A Study on the Income Redistribution Effect of China's 2018 Personal Income Tax Reform

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Personal income tax is an important redistribution tool, its redistribution effect has been concerned by all walks of life. Using CHIP2018, this paper calculates and analyzes the income redistribution effect of the personal income tax reform plan in 2018, and finds that: The comprehensive taxation can raise the average tax rate, progressivity and redistribution effect of personal income tax; The rise of the standard of basic deduction, six special additional deductions, and the change of tax rate structure raise the progressiveness of personal income tax, but reduce the average tax rate and thus weaken the income redistribution effect of personal income tax; The comprehensive income tax will enhance the impact of basic deduction of expenses, six special additional deductions and the change of tax rate structure on the redistribution effect of individual income tax income; Under the joint action of the reform measures, the progressivity of individual income tax has risen as a whole, but the average tax rate of individual income tax and redistribution index have shown a sharp decline, both of which decreased by more than 50%. Using the household survey data of the year of reform, this paper comprehensively investigates the income redistribution effect of the personal income tax reform, which enriches the research on the redistribution effect of the new round of personal income tax reform.

Keywords: personal income tax, comprehensive taxation, special additional deductions, tax rate structure, income redistribution

1. Introduction

Income distribution is an issue that cannot be ignored in the people-centered development philosophy, serving as an important means to narrow the income gap and achieve common prosperity. According to the tenth meeting of the Central Committee for Financial and Economic Affairs held on August 17, 2021, "We should adhere to the concept of people-centered development, promote common prosperity through high-quality development, correctly handle the relationship between efficiency and equity, conduct institutional arrangements for primary distribution,

redistribution and tertiary distribution, and intensify efforts to regulate taxation, social security and transfer payment."[1] Personal income tax is an important redistributive instrument with the function of reducing income disparity (Yue *et al*., 2014). It is an inevitable requirement for optimizing China's income distribution system to improve the personal income tax system and its redistribution function. On August 31, 2018, China launched a new round of personal income tax reform (hereinafter referred to as the "tax reform").[2] The specific schemes are as follows: the threshold of basic deduction is increased from RMB 3500 to RMB 5000 per month; on top of the basic deduction, pre-tax expense deductions are made for six types of special expenses (children's education, continuing education, medical care for major diseases, home loan interest, housing rent, and support for the elderly) (referred to as the "special additional deductions"); the tax brackets of 20% and below are expanded (referred to as the "expansion of low tax brackets"); and comprehensive taxation is applied to wages and salaries, labor remuneration, author's remuneration and royalties (referred to as the "comprehensive taxation"). This paper uses the CHIP2018 household survey data to measure the impact of the tax reform on the income redistribution effect of personal income tax. Section 2 reviews relevant studies on the redistribution effect of tax revenues. Section 3 introduces the data and measurement methods of this paper and describes some possible problems in the data and handling methods in this paper. Section 4 focuses on how to use relevant information in CHIP2018 to identify the information of special additional deductions. Section 5 specifically measures and analyzes the impact of the tax reform on the income redistribution effect of China's personal income tax. Section 6 is the conclusions of this paper.

2. Literature Review

Early studies on income distribution effect of taxation usually evaluated such effects mostly through the changes in the Gini coefficient before and after taxation (Musgrave and Thin, 1948; Pechman and Okner, 1974). It was later proved by scholars that it is somewhat misleading to analyze the income redistribution effect of taxes only by relying on the Gini coefficient (Steueerle and Hartzmark, 1981). Kakwani (1984) decomposed the income redistribution effect of taxes into the effect of average tax rate and the effect of progressivity, an approach that quickly became the main method for studying the redistribution effect of taxes and other redistributive instruments. China's personal income tax has played a weak role in narrowing the income gap (Yue and

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[1] Xinhua News Agency: "Chinese President Xi Jinping presides over the tenth meeting of the Central Committee for Financial and Economic Affairs", the web portal of the Central People's Government of the People's Republic of China, August 17, 2021.

[2] Xinhua News Agency: "Order No. 9 of the President of the People's Republic of China", the web portal of the Central People's Government of the People's Republic of China, August 31, 2018.

Xu, 2012). Yue *et al*. (2012) studied the income redistribution effect of China's 2011 personal income tax reform and found that the average tax rate was the main factor determining the income redistribution effect of China's personal income tax. The tax reform greatly reduced the average rate of personal income tax, resulting in a significant decline in the income redistribution effect of personal income tax. Xu *et al*. (2013) studied the trend of income redistribution effect of personal income tax in China since 1997 and found that the tax reforms in 2006 and later significantly reduced the average rate of personal income tax, although it increased the progressivity of personal income tax, which led to a significant reduction in the income redistribution effect of personal income tax. Some scholars have also studied the impact on the income redistribution effect of the 2018 tax reform plan. Huang (2019) argued that comprehensive taxation weakens the income redistribution effect of personal income tax, while Wan and Xiong (2019) reached the opposite conclusion. The study by Liu and Kou (2019) showed that special additional deductions weaken the income redistribution effect of personal income tax but enhance the overall welfare of society. Both Wang *et al*. (2019) as well as Zhan *et al*. (2019) measured the impact of the entire tax reform package on the income redistribution effect of personal income tax and found that the tax reform significantly weakened the income redistribution effect of personal income tax.

The studies that have been conducted on the income redistribution effect of the 2018 tax reform are based on pre-2018 income data. In addition, the existing studies hardly consider the interactions between various reform measures and cannot fully reflect the impact of this tax reform. The paper refines the relevant research on the above issues. The CHIP2018 database provides information on residents' income and expenditure and living conditions in the year of the tax reform, according to which the impact of the tax reform on the income redistribution effect of personal income tax can be measured more accurately. In addition, the paper presents a detailed description of how to use the information in the CHIP2018 database to identify special additional deductions and calculate the impact on the income redistribution effect of personal income tax under the assumptions of different deduction criteria, so as to test the robustness of the conclusions. This paper also takes into account the interactions among different reform measures and analyzes the impact of comprehensive taxation on policy effects such as the increase in the basic deduction standard, special additional deductions and changes in the tax rate structure to examine more comprehensively the impact of tax reform on the income redistribution effect of personal income tax.

3. Research Methods and Data

3.1. Research Methods

Kakwani (1984) decomposed the income redistributive effect (RE) of tax into

horizontal and vertical equity effects, and further disaggregated the vertical equity effect into the impacts of the P index and the average tax rate by the following formula.

$$RE = G_Y - G^* = (C_d - G^*) + \frac{t}{1-t}P$$

wherein G_Y is the pre-tax income Gini coefficient, G^* is the post-tax income Gini coefficient, and C_d is the post-tax income concentration ratio calculated by ranking pre-tax income. $C_d - G^*$ is the horizontal equity effect, $tP/(1-t)$ is the vertical equity effect, and t is the average effective tax rate, which is equal to the ratio of residents' total personal income tax to their total pre-tax income.[1] P is the tax progressivity indicator (P index). According to Kakwani's method for measuring tax progressiveness proposed in 1977, it is calculated as follows:

$$P = C_T - G_Y$$

wherein C_T is the tax concentration ratio calculated in order of pre-tax income. A tax is progressive when the P-index is greater than 0, regressive when the index is less than 0, and does not change the distribution of residents' income when it is 0. This paper uses this decomposition method to measure and analyze the income redistribution effect of China's personal income tax before and after the tax reform.

3.2. Data Sources and Data Processing

The data in this paper are from the 2018 Chinese Household Income Project survey (CHIP2018). The CHIP database provides income and expenditure data (transcribed data) from the household survey of China's National Bureau of Statistics and information (survey data) on the basic conditions, living conditions, and income and expenditure of household members collected through questionnaires, comprising a total of 71480 samples from 20451 households. Specifically, there are 35002 samples from 9076 rural households and 36478 samples from 11375 urban and mobile households. Residents' income is divided into four major categories (wage income, operational income, property income and transfer income), with each classified into more detailed income items by source. Wage income corresponds to the wage and salary in the *Personal Income Tax Law of the People's Republic of China* (the "Tax Law"), while other incomes include freelance labor remuneration, severance payment and settling-in payment. Freelance labor remuneration corresponds to labor remuneration and

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[1] The horizontal and vertical equity effects correspond to the horizontal and vertical equity principles of tax. See Yue Ximing *et al*. (2012) for a detailed analysis.

author's remuneration. Almost all incomes other than freelance labor remuneration are tax-exempt. Property income includes interest income, dividend income, and property rental income. The rest of property income can be used as an estimate of income from property transfer. Operational income corresponds to that from operation stated in the tax law, and transfer income is tax-free.

In this paper, we simulate and calculate the actual personal income tax payable by each family member before and after the tax reform (sometimes we may call the old tax system that is implemented before the tax reform and the new tax system that is carried out after the tax reform) based on income items in CHIP2018 and relevant provisions of the tax law.[1] Under the old tax system, personal income tax on wage and salary, operational income or other personal incomes was levied on a monthly, annual or case-by-case basis, while the income and expenditure information in CHIP2018 was on an annual basis. In the actual measurement, this paper refers to Yue and Xu (2012) to treat incomes. After the tax reform, wage & salary, labor remuneration, author's remuneration and royalties are taxed comprehensively on an annually cumulative and progressive basis. Therefore, wage and operational incomes are not treated when the actual payable tax of residents is calculated after the tax reform. Other incomes are treated according to the old tax system.

Accurate data on labor remuneration and author's remuneration are not available in CHIP2018. To measure the impact of comprehensive taxation on the income redistribution effect of personal income tax, this paper uses other income minus severance payment and other labor income as the estimated value[2] of labor remuneration and corrects the estimated value of labor remuneration according to the employment information of the sample in the survey data. The specific approaches are as follows. (1) If employers, self-employed workers and family helpers have only one job, the labor remuneration is zero;[3] if there are other jobs in addition to their

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[1] Although rural households pay almost no personal income tax, the actual personal income tax payable is simulated according to income sources for all samples in this paper, as is the case for rural households. For example, if there is a source of wage income in a rural sample, the actual payable tax of wage and salary is calculated in accordance with relevant provisions of the tax law. That is, this paper assumes that all taxpayers (including rural residents) have paid the full amount of personal income tax according to the tax law, and accordingly evaluates the impact of personal income tax on the income distribution of the entire sample, including the rural sample.

[2] The estimate includes both labor remuneration and author's remuneration. The former is calculated as 80% of income, while the latter is calculated as 70% of income. In other words, their income is determined for tax purposes by the two criteria. However, the share of tax on author's remuneration in the total personal income tax in China in recent years was basically at around 0.06% (calculated according to China Tax Yearbook (2008−2019)), so all the incomes estimated based on other incomes are treated as labor remuneration in this paper.

[3] According to the CHIP2018 questionnaire manual, the employment status of freelancers or flexible workers who receive only labor remuneration, such as freelance writers, freelance models, and odd-jobbing workers, is defined as employee. Therefore, in the sample, employers, self-employed workers and domestic helpers without other jobs are considered to have no income from labor remuneration.

main job, the labor remuneration is zero for the sample whose total income from other jobs is zero; and if the total income from other jobs is less than other income minus severance payment and other labor income, the labor remuneration is the total income from other jobs. (2) If an employee of a non-stock enterprise has only one job and his or her main job has not changed since 2014, the total income shall be the labor remuneration after the severance payment and other labor income is subtracted from other income;[1] if there is other work and the total income is less than the other income minus the severance payment and other labor income, the labor remuneration shall be the total income from the other work. (3) If an employee holds a long-term employment contract or serves as a regular worker but without other work, the income from labor remuneration is zero. If there is other work and the generated income is zero, the income from labor remuneration is also zero. (4) No adjustment is made to labor remunerations of other samples.[2]

4. Determination of Special Additional Deductions

To accurately determine special additional deductions, the paper uses a combination of the expenditure information from transcribed data and the expenditure and related information of household members from survey data. The methods are as follows.

4.1. Determination of Children's Education Expenditure

According to the *Guidelines for Special Additional Deductions of Personal Income Tax* (hereinafter referred to as the "Guidelines"), "For children who are three years old or older until primary school, whether or not they are studying in kindergarten, their parents are eligible for special additional deductions. For children who are receiving primary, secondary, tertiary and higher education, their parents are eligible for a monthly deduction of RMB 1000. If there are multiple children in a household who meet the conditions for deduction, their parents are eligible for multiple deduction." According to the survey data containing information about children under 16 years old and those over 16 years old who are still studying in school, identification conditions are as follows: the taxable amount of income is deducted at the monthly rate of RMB

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[1] According to the income classification in the *Survey Program of China's National Bureau of Statistics for Household Income & Expenditure and Living Conditions*, the income after deducting severance pay and other labor remunerations includes that income made as a freelance worker, shares and options distributed or awarded to an employee by joint-stock companies, and settling-in allowance for a job transfer. In this case, if an employee works in a non-stock corporation and has held the same job from 2014 to now, he or she is deemed to have no income from settling-in allowance for a job transfer and stock and options distributed to the employee by the joint-stock corporation.

[2] Regarding the rest samples, there is a sample size of 499 people whose labor remuneration is greater than zero.

1000, regardless of whether children aged 3 to 7 are in school or not. If children aged 7 or older are in and suspended from school, the taxable amount of income are deducted at the monthly rate of RMB 1000.[1] The module also includes the numbered information of a child (children) and parents, whereby the family members who are entitled to the deduction of the offspring's education expenses are determined. If one parent is a member of the household, the deduction is made by that member. If both parents are members of the household, each parent shares half of the deduction. The paper identifies 105 individuals whose parents are both members of the household.[2]

4.2. Determination of Continuing Education Expenses

According to the Guidelines, "The monthly deduction for continuing academic education received in China is RMB 400, and the deduction for the tax year in which a skilled person or technician obtains a professional qualification certificate is RMB 3600. Except that continuing education expenses for those pursuing a bachelor's degree or below that are deducted by parents, other continuing education expenses are generally deducted by oneself." Information on continuing education beyond a bachelor's degree can be identified based on the type of institution from which those received education in the survey data and whether they were studying at the end of the year. Those who were still enrolled in 2018 and were in continuing education (including correspondence/distance learning) were identified as receiving continuing education for academic purposes. Accordingly, 22 people who received continuing education were identified, accounting for less than 1‰ of the total sample, but those who received continuing education and vocational skills training below a bachelor's degree were difficult to be identified. According to the definition of the household survey system of the National Bureau of Statistics, other education and training in the transcribed data can be matched with academic continuing education in the tax law, whereby the sample with continuing education expenditures is identified as 189 households, making up less than 1% of the total sample. The transcribed expenditure data are household-related that cannot be used to identify household members who received continuing education. The identified continuing education expenditures may also be related to vocational skills. The deduction of vocational skill expenses requires the acquisition of a certificate in the

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[1] According to the new tax law, the period of eligibility for the deduction of full-time education expenses includes timeframes of suspension from school due to illness or other non-subjective reasons but being in school registry, so that children who are suspended from school are also included in the deductible range.

[2] The main paper reports the results of calculating half the deduction of offspring's education expenses for each parent when both parents are members of the household. The paper also calculates the case where the full amount is deducted for one parent, with little difference in the calculations of multiple cases. Detailed results are not presented and please contact the authors if you need them.

tax year that meets two requirements of the national vocational qualification catalog published by China's Ministry of Human Resources and Social Security. The two requirements also cannot be determined using transcribed data. Therefore, a certain number of errors will arise whether the continuing education expenditures identified from the transcribed data are treated as those expenditures from continuing academic education or vocational skills training.[1]

4.3. Determination of Housing Loan Interest Expenses

According to the Guidelines, "Loan interest expenses for the first home or first loan interest rate in China are deducted at a monthly rate of RMB 1000 for the period during which the loan interest expenses actually occur. Both oneself and one's spouse can only enjoy one deduction for housing loan interest expenses." In this paper, a household with a loan balance greater than zero for the purchase or construction of a home is identified in the survey data as having a home loan interest expense and having the head of the household to take this deduction.[2] This paper supplements the information on housing loan interest expenses by providing information on the loans taken by households at the time of the purchase or construction of the house and whether households are still making repayments. If the transcribed data show that they are still making repayments, they are considered to have housing loan interest expenses. According to the transcribed data and survey data, the number of people with housing loan interest expenses is 3318, making up 4.6% of the total sample.

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[1] According to the definitions in the *Survey Program for Household Income & Expenditure and Living Conditions* issued by the National Bureau of Statistics, education expenditures in the transcribed data are divided into seven stages: preschool education, primary education, junior high school education, senior high school education, secondary vocational high school education, college and higher education, and other education and training. Although detailed definitions of other education and training are not given, the paper considers other education and training to be more consistent with continuing academic education according to the classification criteria. Therefore, it is more reasonable to identify households with other education and training expenditures as having continuing academic education expenditures. This paper also calculates the results of including this portion of continuing education expenditures as vocational skills continuing education expenditures and not considering this portion of continuing education expenditures, which reveals little difference between the calculations in various cases. As space is limited, the calculation results are not listed but kept for reference.

[2] In the survey data, the information in this module is obtained by inquiring the head of the household or the spouse of the head. The head and the spouse have a clear understanding of the housing loan interest they have spent, but they may not know the housing loan interest expenditures of other household members. As such, this paper considers it more reasonable for the head of a household to make the deduction. The paper also calculates the case where home loan interest is deducted by the member with the highest household income. The calculations do not differ significantly according to the various deduction methods. As space is limited, the calculation results are not listed but kept for reference.

4.4. Determination of Housing Rental Expenses

The Guidelines states the deduction for housing rental expenses as follows: "A couple who does not own a home in the city where they work can choose between housing loan interest and housing rental expenses for deduction. By city, the deduction can be made at a monthly rate of RMB 1500, RMB 1100 or RMB 800." In this paper, a household whose home is currently owned as a rental property in the survey data is identified as being eligible for the household head's pre-tax deduction of housing rental expenses. Meanwhile, the transcribed data is used for expense identification: a home is also recognized as having rental expenses if it is rented in the transcribed data. In this paper, the monthly deductible rent rate is determined based on matching the List of Cities by Household Registration Population in Municipal Districts published by the State Administration of Taxation with the 2018 residence information in the survey data. On the issue of only one deduction for housing loan interest or housing rent, the approach in this paper is taken as follows. For households (a total of 215 households in this paper) with both expenses, housing rent is deducted for households with a housing rent greater than RMB 1000, and housing loan interest is deducted for households with a housing rent less than RMB 1000.

4.5. Determination of Expenses for Supporting the Elderly

The Guidelines specify the conditions for deduction of expenses for the elderly support as follows: "The elderly are 60 years old or older, the deduction is RMB 2000 per month for an only child, and the deduction is apportioned for non-only children shall not exceed RMB 1000 per month per person." The deduction for elderly support expenses of the householder can be determined based on the age of the householder's parents and grandparents and the number of siblings in the survey data.[1] The deduction for elderly support expenses of the householder's spouse can be determined based on the age of the householder's parents and the number of siblings. The deduction for elderly support expenses of the householder's children can be determined based on the age of the householder and the number of children of the householder. The monthly

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[1] The determination is first based on the information of parents as the head of household. If it is determined that there is no deduction for elderly support expenses, the identification continues based on the information of the grandparents. However, information on the deduction for support expenses for grandparents of the spouse of the head of household is not identifiable. Therefore, this may underestimate the special deduction for support expenses.

deduction for an only child is RMB 2000 and for a non-only child is RMB 1000.[1] This paper identifies 9267 non-only children who are eligible for the deduction of elderly support expenses, making up 12.96% of the total.[2]

4.6. Determination of Medical Expenses for Major Diseases

The Guidelines specify that the conditions for deduction of medical expenses of major diseases are: "Medical expenses paid by the taxpayer, spouse or minor children in a tax year that are related to basic medical insurance and exceed RMB 15000 in total can be deducted within RMB 80000 on an actual basis." The actual annual out-of-pocket medical expenses of household members based on the survey data can be used to identify major-disease medical expenses of household members. Medical expenses of major diseases can be deducted by oneself or one's spouse, and minor children's major-disease medical expenses can be deducted by one of parents. In the paper, major-disease medical expenses for minor children are deducted by the head of household, while those for the head of household and the spouse are deducted by themselves.[3] This paper identifies 855 individuals who are eligible to the deduction of medical expenses for major diseases, taking up 1.1% of the total sample.

In this paper, special additional deductions are identified as accurately as the data allow, but assumptions still have to be made for some cases. This paper calculates, to the extent possible, the results under various assumptions made for each special additional deduction, as well as those of deducting each special additional deduction according to the criteria of maximum and minimum possible impacts in order to

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[1] According to the *Guidelines for Special Additional Deductions of Personal Income Tax*, non-only children can share equally or agree to share or be designated by the elderly if they share the deduction for elderly support expenses, but the maximum monthly deduction per person cannot exceed RMB 1000. In this paper, the deduction for non-only children is RMB 1000 with minimal tax burden. Children with higher incomes may choose the highest deduction. This paper also calculates the results of non-only children's equal share of deductions for elderly support expenses, with the findings that the differences are small. Detailed results are not listed; please contact the authors if you need them.

[2] Although the number of non-only children who are entitled to the deduction for elderly support expenses is high in the total sample, the basic deduction of RMB 60000 can be deducted before the special additional deductions. If a resident's income is not higher than RMB 60000, then the tax burden is not affected by the special additional deductions, and the error arising from identifying the special additional deductions can be excluded from consideration. In the paper, there are 1183 non-only children who are entitled to the deduction for elderly support expenses and have an annual income of RMB 60000 or more, representing 1.66% of the total sample.

[3] For the purpose of minimizing tax burden, this approach does not take into account the case where a child's major-disease medical expenses are deducted by the spouse, or a spouse's medical expenses are deducted by the head of household. This may underestimate the deduction of major-disease medical expenses. It is also important to note that the medical expenses that are eligible for major-disease medical expense deductions must be related to the basic medical insurance. However, according to CHIP2018, it is not possible to determine whether medical expenditures are related to basic medical insurance. Also, it is not possible to separate medical expenses that are not related to basic medical insurance. Therefore, the deduction of medical expenses for major diseases may be overestimated.

give a margin of error for the redistribution impact of personal income tax due to the determination of special additional deductions.[1]

5. Calculation and Analysis of the Impact of Tax Reform on the Income Redistribution Effect of Personal Income Tax

5.1. Separate Impact of Each Reform Measure

The comprehensive taxation, the increase in the basic deduction standard, the special additional deductions and the expansion of low tax brackets will not all have the same impact on the average rate, progressivity and income redistribution effect of personal income tax. In this paper, we first assume that multiple reform measures for the tax reform are implemented separately, so as to measure the impact of each reform measure.[2] Table 1 shows the average tax rates for income decile groups before the implementation of the tax reform and after the separate implementation of each reform measure.[3]

Table 1. Average Tax Rate of Decile Groups after Implementation of Each Reform Measure (Unit: %)

Income grouping	Old tax system	Comprehensive taxation	Increase in basic deduction	Special additional deductions	Expanded low tax bracket
1	0.03	0.02	0.01	0.02	0.03
2	0.01	0.01	0.00	0.01	0.01
3	0.08	0.08	0.03	0.04	0.07

[1] The results are very similar to those in the text when all the deductions are at the maximum amount. However, the results are significantly different when the deduction is based on the smallest amount. The RE index of personal income tax increases from 0.0117 to 0.0125 and the index of the new tax system increases from 0.0060 to 0.0063 under the separate impact of special additional deductions and the combined impact of special additional deductions and comprehensive taxation. The reason for such a significant gap is that when the special additional deductions are treated as a minimum. This clearly underestimates the impact of special additional deductions by assuming that all samples do not have deductions of continuing education expenses as well as home loan interest expenses and housing rent expenses identified based on transcribed data, that there is no deduction of elderly support expenses for non-only children, and that there is no deduction of children's education expenses for households with both parents as members of the household. The RE index is 0.0069 after the implementation of the personal income tax reform scheme without any special additional deductions. Due to space limitations, detailed results are not listed. Please contact the authors if you need them.

[2] The impact of some reform measure is calculated assuming that only the reform measure is implemented, and other tax factors remain unchanged. For example, when calculating the impact of comprehensive taxation, we only analyze the impact of whether comprehensive taxation is implemented by assuming that the basic deduction remains at a monthly rate of RMB 3500, the tax rate structure of the old tax system remains unchanged and there are no special additional deductions.

[3] Samples in CHIP2018 were divided by decile based on pre-tax income, with sample size and average income of each group not shown. Please contact the authors if you need them.

Income grouping	Old tax system	Comprehensive taxation	Increase in basic deduction	Special additional deductions	Expanded low tax bracket
4	0.15	0.15	0.03	0.05	0.12
5	0.34	0.32	0.11	0.17	0.25
6	0.62	0.63	0.24	0.35	0.41
7	1.00	1.00	0.48	0.61	0.64
8	1.72	1.74	0.95	1.18	1.08
9	2.73	2.76	1.72	2.00	1.69
10	6.95	7.04	5.72	6.11	4.44
Total sample	3.42	3.44	2.60	2.84	2.19

Note: In this table and Table 3 below, the lowest average rate of personal income tax is not in the lowest income group because the average rate of personal income tax is affected by both income level and income source (composition) due to classified tax. For example, the incomes of two people are RMB 1000 and RMB 900 respectively. If the former is wage income, the tax burden is zero; if the latter is labor remuneration, the tax burden is RMB 20. In this case, although the income from wages and salaries is higher, the tax is lower. Although after the tax reform, some incomes from different sources is subject to comprehensive taxation, it is not a comprehensive taxation of incomes from all sources and the tax burden remains affected by income sources. Source: Calculations from CHIP2018.

The impact of comprehensive taxation on the average rate of personal income tax depends on relative marginal tax rates of wage and salary, labor remuneration, author's remuneration and royalties before and after the tax reform. If the marginal tax rate of wage and salary before the tax reform is high, the average rate of personal income tax will increase after comprehensive taxation. If the marginal tax rate of wage and salary before the tax reform is low, the average rate of personal income tax will be lower after comprehensive taxation. The data in Table 1 indicate that the comprehensive taxation results in a slight increase in the average rate of personal income tax. However, the average tax rate below the fifth income group is reduced by the comprehensive taxation, while that above the fifth income group is increased by the comprehensive taxation, especially in the highest income group, where the average tax rate is significantly higher. Both the increase in basic deduction and the special additional deductions are pre-tax deduction increases for personal income tax, which will lower the average rate of personal income tax for some people.[1] According to the

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[1] Both the basic deduction and the special additional deductions are pre-tax deductions, so the increase in the basic deduction and the special additional deductions are collectively referred to as the increase in pre-tax deductions. For those whose monthly income is less than RMB 3500, the personal income tax burden is zero before and after the basic deduction standard is raised and the tax burden is not affected by the enhanced basic deduction standard and special additional deductions. Those who are not eligible for the special additional deductions are not affected by the special additional deductions in terms of personal income tax.

results in Table 1, it can be seen that the average tax rates of all income groups have been reduced after the implementation of both measures.

The expansion of the three tax brackets of 3%, 10% and 20% will theoretically lower the average rate of personal income tax. According to the results in Table 1, the expansion of low tax brackets as a whole significantly reduces the average tax rate of personal income tax. By group, the low tax bracket expansion has no impact on the average tax rates of the lowest two income groups, but the average tax rates of the remaining eight income groups are significantly lower. Especially for the highest income group, the impact of the expansion of low tax brackets on its average tax rate significantly exceeds that of the increase in the basic deduction rate and special additional deductions. It can be seen that the expansion of low tax brackets seems to be more conducive to reducing the tax burden of high-income people. The reason why the average tax rates of the two lowest income groups are not affected is that the incomes of the two groups are already within the lowest personal income tax brackets. In addition, the expansion of low tax brackets will not change their marginal tax rates or affect their tax burdens.

Table 2. RE Index of Personal Income Tax and Its Decomposition after Implementation of Each Tax Reform Measure

	Old tax system	Comprehensive taxation	Increase in basic deduction	Special additional deductions	Expanded low tax bracket
Pre-tax Gini coefficient (G_y)	0.4414	0.4414	0.4414	0.4414	0.4414
Post-tax Gini coefficient (G^*)	0.4281	0.4280	0.4302	0.4296	0.4328
RE index (RE)	0.0133	0.0134	0.0112	0.0118	0.0086
Horizontal equity effect ($C_d - G^*$)	−0.0003	−0.0003	−0.0002	−0.0003	−0.0001
Vertical equity effect ($=P \times t/(1-t)$)	0.0136	0.0137	0.0114	0.0121	0.0087
Tax concentration rate (C_T)	0.8256	0.8261	0.8664	0.8536	0.8264
Kakwani index (P)	0.3842	0.3847	0.4250	0.4122	0.3850
Average effective tax rate (t)	0.0342	0.0344	0.0260	0.0284	0.0219

Source: Calculations from CHIP2018.

Table 2 shows the RE index of personal income tax and its decomposition after each reform measure is implemented separately. In terms of the RE index, the comprehensive taxation slightly increases the income redistribution effect of personal

income tax. The decomposition results show that the comprehensive taxation has almost no effect on the horizontal equity effect of personal income tax but makes the average tax rate and progressivity of personal income tax slightly higher. The increase in the basic deduction rate, the special additional deductions and the expansion of low tax brackets all reduce the average tax rate of personal income tax and improve the horizontal equity effect and progressivity of personal income tax. However, there are significant differences in the degree of their respective effect. The increase in the basic deduction standard increases the progressivity of personal income tax more significantly than the special additional deductions and reduces the average rate of personal income tax more markedly. This results in greater weakening of the income redistribution effect of personal income tax. The impact of the lower tax bracket expansion on progressivity is not as significant as the increase in the basic deduction rate and special additional deductions. However, it reduces the average rate of personal income tax more significantly and has the strongest weakening effect on the income redistribution of personal income tax.

5.2. Impact of Implementing Other Reform Measures under the Comprehensive Taxation Model

Comprehensive taxation is theoretically beneficial to increasing the income redistribution effect of personal income tax. The previous analysis of the separate effect of comprehensive taxation also confirms the higher income redistribution effect of personal income tax under the model of comprehensive taxation. According to the previous analysis, multiple reform measures, except the comprehensive taxation, have weakened the income redistribution effect of personal income tax to some extent. What about the interplay between the comprehensive taxation and other reform measures? Table 3 shows the average tax rates of income decile groups under the model of comprehensive taxation after the basic deduction standard is enhanced, special additional deductions are conducted and low tax brackets are expanded, respectively. Comparing the results in Table 1, it can be seen that the average tax rate of each group after the increase in pre-tax deduction and the expansion of low tax brackets is smaller than that after the implementation of corresponding reform measures under the model of comprehensive taxation. Thus, the tax reduction effects of other reform measures offset and outweigh the tax increase effects of comprehensive taxation, and the comprehensive taxation reinforces the tax reduction effects of other reform measures. The possible reason is that the increase in pre-tax deductions and the expansion of low tax brackets reduce the marginal tax rate of payroll income tax. When the marginal tax rate of payroll income tax is reduced to a lower rate than that of labor remuneration tax, the comprehensive taxation will allow more income (labor remuneration, etc.) to be subject to the low tax rate.

Table 3. Average Tax Rates of Decile Groups in Implementing Comprehensive Taxation and Other Reform Measures (Unit: %)

Income grouping	Comprehensive taxation plus increase in basic deduction	Comprehensive taxation plus special additional deductions	Comprehensive taxation plus expanded low tax bracket
1	0.00	0.01	0.02
2	0.00	0.01	0.01
3	0.03	0.04	0.06
4	0.03	0.05	0.12
5	0.09	0.14	0.23
6	0.24	0.35	0.41
7	0.46	0.59	0.62
8	0.92	1.15	1.05
9	1.68	1.98	1.65
10	5.76	6.17	4.35
Total sample	2.58	2.83	2.13

Source: Calculations from CHIP2018.

Table 4 shows the RE index of personal income tax and its decomposition after the increase in pre-tax deduction and the expansion of low tax brackets under the model of comprehensive taxation. According to the separate impact of each reform measure in Table 2, the impacts of increasing pre-tax deduction and expanding low-tax brackets on the average tax rate, progressivity and RE index of personal income tax under the model of comprehensive taxation are all more significant than their separate impacts. The impact on the average tax rate has been analyzed previously, so it will not be repeated here. Possible reasons for the greater impact on progressivity under the comprehensive taxation model are as follows. Under a model of classified tax, the marginal tax rate on wages and salaries is low for lower income earners, especially those with lower wages and salaries, and the increase in pre-tax deductions and expansion of low tax brackets may reduce it to a lower marginal tax rate than the tax on labor remuneration. The marginal tax rate of higher income earners, especially those with higher wages and salaries, may still be higher than that for labor remuneration. The comprehensive taxation would result in low tax rates and tax burdens for lower income earners, while higher income earners may be unaffected or less affected. Thus, this makes the personal income tax burden more concentrated on higher income earners, resulting in more tax progressivity.

Table 4. RE Index of Personal Income Tax and Its Decomposition in Implementing Comprehensive Taxation and Other Reform Measures

	Comprehensive taxation plus increase in basic deduction	Comprehensive taxation plus special additional deductions	Comprehensive taxation plus expanded low tax bracket
Pre-tax Gini coefficient (G_y)	0.4414	0.4414	0.4414
Post-tax Gini coefficient (G^*)	0.4303	0.4297	0.4331
RE index (RE)	0.0111	0.0117	0.0083
Horizontal equity effect $(C_d - G^*)$	−0.0002	−0.0002	−0.0001
Vertical equity effect $(=P \times t/(1-t))$	0.0113	0.0119	0.0084
Tax concentration rate (C_T)	0.8692	0.8762	0.8276
Kakwani index (P)	0.4378	0.4145	0.3862
Average effective tax rate (t)	0.0258	0.0283	0.0213

Source: Calculations from CHIP2018.

5.3. Impact of the General Tax Reform Scheme on the Income Redistribution Effect of Personal Income Tax

Table 5. Average Tax Rate of Income Decile Groups under New Tax System (Unit: %)

Income decile groups	Average tax rate
1	0.00
2	0.00
3	0.02
4	0.02
5	0.03
6	0.01
7	0.19
8	0.38
9	0.73
10	3.10
Total sample	1.34

Source: Calculations from CHIP2018.

The impact of this tax reform on the income redistribution effect of personal income tax is the result of the combined effect of various reform measures. Table 5 shows the average tax rates of each income group after the implementation of the whole tax reform package. Comparing the average tax rates of all income groups under the old tax system in Table 1, we can find that the average tax rates are significantly

lower after the tax reform, but the impact is much larger compared to the separate impact of each reform measure. Overall, the tax reform has reduced the average rate of China's personal income tax by over 60%, which is very unfavorable to the income redistribution effect of China's personal income tax according to the decomposition formula of the RE index of personal income tax in the previous section.

Table 6 indicates the RE index of personal income tax and its decomposition after the implementation of the general tax reform package. According to the results in Table 2, before the tax reform, the RE index of China's personal income tax was 0.0133, accounting for 30.13% of the pre-tax Gini coefficient; after the tax reform, it decreased significantly to 0.0060, taking up 13.59% of the pre-tax Gini coefficient, with the RE index dropping by 54.89%. From the decomposition items of the RE index, before the tax reform, the horizontal equity effect of personal income tax was -0.0003, while after the tax reform, it increased to -0.0001. The tax reform obviously improved the negative impact on the income redistribution effect of personal income tax due to the change in residents' income ranking. The personal income tax system after the tax reform is more consistent with the horizontal equity principle of taxation. The tax reform also increased the P index of personal income tax from 0.3824 to 0.4478, up by 17.10%. Although the horizontal equity effect and the enhanced progressivity are conducive to strengthening the income redistribution effect of personal income tax, the average rate of personal income tax is significantly reduced from 3.42% to 1.34% after the tax reform, down by 60.82%. Ultimately this leads to a significant weakening of the income redistribution effect of personal income tax. By comparing the changes in the average tax rate, the P index and the RE index of personal income tax, the RE index and the average rate of personal income tax are very close in their reduction, indicating that the income redistribution effect of China's current personal income tax may be more influenced by the average tax rate, which is consistent with the findings of Yue *et al*. (2012).

Table 6. RE Index of Personal Income Tax and Its Decomposition under New Tax System

Pre-tax Gini coefficient (G_y)	0.4414
Post-tax Gini coefficient (G^*)	0.4353
RE index (RE)	0.0060
Horizontal equity effect ($C_d - G^*$)	−0.0001
Vertical equity effect ($=P \times t/(1-t)$)	0.0061
Tax concentration rate (C_T)	0.8892
Kakwani index (P)	0.4478
Average effective tax rate (t)	0.0134

Source: Calculations from CHIP2018.

6. Conclusions

The 2018 tax reform has improved China's personal income tax system in multiple ways and influenced the income redistribution effect of personal income tax in many aspects. Based on the latest household survey data, this paper examines the impact of the tax reform on the income redistribution effect of personal income tax in China by measuring and decomposing the RE index of personal income tax, drawing the following conclusions: First, the separate impacts of various reform measures are quite different. Comprehensive taxation has a very weak positive effect on the average tax rate, progressivity and income redistribution effect of personal income tax. Increased basic deduction, special additional deductions and expanded low tax brackets have all reduced the average tax rate and income redistribution effect of personal income tax. Second, the effects of different reform measures are not separate. The weak positive impact of the comprehensive taxation on the income redistribution effect of personal income tax is completely offset by the negative impact of the other three reform measures. The comprehensive taxation reinforces the impact of the other three reform measures on the average tax rate, progressivity and income redistribution effect of personal income tax, making the income redistribution effect of personal income tax even weaker. Finally, this tax reform significantly increases the progressivity of the personal income tax on the whole but leads to a slash in the average personal income tax rate and the RE index, which dramatically weakens the income redistribution effect of personal income tax.

Based on the findings of this paper, it is easy to understand that prudence should be exercised in evaluating the impact of the tax reform on the income redistribution effect of personal income tax. The contribution of each reform measure to the income redistribution effect of the tax reform should not be judged unilaterally based on the separate impact of each reform measure or the joint impact of multiple reform measures. What we can determine is only the separate and combined effects of each measure in the tax reform on the income redistribution effect of personal income tax, but it is difficult to determine the contribution of each reform measure to the overall reform effect. From the changes in the progressivity of personal income tax, average tax rate and income redistribution effect, the income redistribution effect of personal income tax is more influenced by the decrease in the average tax rate. Under the current tax structure and income distribution, the average tax rate is the main determinant of the income redistribution effect of personal income tax in China, while the effect of progressivity is relatively minor. To solve the current dilemma of lower income redistribution effect of personal income tax in China, we should start with raising the average rate of personal income tax.

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