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# Inverted U-shaped relationship between non-labor income and labor hours, with wage rates as the threshold variable

Qi Wang [a, *]

[a] *School of Public Administration, Shandong Technology and Business University, Yantai, China*

## ABSTRACT

Non-labor income is a crucial factor influencing time allocation, and prior studies have primarily concentrated on the linear association between non-labor income and labor hours. Utilizing micro-survey data from the CFPS in 2018 and 2020 and employing the panel threshold model, this paper empirically identifies a double threshold with the wage rate as the threshold variable. This finding reveals a non-linear relationship between non-labor income and labor hours. The two thresholds categorize the relationship into three intervals. In the first interval, non-labor income significantly promotes labor hours, while in the second and third intervals, non-labor income significantly decreases labor hours, exhibiting slightly varying degrees of influence. In general, the relationship between non-labor income and labor hours demonstrates an irregular inverted U-shaped pattern. Upon dividing the workers in the sample into three groups based on the two thresholds, it is observed that wage rates exhibit a positive correlation with non-labor income.

## KEYWORDS

Non-labor income; Threshold model; Inverted U-shaped

* Corresponding author: Qi Wang
E-mail address: 931234668@qq.com

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## 1. Introduction

In socio-economic contexts, all incomes can be broadly classified into two primary groups: labor income and non-labor income. Non-labor income serves as compelling evidence for the coexistence of multiple distribution methods. According to classical labor supply theory and a wealth of empirical studies, an increase in non-labor income tends to decrease labor time. Simultaneously, China's demographic structure is undergoing significant transformations, with the aging population exerting a substantial impact on labor force availability (Yan, 2018). Despite adjustments to fertility policies, the working-age population is projected to decline, while the aging population continues to grow (Cai, 2010). Consequently, it appears imperative to examine non-labor income and labor supply within the same framework.

The proportion of non-labor income in the per capita income of residents has consistently risen, demonstrating an upward trajectory during the five-year span from 2018 to 2022. Per capita non-labor income in rural areas increased from 3,262 yuan to 4,712 yuan, while per capita non-labor income in urban areas increased from 11,016 yuan to 14,120 yuan. However, the disparity in non-labor income between urban and rural areas is stark. The gap is most pronounced in 2022, reaching RMB 9,480, and the smallest in 2018, at RMB 7,754. (Note: All data is sourced from the National Bureau of Statistics.)

The share of non-labor income in the per capita income of urban residents consistently hovers around 28%, while in rural areas, it maintains a level of approximately 23%. As marketization deepens, non-labor income is increasingly prevalent across diverse fields of social production and non-production (Qian, 2004). Nevertheless, as the proportion of non-labor income in personal income continues to rise, its influence on the labor market becomes more apparent. Therefore, delving into the impact of non-labor income on labor supply holds significant importance in unraveling the operational mechanisms of the labor market and further advancing sustainable economic development in China.

In conclusion, with the continuous development of China's economy, non-labor income is becoming an increasingly important source of income for people. Compared with wage income and business income, the most distinctive feature of non-labor income is its lack of time constraints. It acquires income through capital elements (e.g., dividends, leasing) (Yuan and Yuan, 2023). However, it also influences the time allocation of households and individuals. Under the constraint of individual time endowment, an increase in non-labor income implies a rise in the level of monetary income, impacting the allocation of individual time as residents can purchase more goods in the market or choose to reduce their market working hours to enjoy the utility derived from leisure. The diversity of non-labor income sources allows individuals to receive a stable income if they hold these assets, which is appealing to labor groups with unstable wage incomes.

According to relevant theories, it can be concluded that non-labor income plays a crucial role in time allocation. The traditional theory of work-leisure posits that an increase in pure income will lead to a decrease in working time, and non-labor income will also impact family time allocation, serving as a significant constraint on family time-use decisions (Becker, 1965). In studying the impact of non-labor income on family time allocation decisions, researchers introduced the two situations of market working time rigidity and non-rigidity into the theoretical model to differentiate the effect of non-labor income on family time allocation. For families with rigid market work, family leisure time increases with the increase of non-labor income; however, for families with non-rigid market work, the adjustment of their leisure time is uncertain (Hu, 2011). When studying the impact of non-labor income on labor supply, the theoretical model introduces the wage rate, revealing that an increase in non-labor income strengthens the substitution effect of the wage rate, indirectly leading to an increase in labor time (Wei and Chu, 2021). According to the study of the theoretical model of multivariate individual distribution, demographic changes affect the distribution of labor income, and individuals' income sources change with age. The results show that the proportion of personal income dependent on non-labor income gradually increases while the proportion dependent

on labor income decreases among individuals whose age ranges from young to old. This suggests a shift in the source of personal income from dependence on labor income to dependence on non-labor income as age increases (Black et al., 1989).

In empirical analyses, there is evidence in the literature that non-labor income does have some negative impact on working hours (Devereux, 2004); other scholars have found differential manifestations of non-labor income on labor supply by studying male and female labor supply in several sectors in Brazil: in the informal and self-employed sectors, men's own non-labor income has a significant negative impact on labor supply, and wives' non-labor income has no significant effect (Tiefenthaler, 1999). A study of the Philippine labor market found that non-labor income has a negative impact on the level of labor supply in all sectors (Tiefenthaler, 1994); in the case of men, their non-labor income is also associated with their preference for more leisure time or time away from the labor market (Schultz, 1990). This has been explained in the literature, which is due to the fact that an increase in non-labor income has a substitutive effect on labor income, leading to a decrease in the amount of time that residents spend on household chores and market work (Liu, 2013). Non-labor income indirectly affects leisure while affecting labor supply, and in the study of income on the time allocation of urban dual-income households, it was found that an increase in non-labor income has a significant positive effect on the wife's study time, leisure time, as well as the husband's leisure (Wang and Gao, 2016).

While a multitude of literature asserts that non-labor income significantly diminishes labor supply, there are contrasting viewpoints in some studies. In research examining time allocation between spouses, it was discovered that non-labor income positively influences the market hours of husbands and has a negative but statistically insignificant impact on the labor hours of wives (Alenezi and Walden, 2004). Another study on the feminization of the labor force in China's agricultural sector found that an increase in non-labor income correlates with an increase in the overall labor hours of an individual (both paid and unpaid) (Chang et al., 2011). Additionally, in scenarios where consumption exhibits a diminishing marginal effect and consumption and leisure are complementary, non-labor income is associated with increased labor supply (Chiu and Eeckhoudt, 2010). Furthermore, literature suggests that heightened income uncertainty results in increased labor supply due to the counteracting substitution effect through labor substitution, which reduces income uncertainty (Block and Heineke, 2010). Xia used non-labor income as an exogenous variable to explore the impact of non-labor income on the labor supply of migrant workers (Xia, 2016). Other scholars have used the data from the China Nutrition and Health Survey (CNHS) 1991-2006 to analyze the impact of economic development on rural household time allocation by using non-labor income as a control variable (Chang et al., 2009).

To summarize, there are few studies on non-labor income, and previous studies only analyze non-labor income as a whole to examine its linear impact on the time allocation of individuals and families. However, the various sources of non-labor income and the different nature of work also lead to variations in the adjustment of working hours. The innovations of this paper are: 1. the discovery of the non-linear impact of non-labor income on labor hours, indicating that the impact of non-labor income on labor hours follows an inverted U-shaped relationship, rising initially and then declining; 2. splitting the components of non-labor income and discovering the positive correlation between non-labor income and the wage rate. This provides a basis for targeted reforms, aiming to implement the right remedies for realizing the long-term growth of the labor force and enjoying the dividends brought by labor supply. The findings of this study offer valuable support and reference for policymakers in implementing targeted reforms to achieve sustainable labor growth.

## 2. Theoretical models

Becker (1965) argues that time allocated to household production serves not only a consumption function but also a production function, crucial for enhancing welfare. Rational economic agents pursue utility maximization,

wherein utility derives from two aspects: spiritual satisfaction, such as engagement in household production or leisure, directly enhancing individual welfare; and monetary income, such as earning money through market production and enhancing individual welfare through consumption. However, the enhancement of the aforementioned utilities is contingent upon input factors, as emphasized by Becker, with their utility increase strictly accompanied by the investment of time resources. Nevertheless, non-labor income represents a unique avenue that boosts monetary income without requiring time resources. Faced with rigid time constraints, non-labor income enables residents to attain monetary income with minimal time investment, sustaining purchasing power and affording them more discretionary time through market substitution behaviors. The monetary support and time spill-over effects of non-labor income are likely to induce changes in residents' time allocation decisions, thereby impacting overall welfare levels.

Duesenberry's relative income hypothesis posits that consumption expenditure is primarily influenced by relative income levels, encompassing two aspects (Duesenberry,1949). Firstly, consumer consumption is influenced not only by their own income level but also by the consumption behavior and levels of their peers. The increase in consumption expenditure among higher-income groups directly leads to the growth of consumption expenditure in adjacent lower-income groups, culminating in the overall rise in societal consumption expenditure, termed as the "dem[1]onstration effect." Secondly, consumption levels are influenced by current income. Consumers derive utility from the consumption of goods and leisure, with higher-income groups having more opportunities to enjoy leisure. For lower-income groups, when wage rates are low, their relative income is lower compared to higher-income groups. Under the influence of the demonstration effect, lower-income groups increase their labor hours to catch up with the consumption of higher-income groups. Income is divided into two parts: labor income and non-labor income. In a low wage rate state, labor income is relatively low compared to non-labor income, and fewer people in low-wage rate groups possess resources for obtaining non-labor income. It is hypothesized that under low wage rate conditions, an increase in non-labor income prompts consumers to increase labor hours to catch up with the consumption of other units. When wage rates are high and they catch up with the consumption levels of other units, consumers reduce labor hours to enjoy leisure. In other words, with wage rate as the threshold variable, non-labor income exhibits different effects on labor hours on either side of the threshold value.

## 3. Data and econometrics model

### *3.1. Data sources*

The information utilized in this paper is sourced from the China Family Panel Studies (CFPS), conducted by the Institute of Social Science Survey (ISSS) at Peking University. The CFPS captures shifts in China's economic, social, and demographic landscape, emphasizing individual, family, and community levels. It serves as a comprehensive database for academic investigations, covering diverse topics such as economic activities and population migration. The CFPS sample encompasses 25 provinces, municipalities, and autonomous regions, including all members within those households. Both CFPS 2018 and 2020 comprise five databases. For this study, which focuses on the influence of non-labor incomes on individual labor supply, two databases are chosen: individual self-responses and household economy.

[1] "People tend to emulate those whom they perceive to have higher social status or income. When an individual sees others possessing higher social status or income, they may feel envious or inspired, hoping to achieve similar levels themselves. This can motivate them to work harder or pursue higher income in order to elevate their own social status or fulfill their personal needs.

### 3.2. Description of variables

The empirical research part of this paper focuses on examining the impact of structural characteristics of non-labor income on labor supply, so the sample of school students is excluded. Considering the retirement age of men and women, only the samples of men aged 18-60 and women aged 18-55 are selected. Furthermore, certain outliers were removed to ensure the stability of subsequent results.

There is no authoritative definition of non-labor income, although numerous literatures have explored non-labor income in depth. For example, non-labor income is income obtained through means other than labor (Tan et al., 2004). According to the theory of factors of production, non-labor factors of production are invested in production and are bound to produce returns (Chen and Kang, 2005). Non-labor income, as the core independent variable in this paper, is mainly defined as income other than wage income, following the established literature (Liu, 2013). This includes the sum of profits from financial investment, factor income (renting out houses or other assets, etc.), transfer income, and gifts from others. The dependent variable is labor supply, with labor hours chosen as the measurement dimension. Labor hours are expressed by the results of the "*weekly working hours*" survey in the questionnaire, and then multiplied by 4 to convert to monthly working hours. Transfer income is represented by "*transfer income*" in the questionnaire, financial investment income is represented by "*profit from financial investment of your household*" in the questionnaire, and factor income is represented by "*total income from rent*" in the questionnaire, *"Total amount of compensation for housing demolition and relocation*", "*Income from renting out land*", "*Total amount of compensation for land expropriation*", "*Income from renting out other assets*", and the sum of "*Total amount of compensation for housing demolition and relocation*", "*Income from renting out other assets*". "*Gifts from others are expressed as the sum of* "*money from children*", "*money from relatives*", and "*money from others*" in the questionnaire. In addition, for the selection of control variables, marriage, gender (0 for female, 1 for male), age, age squared, household registration (0 for rural household registration, 1 for urban household registration), and education level (1 for elementary school and below, 2 for junior high school, 3 for senior high school, 4 for junior college, 5 for undergraduate degree, 6 for master's degree and above) were selected, of which education level was represented by "*highest education level*" in the questionnaire. The education level was recoded as "*highest education level*" in the questionnaire. Political profile is indicated by "*whether or not a member of the party*" in the questionnaire (1 for a member of the party, 0 for a non-member of the party).

### 3.3. Econometrics model

To test the non-linear relationship between non-labor income and labor hours, considering the difficulty of identifying the general model, for this reason, Hansen's (1999) panel threshold model is introduced, with the wage rate as the threshold variable. A self-sampling test is carried out, and the differences in the coefficients between the groups are analyzed based on the thresholds determined by the test.

$$WT = \alpha_0 + \beta_0 LNI(W \le q) + \beta_1 LNI(W > q) + \delta Controls + \varepsilon$$

*WT* represents labor time, *LNI* is a threshold-dependent variable and a key explanatory variable indicating non-labor income, *W* is the threshold variable (wage rate), *q* is the threshold value, $\beta_0$ is the coefficient representing the effect of non-labor income on labor hours when $W \le q$; $\beta_1$ is the coefficient representing the effect of non-labor income on labor hours when $W > q$. If $\beta_1 \ne \beta_2$, it indicates a threshold effect; otherwise, there is no threshold effect. Controls represent the control variables, and $\varepsilon$ represents the error term.

$$WT = \alpha_0 + \beta_0 LNI(W \le q_1) + \beta_1 LNI(q_1 < W \le q_2) + \beta_2 LNI(W > q_2) + \delta Controls + \varepsilon$$

Where $q_1$ and $q_2$ are two thresholds, and $q_1 < q_2$. These two thresholds divide the total sample into three

intervals. $\beta_0$, $\beta_1$, $\beta_2$ are the coefficients representing the influence of the core explanatory variable $R$ on the explanatory variable Y in three different intervals, respectively. This method can be extended to establish a multi-threshold model when there are three or more thresholds.

**Table 1.** Summary Statistics.

| VarName | Obs | Mean | SD | Min | Max |
|---|---|---|---|---|---|
| Working hours | 9614 | 215.02 | 65.02 | .4 | 672.00 |
| Non-laborincome | 9614 | 2.10 | 6.45 | 0 | 119.50 |
| Log of non-labor income | 9614 | 0.57 | 0.83 | 0 | 4.79 |
| Wage rate | 9614 | 22.37 | 23.32 | 0 | 416.67 |
| Gender | 9614 | 0.55 | 0.50 | 0 | 1.00 |
| Household registration | 9614 | 0.28 | 0.45 | 0 | 1.00 |
| Edu | 9614 | 3.01 | 1.51 | 1 | 6.00 |
| Age squared | 9614 | 1021.94 | 419.22 | 324 | 1936.00 |
| Age | 9614 | 31.29 | 6.54 | 18 | 55.00 |
| Marry | 9614 | 0.70 | 0.46 | 0 | 1.00 |
| Political profile | 9614 | 0.03 | 0.17 | 0 | 1.00 |
| Gifts from others | 9614 | 0.11 | 0.37 | 0 | 4.62 |
| Factor income | 9614 | 0.34 | 1.97 | 0 | 58.00 |
| Financial investment | 9614 | 0.10 | 1.36 | 0 | 80.00 |
| Transfer income | 9614 | 0.53 | 1.44 | 0 | 10.00 |

## 4. Data and econometrics model

### *4.1. Test and determination of threshold value*

In order to analyze and determine the non-linear relationship between non-labor income and labor hours, the wage rate was considered as the threshold variable. Using the panel threshold model, the test statistic F was obtained through repeated sampling (with the number of bootstrap samples set to 300) using Stata 17.0 software. The corresponding p-value was then used to test the threshold effect. Table 2 presents the results of the threshold model test, with single and double thresholds being significant at the 1% level, and a triple threshold p-value of 0.56, indicating the presence of a double-threshold effect between non-labor income and labor hours. Table 3 displays the results of the corresponding threshold estimates, with the first threshold and the second threshold identified as 18.52 and 102.78, respectively.

**Table 2.** Threshold effect test results. Threshold variable: wage rate.

| Threshold test | F | P | Boundary value | | |
|---|---|---|---|---|---|
| | | | 10% | 5% | 1% |
| Single threshold | 277.10 | 0.000 | 12.206 | 17.274 | 18.475 |
| Double threshold | 111.41 | 0.000 | 18.791 | 19.555 | 23.874 |
| Triple threshold | 34.94 | 0.560 | 19.216 | 24.885 | 27.954 |

**Table 3.** Estimated threshold. Threshold variable: wage rate.

| Number of thresholds | Threshold variable | 95% confidence interval |
|---|---|---|
| single threshold | 18.52 | [18.00, 18.75] |
| double threshold | 102.78 | [93.75, 125.00] |

Table 3 presents the test results for each threshold estimate. When utilizing the wage rate as the threshold variable, the identified thresholds are 18.52 and 102.78. The corresponding 95% confidence intervals are [18.00,

18.75] and [93.75, 125.00], respectively. Both thresholds align with narrow confidence intervals, signifying significant identification effects. The likelihood ratio (LR) values associated with the dual thresholds for wage rates consistently fall below the 5% critical value, affirming the validity of the threshold estimates. Hence, the threshold estimates pass the test, indicating their authenticity and effectiveness.

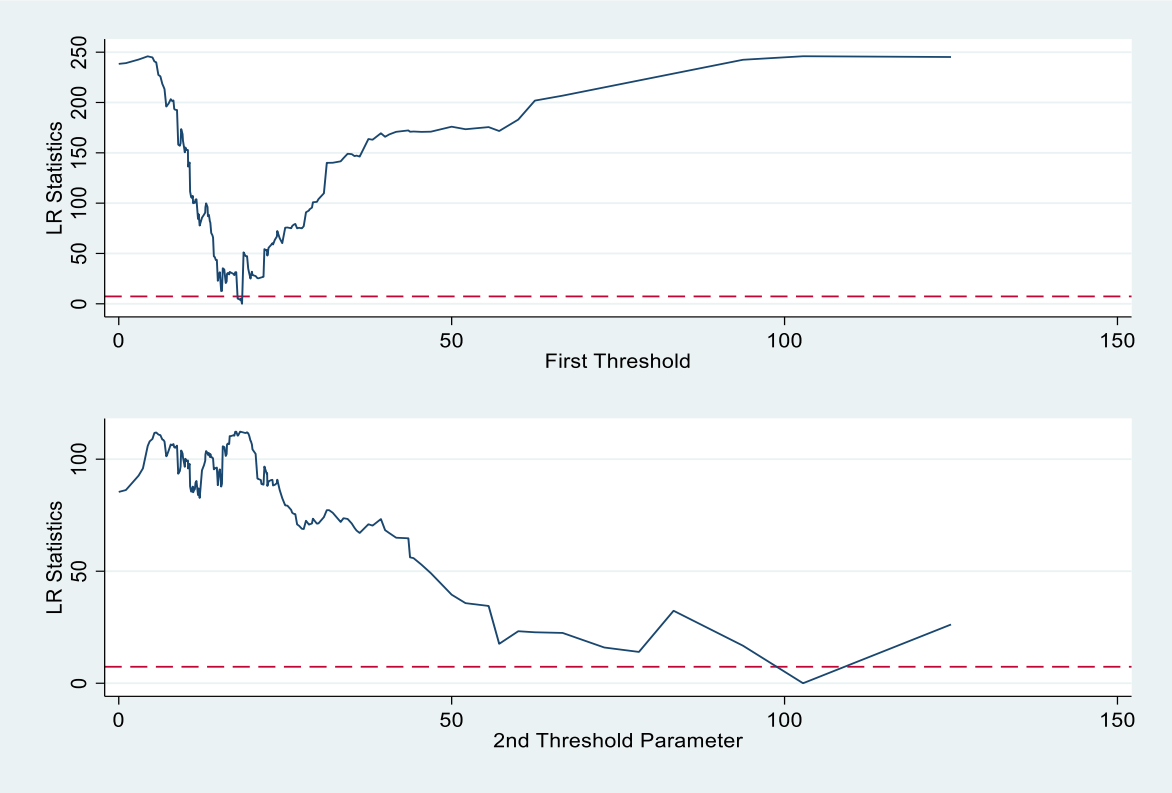


**Figure 1.** Threshold Estimates LR Chart.

### *4.2. Threshold model estimation*

Table 4 displays the outcomes of the panel threshold model regression, revealing two wage rate thresholds: 18.52 and 102.78. These thresholds segment the non-linear relationship between non-labor income and labor hours into three intervals. In the first interval, where the wage rate is below the threshold of 18.52, the impact coefficient of non-labor income on labor hours is 7.79, significant at the 1% level, indicating that an increase in non-labor income positively influences the length of labor hours. In the wage rate range of 18.52 to 102.78, the impact coefficient shifts to -12.57, passing the 1% significance level test. This signifies a reversal in the impact observed in the first interval. Beyond the second threshold of 102.78, the coefficient for the impact of non-labor income on labor hours further decreases to -69.98, maintaining significance at the 1% level. While the direction of the effect aligns with that of the second interval, the magnitude of the effect intensifies. These results, derived using the wage rate as the threshold variable, highlight irregularities in the relationship between non-labor income and labor hours. The observed pattern suggests a non-linear, irregular inverted U-shaped relationship. The explanation lies in the interplay of income levels, where initial growth in non-labor income motivates increased labor hours, but as income continues to rise, individuals prioritize leisure over labor, resulting in reduced work hours.

The relationship between non-labor income and labor hours exhibits an irregular inverted U-shaped pattern. Analyzing this non-linear relationship using the wage rate as the threshold variable reveals three intervals, showcasing the irregular inverted U-shaped relationship. This pattern can be explained by considering the wage

rate's impact. Initially, at the first threshold of 18.52, workers experience low income levels. As non-labor income increases, it contributes to the overall income and consumption of workers. With rising consumption, workers may extend their labor hours, striving to ascend to a higher social class. Even with some non-labor income, individuals at lower wage rates may still increase their work hours to elevate their total income. However, as the wage rate continues to climb, individuals become more inclined to sacrifice labor income to reduce work hours and gain more leisure. This is evident in the second and third intervals, where non-labor income negatively influences labor hours. This dynamic reflects a middle-income trap at the individual labor supply level. The middle-income trap, originally a concept applied to countries, refers to a scenario where a nation achieves a relatively high per capita income based on its advantages but remains at that level for an extended period. This concept extends to individuals, as higher-income workers tend to prioritize leisure, leading to a reduction in labor hours.

**Table 4.** Results from Panel Threshold Regression. Threshold variable: wage rate.

| VARIABLES | Work Hours |
|---|---|
| Gender | 19.94*** |
| | (1.318) |
| Household registration | -11.01*** |
| | (1.667) |
| Edu | -12.39*** |
| | (0.513) |
| Age squared | -0.0108 |
| | (0.0152) |
| Age | 0.463 |
| | (0.992) |
| Marital status | -0.621 |
| | (1.741) |
| Political profile | -1.155 |
| | (3.985) |
| Interval 1# Non-labor income | 7.790*** |
| | (1.066) |
| Interval 2# Non-labor income | -12.57*** |
| | (0.955) |
| Interval 3 # Non-Labor Income | -69.98*** |
| | (5.548) |
| Constant | 241.1*** |
| | (15.17) |
| Observations | 9,614 |
| Number of year | 2 |
| R-squared | 0.170 |

### *4.3. Distribution of non-labor income*

According to the thresholds estimated by the threshold model, namely 18.52 and 102.78, the workers in the sample are categorized into three groups: the first group consists of individuals with a wage rate lower than 18.52; the second group comprises those with a wage rate ranging between 18.52 and 102.78; and the third group includes individuals with a wage rate exceeding 102.78. Additionally, non-labor income is classified into four components: transfer income, income from financial investments, factor income, and gifts from others. Specifically, the distribution of non-labor income and its components among the three groups is observed. As illustrated in Table 5, non-labor income and its four components are minimal in the first group (wage rate less than 18.52), gradually increasing in the second and third groups. A positive correlation trend between wage rate and non-labor income is

evident, particularly in financial investment income and factor income. A higher wage rate implies a higher income level, elevated social status, and more avenues and resources to acquire non-labor income.

**Table 5.** Inter-group distribution of non-labor income.

| | Non-labor income | Transfer income | Financial investmen | Factor income | Gifts from others |
|---|---|---|---|---|---|
| Group 1 | 1.73 | 0.44 | 0.04 | 0.25 | 0.23 |
| Group 2 | 3.52 | 0.68 | 0.26 | 0.45 | 0.50 |
| Group 3 | 3.47 | 0.78 | 0.69 | 0.73 | 0.47 |

Moreover, apart from grouping based on education, the sample cluster is divided into two groups: the first group comprises individuals with education below a master's degree, while the second group consists of those with education at or above a master's degree. As depicted in Table 6, non-labor income and its components are concentrated in the highly educated group. However, there is a notable disparity in financial investment income distribution between the two groups, with the per capita investment income of the group below a master's degree at 0.09 million yuan and that of the second group (master's degree or above) at 0.47 million yuan, resulting in a gap of 5.2 times. This observation suggests a positive correlation between non-labor income and educational attainment.

**Table 6.** Inter-group distribution of non-labor income.

| | Non-labor income | Transfer income | Financial investmen | Factor income | Gifts from others |
|---|---|---|---|---|---|
| Below master's degree | 2.49 | 0.55 | 0.09 | 0.37 | 0.28 |
| Master's degree or higher | 4.65 | 0.87 | 0.47 | 0.57 | 0.78 |

### *4.4. Heterogeneity test*

The robustness of the estimated results for the threshold model has not undergone testing. To address this, group testing is imperative, conducted at three distinct levels: regional, household, and individual. Regionally, areas are categorized into East, Middle, and West. Households are classified as either above-middle-income or below-middle-income, following the criteria set by the National Bureau of Statistics, wherein households with assets ranging from 100,000 to 500,000 yuan are considered below-middle-income, and those with assets exceeding 500,000 yuan are deemed above-middle-income. At the individual level, samples are segregated into those with educational attainment above a master's degree and those below a master's degree.

Group tests are conducted based on this categorization, and the outcomes are presented in Table 7, illustrating the effects of the threshold model test and the estimated values. Specifically, a single threshold is identified for the group with a master's degree or higher, while a double threshold is observed for the remaining tests within each group. Notably, all threshold values for each test are successfully met, and the regression results for each group exhibit an irregular inverted U shape. This reaffirms the robustness of the threshold regression results.

In subgroup regressions, a substantial variation is observed in the second threshold value. Notably, for the highly educated group, above-middle-income households, and the central and eastern regions, the second threshold value experiences a significant decrease. This implies a mitigation of the negative impact of non-labor income on labor hours for affluent individuals and more economically developed regions. Additionally, an elite effect is discerned, where higher income levels correlate with fewer factors influencing labor hours and a weakened overall effect.

**Table 7.** Threshold model group tests.

| | Number of threshold | F | P | Boundary value | | | Threshold value | 95% confidence interval |
|---|---|---|---|---|---|---|---|---|
| | | | | 10% | 5% | 1% | | |
| West | Single threshold | 128.41 | 0.00 | 24.758 | 32.099 | 37.029 | 14.89 | [14.73，15.00] |
| | Double threshold | 61.89 | 0.00 | 19.269 | 24.946 | 25.70 | 102.00 | [90.91，107.75] |
| Mid | Single threshold | 113.47 | 0.00 | 19.116 | 25.873 | 38.495 | 20.83 | [19.88，21.25] |
| | Double threshold | 56.70 | 0.00 | 17.493 | 20.462 | 25.702 | 60.50 | [ 57.14，68.75] |
| East | Single threshold | 87.12 | 0.00 | 12.357 | 13.809 | 16.652 | 21.82 | [20.27,21.88] |
| | Double threshold | 28.13 | 0.00 | 11.031 | 11.698 | 13.997 | 37.50 | [35.59,39.06] |
| Master's degree or higher | Single threshold | 41.69 | 0.00 | 4.537 | 7.414 | 9.326 | 18.52 | [18.00,19.79] |
| Below master's degree | Single threshold | 257.23 | 0.00 | 19.149 | 39.211 | 48.924 | 15.38 | [15.28,15.56] |
| | Double threshold | 154.21 | 0.00 | 13.334 | 21.424 | 41.784 | 55.56 | [52.08,58.33] |
| Above middle income | Single threshold | 244.16 | 0.00 | 21.662 | 32.577 | 40.592 | 18.52 | [17.90,18.75] |
| | Double threshold | 100.40 | 0.00 | 17.627 | 22.633 | 25.137 | 102.78 | [93.75,125.00] |
| Below middle income | Single threshold | 47.53 | 0.00 | 17.005 | 17.694 | 21.558 | 14.93 | [14.73,15.00] |
| | Double threshold | 19.47 | 0.00 | 13.769 | 14.572 | 14.616 | 24.55 | [22.53,25.00] |

**Table 8.** Threshold model group test regression results.

| VARIABLES | West | Mid | East | Master's degree or higher | Below master's degree | Above middle income | Below middle income |
|---|---|---|---|---|---|---|---|
| gender | 19.312*** | 19.25*** | 22.10*** | 15.30*** | 20.91*** | 20.131*** | 17.972*** |
| | (7.50) | (1.836) | (2.815) | (2.445) | (1.488) | (14.53) | (4.32) |
| hukou | -11.400*** | -12.57*** | -7.802** | -2.885 | -13.81*** | -11.620*** | -3.003 |
| | (-3.61) | (2.277) | (3.927) | (2.643) | (1.967) | (-6.73) | (-0.48) |
| edu | -12.758*** | -12.20*** | -12.98*** | 6.096 | -12.10*** | -11.682*** | -15.260*** |
| | (-12.31) | (0.728) | (1.033) | (5.754) | (0.655) | (-21.43) | (-9.66) |
| age2 | 0.003 | 0.0169 | -0.0825*** | -0.00264 | -0.0116 | -0.010 | -0.033 |
| | (0.11) | (0.0216) | (0.0312) | (0.0410) | (0.0164) | (-0.61) | (-0.74) |
| age | -0.160 | -1.375 | 4.772** | 0.0972 | 0.519 | 0.458 | 1.604 |
| | (-0.08) | (1.413) | (2.014) | (2.661) | (1.074) | (0.43) | (0.57) |
| marry | 0.210 | 0.161 | -2.998 | -0.259 | -0.713 | -1.997 | 6.200 |
| | (0.06) | (2.446) | (3.515) | (3.143) | (1.994) | (-1.07) | (1.24) |
| qn4001 | 1.002 | 0.589 | -4.786 | -2.180 | -3.672 | -0.506 | -16.199 |
| | (0.13) | (5.847) | (7.884) | (4.336) | (5.725) | (-0.12) | (-0.95) |
| Interval1#Nonlaborincome | 5.573*** | 12.65*** | 6.753*** | 8.519*** | 10.86*** | 7.188*** | 27.760*** |
| | (2.87) | (1.849) | (2.123) | (2.092) | (1.330) | (6.61) | (5.15) |
| Interval2#Nonlaborincome | -13.595*** | -8.729*** | -15.78*** | -4.366*** | -11.68*** | -12.501*** | -7.467 |
| | (-5.42) | (1.118) | (2.560) | (1.298) | (1.118) | (-12.96) | (-1.27) |
| Interval3#Nonlaborincome | -100.719*** | -51.87*** | -52.98*** | -14.35*** | -61.84*** | -66.714*** | -45.573*** |
| | (-11.25) | (6.310) | (6.620) | (3.490) | (3.684) | (-11.91) | (-5.06) |
| Constant | 248.290*** | 268.4*** | 182.4*** | 144.6*** | 240.7*** | 239.023*** | 234.117*** |
| | (8.21) | (21.68) | (30.39) | (48.51) | (16.49) | (14.62) | (5.54) |
| Observations | 2,607 | 4,608 | 2,334 | 1,491 | 8,141 | 8,500 | 1,132 |
| Number of year | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| R-squared | 0.171 | 0.179 | 0.170 | 0.056 | 0.148 | 0.167 | 0.177 |

## 5. Conclusions and Recommendations

This paper draws upon data from CFPS2018 and 2020, employing the panel threshold model. Building on previous research, it substantiates the inverted U-shaped relationship between non-labor income and labor hours, utilizing the wage rate as the threshold variable. The empirical study identifies two thresholds, specifically 18.52 and 102.78. These thresholds demarcate the impact of non-labor income on labor hours into three intervals: in the first interval, non-labor income positively influences labor hours; in the second and third intervals, non-labor income negatively affects labor hours. This gives rise to an overall irregular inverted U-shaped relationship between non-labor income and labor hours. Further examination of the thresholds reveals the relationship between the wage rate and non-labor income and its components. It is observed that the wage rate and non-labor income exhibit a positive correlation.

Both standard theory and empirical research have consistently confirmed the substantial negative impact of non-labor income on labor supply. As China's aging process continues to accelerate, and the working-age population experiences a persistent decline, a shortage of effective labor supply is an imminent challenge. In light of this, strategic measures should be devised promptly to address the impending labor shortage.

*Reasonable Wage Control and Talent Retention:* Reasonable control of wage rates is essential, aligning them with the distribution of labor and relevant factors. Striking a balance is crucial; excessively low wages can impact workers' morale and lead to overwork, while overly high wages may result in resource wastage and a decline in labor supply. Workers should receive appropriate wages based on their actual contributions to retain talent. The lack of high-end talent and inefficient corporate management are identified as significant barriers hindering industry innovation (Ding et al., 2023). Attention to employee well-being is emphasized (Zhong et al., 2021).

*Supervision of Transfer Income and Financial Investment:* A positive correlation exists between higher wage rates and increased non-labor incomes, coupled with a more pronounced decline in labor hours. Consequently, supervision of transfer income is crucial, particularly as it mostly originates from the government. Before disbursing transfer income, accurate identification of recipients based on conditions and qualifications is essential to prevent waste and negative impacts on labor supply. Rigorous supervision of the financial market, especially concerning financial investment income, is necessary. Strict measures must be implemented to prevent illegal profit-seeking behavior, ensuring investment fairness and legitimacy.

*Protection of Legitimate Non-Labor Income:* Recognizing non-labor income as a vital factor influencing time allocation is crucial. While in the right half of the inverted U-shaped structure it reduces work hours, promoting leisure, and increasing personal welfare, protection of this income is essential. In the left half of the structure, non-labor income promotes increased labor hours, addressing labor supply challenges amid an aging population.

*Diversification of Non-Labor Income Sources:* The expansion of non-labor income sources is advocated. Moderately increasing channels such as welfare, subsidies, and dividend bonuses can elevate overall income levels. Particular attention should be given to property income, as low property income hinders wealth accumulation, especially in rural areas. Vigorous development of the digital economy can foster economic growth in rural areas and narrow income gaps (Wang and Cai, 2023; Zhang, 2022).

However, it is crucial to note that the precondition for non-labor income contributing to personal leisure and welfare is prudent management and planning. Individuals must utilize non-labor income wisely, ensuring sustainable use and meeting basic needs. Simultaneously, individuals should organize leisure time thoughtfully, striking a balance between enjoying leisure and fulfilling essential work and responsibilities.

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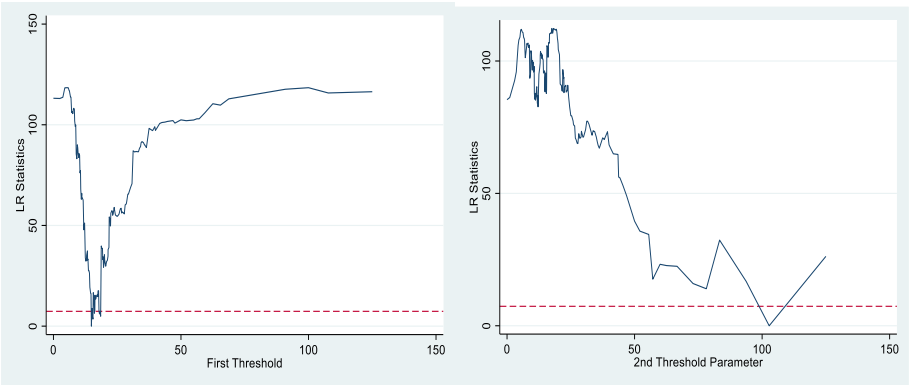
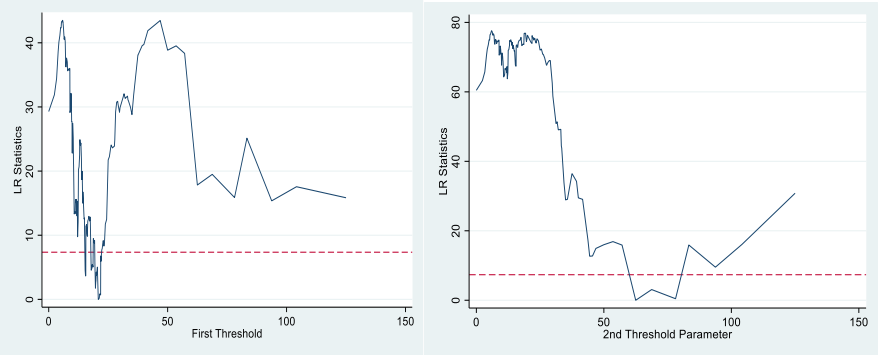
## Conflict of interest

The authors affirm that they do not have any identifiable competing financial interests or personal relationships that could be perceived as influencing the work presented in this paper.

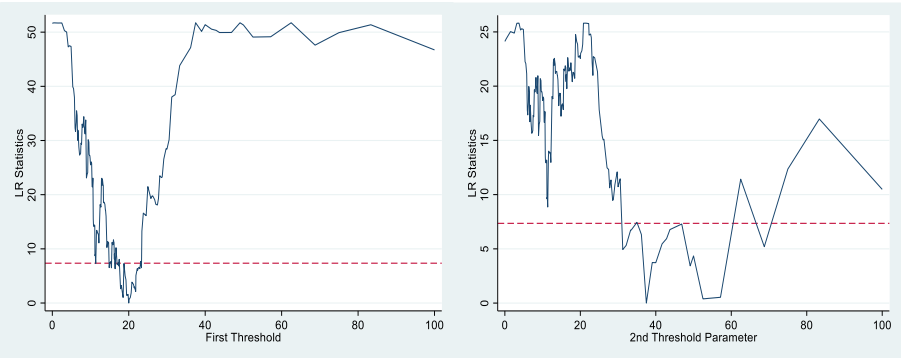
## Appendix



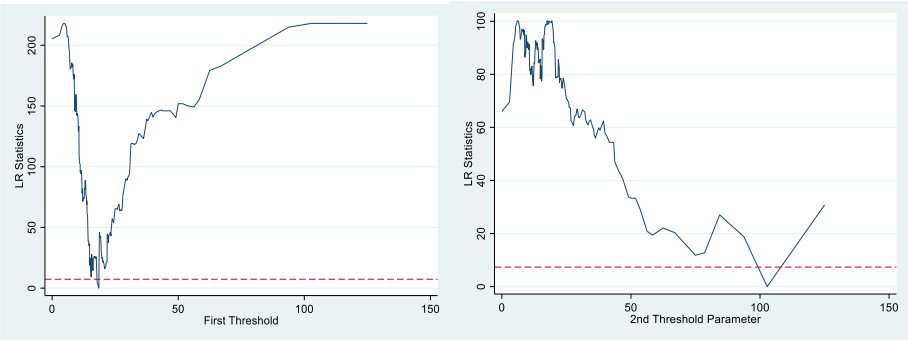

**A1.** Western Region Threshold Test LR Map.



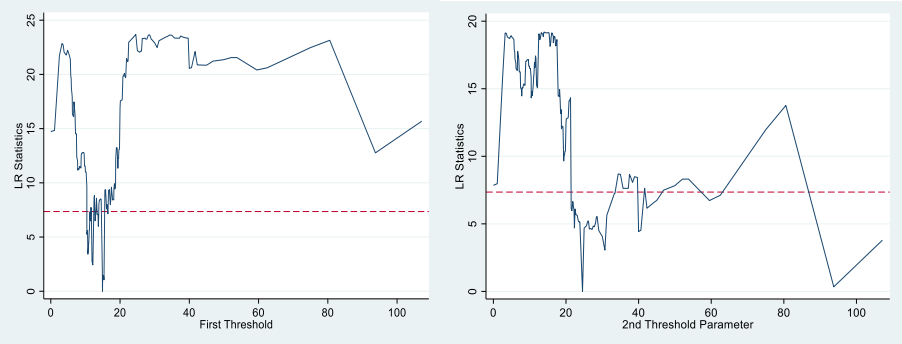

**A2.** Central Region Threshold Test LR Map.



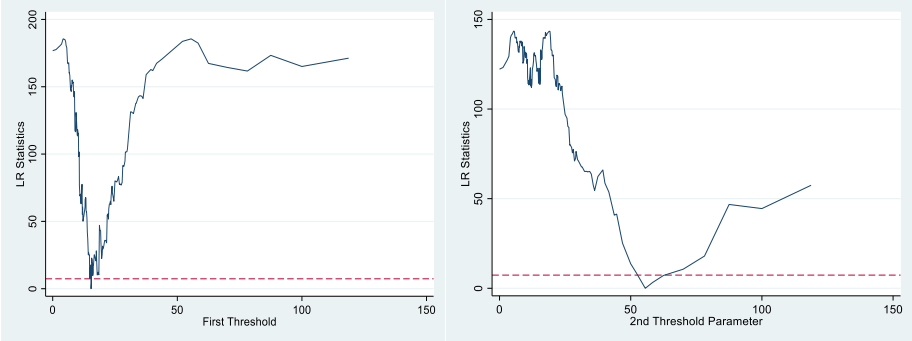

**A3.** Eastern Region Threshold Test LR Map.



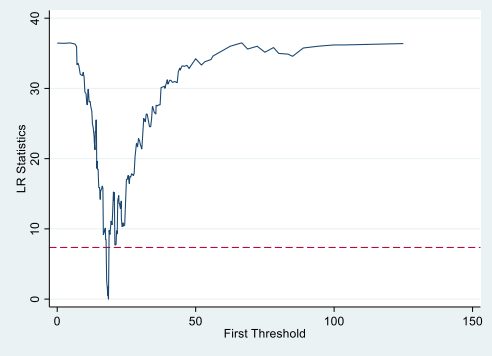

**A4.** Threshold Test LR Chart for Above Middle Income Households.




**A5.** Threshold test LR chart for sub-middle income households.




**A6.** Threshold test LR chart for the under-master's group.




**A7.** Threshold test LR chart for the master's degree or higher group.

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