

Does income diversity really stimulate household consumption expenditure diversity? Evidence from mean-based and unconditional quantile regressions

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Abstract

Although both income diversity and household consumption expenditure diversity are positively correlated with income, little is known about how the former affects the latter. This study investigates how and to what extent income diversity stimulates household consumption expenditure diversity, utilizing data collected by the China Social Survey. We estimate a standard mean-based linear regression model and an unconditional quantile regression (UQR) model to explore mean-based and quantile-specific effects, respectively. The results of the linear regression show that income diversity significantly increases household consumption expenditure diversity. The UQR estimates provide more granular insights, revealing that income diversity improves consumption expenditure diversity at the lower quantiles (5th and 25th), with the largest effect occurring at the lowest 5th quantile; for the higher quantiles, income diversity has no effect on consumption expenditure diversity. Our findings highlight that policies aimed at improving consumption expenditure diversity and the quality of life of people in China should create an economic environment that allows people to diversify their income sources. From a methodological standpoint, we show that mean-based approaches may overlook the finer details of the linkages between income and consumption and thus should be applied cautiously.

Keywords: Income diversity; expenditure diversity; UQR; China

JEL CLASSIFICATION: C21; P36; M14; E21

I. Introduction

Steep and sustained economic growth in China has pulled millions out of abject poverty, yet poverty remains a concern. Pointing out that China has claimed victory in the battle against poverty not by increasing people's income but by lowering the poverty threshold, critics deem China's achievements hollow (Shen and Li 2022; Tang et al. 2021; The Economist 2020). To

clarify, the Chinese government draws the poverty line at approximately \$2.25 per day, expressed in 2011 prices and adjusted for purchasing power parity, whereas the World Bank sets it at \$5.50 per day for upper-middle-income countries such as China (Gill 2021).

In any case, because income is a continuum, a preoccupation with specific thresholds is ill-advised. Consider, as an example, the threshold of \$2.25. Monetarily, a person earning \$2.24 is hardly better off than a person earning \$2.26. Regardless, the former is said to be living in poverty, whereas the latter is not. Does this delineation warrant different policies to improve the living standards of these two people? Absolutely not. On the other hand, different policies may be needed to benefit a person earning \$25 per day and another earning \$2.26 per day, both of whom are above the poverty line but are likely to have different consumption patterns and quality of life. This example illustrates the importance of looking past the widely publicized and debated thresholds and examining people's income and consumption patterns across different economic strata to understand the links between poverty, income, and consumption and make informed policies.

Poverty constrains consumption in two ways. Not only do the poor spend less, but they spend relatively large proportions of their limited incomes mainly to satisfy physiological needs essential to survival: the need for food, water, shelter, clothing, and good health (Jappelli and Pistaferri 2014; Parker 2017). Their consumption expenditure, concentrated on a limited number of goods and services, lacks diversity. For example, the share of the household budget allocated to food ranges from 50 to 78% among the poor (Banerjee and Duflo 2007; Jayasinghe and Smith 2021; Kassahun, Tessema, and Adbib 2022). The fulfilment of these basic needs forms the bedrock of higher-level needs. However, as people escape poverty and their incomes rise, they accrue savings and strive for self-actualization needs (Dang and Viet Nguyen 2021; Kumar 2016). These include the need for education, caring for others, developing skills such as cooking and painting, and participating in recreational activities. That is to say that their share of income devoted to life's necessities falls as they become wealthier – returning to the case of food, consumers in rich high-income countries spend less than 20% of their budget on it. In other words, consumption expenditure diversity, a barometer of economic welfare, increases with income (Chai, Rohde, and Silber 2015; Chakrabarty and Mukherjee 2021; Firdaus et al. 2021).

So does income diversity. Although the poor rely on few if not one source of income, the wealthy may have several income sources. More specifically, the poor, notwithstanding their involvement in multiple occupations (see, for example, Banerjee and Duflo 2007), rely mainly on labour income and income from small nonagricultural businesses. In rural communities, the emergence of non-farm employment has allowed many farmworkers to supplement their livelihoods earned from farming activities (Ba, Anwar, and Mughal 2021; Bui and Hoang 2021; Hossain and Al-Amin 2019; Martey et al. 2022). In contrast, the wealthy may earn income from several sources, including business activities, leasing and selling land, investments in stocks and bonds, farming operations, and pensions

In any case, given that both consumption expenditure diversity and income diversity are positively correlated with income, it should come as no surprise that they are positively correlated with each other. However, the non-linearity of the association between consumption and income may engender a non-linear association between their diversities. In other words, income diversity may not affect consumption expenditure diversity equally at different income levels – it may substantially improve consumption expenditure diversity for the abjectly poor, as few of their needs are already met, while its effects may be negligible for the wealthy.

Similarly, people at different points along the income continuum would respond differently to changes in income diversity. Consequently, policies designed to improve consumption expenditure diversity and thus the quality of life of people at lower-income quantiles will be ineffectual for those at higher-income quantiles.

With the above in mind, this study examines how income diversity affects household consumption expenditure diversity, utilizing the China Social Survey data collected between 2011 and 2019. We make two significant contributions to the literature. First, we explore the relationship between income diversity and consumption expenditure diversity by estimating a standard mean-based linear regression model. This provides a generalized view of the association between income diversity and consumption diversity. However, if not likely, it is plausible that the association depends upon how diverse the consumption expenditure is. Second, we investigate the potential heterogeneous impacts of income diversity on consumption expenditure diversity across different selected quantiles by estimating an unconditional quantile regression (UQR) model. Simpson index is employed to calculate income diversity and consumption expenditure diversity.

Income diversity has received considerable attention in the literature (Hillesland, Swaminathan, and Grown 2022; Wuepper, Yesigat Ayenew, and Sauer 2018; Zhu, Ma, and Leng 2020). For example, Leng et al. (2020) explored how adopting information and communication technology (ICT) affects income diversification in rural China. They reported positive effects of ICT adoption, especially on low-income groups. This result points to potential non-linearity in the association between presumed explanatory factors and income diversification. Additionally, there is a sizable literature investigating the diversification of rural livelihoods (Barrett, Bezuneh, and Aboud 2001; Ho et al. 2022) and crops in particular (Jaleta et al. 2020; Zhang et al. 2022). Analysing the effects of policy shocks on African smallholders' livelihood diversification, Barrett, Bezuneh, and Aboud (2001) noted that liquidity and skills constraints impede access of the poor to relatively lucrative livelihood strategies. Moreover, policy shocks appeared to disproportionately benefit well-off households, highlighting asymmetric effects on the rich and the poor.

Some studies have also investigated household consumption patterns and diversification (Chai, Rohde, and Silber 2015; Chakrabarty and Mukherjee 2021; Clements, Wu, and Zhang 2006; Ma et al. 2022; Vatsa et al. 2022). Analysing the consumption patterns across countries, Clements, Wu, and Zhang (2006) found that the demand for consumption *variety* has a positive income elasticity. Chakrabarty and Mukherjee (2021) showed that financial inclusion increases the consumption diversity of non-food items in India. Besides, many studies have explored the effects of non-farm employment on the consumption of specific goods and services such as food (Duong, Thanh, and Ancev 2021; Liu, Renwick, and Fu 2019), energy (Martey et al. 2022), agricultural assets (Al-Amin and Hossain 2019), and farm inputs (Mondal, Selvanathan, and Selvanathan 2021; Zheng et al. 2022). For example, Zheng et al. (2022) found that non-farm employment significantly increases mechanization service expenditure in rural China. In their investigation of Ghana, Martey et al. (2022) showed that non-farm employment work facilitates the cooking energy transition by increasing households' usage of clean fuels (e.g. gas) and reducing the usage of dirty fuels (e.g. wood and charcoal).

Despite the attention devoted to analysing income diversity and consumption expenditure diversity, the effects of the former on the latter remain unexamined – these two areas have been studied in separate strands with little crossover. This is all the more surprising considering the decided importance of income to consumption. The present study bridges this research gap. It

shows that income diversity improves consumption expenditure diversity in general. However, further exploration reveals that income diversity exclusively exerts statistically significant positive effects on consumption expenditure diversity distributed at the lower quantiles (5th and 25th) and the largest effect occurs at the lowest 5th quantile.

The remainder of this paper proceeds as follows. The data and the diversity indices are presented in Section II. Section III details the econometric approach. The empirical results are presented and discussed in Section IV. Section V concludes the paper and lays out its policy implications.

II. Data and diversity variable measurements

II.i. Data

This study uses the Chinese Social Survey (CSS) data, collected by the Chinese Academy of Social Sciences (CASS), Beijing, China. The primary objective of the CSS is to collect information on individuals' employment, family and social life, and individuals' social attitudes, targeting people aged between 18 and 69. Using a multistage, stratified, probability-to-size proportional cluster sampling approach, the CSS selected and interviewed households living in both urban and rural areas. The CSS is a nationally representative survey covering 31 provinces, autonomous regions, and municipalities. The CASS conducted the first wave of the survey in 2005 and conducted the survey every two or three years. The present study used data collected during the five most recent waves of the CSS: 2011, 2013, 2015, 2017, and 2019. The 2019 survey collected data from 10,283 households, covering 596 villages in 149 cities. Because the CSS is not conducted on the same cross-section of households, panel data are unavailable. Therefore, we used a pooled sample analysis in this study. Year dummies were included in the models to control for the variations occurring over time.

We cleaned the data in four steps. First, we dropped the observations for which the total household income or the total household consumption expenditure was zero or negative. Second, we removed observations for which household consumption expenditure exceeded household income. Third, we removed observations that had missing values for key consumption items such as food and electricity. Fourth, we removed observations whose independent variables (e.g. age and education) have missing values. Finally, we obtained a sample size of 22,936 for the study.

II.ii. Indicators of income diversity and household consumption expenditure diversity

The Simpson and Shannon indices have been widely used to measure diversity indices (Ho et al. 2022; Leng et al. 2020; Vatsa et al. 2022). The two indices share similarities and differences. They are similar in that both indices approach zero if the relative abundance of one income source or one consumption item approaches unity, generating similar results. They are different in that the Simpson index does not consider the evenness among different income sources and gives greater weight to large income sources compared to the Shannon index. The Simpson index is well-suited to measuring income and consumption diversity. Therefore, we employ the Simpson index to measure the key explanatory variable (i.e. income diversity) and the outcome variable (i.e. consumption expenditure diversity).

The income diversity (ID) index is measured as follows:

$$ID_i = 1 - \sum_{j=1}^J P_{i,j}^2 \quad (1)$$

where ID_i represents the income diversity index of household i , measured by the Simpson index; J is the total number of income sources; J is a specific source of income; $P_{i,j}$ refers to the share of income from source J in total household income for household i . The value of the income diversity index falls between 0 and 1. If household i has only one source of income, $P_{i,j} = 1$, and in this case, $ID_i = 0$. When the number of income sources increases, the share of each income source in total household income decreases and ID_i approaches 1.

Consumption expenditure diversity (CED), captured by the Simpson index, is calculated as follows:

$$CED_i = 1 - \sum_{k=1}^K P_{i,k}^2 \quad (2)$$

where CED_i refers to the consumption expenditure diversity index for household i . K is the total number of consumption expenditure categories; K is a specific category of consumption expenditure; $P_{i,k}$ refers to the share of the consumption expenditure on category K in the total consumption expenditure for household i . Like income diversity, the value of the consumption expenditure diversity falls between 0 and 1. If household i has only one category of expenditure, $P_{i,k} = 1$, and in this case, $CED_i = 0$. The share of each consumption expenditure category in total household expenditure decreases when the number of consumption categories increases – in this case, CED_i approaches to 1.

III. Econometric approach

We analyse the mean- and quantile-based effects of income diversity on household consumption expenditure diversity while controlling for individual, household-level, and social-economic characteristics. The mean-based analysis is conducted using the ordinary least squares (OLS) regression, whereas the UQR model is employed to estimate the effects of income diversity on different quantiles of consumption expenditure diversity.

We start with the following baseline OLS regression function:

$$CED_i = \alpha_0 + ID_i \alpha_1 + X_i \alpha_2 + Location_i \alpha_3 + Year_i \alpha_4 + \varepsilon_i \quad (3)$$

where CED_i and ID_i capture consumption expenditure diversity and income diversity, respectively; X_i is a vector of control variables such as age, sex, education, and insurance ownership; $Location_i$ refers to a vector of location dummies used for capturing spatial-fixed heterogeneities such as regional institutional arrangements and social-economic conditions; $Year_i$ refers to a vector of year dummies used for capturing the time-invariant and time-variant heterogeneities; α_0 is a constant; α_1 , α_2 , α_3 and α_4 are parameters to be estimated; ε_i is an error term.

In Equation (3), α_1 captures the average (mean) effect of income diversity on household consumption expenditure diversity, which illustrates the association between the two diversity

variables on the whole. But it is possible that individuals with higher income and income diversity already enjoy a variety of goods and services. That is to say that their consumption diversity is high. In such cases, increasing income diversity may not affect consumption diversity meaningfully; diversifying income sources might have different implications for households with varying consumption levels and patterns. These differences would be of strong interest to policymakers designing interventions to help households diversify consumption through income diversification. Therefore, we also use a quantile regression model to study the heterogeneity in the response of consumption diversity to changes in income diversity.

Previous studies have applied both the conditional quantile regression (CQR) model (Agyire-Tettey, Ackah, and Asuman 2018; Derbali, Wu, and Jamel 2020) and the UQR model (Gregory and Zierahn 2022; Hernæs 2020; Kemigisha et al. 2022; Zhou et al. 2020). For example, using the CQR model, Derbali, Wu, and Jamel (2020) examined the impact of the Organization of Petroleum Exporting Countries (OPEC) news on energy futures' market returns and volatility. Applying the UQR model, Ma et al. (2020) explored the effects of internet use on the economic well-being of rural households in China. They found that internet use has a larger impact on the upper distributions of household income and expenditure. It should be noted here that significant differences exist between the CQR and UQR models. In particular, the CQR model offers a narrower interpretation regarding the effect of income diversity on consumption expenditure diversity because the estimated effect of a covariate is largely conditional on the selection of other variables included in the model (Borah and Basu 2013; Firpo, Fortin, and Lemieux 2009; Gregory and Zierahn 2022; Kemigisha et al. 2022). In contrast, the effect of income diversity in the UQR model does not implicitly rely on the level of other conditional variables in the quantile model. The UQR model can estimate more reliable results, and thus, it is employed in the present study.

The UQR model is based on the concept of the re-centred influence function (RIF) (Agyire-Tettey, Ackah, and Asuman 2018; Firpo, Fortin, and Lemieux 2009; Kemigisha et al. 2022). The influence function (IF) assesses the impact of an individual observation on a distributional statistic, $v(F)$, such as the mean, median, or any quantile, without recalculating that statistic. The IF can be defined as:

$$IF(CED; v(F)) = \lim_{\varepsilon \rightarrow \infty} \left[\frac{v(1-\varepsilon) \cdot F + \varepsilon \delta_{CED} - v(F)}{\varepsilon} \right], 0 \leq \varepsilon \leq 1 \quad (4)$$

where F refers to the cumulative distribution function for the consumption expenditure diversity, δ_{CED} represents a distribution that puts mass at the value of CED . For the τ -th quantile of CED , the influence function can be written as follows:

$$IF(CED; Q_\tau) = \left[\frac{\tau - I[CED \leq Q_\tau]}{f_{CED}(Q_\tau)} \right] \quad (5)$$

where Q_τ is the τ -th quantile of the unconditional distribution of CED , and the probability density function of CED evaluated at Q_τ is represented by $f_{CED}(q_\tau)$. $I[CED < Q_\tau]$ indicates whether the observed value is less than or equal to Q_τ . The RIF is obtained by adding the relevant statistic (i.e. the quantiles) to its IF:

$$RIF(CED; Q_\tau) = Q_\tau + IF(CED; Q_\tau) \quad (6)$$

In this study, the UQR model estimates Equation (6) conditional on a vector of explanatory variables (Agyire-Tettey, Ackah, and Asuman 2018; Firpo, Fortin, and Lemieux 2009) as follows:

$$RIF(CED_i; Q_\tau, F_{CED}) = \beta_0 + ID_i\beta_1 + X_i\beta_2 + Year_i\beta_3 + Location_i\beta_4 + \mu_i \quad (7)$$

where CED_i is the dependent variable, referring to consumption expenditure diversity; Q_τ denotes the τ -th quantile of the dependent variable's cumulative distribution F_{CED} ; ID_i , X_i , $Year_i$ and $Location_i$ variables are defined earlier; β_0 is a constant; β_1 is the parameter we are interested in, which is the unconditional marginal effect of income diversity; β_2 , β_3 , and β_4 are corresponding parameters to be estimated. μ_i is the error term. The UQR estimates from Equation (7) have a similar interpretation as the OLS regression coefficients and denote unconditional quantile marginal effects.

IV. Results and discussions

IV.i. Descriptive results

Table 1 presents the variable definitions and descriptive statistics. The mean consumption expenditure diversity and the mean income diversity, measured by the Simpson index, are 0.657 and 0.184, respectively. The variables used in calculating the consumption expenditure diversity are presented in the Appendix. The average household consumption expenditure per capita was 11.22 thousand Yuan. Table A1 also shows that Chinese households mainly spend their income on 14 consumption activities. Food, social connection, and clothes are the top three spending categories, accounting for about 62.52% of the total household expenditure. Notably, food expenditure alone accounts for 42.29% of the total consumption expenditure. Spending on healthcare and medical treatment accounts for 6.39%, and spending on education constitutes 5.48% of the total household expenditure. Table A2 in the Appendix presents the income sources. It shows that the average household income is 22.19 thousand Yuan per capita. Chinese households obtain income mainly from seven sources. Income from salaries is the primary income source, accounting for 65.61%. This is followed by the income from household members' pensions and insurance (11.86%) and the income from farming operations (11.01%). Income obtained from investing in financial assets accounts for only 0.70% of household income.

Table 1. Variables definitions and descriptive statistics.

Variables	Definitions	Mean (SD)
<i>Dependent variable</i>		
Expenditure diversity	Simpson index, measured by Equation (2)	0.657 (0.147)
<i>Key explanatory variable</i>		
Income diversity	Simpson index, measured by Equation (1)	0.184 (0.201)
<i>Control variables</i>		
Age	Age of respondent (years)	46.584 (14.110)
Sex	1=male, 0=otherwise	0.458 (0.498)
Illiterate	1=yes, 0=otherwise	0.092 (0.289)
Primary school	1=yes, 0=otherwise	0.218 (0.413)
Middle school	1=yes, 0=otherwise	0.322 (0.467)
High school	1=yes, 0=otherwise	0.135 (0.342)
Polytechnic school	1=yes, 0=otherwise	0.051 (0.221)
Vocational technical school	1=yes, 0=otherwise	0.009 (0.093)
Junior college	1=yes, 0=otherwise	0.085 (0.279)
Undergraduate	1=yes, 0=otherwise	0.080 (0.271)
Postgraduate	1=yes, 0=otherwise	0.009 (0.093)
Household size	Total number of people in a household	4.337 (1.872)
Marital status	1=married, 0=otherwise	0.832 (0.374)
Insurance	1=having endowment insurance, 0=otherwise	0.602 (0.489)
Community	1=urban community, 0=otherwise	0.596 (0.491)
Housing ownership	1=owning housing property; 0=otherwise	0.868 (0.339)
Farmland	1=having farmland, 0=otherwise	0.442 (0.497)
Eastern	1=eastern, 0=otherwise	0.455 (0.498)
Central	1=central, 0=otherwise	0.336 (0.472)
Western	1=western, 0=otherwise	0.208 (0.406)
Year_2011	1 = 2011, 0=otherwise	0.147 (0.354)
Year_2013	1 = 2013, 0=otherwise	0.202 (0.401)
Year_2015	1 = 2015, 0=otherwise	0.291 (0.454)
Year_2017	1 = 2017, 0=otherwise	0.186 (0.389)
Year_2019	1 = 2019, 0=otherwise	0.174 (0.379)
Observations		22,936

Standard deviations in parentheses.

Table 1 also shows that the average age of respondents is around 47 years. About 46% of respondents are males, 9.2% are illiterate, and only 0.9% hold a postgraduate degree. On average, households have 4.34 members. Over 80% of the respondents are married, 60% have endowment insurance, and 44.2% of the respondents report having farmland. Lastly, the proportions of the samples living in the eastern, central, and western regions are 45.5%, 33.6%, and 20.8%, respectively.

Figure 1 illustrates the relationship between income diversity and consumption expenditure diversity at the selected quantiles. It shows that consumption expenditure diversity increases monotonically from 0.048 at the lowest 5th quantile to 0.837 at the highest 95th quantile. At the 5th and 25th quantiles, income diversity is zero. This is because households at these two quantiles only have one income source (either from farm work or non-farm work), i.e. their incomes are not diversified. From the 50th to the 95th quantile, consumption expenditure diversity increases from 0.098 to 0.526. Figure 1 also shows a positive association between income diversity and consumption expenditure diversity. Although these findings are informative, they present an incomplete and potentially misleading view of the said association – descriptive statistics and illustrations do not control for confounding variables. Thus, next, we take a deeper look into the associations between the two variables using the OLS and UQR models.

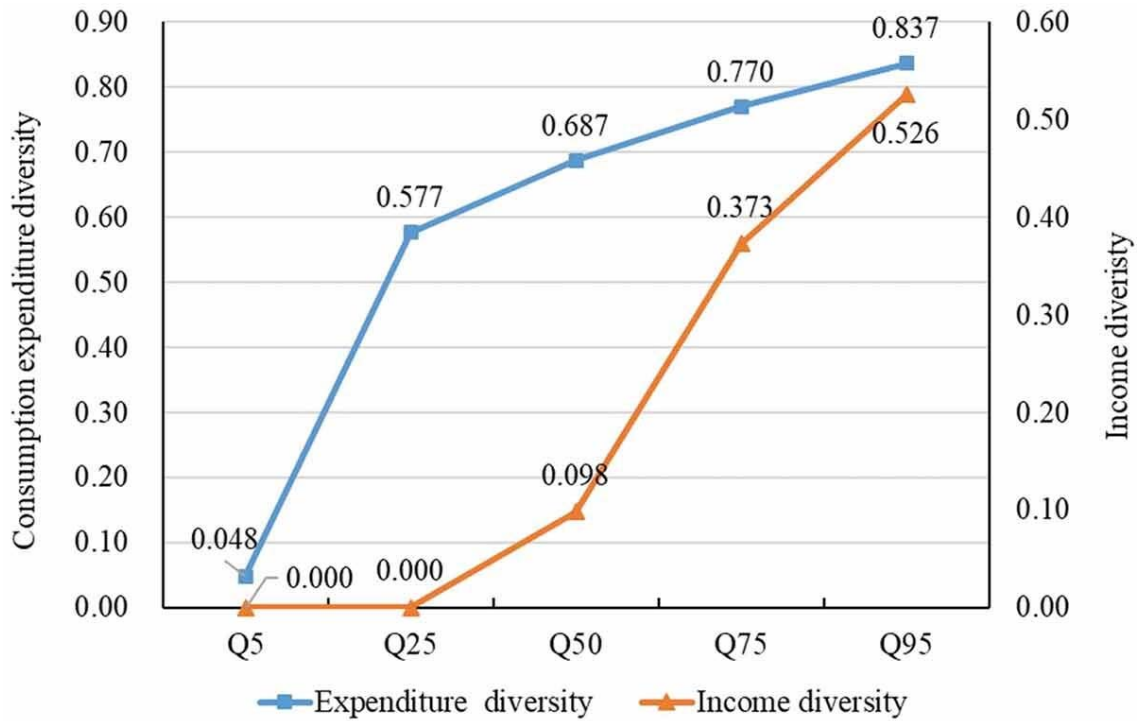


Figure 1. The relationship between income diversity and consumption expenditure diversity.

IV.ii. Empirical results

IV.ii.i. OLS regression results

Table 2 presents the empirical results from the OLS regression model. The results are based on a pooled sample. They show that income diversity significantly increases household consumption expenditure diversity. The finding suggests that a unit increase in income diversity would increase consumption expenditure diversity by 0.018. Standard economic theory suggests that consumption depends upon income. Households seeking higher income strive to diversify their income sources through various sources. When they are successful, not only does their income rise, it also becomes more diverse. Higher incomes help smooth and diversify households' consumptions and purchasing patterns on clean energies such as electricity and gas (Shi, Heerink, and Qu 2009), water (Harlan et al. 2009), food (Mishra, Mottaleb, and Mohanty 2015; Rahman and Mishra 2020), private cars (Yang et al. 2022), and fruit and vegetables (Ma and Zheng 2021). Using microdata from 662 households in Chongqing, China, Huo et al. (2021) also found that rising income increases heating energy consumption.

Table 2. Impact of income diversity on consumption expenditure diversity: OLS regression.

Variables	Consumption expenditure diversity
Income diversity	0.016 (0.004)***
Age	-0.002 (0.000)***
Sex	-0.003 (0.002)**
Primary school	0.006 (0.004)*
Middle school	0.016 (0.004)***
High school	0.030 (0.004)***
Polytechnic school	0.026 (0.005)***
Vocational technical school	0.026 (0.009)***
Junior college	0.050 (0.004)***
Undergraduate	0.060 (0.005)***
Postgraduate	0.070 (0.008)***
Household size	0.001 (0.000)***
Marital status	0.033 (0.002)***
Insurance	0.012 (0.002)***
Community	0.004 (0.002)**
Housing ownership	-0.012 (0.003)***
Farmland	0.016 (0.002)***
Central	0.019 (0.002)***
Western	0.012 (0.002)***
Year_2013	0.029 (0.003)***
Year_2015	-0.133 (0.003)***
Year_2017	0.044 (0.003)***
Year_2019	0.032 (0.003)***
Constant	0.681 (0.006)***
R ²	0.308
Observations	22,936

Robust standard errors in parentheses; * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$; The reference educational level is illiterate; The reference year is 2011; The reference region is eastern.

Among the control variables, the age of the respondents negatively impacts consumption expenditure diversity. As people age, they may become risk-averse and smooth their consumption expenditure in preparation for retirement to buffer themselves against unforeseen adversities such as illness and job loss (Redmond and McGuinness 2020). The sex coefficient is negative and statistically significant, implying that males are less likely to diversify their consumption expenditure relative to females. Men are utilitarian shoppers, whereas women tend to be more immersed in the shopping experience (Wharton 2007). Men shop with a purpose and aim in mind, while women approach shopping with more open-mindedness and are happy to explore various options. This may translate to more time spent in malls and supermarkets, leading to greater diversity and purchasing and consumption. Relative to illiterate people, those having higher education levels have greater diversity in their consumption expenditures. Notably, having a postgraduate education is associated with the highest consumption expenditure diversity. This is in line with previous findings. For example, by estimating the 2017 China Migrants Dynamic Survey data, Cheng (2021) found that having one additional year of education increases monthly household consumption expenditure per capita by 7% points. Education also alters household consumption patterns by increasing expenditures on, for example, electricity (Adom 2021; Kwakwa 2017), life insurance (Zerriaa et al. 2017), and fruit and vegetables (Rains, Giombi, and Joshi 2019), contributing to household consumption expenditure diversity.

Household size is statistically significant and positive, suggesting that households with more members have greater consumption expenditure diversity. Previous studies have found that

household size is a key determinant of household consumption (Bick and Choi 2013; Jayasinghe and Smith 2021; Zou and Luo 2019). Members of a household may consume different kinds of goods and services. Consequently, on the whole, the household has access to a variety of goods and services. Given that sharing within households is common, a larger number of household members may naturally lead to more diversified consumption for each household member. Moreover, larger households can supply more labour, *ceteris paribus*, increasing and diversifying household income and thus consumption. The OLS results also indicate that married respondents are more diverse in their consumption expenditure than unmarried respondents. What applies to larger households applies more to married than unmarried people. Married people, especially those with children, are more likely to consume a wider variety of goods and services due to differences in their tastes and preferences and their propensity for joint consumption. The coefficient of insurance is statistically significant and positive. This implies that respondents having insurance have more diversity in their consumption patterns than those without insurance. The results also show that the consumption of city dwellers is more diverse than that of their rural counterparts. The significant and positive coefficient of community suggests that urban dwellers are associated with a higher consumption expenditure index than their rural counterparts. Urban residents, on average, earn higher incomes, helping them diversify their consumption.

The negative coefficient of housing ownership suggests that owning a housing property reduces respondents' consumption expenditure diversity. Owning a house can reduce the liquidity of households, regardless of how they pay for the house. Both, lumpsum payments and mortgages entail large outlays, leaving households with less money to spend on other goods and services. Thus, households may reduce their consumption (Fan and Yavas 2020). Respondents with farmlands tend to have higher consumption expenditure diversity. This empirical result agrees with (Chang, Lambert, and Mishra 2008), who found that households with farmland diversify their expenditures based on optimal household decisions. The central and western regional dummies are positive and statistically significant. The results imply that people in these regions have higher consumption expenditure diversity than those in China's eastern region. The findings confirm regional disparities in household consumption. All the year dummies are statistically significant. The year dummies for 2013, 2017, and 2019 have positive coefficients, whereas the 2015 dummy has a negative coefficient. The results suggest that people diversified their consumption expenditure more in 2013, 2017, and 2019 while reducing their consumption expenditure diversity in 2015 relative to 2011.

Results of UQR model

Table 3 presents the results from the UQR model at the 5th, 25th, 50th, 75th, and 95th quantiles. The results show that income diversity positively affects consumption expenditure diversity for the lower quantiles (5th and 25th) but has no effect on it at the medium and higher quantiles (50th, 75th, and 95th). A unit increase in income diversity increases the consumption diversity index by 0.024–0.072, and the largest effect is observed at the lowest 5th quantile (Figure 2). The results suggest that households at the lowest consumption expenditure level respond the most to changes in income diversity.

Table 3. The impacts of income diversity on expenditure diversity at the selected quantiles: UQR model regression.

Variables	Q5	Q25	Q50	Q75	Q95
Income diversity	0.072 (0.016)***	0.024 (0.008)***	0.007 (0.005)	-0.001 (0.004)	0.001 (0.003)
Age	-0.003 (0.000)***	-0.002 (0.000)***	-0.002 (0.000)***	-0.001 (0.000)***	-0.001 (0.000)***
Sex	-0.018 (0.007)***	-0.004 (0.003)	0.001 (0.002)	-0.001 (0.002)	-0.003 (0.001)*
Primary school	0.007 (0.015)	0.010 (0.007)	0.005 (0.004)	0.005 (0.003)*	0.000 (0.002)
Middle school	0.038 (0.015)**	0.021 (0.007)***	0.014 (0.004)***	0.009 (0.003)***	0.005 (0.002)**
High school	0.064 (0.016)***	0.034 (0.008)***	0.030 (0.005)***	0.020 (0.004)***	0.014 (0.003)***
Polytechnic school	0.044 (0.019)**	0.032 (0.009)***	0.021 (0.006)***	0.023 (0.005)***	0.016 (0.004)***
Vocational technical school	0.029 (0.034)	0.022 (0.017)	0.038 (0.011)***	0.027 (0.010)***	0.026 (0.010)***
Junior college	0.073 (0.018)***	0.059 (0.008)***	0.050 (0.005)***	0.045 (0.004)***	0.023 (0.004)***
Undergraduate	0.090 (0.017)***	0.066 (0.008)***	0.056 (0.006)***	0.057 (0.005)***	0.038 (0.004)***
Postgraduate	0.094 (0.025)***	0.068 (0.015)***	0.075 (0.010)***	0.071 (0.010)***	0.039 (0.011)***
Household size	-0.001 (0.002)	0.001 (0.001)	0.003 (0.001)***	0.003 (0.000)***	0.000 (0.000)
Marital status	0.067 (0.010)***	0.041 (0.005)***	0.029 (0.003)***	0.022 (0.002)***	0.011 (0.002)***
Insurance	0.029 (0.007)***	0.019 (0.003)***	0.009 (0.002)***	0.007 (0.002)***	0.004 (0.001)**
Community	0.006 (0.008)	0.007 (0.004)*	0.002 (0.003)	0.004 (0.002)*	0.003 (0.002)*
Housing ownership	-0.034 (0.009)***	-0.024 (0.005)***	-0.012 (0.003)***	0.001 (0.003)	-0.002 (0.002)
Farmland	0.035 (0.008)***	0.023 (0.004)***	0.013 (0.003)***	0.010 (0.002)***	0.005 (0.002)***
Central	0.047 (0.007)***	0.030 (0.003)***	0.017 (0.002)***	0.008 (0.002)***	0.003 (0.002)**
Western	0.023 (0.009)**	0.019 (0.004)***	0.010 (0.003)***	0.007 (0.002)***	0.006 (0.002)***
Year_2013	0.020 (0.008)**	0.036 (0.005)***	0.037 (0.004)***	0.030 (0.003)***	0.011 (0.003)***
Year_2015	-0.208 (0.011)***	-0.194 (0.005)***	-0.146 (0.003)***	-0.082 (0.002)***	-0.022 (0.002)***
Year_2017	0.035 (0.008)***	0.059 (0.005)***	0.054 (0.004)***	0.044 (0.003)***	0.018 (0.003)***
Year_2019	0.032 (0.009)***	0.043 (0.005)***	0.036 (0.004)***	0.030 (0.003)***	0.013 (0.003)***
Constant	0.404 (0.024)***	0.625 (0.012)***	0.718 (0.008)***	0.767 (0.006)***	0.832 (0.005)***
R ²	0.058	0.196	0.267	0.182	0.044
Observations	22,936	22,936	22,936	22,936	22,936

Robust standard errors in parentheses; * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$; The reference educational level is illiterate; The reference year is 2011; The reference region is eastern.

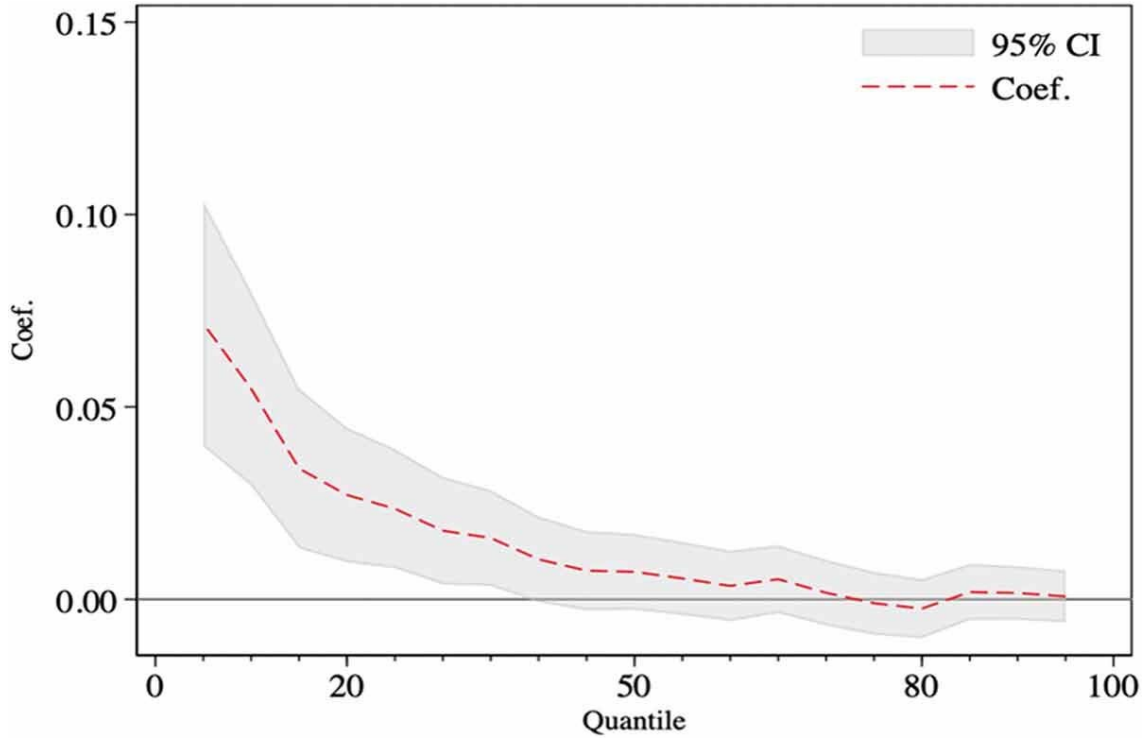


Figure 2. Impacts of income diversity on consumption expenditure diversity across the selected quantiles.

Next, we discuss the effects of the control variables. A one-year increase in age is associated with a decline in consumption expenditure diversity of 0.1–0.3%. This result is very close to what we obtained from the OLS regression. The coefficient of sex is negative at the lowest 5th and highest 95th quantiles, which suggests that males’ consumption expenditure diversity is 0.3–1.18% lower than their female counterparts. The coefficient of education indicates that relative to illiterate people, those with primary school education have more diverse consumption but only at the 75th quantile. In contrast, vocational education increases consumption expenditure diversity at the medium and higher quantiles (50th, 75th, and 95th) by 2.6–3.8%. Other education variables are statistically significant across the selected quantiles, increasing household consumption expenditure diversity by around 0.5–9.4%. Furthermore, we find that educational variables have the largest impacts on household consumption expenditure diversity at the lowest 5th quantile. Household size affects consumption expenditure diversity only at the 50th and 75th quantile, increasing it by around 0.3%.

The magnitudes of the coefficients of marital status and insurance decrease monotonically from the lowest 5th quantile to the highest 95th quantile. For example, the consumption expenditure diversity of married people is 6.7% higher at the 5th quantile and 1.1% higher at the 95th quantile than their unmarried counterparts. The community variable has the largest effect on consumption expenditure diversity at the 25th quantile. The estimated coefficient indicates that urban dwellers’ consumption expenditure diversity is 0.7% higher than that of rural dwellers. The effects of the housing ownership and farmland variables on household consumption expenditure diversity are monotonically decreasing from low to high quantiles. Our estimates reveal that, at the lowest 25th quantile, people owning houses are associated with 3.4% lower

consumption expenditure diversity than those without houses, while people having farmland are associated with 3.5% higher consumption expenditure diversity than those without.

The empirical results show that the geographical location of respondents is crucial to consumption expenditure diversity. We find that compared with eastern households, the consumption expenditure diversity of central and western households is 0.3–4.7% and 0.6–2.3% higher, respectively. Again, the largest effects occur at the lowest 5th quantile. The estimated coefficients of the year dummies indicated differences in consumption diversity over time. For example, relative to 2011, the consumption expenditure diversity in 2013 is the highest at the 50th quantile, while that in 2015 is the lowest at the 25th quantile.

V. Conclusions and policy implications

Poverty, income, and consumption are closely linked. The poor tend not to have the wherewithal to address their self-actualization needs, such as education, caring for others, travel, and recreational activities; large shares of their incomes are spent on attending to their physiological needs essential for survival. As a result, their consumption expenditure is concentrated on relatively few goods and services: their consumption lacks diversity. Furthermore, the poor also have relatively few sources of income, with labour income being the primary source. In contrast, the wealthy may benefit from multiple income sources, earning incomes from business activities, financial investments, farming operations, and pensions. All in all, poverty reduces both income diversity and consumption diversity. This paper explores how income diversity affects household consumption expenditure diversity in China. We also study the effects of socioeconomic, demographic, and regional factors on consumption diversity. The Simpson index is employed to calculate income diversity and consumption expenditure diversity, and the standard linear regression and UQR models are used to analyse mean- and quantile-based relationships between income diversity and consumption expenditure diversity. The China Social Survey data collected between 2011 and 2019 are used.

The results from the linear regression model suggest that income diversity increases household consumption expenditure diversity. Besides, a higher level of consumption expenditure diversity is also positively associated with respondents' educational levels, household size, marital status (married), having insurance, residence in urban communities, and owning farmland. Consumption expenditure diversity is lower among older individuals than younger ones and among males relative to females. Owning a house lowers consumption expenditure diversity. The UQR model provides a more detailed perspective on the links between income diversity and consumption diversity, showing that although income diversity improves consumption expenditure diversity, the effects are statistically significant only for those at the lower 5th and 25th quantiles. The effects of sex, educational levels, marital status, insurance, housing ownership, and having farmland on consumption expenditure diversity are the largest at the lowest 5th quantile. These findings underscore the importance of considering a more disaggregated view of the data on income sources, income levels, and consumption spending to understand the links between income diversity and consumption diversity; mean-based analyses, which are common in the literature, may mask their associations across different consumption expenditure quantiles.

China has achieved the incredible feat of lifting 800 million people out of extreme poverty in four decades. Broad-based growth combined with targeted initiatives to alleviate poverty has underpinned this accomplishment. Nevertheless, income and the quality of life in rural China, home to more than 500 million people, lag behind those in the country's urban regions. The

fate of China's rural regions is inextricably connected to the country's overall welfare. And China's government realizes that revitalizing rural areas will be instrumental to the country's long-term prosperity. Our results suggest that policies aimed at improving consumption expenditure diversity and the quality of life of people in China should create an economic environment that allows people to diversify their income sources. This is likely to translate to greater consumption diversity. The government should promote non-farm work, helping rural residents diversify their income through the farm and non-farm activities. Furthermore, these policies should target specific social segments exhibiting lower consumption diversity: for example, older individuals. Gender-specific policies should also be considered. Initiatives supporting formal education may prove quite effective, as higher education is associated with greater consumption diversity. This policy can be implemented through educational campaigns and improvements in educational infrastructure across all geographical locations in China. Future studies could apply randomized control trials (RCTs) to analyse the same phenomenon by targeting different age groups, genders, and geographical locations.

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Disclosure statement

No potential conflict of interest was reported by the authors.

Data availability statement

The data that support the findings of this study are available from Xiaoshi Zhou upon reasonable request.

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