

Income Redistribution Effect of Personal Income Tax Reform- Micro Simulation based on Labor Income

Xudong Gong

Department of Public Finance, School of Economics, Jinan University, Guangzhou 10559, China

Abstract

This article uses data from the China Family Tracking Survey (CFPS) to micro-simulate the income redistribution effect of my country's personal income tax reform on labor income in 2018. The results of using the MT index and decomposing the MT index show that the comprehensive taxation system has greatly improved the progressive level of personal income tax, especially the introduction of special additional deductions has further improved the progressiveness of personal income tax. After the reform of the tax system, the average tax rate has dropped significantly, and the special additional deductions have further aggravated the decline in the average tax rate. The lower average tax rate has reduced the effect of taxation to a certain extent. On the whole, when the new personal income tax burden reduction effect is significant, its effect on income gap adjustment is limited. The substantial reduction in the average tax rate makes the horizontal and vertical fairness effects of the new tax system inferior to the old tax system.

Keywords

Personal income tax; Labor income; Comprehensive taxation; Special additional deduction; Redistribution effect.

1. INTRODUCTION

1.1. Research Questions and Background

Personal income tax is currently the third largest tax category in my country after value-added tax and corporate income tax. It has two functions: raising fiscal revenue (also called income function) and regulating income distribution (also called adjustment function). In addition, personal income tax has the characteristics of directly levying taxes on personal income and income, which is called "social justice regulator", and it is also an important means for the government to implement income redistribution. For a long time, my country's personal income tax has been unsatisfactory in terms of fairness due to various defects. The deduction of salary income under the original classification system in my country is based on a single standard of a unified fixed amount based on the individual. Several adjustments only involve an increase in the absolute amount, which is essentially only equivalent to an increase in the exemption. On August 31, 2018, the Standing Committee of the National People's Congress reviewed and approved the "Decision on Amending the Individual Income Tax Law of the People's Republic of China". The main revisions of this personal income tax reform include: First, the classified collection of personal income tax has been changed to a classified comprehensive collection model, and the income from wages and salaries, income from labor services, income from author's remuneration and income from royalties are combined. Second, the original one-size-fits-all expense deduction model was changed, and six special additional deductions including children's education, support for the elderly, housing loan interest, housing rent,

continuing education, and serious illness medical care were included in the expense deduction category. Third, the standard expense deduction has been increased from 3,500 yuan per month to 5,000 yuan per month, and the tax rate level applicable to the lower comprehensive income tax rate has been widened, and the tax rate level of operating income has been adjusted. This amendment to the Individual Income Tax Law marks the beginning of the transformation of individual income tax from a classified tax system to a tax system that combines classification and integration. It is not only a major breakthrough in the establishment of the rule of law for individual income tax, but also a historic breakthrough in the reform of individual income tax.

1.2. Research Results and Existing Problems

The income redistribution effect of personal income tax has always been the focus of domestic and foreign academic circles. Foreign experts and scholars have analyzed the income distribution effect of personal income tax from an empirical point of view. Relevant studies have shown that personal income tax has a certain effect on improving the income distribution gap, but due to different countries and regions, the role it plays is also different. Wagstaff et al. (1999) analyzed the progressiveness and redistribution effect of personal income tax in 12 OECD countries, and found that the average tax rate and tax rate structure have the greatest impact on the redistribution effect of personal income tax [1]. Thoresen (2004) conducted an empirical analysis on the impact of the Norwegian tax reform in 1992 on the progressiveness of the tax system. The results showed that the inequality of pre-tax income has increased, but the concentration of tax burden has remained basically unchanged [2]. Richard & Bird (2005) believed that the inefficiency of tax management of the tax structure with regressive consumption tax as the main body and the orientation of policy objectives have caused the limited income distribution of personal income tax in developing countries [3]. Leigh Andrew (2008) defined the tax redistribution index based on the difference in the Gini coefficient before and after taxes [4]. The results showed that US state taxes have no obvious effect on improving the inequality of pre-tax hourly wages; Wulff gobetti et al. (2017) analyzed the income concentration and tax progress of Brazil's income tax and profits tax. A review of tax data showed that income concentration is high and tax progress is low, and they recommend a return to the tax system that focuses on progress [5].

Based on the reality of my country's tax reform, domestic scholars have conducted a lot of empirical research on the income redistribution effect of my country's previous major personal income tax reforms. Haiqin Rao et al. (2010) selected the sample data of Shanghai Statistical Yearbook 1990-2006 as the analysis object, and carried out the analysis and comparison of pre-tax income, after-tax income and Gini coefficient. Research showed that the current personal income tax has a significant regulatory function on the middle-income class, while the regulation function on the high-income class is weak [6]. Ying Wan (2011) used China Statistical Yearbook and China Price and Urban Residents' Income and Expenditure Survey Data to analyze the redistributive effect of China's personal income tax in terms of tax progression and average tax rate. Research showed that the redistribution of personal income tax is very small, and the low average tax rate is the most important obstacle that restricts the adjustment function of personal income tax in China [7]. Guizhi Zhao (2010) used the seven-level data of the income distribution of Chinese residents from 1994 to 2007, and calculated various income gap measurement indicators such as the Gini coefficient before and after tax, the income parity index, the Aluwariya index, and the poor income index. Compared with income gap measurement index, it showed that the adjustment effect of China's taxation on the income distribution gap of residents is very weak, and even a certain period of time and a certain degree of reverse adjustment [8]. Jianwei Xu et al. (2013) used the 1997-2005 micro household survey data to investigate the income distribution of personal income tax since 1997 During the period when the tax system remains unchanged and the income of residents increases, the

progressiveness of individual taxes decreases year by year, but due to the increase in the average effective tax rate, the income distribution effect of individual taxes is still increasing [9]. Shufen Pang et al. (2016) analyzed the data of urban residents in Beijing from 2008 to 2014 and showed that personal income tax has a positive effect on adjusting income distribution, but due to the low average tax rate, its adjustment effect is limited [10].

The above study used the data of actual tax payment to analyze the progress of taxation, and what was obtained in this way will be the actual progress of personal income tax. Another type of research did not use actual tax data, but simulated income data, and then calculated personal income tax based on the tax system to analyze the progress or redistribution effect of personal income tax. Ximing Yue et al. (2012) calculated the estimated value of the MT index and its decomposition based on the tax rate table and the information on the personal income structure in the household survey data. The results showed that the effect of personal income tax on reducing resident income inequality is small, and the low average tax rate (Not a tax that is less progressive) is the main reason for the insufficient contribution of personal income tax in regulating income distribution [11]. Qing Li (2012) used the income share gap before and after tax and the average tax rate as indicators to examine the redistributive effect and progressiveness of Chinese personal income tax from the perspective of taxpayers and income. Studies have shown that the redistribution effect and progressiveness of personal income tax are relatively weak, and from the perspective of income, personal income tax shows regressiveness [12]. Yajun Gao (2015) used China Health and Nutrition Survey data to conduct a micro-simulation analysis on the effectiveness of my country's personal income tax in regulating residents' income distribution. The research showed that my country's personal income tax can reduce the income distribution gap of residents to a certain extent. The personal income tax had the most significant effect on the adjustment of residents' income distribution [13]. Hongquan Lian (2018), based on CHNS's 1997-2011 micro-social survey data, used the knife-cut method to empirically evaluate the tax redistribution effect of my country's personal income tax from 1996 to 2010. The study showed that the low average tax rate of taxation leads to limited tax redistribution effects in my country [14]. Nan Zhang (2018) used the 2012 data of the China Family Tracking Survey (CFPS) to measure the progressiveness and redistribution effect of personal income tax from the two levels of residents' personal income and household income. The research showed that the redistributive effect of personal income tax in my country is relatively high. The main reason is that the average tax rate of personal income tax is too low; personal income tax is difficult to achieve horizontal fairness in the process of adjusting the family income gap [15].

1.3. Research Value

This article intends to use micro-primary data to truly simulate the actual impact of my country's personal income tax reform on the income distribution gap of residents, in order to reveal the actual economic effects that my country's personal income tax reform may bring, so as to provide more realistic policy suggestions for my country to further improve the personal income tax system. First, explain the data source and the simulation calculation method of each indicator; second, calculate and analyze the overall fairness effect of this personal income tax reform, including the comparison of the fairness effect of the old and new tax systems, and the role of special additional deductions in income redistribution; Third, decompose the overall fairness effect into horizontal fairness effect and vertical fairness effect to find specific reasons for the redistributive effect of individual tax reform; Finally, it evaluates the redistribution effect of the tax system reform, and proposes relevant policy recommendations for further reform of personal income tax based on the simulation conclusion.

2. DATA PROCESSING AND INCOME DISTRIBUTION MEASUREMENT INDICATORS

2.1. Data Sources and Income Definition

This article uses the adult database and family relationship database in CFPS2018 to filter out the main work income data in the adult database. The main work income deducts the year-end bonus as the basic salary, other work income as the labor remuneration, and the annual bonus as the year-end bonus. And calculate the tax payable and after-tax income of various labor income according to the old and new personal income tax laws.

The main work income minus the year-end bonus is used as the basic salary, and the annual basic salary is divided by 12 as the monthly basic salary. Using the formula for calculating the tax payable under the old tax system, the tax payable = [(monthly basic salary without tax-3500-quick deduction) / (1-applicable tax rate)] × applicable tax rate-quick deduction. Based on the sum of tax payable and after-tax income, the basic salary before tax is calculated.

The tax amount of labor remuneration is calculated based on other work income, and the annual tax is divided into 12 times, and the taxable amount according to the formula = [(excluding tax income-800) / (1-tax rate)] × tax rate. If the tax-exclusive income exceeds 3360 yuan, the tax payable according to the formula = [(tax-exclusive income-quick calculation deduction) × conversion factor] × applicable tax rate-quick calculation deduction, multiply it by 12 to get the taxable amount of labor remuneration for one year. Since there is no single list of labor remuneration, author's remuneration and royalties in the database, it can only be approximated as a substitute for labor remuneration.

The original data is the after-tax year-end bonus, so the formula taxable income = (excluding tax year-end bonus- the difference between the salary of the current month and the deduction standard -excluding the quick deduction of the tax bracket) / (1-excluding the applicable tax rate of the tax bracket). After finding the new applicable tax rate and quick calculation deduction, the taxable amount of the year-end bonus paid by the individual can be calculated by using the formula for the taxable amount of the year-end bonus.

Refer to the personal income tax and its six special additional deductions implemented in 2019 to calculate the individual's special additional deductions. The specific operation: According to the deduction method, the housing loan interest can be deducted if the first home has a housing loan and the repayment time does not exceed 240 months. Due to data limitations, this article adopts a uniform standard that all housing loans can be deducted 1,000 yuan per month; The rent cost shall be deducted according to the rules that the rent cannot be deducted if there is a house. This article deducts 1,100 yuan per month according to the unified standard; The deductible amount of maintenance expenses for the elderly refers to the method that a taxpayer with an elderly person over 60 years old and non-only child who supports one or more dependents can deduct 1,000 yuan per month; The deduction of children's education expenses is based on the taxpayer's children's full-time academic education related expenses, and a fixed deduction is made at the standard of 1,000 yuan per child per month. This article calculates the deduction amount based on whether the child is between 3 and 25 years old and the number of children, and at the same time screens based on whether they are receiving academic education and whether they are full-time; Continuing education expenses are determined by full-time or on-the-job student variables to determine whether to accept academic education and deducted according to a fixed amount of 4,800 yuan per year. Due to data limitations, no vocational qualification education data is obtained, and this article will not consider it; Major illness medical expenses are deducted according to the actual occurrence, and the standard that the deduction amount does not exceed 80,000 yuan for the annual medical expenditure exceeding 15,000 yuan. Since children's education, housing loan interest deduction, and rent deduction

cannot be matched to individuals when screening variables, but can only be matched to families, this article uses the method of sharing among family members with working income to calculate their special additional deductions. Finally, use the new individual tax rate table to calculate the tax payable under the personal income tax and the net labor income after tax.

It should be noted that the calculated tax payable may deviate from the tax paid by the individual. The main reasons are as follows: First, this article calculates the structural tax rate of the personal income tax system, without considering factors such as tax collection cost and collection efficiency, the overall personal income tax rate may be overestimated; Second, under the old personal income tax, the salary income is calculated by using the average value of 12 months to calculate the tax amount. The actual situation may not be the average value of the annual income, and the tax amount may be underestimated; Third, under the new tax system, this article incorporates the annual one-off bonuses obtained by individual residents into comprehensive income taxation, and does not adopt the method of separate calculation of taxation in the transitional tax system, which may lead to an overestimation of the taxable income of individual samples.

2.2. Measurement Indicators of Income Distribution

The most commonly used indicator to measure the income redistribution effect of taxation is the MT index proposed by Musgrave & Thin (1948), which is equal to the difference between the pre-tax Gini coefficient and the after-tax Gini coefficient, expressed as follows [16]:

$$MT = G_X - G_Y \quad (1)$$

The meaning of formula (1) is that if taxation has an equal effect, then the Gini coefficient of after-tax income will be lower than the Gini coefficient of pre-tax income, and the MT index is a positive number. On the contrary, if taxation has an unequal effect, the MT index will be a negative value.

Through the decomposition of the MT index, the tax system factors that affect the MT index and the degree of influence can be investigated. The most commonly used in the existing MT decomposition is the decomposition method proposed by Kakwani (1984), which is expressed as follows [17]:

$$MT = (C_Y - G_Y) + \frac{t}{1-t} P \quad (2)$$

Where C_Y represents the concentration rate of after-tax income sorted by pre-tax income, and t is the average tax rate (that is, the ratio of the tax amount to the total pre-tax income). And P is an index proposed by Kakwani (1977b) to measure tax progress, expressed by the formula [18]:

$$P = C_T - G_X \quad (3)$$

Here C_T is the tax concentration ratio (Concentration ratio), which is a measure of the distribution of tax burden among individuals relative to income. When the tax concentration rate C is greater than the Gini coefficient G of pre-tax income (ie $P > 0$), the tax burden is distributed more heavily on high-income groups, and the proportion of high-income groups in the total tax revenue is higher than that in the total income, such taxes are progressive taxes. On the contrary, taxes with $P < 0$ are regressive taxes. When $P = 0$, the tax burden is exactly the same as the distribution of income among individuals, that is, the proportion of each person in the

total tax income is equal to his proportion in the total income, and the tax at this time is a proportional tax.

The two terms on the right side of equation (2) measure the two fairness of taxation: horizontal fairness and vertical fairness. The horizontal fairness index (ie $C_Y - G_Y$) in the equation (2) is based on the comparison of the individual ranking of pre-tax and after-tax income. The maximum value is 0, and the maximum value is taken only when the horizontal fairness principle is realized, otherwise it is negative. Not only that, but under certain conditions, if taxation undermines the principle of horizontal fairness, that is, $C_Y - G_Y < 0$, the value of MT becomes smaller, which means that the income redistribution effect of taxation is weakened. The second item on the right side of equation (2) is a measure of the effect of taxation on the income distribution of residents through the use of the principle of vertical equity, or the effect of vertical equity. It can be seen from this item that the vertical fairness effect consists of two components: progressiveness and average tax rate. The value of the progressiveness index determines the direction of the vertical fairness effect of taxation.

3. ANALYSIS ON THE INCOME REDISTRIBUTION EFFECT OF THE REFORM OF PERSONAL INCOME TAX

This paper uses personal income from work as a sample to calculate the Gini coefficients of four types of income: pre-tax income, after-tax income under the old tax system, new tax system (excluding special additional deductions), and after-tax income under the new tax system. And then calculated the MT index and MT index decomposition under the above three different tax systems. Among them, the redistribution effect is the difference between the Gini coefficient before tax and the Gini coefficient after tax, and the degree of redistribution (%) is equal to the redistribution effect divided by the Gini coefficient before tax.

3.1. Overall Income Redistribution Effect

It can be seen from Table 1:

First, compared with the pre-tax Gini coefficient, the after-tax Gini coefficient has a slight decrease, indicating that the personal income tax has a certain effect in improving the income distribution gap of residents. However, the MT values of the old tax system, the new tax system (without special additional deductions), and the new tax system are all between 0.007 and 0.013, which also shows that the adjustment effect of personal income tax on income distribution is very limited.

Second, among the three MT indexes, the MT index of the old tax system is the highest at 0.01245735; the second is the new tax system (excluding special additional deductions), which is 0.00778524; the lowest is the MT index of the new tax system, which is 0.00706801. This shows that the fair effect of the new tax system is lower than that of the old tax system, and the use of special additional deductions also reduces the fair effect of personal income tax to a certain extent.

Table 1. Progressiveness of personal income tax and effect of redistribution

	Gini coefficient before tax	Gini coefficient after tax	Redistribution effect	Degree of redistribution (%)
Old tax system	0.43108872	0.41863137	0.01245735	2.890%
New tax system (excluding special additional deductions)	0.43108872	0.42330348	0.00778524	1.806%
New tax system	0.43108872	0.42402071	0.00706801	1.640%

3.2. Horizontal Fairness Effect

It can be seen from Table 2:

First, in terms of horizontal fairness, the three tax systems have changed the income ranking of taxpayers to a certain extent, and have certain negative effects. However, the absolute value of the horizontal fairness index of the old tax system, the new tax system (without special additional deductions), and the new tax system is between 0.0000006 and 0.0007, which also shows that the role of personal income tax in adjusting horizontal fairness is very limited.

Second, the absolute value of the new tax system (without special additional deductions) (-0.00000065) and the new tax system (-0.00000170) are smaller than the absolute value of the old tax system (-0.00062799), indicating that the new tax system has less negative impact on horizontal equity. This is related to the introduction of comprehensive income, the increase in exemption, and the change in grades. The introduction of special additional deductions has also improved horizontal equity, but the improvement is small.

Table 2. Horizontal fairness indicators

	After-tax income concentration ratio (C _Y)	Gini coefficient after tax (G _Y)	Horizontal fairness index (C _Y - G _Y)
Old tax system	0.41800338	0.41863137	-0.00062799
New tax system (excluding special additional deductions)	0.42330283	0.42330348	-0.00000065
New tax system	0.42401901	0.42402071	-0.00000170

3.3. Vertical Equity Effect

It can be seen from Table 3:

First, the P value under the old tax system, the new tax system (excluding special additional deductions), and the new tax system is greater than 0, indicating that the personal income tax has a certain positive adjustment effect on the overall income distribution, and there is no reverse adjustment. The P index under the new tax system (0.54088530) and the P index (0.53540358) of the new tax system (without special additional deductions) are higher than the P index (0.30802461) under the old tax system, indicating that the new tax system is more progressive than the old tax system. In particular, the introduction of special additional deductions has further improved the progressiveness of personal income tax.

Second, from the overall average tax rate, the average tax rate under the old tax system (0.0407527) is significantly higher than the average tax rate under the new tax system (0.01290208), and the average tax rate (0.01433362) of the new tax system (excluding special additional deductions). After the reform of the tax system, the average tax rate has dropped significantly, and the special additional deductions have further aggravated the decline in the average tax rate. The lower average tax rate has reduced the effect of taxation to a certain extent.

Third, the vertical fairness index is 0.013086130, 0.007785871 and 0.00706976 under the old tax system, the new tax system (excluding special additional deductions), and the new tax system. The ranking is consistent with the three MT indexes, indicating that the decline of the vertical fairness effect leads to the decline of the MT index. The vertical fairness index V is jointly determined by the P index and the average tax rate t. As mentioned earlier, the tax system reform has led to a sharp drop in the average tax rate. The average tax rate of the new tax system

has fallen as much as 68.34% compared with the old tax system. Therefore, the fundamental reason for the reduction of the vertical fairness effect of the new tax system is the decline in the average tax rate.

Table 3. Vertical equity indicators

	Average tax rate (t)	Tax concentration rate (C_T)	Gini coefficient before tax (G_X)	$P = C_T - G_X$	Vertical fairness index ($t/(1-t)*P$)
Old tax system	0.0407527	0.73911333	0.43108872	0.30802461	0.01308613
New tax system (excluding special additional deductions)	0.01433362	0.9664923	0.43108872	0.53540358	0.00778587
New tax system	0.01290208	0.97197402	0.43108872	0.54088530	0.00706976

4. CONCLUSION

From the above empirical results, the following conclusions can be drawn:

First, the tax reduction effect of this tax reform on labor income is very significant. From the simulation results of different tax systems, the new tax system has the largest tax reduction, and the new tax system (excluding special additional deductions) has a slightly smaller tax reduction. It shows that, relative to the increase in the exemption amount and the changes in grades, special additional deductions have also reduced the overall tax burden to a certain extent, but the impact is limited.

Second, when the new personal income tax burden reduction effect is significant, it is found that it has a certain regulatory effect on the income gap, but the effect is limited. In terms of horizontal fairness, the three tax systems have changed the income ranking of taxpayers to a certain extent; the horizontal fairness index of the new tax system is 2.62 times that of the new tax system (excluding special additional deductions). Indicating that the special additional deduction has significantly improved the horizontal fairness. Compared with the old tax system, even the horizontal fairness index of the new tax system is only 0.27% of the old tax system, indicating that the horizontal fairness effect of the new tax system is very limited. In terms of vertical equity, the progressiveness is higher than the old tax system, especially the introduction of special additional deductions has further improved the progressiveness of personal income tax; However, the overall vertical fairness index under the new tax system (excluding special additional deductions) and the new tax system is only one-half of that under the old tax system, and the vertical equity index of the new tax system is also lower than the new tax system (excluding special additional deductions). It shows that the average tax rate limits the vertical fairness effect.

Third, China's personal income tax reform this time gives priority to efficiency. Although there are a few measures that take into account fairness, the substantial reduction in the average tax rate has significantly improved efficiency, but has reduced the redistributive capacity of the tax system. On the macro level, my country's personal income tax accounts for a small proportion of tax revenue. With such a low scale, even with highly progressive cooperation, it is difficult to achieve a good income adjustment effect. The specific measures are as follows: (1) Gradually expand the scope of application of syndrome income and appropriately coordinate the tax rates of different types of income. Although it is impossible to implement a complete comprehensive

income tax, gradually expanding the scope of the comprehensive income and coordinating the tax rates of different types of income, such as comprehensive income and business income, has a positive effect on fairness. (2) Appropriate optimization of special additional deductions can make the deduction standard for special additional deductions more detailed and scientific.

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