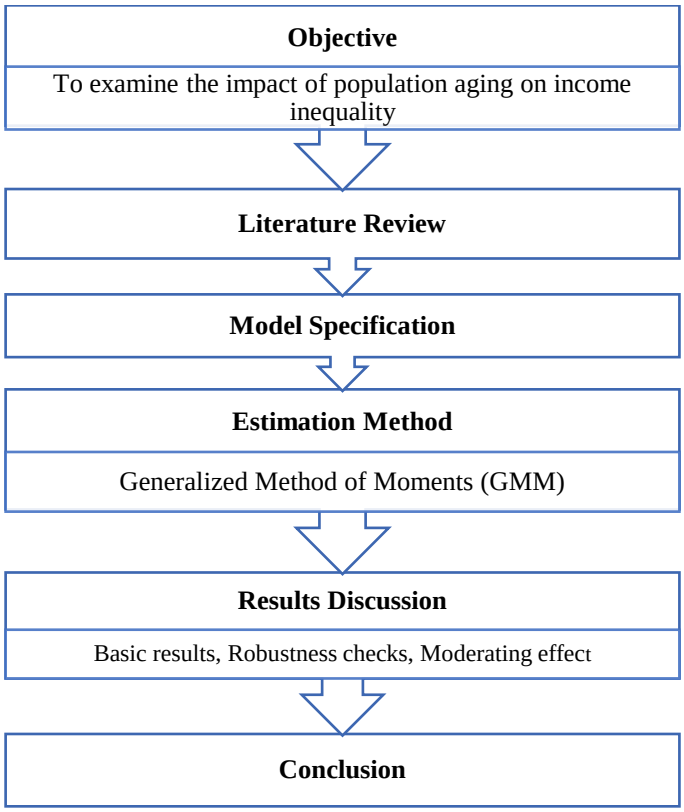

Figure 1. Flowchart of the research methodology (authors' design)

2. Literature Review

The phenomenon of population aging has drawn increasing scholarly attention as more countries undergo demographic transitions toward aging societies. However, the existing body of research, characterized by diverse methodologies and study subjects, has produced conflicting findings regarding the relationship between population aging and income inequality.

Some scholars posit that population aging intensifies income inequality. For example, Lin et al. (2015) employed a fixed-effects model incorporating spatial effects with data from 22 regions in Taiwan and concluded that population aging intensifies income inequality while considering spatial dependence. On the contrary, Onafowora and Owoye (2017) suggested that the lower labor force participation rate and income of the elderly population compared to younger individuals contribute to an exacerbation of income inequality with an aging population. Dong et al. (2018) corroborated this view using provincial-level panel data from China (1998-2014), finding that increasing elderly dependency ratios and declining child dependency ratios significantly widen income inequality. More recently, Zhang et al. (2021) focused on China, employing dynamic computable general equilibrium (CGE) modeling to link macroeconomic variables to a micro-level household simulation model, ultimately concluding that population aging exacerbates income inequality. Similarly, in Korea, Hwang et al. (2021) used the Recentered Influence Function (RIF) regression method, revealing a substantial exacerbation of inequality in low-income households due to population aging.

Conversely, other scholars contend that population aging does not worsen income inequality and may even alleviate it. Likewise, Wang et al. (2016), employing CGE from a micro perspective, argued that population aging leads to a reduction in income inequality, especially among older households in rural areas, due to higher savings rates and imperfect social welfare in those populations. Similarly, Alimi et al. (2018), drawing from life-cycle theory, demonstrated in New Zealand that population aging mitigates the significant increase in income inequality.

Additionally, the study conducted by Md Jamil et al. (2024) suggests that while population aging does not exert a statistically significant impact on income inequality across the entire sample, it may reduce income inequality in subsamples characterized by lower initial levels of inequality.

3. Methodology and Data

3.1. Model Specification and Estimation Method

Following previous research (Dabla-Norris et al., 2015; Dong et al., 2018; Koochakzadeh et al., 2021), the general regression model is represented by Equation (1):

$$GINI = f(PA, RGDP, RGDP^2, INF, Trade, FDI) \quad (1)$$

where GINI represents the Gini coefficient. PA represents the population aging coefficient. RGDP denotes GDP per capita. $RGDP^2$ denotes the square of per capita GDP. INF denotes the inflation rate. Trade denotes trade openness. FDI denotes foreign direct investment.

Recognizing the potential endogeneity issues associated with static estimation methods, we adopted Generalized Method of Moments (GMM) estimation for our benchmark regression, following the recommendations of Ghaemi Asl & Mirzaei Abbasabadi (2021) and Ding et al. (2023). GMM was initially introduced by Hansen (1982) and has since undergone continuous refinement by subsequent scholars such as Arellano & Bond (1991) and Blundell & Bond (1998). GMM encompasses two distinct methodologies: Difference GMM and System GMM. The difference GMM relies solely on the moment conditions within the first-order difference equations, rendering it susceptible to weak instrumental variables and substantial downward finite-sample bias. Conversely, the system GMM integrates moment conditions from both difference and level equations, thereby not only addressing issues related to unobserved individual heterogeneity, omitted variable bias, measurement error, and potential endogeneity, but also mitigating potential biases and inaccuracies inherent in first-order difference

GMM estimation methods. Consequently, system GMM (SYS-GMM) was adopted as the estimation approach in this study. The estimation equation for the GMM method is delineated in Equation (2):

$$GINI_{it} = \alpha_0 + \alpha_1 GINI_{i,t-1} + \alpha_2 PA_{it} + \beta X_{it} + \varepsilon_{it} \quad (2)$$

In Equation (2), GINI represents the Gini coefficient, PA signifies the population aging coefficient, X encompasses a set of control variables influencing income inequality, ε is the random error term, and i and t denote the country and time, respectively. The coefficients α_0, α_1, α_2 and β correspond to the respective variables.

The consistency of the GMM estimates typically requires the following two tests. The first is the over-identification test, which verifies whether the instrumental variables behave exogenously through the Sargan test. The p-value exceeding 0.05 indicates the validity of the instruments and the absence of an over-identification issue. The second is the residual serial correlation test using the Arellano-Bond test. In this test, we pay special attention to the correlation of the second-order series, and if the P-value of AR (2) is greater than 0.05, it indicates that there is no autocorrelation in the second-order series, i.e., the instruments are valid.

3.2. Data Description

This study adopts a macro perspective and therefore the selection of research subjects should be diverse. Based on data availability and consistency, this study selected empirical data from 143 countries spanning from 2010 to 2019 for analysis. The countries chosen represent various levels of economic development and social structures, which helps to improve the generalizability and applicability of the study's findings. The Gini coefficient data were sourced from the World Inequality Database, while all other relevant data were obtained from the World Bank.

The detailed description of the variables is as follows:

Gini Coefficient (GINI): The Gini coefficient, ranging from zero to one, serves as the dependent variable in this study and is widely recognized as an indicator of income inequality. This measure offers a clear and objective assessment of wealth disparity among various demographic groups, aiding in the identification and mitigation of the rich-poor polarization.

Population Aging Coefficient (PA): This core explanatory variable denotes the proportion of the population aged 65 years and above within a specific country or region relative to the total population. A higher value of PA signifies a more significant degree of population aging within the area under consideration.

GDP per capita (RGDP): As a control variable, RGDP reflects the level of economic development, which is treated logarithmically in the empirical analysis. Consistent with the Kuznets curve theory, there exists an inverted U-shaped relationship between economic development and income distribution status. In accordance with this theory, this study introduces both primary and secondary terms of GDP per capita to capture the Kuznets effect.

Foreign direct investment (FDI): This study incorporated FDI as a control variable, which measures the proportion of FDI relative to GDP.

Inflation rate (INF): As an additional control variable, INF is derived from the rate of change in the consumer price index.

Trade openness (Trade): Included as a control variable, Trade represents the total value of exports and imports as a percentage of GDP.

4. Results and Discussion

4.1. Basic Results

Table 1 presents the results of the baseline regression. Column I shows the estimation results without using any control variables in the regression, while Column II includes all the control variables. The results in Column I show that the estimated coefficient of the Population Aging Coefficient (PA) is -0.0855, while the results in Column II show that the estimated coefficient of PA is -0.054. Both estimated coefficients of PA are negative and statistically significant at the 1% level, indicating that as population aging increases, the income inequality will improve and gradually improve.

Table 1. Baseline regression results (compiled by the authors)

Variables	I	II
L. GINI	0.8981***(0.0194)	0.9426***(0.0018)
L. IS		
PA	-0.0855***(0.0166）	-0.054***(0.004)
Odep		
RGDP		0.0162***(0.0013)
$(RGDP)^2$		-0.0009***(0.00007)
FDI		-0.0021***(0.0002)
INF		0.007***(0.0004)
Trade		-0.0007***(0.0002)
Constant	0.0641***(0.0122）	-0.0322(0.0058)
Observations	1234	1234
Sargan Test	0.1035	0.2625
AR (2)	0.2001	0.2189

Note: ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

The findings are consistent with those of Wang et al. (2016) and Alimi et al. (2018). However, it differed from the results of Lin et al. (2015), Onafowora & Owoye (2017), Dong et al. (2018), and Hwang et al. (2021). They contend that as the population ages, income inequality rises. The different findings may stem from the inclusion of only a single study subject in their studies, such as South Korea, China, and the US; as a result, the conclusions may only be applicable to the sample nations and cannot be broadly applied. In

contrast, this study selected a wider sample including 143 countries for the study. This could account for the variations in the study findings. As previously discussed, population aging may result in a labor shortage in the labor market, causing the minimum wage level to rise in order to encourage more individuals to enter the labor market, hence improving income inequality to some extent. Furthermore, population aging may stimulate the development of the healthcare service industry, creating more job opportunities and facilitating the optimization and upgrading of the industrial structure, all of which are beneficial to reducing income inequality and promoting a more equitable distribution of wealth.

4.2 Robustness Checks

To validate the reliability of the conclusions derived from the benchmark regression, a robustness test is essential. Typically, such a test involves modifying the model by introducing variations in the variables (Fang et al., 2022). In this study, the variable substitution method was employed to assess the robustness of the baseline regression. First, as suggested by Md Jamil et al. (2024), we replaced the population aging coefficient with the old age dependency ratio (Odep). The old-age dependency ratio denotes the proportion of the population aged 65 and above in the working-age population, offering another measure of population aging.

According to the regression results in Columns I and II of Table 2, there is a negative correlation between Odep and GINI. Specifically, as Odep increases, GINI shows a downward trend. A higher Odep indicates a greater degree of aging, suggesting that an increase in population aging may promote an improvement in income distribution and reduce income inequality. This result is consistent with the findings of the baseline regression.

Table 2. Robustness check results (compiled by the authors)

Variables	I	II	III	IV
L. GINI	0.9206*** (0.0161)	0.9429*** (0.0018)		
L. IS			0.8644*** (0.1879)	0.9313*** (0.0021)
PA			-0.1209*** (0.0156)	-0.0649*** (0.0044)
Odep	-0.0462*** (0.0095)	-0.0341*** (0.0025)		
RGDP		0.0154*** (0.0013)		0.0104 (0.0015)
$(RGDP)^2$		-0.0009*** (0.00007)		-0.0006*** (0.0001)
FDI		-0.0023*** (0.0002)		-0.0049*** (0.0001)
INF		0.0072*** (0.0004)		0.0035*** (0.0003)
Trade		-0.0074*** (0.00023)		-0.0003 (0.0003)
Constant	0.0502*** (0.0102)	-0.0282 (0.0058)	0.0706*** (0.0096)	-0.0072 (0.0067)
Observations	1234	1234	1234	1234
Sargan Test	0.1378	0.4033	0.2504	0.2286
AR (2)	0.1985	0.2211	0.2196	0.1061

Note: ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

Second, we referred to Flores (2021) regarding the substitution of explanatory variables and replaced the Gini coefficient with the income of the top 10% income share (IS) to gauge income inequality. The regression results from Columns III and IV of Table 2 indicate a negative correlation between the population aging coefficient (PA) and IS. Both the results without and with controlling variables show that as PA increases, IS decreases. Here, IS represents the income share held by the wealthiest 10% of the population, so a lower IS indicates a fairer income distribution. Therefore, the negative correlation suggests that an increase in population aging improves income inequality, making the social income distribution more equitable. This result is also consistent with the findings of the baseline regression, verifying the reliability of the baseline regression results.

4.3. Moderating Effect

As mentioned earlier, population aging may affect the labor market, which in turn impacts income inequality. Research by Nahar et al. (2015) highlights the pivotal role of education in shaping labor market outcomes, suggesting that higher levels of education correlate with heightened labor productivity. Consequently, it is conceivable that education level serves as a moderating factor in the association between population aging and income inequality.

To confirm this hypothesis, we conducted a moderation analysis, and the estimated results are presented in Table 3.

Table 3. Moderating effect (compiled by the authors)

Variable	I	II
PA		0.1062 (0.1011)
Edu	0.0124*** (0.0040)	-0.0060 (0.0103)
PA*Edu		-0.2434** (0.1061)
RGDP	0.0097 (0.0079)	-0.0057 (0.0073)

$(RGDP)^2$	-0.0005 (0.0005)	0.0003 (0.0004)
FDI	-0.0072*** (0.0017)	-0.0082*** (0.0013)
INF	0.0009 (0.0021)	0.0070*** (0.0014)
Trade	0.0069*** (0.0008)	-0.00027 (0.0007)
L. Gini	1.0603***(0.0240)	0.9518***(0.0160)
Constant	-0.1094***(0.0316)	0.0546*(0.0281)
Observations	1234	1234
Sargan Test	0.1135	0.3961
AR (2)	0.2215	0.2437

Note: ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels.

On the one hand, the findings in Column I indicate that education level impacts income inequality. On the other hand, the results in Column II reveal that the estimated coefficient of the interaction term (PA*Edu) is negative at the 1% significance level.

In Table 3, the coefficient of the Population Aging Coefficient (PA) is also significantly negative. This implies that education level not only impacts the association between population aging and income inequality but also enhances this relationship, leading to a further reduction in income inequality. This phenomenon may be attributed to several factors. First, individuals with higher levels of education often have higher productivity and competitiveness, making them more likely to obtain employment opportunities and higher wages, thus placing them in a more advantageous position in the labor market (Friedrich & Hirtz, 2021) and relatively less affected by population aging. Therefore, as the level of education increases, the mitigating effect of population aging on income inequality becomes more pronounced. Second, individuals with a good education are likely to have higher skills and knowledge, making them more adaptable to the changing social and economic situations (Mili, 2018). Therefore, compared to individuals with lower levels of education, those with higher levels of education are more capable of coping with the economic pressures brought about by population aging, thereby enhancing the mitigating effect of population aging on income inequality.

5. Conclusion

This study systematically examined the impact of population aging on income inequality in 143 countries using dynamic GMM estimation. The use of the dynamic GMM method effectively overcomes the potential endogeneity problem and ensures the reliability and robustness of the results.

Specifically, the study draws the following key conclusions:

1) The overall sample shows a negative correlation between population aging and income inequality, implying that income inequality improves as population aging progresses, promoting a more equitable income distribution.

2) The study empirically tested the potential moderating effect by incorporating the average years of schooling into the model. The results indicate that education level positively moderates the impact of population aging on income inequality.

The implications of this study lie in two aspects: Firstly, this study offers new insights into the relationship between population aging and income inequality, particularly in terms of its broader applicability across different global economies. Policymakers should recognize that population aging is an important factor affecting income inequality. Second, this study highlights the crucial role of education in moderating this relationship. Therefore, governments should focus more on universal access to quality education, increase investment in the education sector, and work toward improving the overall educational attainment of their citizens.

6. Limitations and Further Study

This study was constrained by limitations in data availability, which narrowed its scope. Future research could expand the scope by increasing the number of countries in the sample or extending the time period, enabling a more comprehensive analysis.

Author Contributions

Conceptualization, S.I., and S.L.; methodology, S.I., and S.L.; validation, S.I., and L.C.; data curation, S. L.; writing—original draft preparation, S.L.; writing—review and editing, S.I., and L.C.; visualization, L.C.; supervision, S.L.; project administration, S.L. All authors have read and agreed to the published version of the manuscript.

Funding

This research received no external funding.

Institutional Review Board Statement

The study was conducted in accordance with the Declaration of Helsinki.

Informed Consent Statement

Informed consent was obtained from all subjects involved in the study.

Data Availability Statement

The raw data supporting the conclusions of this article will be made available by the authors on request.

Acknowledgments

We thank the anonymous reviewers for their careful reading of our manuscript and their many insightful comments and suggestions.

Conflicts of Interest

The authors declare no conflicts of interest.

References

[1] ALIMI, O.B., MARÉ, D.C., & POOT, J. (2018). More Pensioners, Less Income Inequality? The Impact of Changing Age Composition on Inequality in Big Cities and Elsewhere. In: STOUGH, R., KOURTIT, K., NIJKAMP, P., BLIEN, U. (Eds.) *Modelling Aging and Migration Effects on Spatial Labor Markets. Advances in Spatial Science*. Springer, Cham. https://doi.org/10.1007/978-3-319-68563-2_8

[2] 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. https://doi.org/10.2307/2297968

[3] BLUNDELL, R., & BOND, S. (1998). Initial conditions and moment restrictions in dynamic panel data models. *Journal of Econometrics*, 87(1), 115-143. https://doi.org/10.1016/S0304-4076(98)00009-8

[4] DABLA-NORRIS, E., KOCHHAR, K., SUPHAPHIPHAT, N., RICKA, F., & TSOUNTA, E. (2015). *Causes and consequences of income inequality: A global perspective.* International Monetary Fund.

[5] DEATON, A., & PAXSON, C. (1994). Intertemporal Choice and Inequality. *Journal of Political Economy*, 102(3), 437–467. https://doi.org/10.1086/261941

[6] DEATON, A. S., & PAXSON, C. H. (1997). The effects of economic and population growth on national saving and inequality. *Demography*, 34(1), 97–114. https://doi.org/10.2307/2061662

[7] DING, Y., LEE, C., & LU, M. (2023). Does market sentiment push up China's housing prices? An empirical study based on the data of 45 mainstream cities in China. *Journal of Housing and the Built Environment*, 38(2), 1119–1147. https://doi.org/10.1007/s10901-022-09985-7

[8] DONG, Z., TANG, C., & WEI, X. (2018). Does population aging intensify income inequality? Evidence from China. *Journal of the Asia Pacific Economy*, 23(1), 66–77. https://doi.org/10.1080/13547860.2017.1354270

[9] EZOJI, A., ASSARI, A., MAHDAVI, M. R. V., & JAHANGARD, E. (2019). The Impact of Human Capital (Health and Education) on Labor Productivity; a Composite Model Approach- a Case Study of Iran. *Iranian Economic Review*, 23(2), 373–397. https://doi.org/10.22059/ier.2019.70287

[10] FANG, Z., RAZZAQ, A., MOHSIN, M., & IRFAN, M. (2022). Spatial spillovers and threshold effects of internet development and entrepreneurship on green innovation efficiency in China. *Technology in Society*, 68, 101844. https://doi.org/10.1016/j.techsoc.2021.101844

[11] FLORES, I. (2021). The capital share and income inequality: Increasing gaps between micro and macro-data. *Journal of Economic Inequality*, 19(4), 685–706. https://doi.org/10.1007/s10888-021-09482-x

[12] FRIEDRICH, A., & HIRTZ, S. (2021). Same educational level, same wage returns? An analysis over time and across occupations in Germany. *Journal of Education and Work*, 34(5–6), 632–648. https://doi.org/10.1080/13639080.2021.1965967

[13] GHAEMI ASL, M., & MIRZAEI ABBASABADI, H. (2021). Age Effects on Health Expenditures: A Global View. *Journal of Population Ageing*, 14(2), 247–270. https://doi.org/10.1007/s12062-020-09285-4

[14] GOH, L. T., & LAW, S. H. (2019). The Effect of Trade Openness on Income Inequality with the Role of Institutional Quality. *Indonesian Journal of Economics, Social, and Humanities*, 1(2), 65–76. https://doi.org/10.31258/ijesh.1.2.65-76

[15] HANSEN, L. P. (1982). Large Sample Properties of Generalized Method of Moments Estimators. *Econometrica*, 50(4), 1029. https://doi.org/10.2307/1912775

[16] HONG, M., & ZHANG, W. (2021). Industrial structure upgrading, urbanization and urban-rural income disparity: evidence from China. *Applied Economics Letters*, 28(15), 1321–1326. https://doi.org/10.1080/13504851.2020.1813244

[17] HWANG, S., CHOE, C., & CHOI, K. (2021). Population ageing and income inequality. *Journal of the Economics of Ageing*, 20. https://doi.org/10.1016/j.jeoa.2021.100345

[18] KAMPELMANN, S., RYCX, F., SAKS, Y., & TOJEROW, I. (2018). Does education raise productivity and wages equally? The moderating role of age and gender. *IZA Journal of Labor Economics*, 7(1), 1–37. https://doi.org/10.1186/s40172-017-0061-4

[19] KAULIHOWA, T., & ADJASI, C. (2018). FDI and income inequality in Africa. *Oxford Development Studies*,46(2), 250–265. https://doi.org/10.1080/13600818.2017.1381233

[20] KHODA, M. S. E., & KRÖGER, T. (2024). Policy-makers and Population Ageing in Bangladesh: A Dearth of Attention. *Journal of Population Ageing*, 1-24. https://doi.org/10.1007/s12062-024-09452-x

[21] KOOCHAKZADEH, S., HEYDARI, H., FEYZABADI, V. Y., & SHAKIBAIEE, A. (2021). Does Population Aging Affect Income Inequality in

Iran? *Iranian Journal of Ageing*, 16(3), 396–411. https://doi.org/10.32598/sija.2021.16.3.3113.1

[22] LEE, H. H., & SHIN, K. (2019). Nonlinear effects of population aging on economic growth. *Japan and the World Economy*, 51, 100963. https://doi.org/10.1016/j.japwor.2019.100963

[23] LIN, C. H. A., LAHIRI, S., & HSU, C. P. (2015). Population Aging and Regional Income Inequality in Taiwan: A Spatial Dimension. *Social Indicators Research*, 122(3), 757–777. https://doi.org/10.1007/s11205-014-0713-8

[24] LIN, C., & YUN, M. S. (2016). The effects of the minimum wage on earnings inequality: Evidence from China. *Research in Labor Economics*, 44, 179–212. https://doi.org/10.1108/S0147-912120160000044012

[25] LITWIN, B. (2015). Determining the Effect of the Minimum Wage on Income Inequality. *Student Publications.* Retrieved from https://cupola.gettysburg.edu/student_scholarship/300

[26] MAESTAS, N., MULLEN, K. J., & POWELL, D. (2023). The Effect of Population Aging on Economic Growth, the Labor Force, and Productivity. *American Economic Journal: Macroeconomics*, 15(2), 306–332. https://doi.org/10.1257/mac.20190196

[27] MD JAMIL, A. R., LAW, S. H., KHAIR-AFHAM, M. S., & TRINUGROHO, I. (2024). Financial inclusion and income inequality in developing countries: The role of aging populations. *Research in International Business and Finance*, 67A, 102110. https://doi.org/10.1016/j.ribaf.2023.102110

[28] MILI, B., KATYAINI, S., & BARUA, A. (2018). Enhancing Adaptive Capacity through Education: A Case Study of Rural Mountain Communities, Sikkim, Eastern Himalaya India. In *Climate Change Governance and Adaptation*, Chapter 7, 109–135.

[29] NAHAR, M., ARSHAD, M., & AB MALIK, Z. (2015). Quality of Human Capital and Labor Productivity: A Case of Malaysia. *International Journal of Economics, Management and Accounting*, 23(1), 37–55. https://doi.org/10.31436/ijema.v23i1.289

[30] ONAFOWORA, O., & OWOYE, O. (2017). A panel vector AutoRegression analysis of income inequality dynamics in each of the 50 states of USA. *International Journal of Social Economics*, 44(6), 797–815. https://doi.org/10.1108/IJSE-06-2015-0154

[31] SIAMI-NAMINI, S., & HUDSON, D. (2019). Inflation and income inequality in developed and developing countries. *Journal of Economic Studies*, 46(3), 611–632. https://doi.org/10.1108/JES-02-2018-0045

[32] WANG, X., CHEN, K. Z., ROBINSON, S., & HUANG, Z. (2016). Will China's demographic transition exacerbate its income inequality? –CGE modeling with top-down microsimulation. *Journal of the Asia Pacific Economy*, 22(2), 227–252. https://doi.org/10.1080/13547860.2016.1263043

[33] WEI, N., & ZHOU, L. (2020). Time-to-Death and Health Care Expenditure: Evidence from China. *Journal of Population Ageing*, 13(4), 485–495. https://doi.org/10.1007/s12062-019-09256-4

[34] YANG, Y., ZHENG, R., & ZHAO, L. (2021). Population Aging, Health Investment and Economic Growth: Based on a Cross-Country Panel Data Analysis. *International Journal of Environmental Research and Public Health*, 18(4), 1801. https://doi.org/10.3390/ijerph18041801

[35] ZHANG, H., KE, L., & DING, D. (2021). The Effect of Chinese Population Aging on Income Inequality: Based on a Micro-Macro Multiregional Dynamic CGE Modelling Analysis. *Emerging Markets Finance and Trade*, 57(5), 1399–1419. https://doi.org/10.1080/1540496x.2019.1623781

[36] ZHOU, Q., & LI, Z. (2021). The impact of industrial structure upgrades on the urban–rural income gap: An empirical study based on China's provincial panel data. *Growth and Change*, 52(3), 1761–1782. https://doi.org/10.1111/grow.12502

参考文:

[1] ALIMI, O.B.、MARÉ, D.C. 和 POOT, J. (2018)。养老金领取者增多，收入不平等减少？年龄结构变化对大城市及其他地区不平等的影响。收录于：STOUGH, R.、KOURTIT, K.、NIJKAMP, P. 和 BLIEN, U. (Eds.) 模拟老龄化和移民对空间劳动力市场的影响。空间科学进展。Springer, Cham 。 https://doi.org/10.1007/978-3-319-68563-2_8

[2] ARELLANO, M. 和 BOND, S. (1991)。面板数据的一些规范测试：蒙特卡罗证据及其在就业方程中的应用。经济研究评论，58(2)，277–297。https://doi.org/10.2307/2297968

[3] BLUNDELL, R., 和 BOND, S. (1998). 动态面板数据模型中的初始条件和矩限制。计量经济学杂志，87(1)，115-143 。https://doi.org/10.1016/S0304-4076(98)00009-8

[4] DABLA-NORRIS, E., KOCHHAR, K., SUPHAPHIPHAT, N., RICKA, F., 和 TSOUNTA, E. (2015). 收入不平等的原因和后果：全球视角。国际货币基金组织。

[5] DEATON, A., 和 PAXSON, C. (1994). 跨期选择与不平等。政治经济学杂志，102(3)，437–467。https://doi.org/10.1086/261941

[6] DEATON, A. S., 和 PAXSON, C. H. (1997). 经济和人口增长对国民储蓄和不平等的影响。人口统计学，34(1)，97–114 。https://doi.org/10.2307/2061662

[7] DING, Y., LEE, C., 和 LU, M. (2023). 市场情绪推

高了中国房价吗？基于中国 45 个主流城市数据的实证研究。住房与建筑环境杂志，38(2)，1119–1147 。 https://doi.org/10.1007/s10901-022-09985-7

[8] DONG, Z., TANG, C., 和 WEI, X. (2018). 人口老龄化加剧收入不平等吗？来自中国的证据。《亚太经济杂志》，23(1)，66–77 。https://doi.org/10.1080/13547860.2017.1354270

[9] EZOJI, A., ASSARI, A., MAHDAVI, M. R. V., 和 JAHANGARD, E. (2019). 人力资本（健康和教育）对劳动生产率的影响；综合模型方法——以伊朗为例的研究。《伊朗经济评论》，23(2)，373–397。 https://doi.org/10.22059/ier.2019.70287

[10] FANG, Z.、RAZZAQ, A.、MOHSIN, M. 和 IRFAN, M. (2022)。互联网发展和创业对中国绿色创新效率的空间溢出效应和阈值效应。《技术与社会》，68，101844 。https://doi.org/10.1016/j.techsoc.2021.101844

[11] FLORES, I. (2021)。资本份额和收入不平等：微观和宏观数据之间的差距越来越大。《经济不平等杂志》，19(4)，685–706 。https://doi.org/10.1007/s10888-021-09482-x

[12] FRIEDRICH, A., 和 HIRTZ, S. (2021). 同等教育水平，同等工资回报？对德国不同时期和不同职业的分析。《教育与工作杂志》，34(5–6)，632–648 。https://doi.org/10.1080/13639080.2021.1965967

[13] GHAEMI ASL, M., 和 MIRZAEI ABBASABADI, H. (2021). 年龄对健康支出的影响：全球视角。《人口老龄化杂志》，14(2)，247–270 。https://doi.org/10.1007/s12062-020-09285-4

[14] GOH, L. T., 和 LAW, S. H. (2019). 贸易开放对收入不平等的影响以及制度质量的作用。《印度尼西亚经济、社会和人文杂志》，1(2)，65–76。https://doi.org/10.31258/ijesh.1.2.65-76

[15] HANSEN, L. P. (1982). 广义矩估计量的大样本特性。《计量经济学》，50(4)，1029 。https://doi.org/10.2307/1912775

[16] HONG, M., 和 ZHANG, W. (2021)。产业结构升级、城镇化与城乡收入差距：来自中国的证据。应用经济学快报，28(15)，1321–1326 。https://doi.org/10.1080/13504851.2020.1813244

[17] HWANG, S., CHOE, C., 和 CHOI, K. (2021). 人口老龄化与收入不平等。老龄经济学杂志，20。https://doi.org/10.1016/j.jeoa.2021.100345

[18] KAMPELMANN, S., RYCX, F., SAKS, Y., 和 TOJEROW, I. (2018). 教育能平等地提高生产率和工资吗？年龄和性别的调节作用。 IZA 劳动经济学杂志，7(1)，1–37 。https://doi.org/10.1186/s40172-017-0061-4

[19] KAULIHOWA, T.，和 ADJASI, C. (2018)。非洲的 FDI 与收入不平等。牛津发展研究，46(2)，250–265 。https://doi.org/10.1080/13600818.2017.1381233

[20] KHODA, M. S. E.，和 KRÖGER, T. (2024)。孟加拉国的政策制定者和人口老龄化：关注度不足。人口老龄化杂志，1-24 。https://doi.org/10.1007/s12062-024-09452-x

[21] KOOCHAKZADEH, S.、HEYDARI, H.、FEYZABADI, V. Y. 和 SHAKIBAIEE, A. (2021)。人口老龄化是否影响伊朗的收入不平等？伊朗老龄化杂志，16(3)，396–411 。https://doi.org/10.32598/sija.2021.16.3.3113.1

[22] LEE, H. H., 和 SHIN, K. (2019). 人口老龄化对经济增长的非线性影响。日本与世界经济，51，100963 。https://doi.org/10.1016/j,japwor.2019.100963

[23] LIN, C. H. A.、LAHIRI, S.、和 HSU, C. P. (2015). 台湾人口老龄化与地区收入不平等：空间维度。社会指标研究，122(3)，757 – 777 。https://doi.org/10.1007/s11205-014-0713-8

[24] LIN, C.、和 YUN, M. S. (2016). 最低工资对收入不平等的影响：来自中国的证据。劳动经济学研究，44，179–212。https://doi.org/10.1108/S0147-912120160000044012

[25] LITWIN，B.（2015）。确定最低工资对收入不平等的影响。学生出版物。取自 https://cupola.gettysburg.edu/student_scholarship/300

[26] MAESTAS，N.、MULLEN，K. J. 和 POWELL，D.（2023）。人口老龄化对经济增长、劳动力和生产力的影响。美国经济学杂志：宏观经济学，15(2)，306 – 332 。https://doi.org/10.1257/mac.20190196

[27] MD JAMIL, A. R.、LAW, S. H.、KHAIR-AFHAM, M. S. 和 TRINUGROHO, I. (2024)。发展中国家的金融包容性和收入不平等：老龄化人口的作用。国际商业与金融研究，67A，102110。https://doi.org/10.1016/j.ribaf.2023.102110

[28] MILI, B.、KATYAINI, S. 和 BARUA, A. (2018)。通过教育提高适应能力：印度东喜马拉雅锡金农村山区社区案例研究。《气候变化治理与适应》，第 7 章，109-135。

[29] NAHAR, M.、ARSHAD, M. 和 AB MALIK, Z. (2015)。人力资本质量和劳动生产率：以马来西亚为例。《国际经济学、管理与会计杂志》，23(1)，37 – 55 。https://doi.org/10.31436/ijema.v23i1.289

[30] ONAFOWORA, O. 和 OWOYE, O. (2017)。美国 50 个州收入不平等动态的面板向量自回归分析。《国际社会经济学杂志》，44(6)，797–815。https://doi.org/10.1108/IJSE-06-2015-0154

[31] SIAMI-NAMINI, S. 和 HUDSON, D. (2019)。发达国家和发展中国家的通货膨胀和收入不平等。《经济研究杂志》，46(3)，611 – 632。https://doi.org/10.1108/JES-02-2018-0045

[32] WANG, X., CHEN, K. Z., ROBINSON, S., 和 HUANG, Z. (2016). 中国的人口结构转型会加剧其收入不平等吗？–自上而下的微观模拟的 CGE 建模。《亚太经济杂志》，22(2)，227 – 252。https://doi.org/10.1080/13547860.2016.1263043

[33] WEI, N., 和 ZHOU, L. (2020). 死亡时间和医疗保健支出：来自中国的证据。人口老龄化杂志，13(4)，485 – 495。https://doi.org/10.1007/s12062-019-09256-4

[34] YANG, Y., ZHENG, R., 和 ZHAO, L. (2021). 人口老龄化、健康投资与经济增长：基于跨国面板数据分析。国际环境研究与公共健康杂志，18(4)，1801。https://doi.org/10.3390/ijerph18041801

[35] ZHANG, H., KE, L., 和 DING, D. (2021). 中国人口老龄化对收入不平等的影响：基于微观-宏观多区域动态 CGE 模型分析。新兴市场金融与贸易，57(5)，1399 – 1419。https://doi.org/10.1080/1540496x.2019.1623781

[36] ZHOU, Q., 和 LI, Z. 2021）。产业结构升级对城乡收入差距的影响：基于中国省级面板数据的实证研究。增长与变化，52(3)，1761 – 1782。https://doi.org/10.1111/grow.12502