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Managing financial risk in healthcare: Medical cost anxiety, financial innovation, and income mobility in China

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Xindan Zhang[1] Musa Abdu[2,3], Romanus Osabohien[3,4] and Mihajlo Jakovljevic[5,6,7]*

College of Finance & Information, Ningbo University of Finance & Economics, Ningbo, 315175, Zhejiang, China[1]; Department of Economics, Gombe State University, Gombe, Nigeria[2]; DEPECOS Institutions and Development Research Centre (DIaDeRC), Ota, Nigeria[3]; Department of Economics, Monarch University, Iyesi-Ota, Nigeria[4]; UNESCO-TWAS, Trieste, Italy[5]; Shaanxi University of Technology, Hanzhong, China[6]; Department of Global Health Economics and Policy, University of Kragujevac, Serbia[7]

***For Correspondence:** Email: *zxd997152429@163.com*

Abstract

As healthcare expenses continue to rise without social security, many households in developing countries, are grappling with financial strain and uncertainty, leading to a growing concern known as medical cost anxiety. The level of financial innovation among individuals plays a critical role in how they navigate and manage healthcare costs. Understanding financial concepts, making informed decisions, and effectively planning for medical expenses can significantly impact an individual's ability to cope with medical cost anxiety. This study examines the relationship between medical cost anxiety, financial innovation, and household income mobility in China. Using the 2021 survey data obtained from Global Financial Inclusion (Global Findex) for China, we employed the Ordered Probit Regression and Linear Probability regression models to analyse the impact of medical cost anxiety and financial innovation on household income mobility. The results show that individuals who experience greater medical cost anxiety are 20% more inclined to move from the middle 20% income quintile to the fourth 20% income quintile than those with lower levels of medical cost anxiety in the same income quintile. This indicates that medical cost anxiety drives middle-income individuals to strive for a higher income group more strongly than it motivates low-income individuals to move to a middle-income group. Overall, medical cost anxieties have negative effects on the probability of individuals to move from lower income quintiles to higher ones. These findings highlight the importance of addressing healthcare affordability and promoting financial inclusion to enhance household income mobility in China. *(Afr J Reprod Health 2025; 29 [11]: 189-203).*

Keywords: medical cost, health anxiety, financial literacy, financial innovation, income mobility

Résumé

Face à l'augmentation constante des dépenses de santé en l'absence de protection sociale, de nombreux ménages dans les pays en développement sont confrontés à des difficultés financières et à une grande incertitude, engendrant une anxiété croissante liée aux coûts médicaux. Le niveau d'innovation financière des individus joue un rôle crucial dans leur capacité à gérer ces coûts. Comprendre les concepts financiers, prendre des décisions éclairées et planifier efficacement ses dépenses médicales peut avoir un impact significatif sur la capacité d'un individu à faire face à cette anxiété. Cette étude examine la relation entre l'anxiété liée aux coûts médicaux, l'innovation financière et la mobilité des revenus des ménages en Chine. À partir des données de l'enquête 2021 de Global Financial Inclusion (Global Findex) pour la Chine, nous avons utilisé les modèles de régression probit ordonnée et de régression linéaire de probabilité pour analyser l'impact de l'anxiété liée aux coûts médicaux et de l'innovation financière sur la mobilité des revenus des ménages. Les résultats montrent que les individus souffrant d'une plus grande anxiété liée aux coûts médicaux ont 20 % plus de chances de passer du quintile de revenus médian au quintile de revenus supérieur que ceux présentant des niveaux d'anxiété plus faibles au sein du même quintile. Cela indique que l'anxiété liée aux coûts médicaux pousse les personnes à revenu moyen à viser un groupe de revenus plus élevé plus fortement qu'elle ne motive les personnes à faible revenu à passer à un groupe de revenus moyen. Globalement, l'anxiété liée aux coûts médicaux a un impact négatif sur la probabilité pour les individus de passer des quintiles de revenus les plus bas aux plus élevés. Ces résultats soulignent l'importance de s'attaquer au problème de l'accessibilité financière aux soins de santé et de promouvoir l'inclusion financière afin d'améliorer la mobilité sociale des ménages en Chine. *(Afr J Reprod Health 2025; 29 [11]: 189-203).*

Mots-clés: coûts médicaux, anxiété liée à la santé, littératie financière, innovation financière, mobilité sociale

Introduction

Household income mobility is a key indicator of economic well-being and social progress, reflecting the ability of individuals and families to move up the income ladder over time. In China, rapid economic growth and urbanisation have led to significant changes in income distribution and social stratification, creating both

opportunities and challenges for household income mobility. However, rising healthcare costs and medical expenses have emerged as major sources of financial stress for many households, potentially impeding their ability to achieve upward income mobility[1,2].

Medical cost anxiety, defined as the fear or concern about the financial burden of healthcare expenses, can have profound implications for household financial stability and economic mobility[2-5]. High levels of medical cost anxiety may lead individuals to forgo necessary medical treatment, deplete savings, or incur debt, all of which can hinder their ability to invest in education, entrepreneurship, or other income-generating activities. Moreover, the lack of adequate insurance coverage and financial protection mechanisms can exacerbate the impact of medical cost anxiety on household income mobility[3-6]

Against this backdrop, financial innovation has emerged as a potential solution to address the challenges posed by medical cost anxiety and promote household income mobility, but there has been lack of empirical evidence in China to substantiate this position. On the other hand, financial innovations such as health insurance[7], savings mechanisms and other risk-sharing tools can help individuals and families better manage healthcare expenses, reduce financial uncertainty, and protect against income shocks.

By providing access to these innovative financial products and services, policymakers and financial institutions can empower households to navigate the complexities of the healthcare system and enhance their economic resilience. This study aims to investigate the relationship between medical cost anxiety, financial innovation, and household income mobility in China. By analysing data from a national survey, we seek to understand how medical cost anxiety affects income mobility and examine the role of financial innovation in mitigating its negative impact. Therefore, the study provides answers to the following research questions:

RQ1: What is the impact of medical cost anxiety on household income mobility in China?

The research question focuses on exploring the impact of medical cost anxiety on household income mobility in China. This research question investigates how concerns related to healthcare expenses, specifically medical cost anxiety, can influence the ability of households to move up the income ladder over time. The measurement of medical cost anxiety in this research includes key indicator: Financial worry specifically due to medical costs: This indicator focuses specifically on the anxiety and concern individuals have regarding the financial implications of medical expenses. Following Osabohien et al.[1] in the case of Malaysia, it reflects the extent to which healthcare costs pose a significant financial threat to households and can potentially impact their economic well-being and mobility.

RQ2: How does financial innovation influence household income mobility in China?

The research question aims to investigate the relationship between financial innovation and household income mobility in China. Financial innovation refers to the introduction of new financial products, services, technologies, or practices that enhance the efficiency, accessibility, and effectiveness of financial systems. In this study, financial innovation is measured using three key indicators:

a) The use of mobile or internet technology to access financial accounts: This indicator captures the extent to which households leverage digital platforms, such as mobile apps or online banking services, to manage their financial transactions and accounts. The adoption of mobile and internet technologies in financial management can improve convenience, accessibility, and efficiency, potentially impacting household income mobility.

b) Formal savings (using a mobile account to store money): This indicator reflects the practice of utilizing mobile-based savings accounts to store and manage financial resources. Formal savings accounts provide a secure and regulated means of saving money, facilitating financial planning and asset accumulation. The use of mobile accounts for savings can enhance financial inclusion and promote savings behaviour among households, which may influence income mobility.

c) Savings for old age: This indicator focuses on the specific aspect of saving for retirement or old age. As individuals plan for their future financial security, saving for old age becomes crucial for maintaining economic well-being in later stages of life. By examining the extent to which households prioritize saving for old age, the research seeks to understand how this financial behaviour relates to income mobility outcomes.

Literature review

In China, rising healthcare costs and inadequate insurance coverage have resulted in an escalation of medical cost anxiety. Zhang *et al*.[8] found that individuals with high medical cost anxiety delayed care, worsening health outcomes, which were compounded by income and perceived financial insecurity. In Sri Lanka, Kumara and Samaratunge[9] pointed out that non-communicable disease prevalence and hospitalization often led to food intake decline among households, and the decrease in private hospitalization reduced aggregate

consumption capacity. Baldacci *et al*.[10] reported that an increase of 1% in public spending on education, health, and pensions increased household consumption by 1.25% in a permanent manner.

Sheu and Lu[11] used a difference-in-differences (DID) approach on Taiwan's family income and spending data and found that the national health insurance (NHI) changed spending patterns, with improvements in the quality of housing observing the greatest post-NHI increase. Rajaram *et al*.[12] and Figari and Fiorio[13], using DID approaches, detected no correlation between the 2011 ACGME duty hour reforms and the clinical outcomes of mortality and readmissions.

With regard to financial literacy, Palomino *et al*.[14] recorded low knowledge among Chinese adults concerning financial products, budgeting, and investments, with particular emphasis on the need for financial education to enable healthcare decisions to be made in an informed manner. Financial well-being as satisfaction and stability in finances[15] is positively influenced by sound financial habits[16, 17]. Joo and Grable[17] found that financial stress, behaviors, and income management enhance financial well-being, whereas Hira *et al*.[18] reported that education, age, household size, and homeownership are strong predictors of financial stability.

Inequality in household income quintiles also has an impact on access to healthcare in China. Ozili[19] found that underprivileged groups have affordability issues and limited insurance, which compromises the use of healthcare. Clark *et al*.[20], using the COME-HERE database for France, Germany, Italy, and Spain, proved inequality in income increased during early COVID-19 (Jan–May 2020) but came back by September after the implementation of income support for low-income individuals. Menta[21] also revealed poverty rates increased higher in early 2020 but later reduced, though the trend varied by country.

The literature indicates that medical cost anxiety, financial literacy, and income differences are connected in affecting health care access as well as financial resilience in China. Medical cost anxiety is supported by low financial literacy, while poorer families face compounded barriers to health care and overall wellbeing. Social expenditures and insurance protection are apparent to alleviate these inequalities, as are policies targeting vulnerable groups.

In addition, cross-country tax-benefit microsimulation studies, such as Almeida *et al.*[22] and Christl *et al.*[23], with the EUROMOD model, examined the economic impact of COVID-19 across 27 EU nations. Almeida *et al*.[22] used macro data reweighting to estimate shock, while Christl *et al.*[23-24] used a worker transition-based nowcasting method into unemployment or compensation.

Methods

Theoretical underpinnings and empirical model

This study is hinges on the theory of financial literacy, which refers to the knowledge, skills, and attitudes that enable individuals to make informed financial decisions and effectively manage their finances. This theory suggests that individuals with higher levels of financial literacy are better equipped to navigate complex financial systems, understand the implications of financial decisions, and plan for future expenses, including healthcare costs. Financial literacy is influenced by factors such as education level, access to financial resources, exposure to financial education programs, and cultural norms related to money management.

To examine the effect of medical anxiety and financial innovation on household income in China, the following econometric model was developed. This is in line with theories of financial innovation and medical anxiety that influence individual income mobility, following the empirical work by Osabohien *et al*.[2]

$$INCQ_h = \beta_0 + \beta_1 MEAX_h + \beta_2 FIIN_h + \beta_3 WORR_h + \beta_4 AGE_h + \beta_5 EDUC_h + \mu_h \quad (1)$$

Where h denotes the household, and μ_h represents the random error term in the equation. The dependent variable, $INCQ_h$ signifies the household income mobility and it is measured by dividing the household population into five equal groups based on their income levels. Each group represents 20%

of the population and is referred to as a quintile. Previous studies[25,26] have used income quintile to represent income level of the households. $MEAX_h$ stands for the household medical cost anxiety measured by a dummy variable suggesting whether or not a household is worried by medical cost. This is proxy was used Osabohien *et al*.[2] to represent medical cost anxiety. $FIIN_h$ is a vector of financial innovation variables (mobile banking, savings in bank account and savings for old age).

Many household-level factors were included as control variables to account for their potential influence on the household income quintile. For example, general anxiety (WORR) including worries about medical cost, cost of education and other bills, which is likely retard the household movement from low income mobility to higher one. Age was included as a control variable. It is expected that as households gets older, they become more concerned about their health, their productivity decreases. Educational attainment (EDUC) strongly determines income mobility of the households, for households with high educational attainment tend to be placed in high income quintile.

Data and estimation techniques

The major and only source of data for this study is Global Financial Inclusion Index (Global Findex) 2021. The Global Findex Database is a comprehensive dataset that contains detailed data regarding individual saving, borrowing, payment and risk management behaviours. The database provides insights into how people access and use financial services, including bank accounts, digital payments, and credit. The World Bank generated the dataset interviewing more than 150,000 adults in over 140 countries. Table 1 presents the definitions of the variables and how they are measured. Given that the dependent variable (household income quintile) is naturally ordered variable, this study applied ordered probit regression model to analyse the data. Ordered Probit Regression is a statistical method used for modelling relationships between an ordinal dependent variable and a set of independent variables.

It is used for a qualitative dependent variable in which the categories represent a natural or inherent order or ranking that corresponds to the level of a latent continuous variable[27]. In this study, household quintile has a natural order from the poorest 20% through the second poorest 20% and middle 20% to fourth 20% and the richest 20%. Equation (2) specifies the econometric form of ordered probit regression model:

$$y_i^* = \alpha + \beta_i x_i + \mu_i$$

Where y_i^* is the unobserved latent variable; x_i is a vector of explanatory variables; μ_i is an error term and it is assumed to be independent and identically distributed [(i.i.d.) ~ 0, σ^2] across observations.
Given that our dependent variable is ordered from 1 (the poorest 20%) to 5 (the richest 20%), instead of y* we observe:

$$y = \begin{cases} 1 \; if \; y_i^* \leq \tau_1 \\ 2 \; if \; \tau_1 < y_i^* \leq \tau_2 \\ 3 \; if \; \tau_2 < y_i^* \leq \tau_3 \\ 4 \; if \; \tau_3 < y_i^* \leq \tau_4 \\ 5 \; if \; \tau_4 < y_i^* \leq \tau_5 \end{cases}$$

The τ's are unspecified "threshold" parameters that need to be estimated together with α and β_i's. Estimation is conducted using maximum likelihood (ML), which, for the ordered probit model, assumes that the error term μ_i follows a standard normal distribution. Equation (3) specified the probabilities associated with the ordered categories.

Table 1: Variables and measurement

Variable	Measurement	Nature	Position
Income Mobility	Within-economy household income quintile Poorest 20%, Second 20%, Middle 20%, Fourth 20%, Richest 20%	Income Level	Dependent
Worry	Financially worried due cost associated with old age, medical cost, bills and Education. 1 if worried and 0 if not worried about these cost	Anxiety	Independent
Med cost anxiety	Financially worried due to medical cost. Yes (1) if worried and 0 (No) is not worried		
Education	Highest level of education. 0 if the respondent completed primary school or less, and 1 if the respondents completed secondary school, completed tertiary education or more	Control and household characteristics	
Age	Age of the respondents in years		
Mobacc	If the respondent's mobile phone or internet to access account, 1 yes, and 0 of no	Financial Literacy	Independent
Formal Savings	Used account to store money. Yes =1, No =0		
Saved for Old age	If the respondents saved for old age. Yes =1, N0 =0		

$$Prob\{\tau_{j-1} < y_i^* = \alpha + \beta_i x_i + \mu_i \leq \tau_j\} = \Phi\{\tau_{j-1} - \alpha - \beta_i x_i < \mu_i \leq \tau_j - \alpha - \beta_i x_i\} \quad (3)$$

This formula calculates the probability that the latent variable falls within the interval defined by the thresholds, which corresponds to the observed category *j* and Φ represents the standard normal, which is cumulative distribution function (CDF). For robustness check, we use linear probability model that assumes that dependent variable is continuous and estimates the model ordinary least squares

Results

Summary statistics of the variables

Table 2 shows that the dataset contains one continuous variable, which is age. The average age of individuals in the dataset is 35.5 years, ranging from 15 to 87 years, with a standard deviation of approximately 12 years, indicating some variability in ages. The other variables in the dataset are categorical, with the household quintile being the only ordinal categorical variable, while the remaining variables are binary dummy variables. When we specifically look at female-headed households in Table 2, we notice that the maximum age decreases to 78 years. This implies that, on average, males tend to live longer than females in this dataset. Interestingly, individuals in the poorest 20% income bracket are likely to live longer than individuals in any other income bracket. Additionally, the table indicates that individuals in the middle 20% income bracket have a shorter life expectancy, with a maximum age limit of 75 years. This observation may seem intuitive, as middle-income earners are often part of the working class and may be exposed to more work-related hazards.

Econometric results

Table 3 presents the marginal effects of each explanatory variable on different ordinal outcomes. For example, individuals with higher levels of medical cost anxiety are 4.7% points more likely to transition from the poorest 20% income quintile to the second 20% income quintile compared to those with lower levels of medical cost anxiety in the same income quintile (see model 1). Medical cost anxiety has similar marginal effect on individuals' transition from the second 20% to the middle 20% in the same income quintile (see model 2).

Interestingly, individuals who experience greater medical cost anxiety are 20% points more inclined to move from the middle 20% income quintile to the fourth 20% income quintile than those with lower levels of medical cost anxiety in the same income quintile (see model 3).

Table 2: Summary statistics

Variable	**1**		**2**		**3**		**4**		**5**		**6**		**7**		**8**	
	All HH		**Male HH**		**Female HH**		**Poorest 20%**		**Second 20%**		**Middle 20%**		**Fourth 20%**		**Richest 20%**	
	Mean (SD)	**Min /Ma**	**Mean (SD)**	**Min /Max**	**Mean (SD)**	**Min /Max**	**Mean (SD.)**	**Min/ Max**	**Mean (SD)**	**Min/ Max**	**Mean (SD**	**Min /Ma**	**Mean (SD)**	**Min/ Max**	**Mean (SD)**	**Min/ Max**
Income Quintile	3.278 (1.345)	1/5	3.263 (1.38)	1/5	3.295 (1.307)	1/5	0.132 (0.338)	0/1	0.1748 (0.3798)	0/1	0.211 (0.408)	0/1	0.247 (0.432)	0/1	0.234 (0.424)	0/1
Worry	0.220 (0.414)	0/1	0.229 (0.420)	0/1	0.210 (0.408)	0/1	0.435 (0.496)	0/1	0.289 (0.454)	0/1	0.213 (0.409)	0/1	0.144 (0.351)	0/1	0.135 (0.342)	0/1
Med cost anxiety	0.647 (0.478)	0/1	0.635 (0.482)	0/1	0.661 (0.474)	0/1	0.764 (0.425)	0/1	0.763 (0.426)	0/1	0.666 (0.472)	0/1	0.589 (0.492)	0/1	0.539 (0.498)	0/1
Education	0.805 (0.397)	0/1	0.768 (0.422)	0/1	0.846 (0.361)	0/1	0.528 (0.499)	0/1	0.719 (0.449)	0/1	0.819 (0.385)	0/1	0.899 (0.302)	0/1	0.911 (0.285)	0/1
Mobacc	0.844 (0.363)	0/1	0.848 (0.359)	0/1	0.839 (0.367)	0/1	0.725 (0.447)	0/1	0.829 (0.377)	0/1	0.855 (0.352)	0/1	0.870 (0.336)	0/1	0.875 (0.330)	0/1
Age	35.455 (11.798)	15/87	35.814 (12.620)	15/87	35.050 (10.787)	15/78	37.887 (13.674)	15/87	36.829 (12.253)	16/ 79	35.522 (11.379)	16/ 75	36.001 (11.043)	15/76	32.412 (10.845)	15/81
Formal Savings	0.764 (0.425)	0/1	0.769 (0.421)	0/1	0.757 (0.429)	0/1	0.571 (0.496)	0/1	0.724 (0.447)	0/1	0.771 (0.421)	0/1	0.817 (0.387)	0/1	0.823 (0.382)	0/1
Saved for Old age	0.364 (0.481)	0/1	0.340 (0.474)	0/1	0.392 (0.488)	0/1	0.259 (0.439)	0/1	0.325 (0.469)	0/1	0.370 (0.483)	0/1	0.416 (0.493)	0/1	0.392 (0.488)	0/1

Note: HH means household, SD means standard deviation, Min means minimum values and Max means maximum values.
Source: Authors' computation

Table 3: Marginal effects from ordered probit regression estimation

	Total				**Female**			
Column	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Variable	**Poorest 20%**	**Second 20%**	**Middle 20%**	**Fourth 20%**	**Poorest 20%**	**Second 20%**	**Middle 20%**	**Fourth 20%**
Worry	0.068***	0.055***	0.014***	-0.042***	0.073***	0.065***	0.018***	-0.054***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Medical Cost	0.047***	0.047***	0.200***	-0.026***	0.040***	0.045***	0.022**	-0.027***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Education	0.137***	0.090***	0.010***	0.083***	-0.151***	-0.104***	-0.009	0.106***
	(0.000)	(0.000)	(0.004)	(0.000)	(0.000)	(0.000)	(0.164)	(0.000)
Mobacc	-0.024**	-0.021**	-0.007***	0.014**	-0.013	-0.014	-0.005	0.010
	(0.028)	(0.018)	(0.005)	(0.033)	(0.324)	(0.303)	(0.260)	(0.331)
Age	0.001***	0.001***	0.0005***	-0.001***	-.0004	-0.0004	-0.002	0.0003
	(0.000)	(0.000)	(0.000)	(0.000)	(0.417)	(0.415)	(0.411)	(0.419)
Formal Savings	0.005***	-0.043***	-0.012***	0.031***	-0.050***	-0.048***	-0.016**	0.037**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Saved for Old age	-0.018***	-0.018***	0.007**	0.011***	-0.015	-0.016	-0.007	0.010
	(0.007)	(0.008)	(0.012)	(0.007)	(0.106)	(0.110)	(0.122)	(0.105)
obs	3,999				1,493			
F_stat	452.46***				193.13***			
Prob >Chi2	0.000				0.000			
Log-pseudolikelihood	4806.065				-2234.203			
Pseudo R-squared	0.048				0.043			

Prob. values are in brackets and the values are based on robust standard errors to account for heteroscedasticity. * $p<0.10$, ** * $p<0.05$, and *** $p<0.01$

Table 3: Continued

	Male			
Column	**9**	**10**	**11**	**12**
Variable	**Poorest 20%**	**Second 20%**	**Middle 20%**	**Fourth 20%**
Worry	0.065***	0.049**	0.011***	-0.035***
	(0.000)	(0.000)	(0.000)	(0.000)
Medical Cost	0.053***	0.049***	0.019***	-0.026***

	(0.000)	(0.000)	(0.000)	(0.000)
Education	-0.126***	-0.082***	-0.009**	0.068***
	(0.000)	(0.000)	(0.016)	(0.000)
Mobacc	-0.036**	-0.029**	-0.007***	0.020**
	(0.033)	(0.018)	(0.002)	(0.040)
Age	0.003***	0.002***	0.001***	-0.001***
	(0.000)	(0.000)	(0.000)	(0.000)
Formal Savings	-0.048***	-0.038***	-0.010***	0.026***
	(0.001)	(0.000)	(0.000)	(0.001)
Saved for Old age	-0.020**	-0.018**	-0.006*	0.010**
	(0.043)	(0.049)	(0.067)	(0.042)
Obs	1,706			
F_stat	283.50			
Prob >Chi2	0.0000			
Log-pseudolikelihood	-2554.2661			
Pseudo R-squared	0.056			

Prob. values are in brackets and the values are based on robust standard errors to account for heteroscedasticity. * $p<0.10$, ** * $p<0.05$, and *** $p<0.01$. Source; Authors computation

Table 4: Linear probability regression estimation

Column	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Variable	**Total**	**Male HH**	**Female HH**	**Poorest 20%**	**Second 20%**	**Middle 20%**	**Fourth 20%**	**Richest 20%**
Worry	-0.1271***	-0.1082***	-0.1537***	0.1048***	0.0293*	-0.0069	-0.0751***	-0.0519***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.093)	(0.713)	(0.000)	(0.007)
Medical Cost	-0.1217***	-0.1362***	-0.1049***	0.0156	0.0835***	0.0227	-0.0217	-0.1001***
	(0.000)	(0.000)	(0.000)	(0.192)	(0.000)	(0.155)	(0.195)	(0.000)
Education	0.2303***	0.1915***	0.2871***	-0.1689***	-0.0709***	0.0096	0.1278***	0.1025
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.641)	(0.000)	(0.000)
Mobacc	0.0276	0.0268	0.0330	-0.0645***	0.0080	0.0289	0.0306	-0.0029
	(0.250)	(0.425)	(0.338)	(0.000)	(0.671)	(0.162)	(0.159)	(0.888)
Age	-0.0020**	-0.0036	0.0006	-0.0001	0.0019***	0.0002	0.0026***	-0.0045***
	(0.013)	(0.000)	(0.618)	(0.876)	(0.003)	(0.774)	(0.000)	(0.000)

Formal Savings	0.0873*** (0.000)	0.0645** (0.023)	0.1132*** (0.000)	-0.0796*** (0.000)	-0.0154 (0.346)	0.0077 (0.664)	0.0418** (0.025)	0.0455** (0.012)
Saved for Old age	0.0423 (0.020)	0.0479* (0.057)	0.0305 (0.251)	-0.0155 (0.188)	-0.0290** (0.044)	0.0022 (0.888)	0.0151 (0.359)	0.0272* (0.088)
Constant	0.2452*** (0.000)	0.3015*** (0.001)	0.1458 (0.151)	0.4063*** (0.000)	0.1914*** (0.000)	0.1571*** (0.006)	-0.0699 (0.245)	0.3152*** (0.000)
obs	3,199	1,706	1,493	3,199	3,199	3,199	3,199	3,199
F_stat	35.58	22.95*	18.70*	37.92	9.49	1.36	11.45	19.90
Prob > F	0.0000***	0.0000***	0.0000***	0.0000***	0.0000***	0.0000***	0.0000***	0.0000***
R-squared	0.1004	0.1086	0.1019	0.1063	0.0289	0.0043	0.0347	0.0587
Adj R-squared	0.0976	0.1038	0.0965	0.1036	0.0259	0.0011	0.0316	0.0558

This indicates that medical cost anxiety drives middle-income individuals to strive for a higher income group more strongly than it motivates low-income individuals to move to a middle-income group. However, individuals with higher levels of medical cost anxiety are 2.6% points less probable to transition from the fourth 20% income quintile to the richest 20% income quintile compared to those with lower levels of medical cost anxiety in the fourth income quintile (see model 4). This means medical cost anxiety discourages individuals in the fourth 20% quintile from striving for a higher income group. Overall anxiety leads to similar pattern of income mobility with somewhat greater marginal effects than those of medical cost anxiety.

In Table 3, individuals who can access a bank account through cell phones or the internet are 2.4% points less likely to move from the poorest 20% income quintile to the second 20% income quintile compared to those without such access in the poorest income quintile. Similarly, individuals who can access a bank account via cell phones or the internet are 2.1% points less likely to move from the second 20% income quintile to the middle 20% income quintile compared to those without such access in the income quintile. Again, individuals who have access are 0.7% points less likely to transition from the middle 20% income bracket to the fourth 20% income bracket compared to those without access within the middle-income bracket. But, accessing a bank account through cell phones or the internet increases individuals' likelihood of moving from the fourth 20% income bracket to the richest 20% income bracket by 1.4% points compared to those without such access within the fourth income bracket. This indicates that access to a bank account through cell phones or the internet has a non-linear effect on an individual's probability of moving from a lower income quintile to a higher one. The probability is negative for social mobility until it reaches the fourth 20% income bracket, after which it becomes positive

Table 3 also shows that individuals who save in a formal bank account are 0.5% point more likely to transition from the poorest 20% income quintile to the second 20% income quintile compared to those without such savings. The probabilities for formal savings-related transitions to the middle 20% and fourth 20% income brackets are negatives (that is, -0.043 and -0.012 respectively) but the probability later becomes positive when transitioning from the fourth 20% income bracket to the richest 20% income quintile. Also, individuals who save for old age are 1.8% points less likely to move from lower income groups to the second and middle 20% income groups compared to those who do not save for old age. However, individuals who save for old age are 0.7 and 1.1% points more likely to move from the middle and fourth 20% income groups to the fourth and the richest 20% income groups respectively compared to those who do not save for old age.

In Table 3, among the variables controlled for, the level of education shows positive and somewhat increasing effects on income mobility at the lower end of the income distribution, indicating a kind of convergence speed. On the other hand, age has positive effects on income mobility at the lower end of the income quintile up to the middle 20%, after which it tends to have negative effects on higher income mobility. For female individuals (models 5-8 in Table 3), the marginal effects of medical and overall cost anxieties are almost the same as in the overall models. The probabilities of upward income mobility from the poorest 20% to the fourth 20% income brackets are positive, but they become negative when transitioning to the richest 20% income quintile.

Having a bank account accessed through cell phones or the internet, as well as saving for old age, does not have any significant effects on the probability for female individuals to move from lower income quintiles to higher ones. However, formal savings reduce the likelihood of female individuals moving from the lower income brackets to the second, middle, and fourth 20% income brackets by 5.0, 4.8, and 1.6% points, respectively, compared to those without such access within the same income brackets. Educational level is the only significant control variable, reducing the likelihood for female individuals to transition to the second and middle 20% income quintiles by 15.1 and 10.4%

points, respectively. As the educational level advances, the transition to the richest 20% income bracket increases by 10.6 percentage points.

Considering male individuals (see models 9-12), medical and overall cost anxieties maintain the same sign as in overall model but with greater marginal effects than on female individuals' income mobility. Unlike under female models, having a bank account accessed through cell phones or the internet and savings for old age have significant effects on the probability for male individuals to move from lower income quintiles to higher ones. The probabilities are negative when transitioning to the second, middle, and fourth 20% income brackets, but change to positive when moving to the richest 20% income bracket. Although they have same sign in female and male models, formal savings have greater impact on female individuals' propensity for income mobility from lower income quintiles to higher ones than do they affect male individuals' propensity for income mobility.

As the control variables, educational level reduces the male individuals' likelihood for upward income mobility from the lower income quintiles to the fourth 20% income bracket. But, as the educational level advances, the male individuals' likelihood to move to the richest 20% income category by 6.8 percentage points. Conversely, as the age increases, the male individuals' chances for income mobility up upsurges up to the fourth 20% income bracket. However, the probability for male individuals' transition to the richest 20% income group decreases, as age goes up.

Robustness check

The classical linear regression model's assumption of linearity in parameter does not hold here, that is the relationship between the independent variables and the probability of the outcome is not linear. However, we still apply ordinary least squares (OLS) for sensitivity analysis. Models 1-3 in Table 4 shows that overall and medical cost anxieties have negative effects on the probability of individuals (both females and males) to move from lower income quintiles to higher ones. In the same models, formal savings have significant and positive effects on the probability while savings for old age are only significant at 10% in male model. Accessing a bank account through cell phones or internet is not significant across models 1-3.

When a binary dummy for each income quintile is created and made the dependent variable in models 4-8 of Table 4, we observe that the results seem affirm those in Table 3. For instance, individuals within the poorest and second 20% income quintiles are more likely to be financially worried at 1% and 10 % levels of significance respectively. However, Individuals in middle and fourth 20% income quintiles are less likely to be financially worried, though insignificantly. Only individuals within the second 20% income bracket are significantly more likely to be worried by medical costs. Accessing a bank account through cell phones or internet lowers the chances for the individuals to be within the poorest 20% income bracket while formal savings increases the likelihood for the individuals to be within the fourth 20% income bracket. Savings for old age decreases the probability for the individuals to fall within the second 20% income bracket but it improves the chances for them to be within the richest 20% income group.

Discussion

Evident from the findings in the preceding analysis, medical cost and general financial anxieties have non-linear relationships with household income mobility. Worried by medical cost and other financial burdens, individuals may strive hard to move to higher income groups which afford them the resources to take care of the future medical costs and other financial burdens. To cope with future medical costs, individuals can invest in their education and skills that would qualify them for more lucrative jobs or industries with better health benefits. This translates into an upward income mobility. This finding collaborates that of Hudson *et al*. in which they established that health costs correlate with upward social mobility among Black Americans.

Another finding is that accessing a bank account through cell phones or internet retards individuals from upward income mobility

Although this finding seems to despise logic, it is still plausible given the relative high prevalence of "digital divide" in China. More often than not, individuals in lower income quintiles find it difficult to afford smartphones or access the internet, which short-change them from benefit from digital financial services. Limited access to finance may impoverish them and retard them from upward income mobility. Conversely, individuals in upper income quintiles have the adequate resources to afford sophisticated smartphones and get internet connectivity, which altogether could further enhance their access to finance, and thus move up higher income ladder. This finding corroborates those of Asongu and Odhiambo[28] and Nsiah and Tweneboah[29] that mobile banking services decrease inequality or poverty among households in higher quintiles in Africa.

The findings also reveal that formal savings enhance income mobility in between lower quintiles and between upper quintiles but discourage the mobility in the middle quintiles. It is likely that low-income earners save to smoothen consumption as they are more vulnerable to income shocks, and the savings enable them to invest in their human capital development or setting up a small business, thereby allow them to transition to higher income quintiles. This finding is consistent with Ansong *et al.*[30] finding. Mian *et al.*[31] argue that the tremendous rise in savings of the upper income earners is driven by increasing need for wealth accumulation among the rich. In this context, wealth accumulation facilitates upward income mobility among the rich by affording them more opportunities for income growth such as investments in stocks, real estate and establishment of large business firms. Given that individuals in middle quintiles experience higher opportunity costs due to savings compared to those in the lower and upper quintiles, they could be less motivated to save as savings could be used for current consumption or as investment in education, setting up a business[32, 33, 34].

Hao and Yang[35] and Li *et al.*[36] introduced advanced econometric frameworks suitable for analysing heterogeneous impacts in income mobility, an approach consistent with the nonlinear effects observed in this study. Hu *et al.*[37] and Zhang *et al.*[38] underscored the role of innovation networks and digital consultation systems in improving access to services, aligning with the significance of financial innovation for health-related resilience. Wu *et al.* [39] and Xu *et al.*[40] highlighted that digital integration and data security enhance institutional efficiency, supporting inclusive financial mechanisms. Similarly, Gao *et al.*[41], Tian *et al.*[42], and Chen and Pan[43] emphasized demographic, behavioural, and policy dimensions that affect healthcare affordability and income mobility.

The findings suggest that there is a U-shaped relationship between saving for old age and income mobility. At lower income quintiles, saving for old age retards income mobility, perhaps individuals have to sacrifice a reasonable portion of their current consumption or high-returns investments. At higher income quintiles, however, saving for old age speed up income mobility. High-income earners tend to have adequate resources to save for retirement, thereby serving financial security and freedom to engage in high-return investment opportunities. Finally, medical cost anxiety and financial innovation are more impactful on male income mobility than they affect female income mobility. This is possible as men in many societies tend have greater access to lucrative jobs and career development opportunities compared to females. Men are more likely to take financial risks compared to women[2].

Study strengths and limitations

The study addresses a timely and relevant issue by linking medical cost concern, financial innovation, and income mobility, a research niche with limited research in the past. It is based on nationally representative 2021 World Bank Global Findex survey data to ensure robust representation of the Chinese people. Adopting both Ordered Probit and Linear Probability models lends robust assurance to the findings. Additionally, the precise investigation of non-linear effects of financial innovation provides novel policy suggestions. The analysis is restricted to China, so there is limited generalisability to other countries with diverse healthcare and financial

systems. Cross-sectional data limitation implies that it is hard to determine long-term effects as well as causality. Some variables, for instance, cultural attitudes towards health expenditure or private financial conduct, were not included. Furthermore, the limitation to self-reported survey data could result in response bias, compromising validity of findings.

Policy implications

With evidence, medical cost anxiety needs to be an area of priority reduction. Policy makers can provide targeted healthcare subsidies and income-based premium caps to bring down the costs of healthcare, particularly for middle- and upper-middle-income households. Expanding affordable health coverage, including private supplementary plans, will enable households to pay for unexpected medical expenses and not alter income mobility strategies out of cost anxiety.

With the general anxiety playing the determining role in income mobility, social protection measures need to be strengthened, including emergency health funds. Offering mental aid by way of community healthcare initiatives may also reduce mental hurdles which impede economic advancement. In terms of financial innovation, it should be promoted to foster digital financial inclusion by deepening rural internet connectivity and subsidized mobile banking adoption.

Policymakers should promote the rollout of tailored digital products for example, mobile health savings accounts and microinsurance, which target in particular healthcare-related risks. Finally, to improve income mobility trends, especially for those in the fourth quintile of income, incentive-linked savings programs and focused financial literacy programs can facilitate households using digital banking for wealth accumulation and upward mobility to the wealthiest quintile. These combined actions can grant resilience, relieve financial strain, and enhance sustainable upward income mobility.

Conclusion

This study examined the relationship between medical cost anxiety, financial innovation, and income mobility of households in China using 2021 World Bank Global Findex survey data and Ordered Probit and Linear Probability models. The findings revealed that medical cost anxiety significantly affected income mobility. While it motivated middle-income household members to rise up the income ladder, it discouraged higher-middle-income household members from rising to the richest quintile. General anxiety showed parallel patterns with smaller effects. Financial innovation, in the form of access to bank accounts via internet or mobile, allowed upward mobility at higher-middle-income to top incomes, though its impact was non-linear for all income levels. The study concluded that specialized financial instruments, such as health savings accounts and insurance products, can limit the harmful effects of medical cost anxiety and build economic resilience. It. requested additional research with comparative and longitudinal data to study variation between countries and over time to provide broader insight.

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