

A Research on the Evaluation System and Determinants of Starting Point Fairness

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Abstract—This article defines the connotation of starting point fairness, designs the evaluation indexes of starting point fairness, and puts forward the measure method of starting point fairness. Based on the panel data of 31 provinces from 1985 to 2017, the article conducts a statistical measure of starting point fairness and econometric analysis of the determinants of starting point fairness in China. The research results show that:(1) China's starting point fairness is relatively fair generally, showing an upward trend. Education equity and public health equity are very fair. Public infrastructure equity is quite fair. Public natural resources equity is relatively fair. Employment equity is relatively unfair. (2) Inequalities in education, employment, public health, public infrastructure and public natural resources have significant negative effects on the starting point fairness, vice versa. (3) Policy bias, urban-rural differences, and regional differences have significant negative effects on the starting point fairness. The relationship between opening-up and starting point fairness is a significant inverted U-type. Policy bias, urban-rural differences, regional differences and opening-up have further widened the negative effects of education inequality and employment inequality on the starting point fairness. The findings provide important policy implications.

Keywords—starting point fairness; education equity; employment equity; evaluation system; determinants

I. INTRODUCTION

Since the reform and opening-up, China's economy has gained sustaining growth, but the problem of income distribution inequality has also become increasingly serious [1][2]. Income distribution inequality has become an obstacle to cross the middle-income trap and maintain harmonious economic and social development in China. The serious challenge in current society is not only the result inequality of income distribution, but also the starting point inequality of income distribution, that is, the inequality of right and opportunity. Opportunity inequality refers to the income gap caused by factors that individuals cannot control. It is one of the most focused issues in modern social justice theory [3][4]. In the process of social transformation, opportunity equality is particularly important for the formulation of public policies and the sustainability of economic growth. It has attracted the attention of scholars and policymakers [5]. The report of the 18th National Party Congress advocated establishing a complete equity social guarantee system, promoting the equity of right, rule and opportunity, and realizing social equity and

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justice. Therefore, under the background of China entering into the high-quality development and building a moderately prosperous society in an all-round way, the depth research on evaluation system of starting point fairness and determinants of starting point fairness is significance for formulating a scientific and reasonable income distribution policy, reducing the income distribution inequality caused by the starting point inequality, and achieving social equity and justice.

II. LITERATURE REVIEW AND RESEARCH HYPOTHESIS

Distribution equity includes starting point fairness, procedural fairness and outcome fairness [6]. After several hundred years of development, the theory of distributive equity(justice) has put forward many shining thoughts on the connotation, basic principles and ways of realization. And it has certain reference value and significance. However, these theories and existing relevant researches rarely involve starting point fairness (right equity and opportunity equity), and do not involve evaluation system and determinants of starting point fairness.

A. Connotation of Starting Point Fairness

In reality, because of different endowments, different social and economic conditions and different natural environmental conditions, it is normal for people to engage in economic and social activities from different starting points. Starting point fairness mainly refers to right equity and opportunity equity. Right equity means that people have equal right to participate in all kinds of economic and social activities and equal access to all kinds of social public resources. Distributive equity is not equal to income equity, but rather right and opportunity equity. Opportunity is the possibility of obtaining resources, including economic resources, organizational resources and cultural resources, etc. [7]. Rawls (1958) first pointed out the concept of opportunity equity [8], considering that fairness does not require the outcome fairness, but opportunity equity [9]. Greater opportunity equity will lead to greater income equity [10]. Dworkin (1981) discussed resource equity, which includes the physical environment that individuals should not be responsible for [11]. Arneson (1989) proposed that the goal of society should be equal opportunities for welfare [12]. Roemer(1998) pointed out that the principle of equity is not individual's outcome fairness, but to provide everyone with the same opportunity, so that the individual's ultimate achievement

depends on his own choice[13]. According to Wu zhongmin (2004), opportunities include sharing opportunities and competitive opportunities. Sharing opportunities are equal eligibility for participation; Competitive opportunities are differentiated opportunities. Under limited resources conditions, people actually have different development opportunities due to different labor conditions, capabilities, and talents [14]. In addition, some scholars have revealed the connotation of opportunity equity by constructing quantitative models characterized by intergenerational human capital investment and luck [15]. According to Sun jingshui and Zhao qianqian (2017), the starting point fairness means that members of society have equal right and opportunity for participation and development in economic activities[16].

B. Evaluation System of Starting Point Fairness

Now the theoretical circle rarely involves the evaluation indexes and measure method of distribution equity, mainly aiming at the measurement of distribution results inequality, usually using the Gini coefficient, the Theil index and other income inequality indicators to indicate. Due to some defects in these indicators, Amartya Sen (2004) conducted the capability index [17]. Almás et al.(2011)proposed to use the generalized Gini coefficient to measure income distribution inequality[18]. Guglielmo(2015) constructed the population dynamic Theil's entropy index to measure income distribution inequality [19]. "Parametric method" and "non-parametric method" are commonly used to measure opportunity inequality[20]. Generally, log-linear model is adopted for parameter estimation [21]. Non-parametric method takes environment types as grouping basis to decompose the total inequality into intra-group inequality and inter-group inequality [22].Using CHNS data, Zhang and Eriksson (2010) measured opportunity inequality in nine provinces of China with the parametric method. The results showed that the ratio of opportunity inequality measured by the Gini coefficient to income inequality is between 46% and 63% [23]. Ma zhanli and Zou wei (2018) estimated the opportunity inequality in individual income distribution by using the Theil zero-order index. By using the non-parametric method, the results showed that the opportunity inequality in China became more and more serious from 2007 to 2013[24]. Sun jingshui and Zhao qianqian (2017) constructed the distribution equity evaluation indexes system from two aspects---initial distribution equity and redistribution equity. Based on the Gini coefficient, the authors established a measure method of distribution equity [16].

C. Determinants of Starting Point Fairness and Research Assumptions

The starting point fairness refers to the right equity and opportunity equity, mainly including the equality of education, employment and social public resources, etc. Therefore, the inequality of education, employment and social public resources have important effects on the starting point fairness. Existing relevant researches mainly focus on the influence factors of income inequality and opportunity inequality, rarely involving the determinants of income distribution equity, and not the determinants of starting point fairness.

1) *Education inequality, employment inequality and starting point fairness*: Beck and Cheswick (1966) found a positive correlation between educational inequality and income inequality [25]. Using panel data of 100 countries from 1960 to 1990, Gregorio and Lee (2002) found that the greater educational inequality, the greater income inequality. Raising the average level of education helps to reduce income inequality[26]. Secular et al.. (2007) from the perspective of individual and family endowments, pointed out that the education level is an important reason for urban-rural income inequality[27]. Shi daqian and Zhang zhecheng(2018) found that education inequality significantly increases income inequality[28]. People value employment because it provides income and welfare and helps increase self-esteem and happiness (World Bank, 2013)[29]. There are inequalities in employment opportunities for different household registration workers in China[30]. For migrant workers, high-level occupations have high education entry threshold, while low-level occupations have urban household registration threshold[31]. Ye Guang(2015) found that employment opportunity inequality is the main reason for the difference in return on education and wage gap between urban and rural areas [32].

The authors believe that education equity and employment equity are the basis of starting point fairness. Every member of society has the right and opportunity to receive education, participate in employment and choose employment independently. Education inequality and employment inequality have significant effects on starting point fairness. Therefore, the following hypothesis are put forward:

Hypothesis 1: Education inequality and employment inequality have significant negative effects on starting point fairness, and vice versa.

2) *Public resources inequality and starting point fairness*: Public health, public infrastructure and public natural resources have significant impact on the survival and development of human being. Every member of society should be treated fairly and equally in the enjoyment of these public resources, which is the basic content of starting point fairness. Wu yipin and Lu Jian (2015) found that public health investment can effectively and directly reduce income inequality[33]. Ma Chao et al. (2017) found that urban-rural medical care discrimination and urban-rural income gap are the important reasons for opportunity inequality [34]. Using panel data of 76 developed and developing countries from 1980 to 2010, Seneviratne and Sun(2013) empirically analyzed that better public infrastructure helps to improve income equity[35]. Donaldson(2018) also believed that public infrastructure has accelerated the speed of economic development and has a positive spillover effect on the employment, which can reduce the urban-rural income gap[36]. Sakamoto(1988) showed that the difference in resource endowment was one of the reasons for the urban-rural income gap[37]. Lessmann and Steinkraus(2019) pointed out that the spatial distribution of resources is the main driver of

income inequality [38]. Other scholars have put forward the phenomenon of "resource curse", that is, regions with abundant natural resource endowment will have negative effects on local economic growth [39-40]. Due to the large differences between urban-rural areas and regions in public health, public infrastructure, public natural resources, etc., members of society cannot enjoy these public resources equally, resulting starting point unfairness. Therefore, the following hypothesis are put forward:

Hypothesis 2: Public health inequality, public infrastructure inequality, and public natural resources inequality have significant negative effects on starting point fairness, and vice versa.

3) *Policy Bias, Regional Differences, Urban-Rural Dual Structure, Opening-up and Starting Point Fairness:* The government's policy on urban preferences will increase income inequality between urban-rural areas. Conversely, policy on rural preferences will reduce income inequality between urban-rural areas [41-42]. Acemoglu and Robinson(2006) indicated that policy bias is the decisive factor of income inequality[43]. Wan and Zhou(2005) found that geographical location is a prominent factor affecting income inequality [44]. Cai et al. (2010), Li and Gibson(2013) found that regional differences and regional economic imbalances are the main factors causing income inequality in China[45-46].Lei xin et al. (2018) pointed out that the proportion of opportunity inequality in income inequality is about 29% on average. And the differences in family education backgrounds, regional disparities, urban-rural disparities, and gender discrimination constitute the main sources of opportunities inequality at the present stage [47].Some scholars believe that the government's urbanization policy and the urban-rural dual structure are the main reasons for the income inequality of urban and rural residents in China (Chen zongsheng,1991; Tao ran and Liu mingxing,2007) [48-49]. If the household registration system is eliminated to realize the free flow of labor, then the existing income inequality of residents will no longer exist [50].The household registration system has led to significant income differences between migrant workers and urban residents [51]. Whether the policy of opening-up will help to reduce income inequality has led to different conclusions. Using panel data of 80 countries between 1970 and 2005,Bergh and Nilsson(2010) found that there is a significant positive correlation between the liberalization, globalization of international trade and income inequality [52].Tsai et al.. (2011) found that there is a negative correlation between globalization and the Gini coefficient. Globalization has helped to reduce domestic income inequality[53]. Wu and Yao(2012) indicated that trade can reduce income inequality[54].In the East and the coastal open cities, which enjoyed preferential policies at an early stage, there were large differences in geography and natural resources, social and economic development, and marketization between urban-rural areas and between regions. As a result, there are large

differences in the urban-rural dual structure and income gap. Therefore, the following hypothesis are put forward:

Hypothesis 3: The greater regional differences, urban-rural differences and policy bias, the greater starting point unfairness, and vice versa. Opening-up has a significant effect on starting point fairness.

To sum up, the connotation of distribution equity in theoretical circles is often limited to distribution outcome fairness, rarely involves the starting point fairness. The evaluation indexes and measure method of distributive equity mainly focus on the outcome unfairness. The current researches rarely involve the evaluation indexes, measure method and determinants of starting point fairness.

Compared with the existing related researches, the main contributions of this article are as follows: First, this article defines the connotation of starting point fairness. From the five aspects of education equity, employment equity, public health equity, public infrastructure equity and public natural resources equity, the authors constructed the evaluation indexes system of starting point fairness. Second, on the basis of the Gini coefficient and using the comprehensive evaluation method, the article proposed a measure method of starting point fairness. The starting point fairness (education equity, employment equity, public health equity, public infrastructure equity, and public natural resources equity are the secondary indexes) are measured statistically. The evaluation indexes and measure method are put forward according to the distribution inequality theories and modern statistical methods. It is helpful to understanding the starting point fairness in China. Third, the determinants of starting point fairness are measured through education inequality, employment inequality, public health inequality, public infrastructure inequality, public natural resources inequality, policy bias, regional differences, urban-rural differences, and opening-up etc. The conclusion of this article is instructive and provides empirical basis for the government to formulate scientific and reasonable policies.

III. METHODS AND MODELS

The starting point fairness in this article refers to the right equality and opportunity equality. Members of society enjoy equal right and equal opportunity in participating in political, economic, cultural and social activities. Right equality means that members of society have equal right according to law (right to life, education, employment, vote and be elected, etc..). They shall not be discriminated against because of gender, age, race, family background, religious belief, region, culture, etc. Opportunity equality means participation opportunity, development opportunity and sharing opportunity. Everyone is on the same starting line and individual's abilities are fully developed and rewarded.The starting point fairness mainly includes education equity, employment equity, public health equity, public infrastructure equity, public natural resources equity, etc.

A. *Evaluation Indexes of Starting Point Fairness*

Education and employment are important issues related to everyone's life and development, which affect one's behavior

ability and determine one's life prospects to a large extent. Education and employment have unique effects on opportunity equality and provide the impetus of upward mobility for people's socioeconomic status. Education equity and employment equity are the basic categories of starting point fairness. Education equity means that every member of society has an equal right to education and is not affected by gender, nation, family background, property status, religious beliefs, etc. The evaluation indexes of education equity consist of eight third-level indicators: the coverage rate of compulsory education, the enrollment rate of school-age children, the primary school enrollment rate, the junior middle school enrollment rate, the average education expenditure of primary school students, the average education expenditure of junior middle school students, the ratio of education budget to public financial expenditure, the sex ratio of primary and junior middle school students, etc. Employment is the foundation of people's livelihood and plays an important role in economic and social development. Employment equity means that in the employment process, everyone has a fair chance to participate in the competition. The evaluation indexes of employment equity consist of five third-level indicators: employment rate, number of employment agencies per 1,000 people seeking employment, number of vocational training institutions for job-seekers per 1,000 people, urban and rural comparative employment rate, and male and female comparative employment rate. As shown in Table I.

Public health, public infrastructure, public natural resources and other social public resources are the most basic equitable objects in income distribution. They play an important role in the same "starting point" among social members. Only fair distribution of public resources can guarantee opportunity equal for development and sharing. A society with right equity and opportunity equity should be a society in which the distribution of public resources takes precedence over competition. The article brings public health equity, public infrastructure equity and public natural resources equity into the scope of starting point fairness. The public health equity evaluation indexes consist of six third-level indicators: per capita public health expenses, public health expenditure as a percentage of GDP, the number of beds in medical institutions per 1,000 people, the number of health technical staffs per 1,000 people, the urban-rural ratio of health technical staffs per 1,000 people, and the average life expectancy. The public infrastructure equality evaluation indexes consist of four third-level indicators: per capita road area per square kilometre, road and railway density, public transport vehicles per 10,000 people, and per capita communication infrastructure. The public natural resources equality evaluation indexes consist of three third-level indicators: per capita land area (cultivated lands, woodlands, grasslands), per capita water resources, and per capita green area. As shown in Table I.

TABLE I. EVALUATION INDEXES SYSTEM OF STARTING POINT FAIRNESS

First-Level Indicators	Second-Level Indicators	Third-Level Indicators (Meanings and Calculation Formulas)
Starting Point Fairness	Education Equity	the coverage rate of compulsory education (number of junior middle schools graduates/total number of primary school-age children in school); the enrollment rate of school-age children (total number of primary school-age children in school/total number of primary school-age children in and out of school); the primary school enrollment rate; the junior middle school enrollment rate; the average education expenditure of primary school students (expenditure on primary education / number of students enrolled in primary school); the average education expenditure of junior middle school students (expenditure on junior middle school education / number of students enrolled in junior middle school education); the ratio of education budget to public financial expenditure (public finance budget on education expenditure/public finance expenditure); the sex ratio of primary and junior middle school students (the number of boys in primary and middle schools divided by the number of girls, reflecting the gender equity of compulsory education).
	Employment Equity	employment rate (total employed persons/economically active population); number of employment agencies per 1,000 people seeking employment (number of employment agencies/job-seekers / 1000); number of vocational training institutions for job-seekers per 1,000 people (number of vocational training institutions/job-seekers / 1000); urban and rural comparative employment rate (urban employment rate/rural employment rate, reflecting equity in urban and rural employment); male and female comparative employment rate (male employment rate/female employment rate, reflecting gender equity in employment).
	Public Health Equity	per capita public health expenses (use per capita health expenditure indicators instead); public health expenditure as a percentage of GDP (use the indicator of health expenses/GDP instead); the number of beds in medical institutions per 1,000 people (the number of beds in medical institutions / population/1000); the number of health technical staffs per 1,000 people (the number of health technical staffs / population /1000); the urban-rural ratio of health technical staffs per 1,000 people (the number of urban health technical staffs per 1,000 people/ the number of rural health technical staffs per 1,000 people); the average life expectancy (life expectancy at birth).
	Public Infrastructure Equity	per capita road area per square kilometre (use urban per capita road area per square kilometre instead); road and railway density (use kilometers of road and railway per square kilometre instead); public transport vehicles per 10,000 people (use urban public transport vehicles per 10,000 people instead); per capita communication infrastructure (use the length of long-distance cable lines per 10,000 people, the total length of postal routes per 10,000 people instead).
	Public Natural Resources Equity	Per capita land area (cultivated lands, woodlands, grasslands); per capita water resources (total water resources/total population); per capita green area (use urban per capita park green area instead).

^a Note: indicator data with * is missing.

In the evaluation indexes of starting point fairness, some indexes (positive indexes) the higher, the better; some indexes (negative indexes) the lower, the better. When dealing with these indexes, it is necessary to treat the indexes positively according to the properties.

B. Measure Method of Starting Point Fairness

In the measure of distributive equity, the most common method is the Gini coefficient method, which is also one of the most widely used indexes by scholars.

The Gini coefficient used in this article adopts the calculation method proposed by Sen(1977) [55]. The equity of each index is obtained by calculating the Gini coefficient. The specific calculation formula is as follows:

$$G_{ijt} = \frac{2}{q^2 \mu} \sum_{k=1}^p (1 - \frac{q+1}{2}) a_{ijk} \tag{1}$$

$$SPF_{ijt} = 1 - G_{ijt} \tag{2}$$

a_{ijk} represents the observed value of the second-level index of i , third-level index of j in k province and t year, (ranked from low to high), $i=1,2,\dots,m$; $j=1,2,\dots,n$; $k=1,2,\dots,p$;

$$\mu = \frac{1}{P} \sum_{k=1}^p a_{ijk} \tag{3}$$

$t=1,2,\dots,T$; is the mean value.

G_{ijt} represents the Gini coefficient of second-level index of i and third-level index of j in t year, and SPF_{ijt} represents the equity of the corresponding third-level index. The equity of second-level index can be determined by linear weighted evaluation function method[56].

$$SPF_{it} = \sum_{j=1}^n w_{ij} SPF_{ijt} \tag{3}$$

$$w_{ij} = \frac{\sigma_{ij}}{\sum_{j=1}^n \sigma_{ij}} \tag{4}$$

is the contribution rate of the

SPF_{ijt} ($t=1,2,\dots,T$) standard deviation σ_{ij} .

$$\sigma_{ij} = \sqrt{\frac{1}{T-1} \sum_{t=1}^T (SPF_{ijt} - \overline{SPF}_{ij})^2} \tag{5}$$

$$\overline{SPF}_{ij} = \frac{1}{T} \sum_{t=1}^T SPF_{ijt} \tag{6}$$

The starting point fairness can be determined by the geometrically weighted evaluation function method:

$$SPF_t = \prod_{i=1}^m SPF_{it}^{w_i} \tag{4}$$

w_i is the contribution rate of the SPF_{it} standard deviation σ_i ($T = 1, 2, \dots, T$).

The starting point fairness (SPF_t) $\in [0,1]$. The SPF_t closer to 1, the higher the starting point fairness; The

SPF_t closer to 0, the lower the starting point fairness. With reference to the division method of income inequality by the Gini coefficient, the authors make the following division of the starting point fairness: when $0 < SPF_t \leq 0.5$, the starting point fairness is quite unfair; When $0.5 < SPF_t \leq 0.6$, the starting point fairness is relatively unfair; When $0.6 < SPF_t \leq 0.7$, the starting point fairness is relatively fair. When $0.7 < SPF_t \leq 0.8$, the starting point fairness is quite fair. When $0.8 < SPF_t \leq 1$, the starting point fairness is very fair[16]21.

C. Measurement Model of Determinants of Starting Point Fairness

The interpreted variable is the starting point fairness (SPF). There are two main types of interpretation variables: First, the core variables that affect the starting point fairness, mainly including five variables. That is, education inequality (**inequ₁**), employment inequality (**inequ₂**), public health inequality (**inequ₃**), public infrastructure inequality (**inequ₄**), public natural resource inequality (**inequ₅**); Second, the non-core variables that affect the starting point fairness, mainly including policy bias (**Poli**), urban-rural differences (**Ur**), regional differences (**regs**), and opening-up. Based on the determinants and research assumptions of the starting point fairness, the following econometric models are constructed:

$$SPF_t = \beta_0 + \sum_{i=1}^5 \beta_i inequ_{it} + \beta_6 poli_t + \beta_7 ur_t + \beta_8 reg_t + \beta_9 open_t + \sum \beta_j interactio_{nj} + \varepsilon_t \tag{5}$$

Interaction is an interaction term between variables and ε is a random error term. The core variable inequ1-inequ5 can use the third-level index in Table I to calculate its Gini coefficient and use the weighted average method (the weight is its standard deviation contribution rate). Proxy indicators for non-core variables: First, policy bias. There are four proxy indicators of policy bias: the proportion of fixed assets investment in the non-state economy, the proportion of employment in the non-state economy, the proportion of rural fixed assets investment, and the proportion of agricultural expenditure (fiscal spending on agriculture)/fiscal expenditure; Second, urban-rural difference. There are two proxy indicators of urban-rural difference: the urban-rural dual structure (non-farm comparative labor productivity / agricultural comparative labor productivity, of which non-farm comparative labor productivity = non-farm gross product/non-farm employed population, The agricultural comparative labor productivity = agricultural gross product/agricultural employed population), urban and rural human capital differences (urban residents' expenditure on cultural, educational and health care as a proportion of total expenditure / rural residents' expenditure on cultural, educational and health care as a proportion of total expenditure); Third, regional differences. There are two proxy indicators of regional differences: differences in infrastructure construction (inequality in public infrastructure) and natural resource endowments (inequality in public natural resources); Fourth, opening-up. there are three proxy indicators of

opening-up: the export dependence of goods, the import dependence of goods, and the actual tariff rate. The Gini coefficient of proxy index is calculated first, and then the Gini coefficient of non-core variable index is obtained by weighted average method. Variables, symbols, and descriptive statistics in the models are shown in Table II.

IV. ESTIMATES AND RESULTS

Based on the panel data of 31 provinces from 1985 to 2017, the article conducts a statistical measure of starting point fairness and econometric analysis of the determinants of starting point fairness in China.

A. Data Sources

The data sources of the indicators are as follows: the data of education equity indicators are derived from Educational Statistics Yearbook of China and China Educational Finance Statistical Yearbook. The data of public health equity indicators are derived from China Health Statistics Yearbook. Other indicators are derived from China Statistical Yearbook, China Compendium of Statistics 1949-2008, and the statistical yearbooks of each province. In view of the missing annual data of some indicators, this article uses linear extrapolation to fit the missing year data.

B. Statistical Measure of Starting Point Fairness

The estimated results of starting point fairness of the whole country and the three major regions from 1985 to 2017 are shown in Table III. From Table III, we can see that the average of the starting point fairness in China from 1985 to 2017 was 0.7143, indicating that the starting point fairness in China is quite fair. In 1985-2017, the starting point fairness has been increasing steadily, from 0.565 to 0.8017, that is, from relatively unfair to very fair. In 1985-1987, the starting point fairness was relatively unfair (due to the low equity in public natural resources, public infrastructure, and employment). In 1988-1997, the starting point fairness was relatively fair. In 1998-2016, the starting point fairness was quite fair. In 2017, the starting point fairness was very fair (due to the high equity in public health and education).

The mean of the five second-level indicators—educational equity, employment equity, public health equity, public infrastructure equity and public natural resources equity in China from 1985 to 2017 were 0.8202, 0.5879, 0.8384, 0.7140 and 0.6706, respectively. It showed that China's education equity, employment equity, public health equity, public infrastructure equity and public natural resources equity were very fair, relatively unfair, very fair, quite fair and relatively fair, respectively.

Among them, the public health equity and the education equity are the first higher, the public infrastructure equity and the public natural resources equity are the second, and the employment equity is the lowest (the main reason is that the number of vocational training institutions for job-seeking population varies greatly in different regions, leading to the low level of equity in the number of vocational training institutions for job-seekers per 1,000 people). In 1985-1994, the education equity was lower than the public health equity. In

1995-2000, the education equity was slightly higher than the public health equity. In 2001-2011, they were approximately equal. In 2012-2017, the public health equity was significantly higher than the education equity. In 1985-2017, the public health equity and the education equity were higher than the public infrastructure equity and the public natural resources equity. In 1985-2002, the public infrastructure equity was higher than the public natural resources equity, and the differences between them were relatively small in 2003-2017. Employment equity is significantly lower than others. As shown in Fig. 1.

From Table III and Fig. 1, we can see that the education equity increased from 0.7337 in 1985 to 0.8701 in 2017, that is, from quite fair to very fair, which was in a steady rise in general. In 1985-1993, it was quite fair. And in 1994 - 2017, very fair. The employment equity increased from 0.5518 in 1985 to 0.6856 in 2017, that is, from relatively unfair to relatively fair, which was in a steady rise in general. In 1985-2002, 2004, 2008-2009, it was relatively unfair (mainly due to the low level of equity in the number of vocational training institutions for job-seekers per 1,000 people), and in other years it was relatively fair. The public health equity increased from 0.7877 in 1985 to 0.9203 in 2017, that is, from quite fair to very fair, which was in a steady rise in general. The public infrastructure equity has increased from 0.5288 in 1985 to 0.8033 in 2017, that is, from relatively unfair to very fair, which was in a steady rise in general. In 1985-1989, it was relatively unfair (mainly due to the low level of equity in public transport vehicles per 10,000 people and per capita communication infrastructure). In 1990-1995, relatively fair. In 1996-2016, quite fair. And in 2017, very fair. The public natural resources equity increased from 0.4448 in 1985 to 0.7693 in 2017, that is, from quite unfair to quite fair, which was in a steady rise in general. In 1985-1987, it was quite unfair. In 1988-1993, 1996, it was relatively unfair (mainly due to the low level of equity in per capita water resources). In 1994-1995, 1997-1999, it was relatively fair. In 2000-2017, it was quite fair.

C. Estimation Results of the Determinants of Starting Point Fairness

According to the determinant measurement model of starting point fairness (5), with the help of EVIEWS9.0 software, the GLS estimation method is applied to obtain the regression results in Table IV. Model 1 is the basic model, namely the regression results of core variables and starting point fairness. And model 2-1 to model 5-2 is the regression results of non-core variables, interaction items and starting point fairness (non-significant interaction items are eliminated). The regression results show that the adjusted determination coefficient adj-R² is close to 1, indicating that explanatory variables have a strong ability to explain the starting point fairness and a high goodness of fit, and the significance level corresponding to F statistic is high, and the regression model is significantly established.

TABLE II. VARIABLES, SYMBOLS AND DESCRIPTIVE STATISTICS IN THE MODEL

Variables	Symbols	Mean	Standard Deviation
Explained Variable: Starting Point Fairness	SPF	0.7143	0.0738
Explanation Variable: Core Variable			
Education Inequity	inequ1	0.1798	0.0411
Employment Inequity	inequ2	0.4121	0.0344
Public Health Inequity	inequ3	0.1616	0.0390
Public Infrastructure Inequity	inequ4	0.2860	0.0831
Public Natural Resources Inequity	inequ5	0.3294	0.1104
Non-core Variable(Control Variable):			
Policy Bias	poli	0.1691	0.0418
Regional Differences	ur	0.1534	0.0784
Urban-Rural Dual Structure	reg	0.3137	0.0980
Opening-up	open	0.6284	0.0974

a) *Core variables and starting point fairness:* The model 1 in Table IV reflects the effects of the core variables such as education inequality(inequ₁), employment inequality (inequ₂), public health inequality(inequ₃), public

infrastructure inequality(inequ₄), and public natural resources inequality(inequ₅) on the starting point fairness(SPF).The regression results show that education inequality(inequ₁), employment inequality (inequ₂), public health inequality(inequ₃), public infrastructure inequality(inequ₄), and public natural resources inequality(inequ₅) have significant negative effects on the starting point fairness (SPF).It indicates that the higher inequality of education, employment, public health, public infrastructure and public natural resources, the lower fairness of starting point, and vice versa. From the absolute value of the regression coefficient, we can see that the employment inequality and the public infrastructure inequality have greater negative effects on the starting point fairness. The education inequality and the public health inequality have lower negative effects on the starting point fairness. The negative effect of public natural resource inequality on the starting point fairness is relatively smallest. Therefore, reducing employment inequality, public infrastructure inequality, education inequality, public health inequality, and public natural resources inequality are the most important ways to increase the starting point fairness.

b) *Non-core Variables, Interaction Items and Starting Point Fairness:* Policy bias, its interaction items and starting point fairness.

TABLE III. THE ESTIMATED RESULTS OF STARTING POINT FAIRNESS

Year	Starting Point Fairness	Education Equity	Employment Equity	Public Health Equity	Public Infrastructure Equity	Public Natural Resources Equity
1985	0.5650	0.7337	0.5518	0.7877	0.5288	0.4548
1986	0.5790	0.7410	0.5533	0.7939	0.5486	0.4738
1987	0.5905	0.7484	0.5422	0.8001	0.5646	0.4921
1988	0.6026	0.7558	0.5446	0.8031	0.5807	0.5092
1989	0.6146	0.7623	0.5464	0.8071	0.5970	0.5261
1990	0.6256	0.7676	0.5493	0.8077	0.6124	0.5422
1991	0.6369	0.7748	0.5517	0.8084	0.6288	0.5577
1992	0.6486	0.7878	0.5543	0.8095	0.6438	0.5728
1993	0.6585	0.7911	0.5570	0.8106	0.6577	0.5875
1994	0.6695	0.8005	0.5613	0.8127	0.6719	0.6019
1995	0.6847	0.8457	0.5625	0.8178	0.6849	0.6155
1996	0.6868	0.8342	0.5682	0.8177	0.7187	0.5986
1997	0.6920	0.8331	0.5708	0.8160	0.7139	0.6169
1998	0.7062	0.8317	0.5756	0.8188	0.7390	0.6357
1999	0.7079	0.8250	0.5790	0.8214	0.7367	0.6425
2000	0.7307	0.8255	0.5885	0.8243	0.7367	0.7020
2001	0.7331	0.8259	0.5863	0.8264	0.7350	0.7097
2002	0.7329	0.8308	0.5959	0.8208	0.7310	0.7095
2003	0.7483	0.8215	0.6085	0.8434	0.7391	0.7379
2004	0.7502	0.8194	0.5996	0.8430	0.7424	0.7443
2005	0.7607	0.8244	0.6066	0.8313	0.7770	0.7478
2006	0.7709	0.8212	0.6131	0.8314	0.7705	0.7803
2007	0.7818	0.8396	0.6323	0.8364	0.7756	0.7921
2008	0.7829	0.8505	0.5937	0.8473	0.7912	0.7877
2009	0.7801	0.8523	0.5829	0.8576	0.7920	0.7784
2010	0.7792	0.8497	0.6091	0.8516	0.7937	0.7693
2011	0.7839	0.8539	0.6032	0.8584	0.7941	0.7802
2012	0.7856	0.8654	0.6060	0.8822	0.7881	0.7758
2013	0.7910	0.8673	0.6085	0.9024	0.7935	0.7781
2014	0.7965	0.8689	0.6210	0.9182	0.7895	0.7863
2015	0.7985	0.8759	0.6381	0.9207	0.7929	0.7807
2016	0.7965	0.8722	0.6531	0.9197	0.7897	0.7745
2017	0.8017	0.8701	0.6856	0.9203	0.8033	0.7693
MEAN	0.7143	0.8202	0.5879	0.8384	0.7140	0.6706

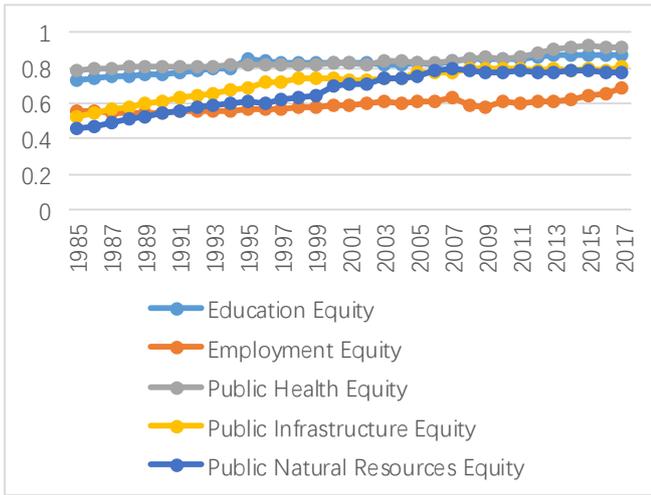


Fig. 1. Trend chart of starting point fairness.

The models 2-1 and 2-2 in Table IV reflect the regression results of the policy bias(Poli), educational inequality(inequ₁), public health inequality (inequ₃) and its interaction items with the starting point fairness (SPF). The results show that the policy bias(Poli) has a significant negative effect on the starting point fairness (SPF), indicating that the higher policy bias, the lower starting point fairness, and vice versa. The interactions between policy bias(Poli), educational inequality(inequ₁) and public health inequality(inequ₃) have significant negative effects on the starting point fairness (SPF), indicating that the higher policy bias, the higher negative effects of education inequality and public health inequality on the starting point fairness (SPF). Or the higher education inequality and public health inequality, the higher negative effect of policy bias on the starting point fairness (SPF).

Urban-rural differences, its interaction items and starting point fairness.

The models 3-1 and 3-2 in Table IV reflect the regression results of the urban-rural differences(ur), educational inequality(inequ₁), employment inequality(inequ₂) and its interaction items with the starting point fairness (SPF).The results show that the urban-rural differences(ur) has a significant negative effect on the starting point fairness (SPF), indicating that the higher urban-rural differences, the lower starting point fairness (SPF), and vice versa.The interactions between urban-rural differences(ur), educational inequality(inequ₁) and employment inequality(inequ₂) have significant negative effects on the starting point fairness (SPF), indicating that the higher urban-rural differences, the higher negative effects of education inequality and employment inequality on the starting point fairness (SPF). Or the higher education inequality and employment inequality, the higher negative effect of urban-rural differences on the starting point fairness (SPF).

Regional differences, its interaction items and starting point fairness.

The models 4-1 and 4-2 in Table IV reflect the regression results of the regional differences (reg), employment inequality(inequ₂), public infrastructure inequality(inequ₄) and its interaction items with the starting point fairness (SPF).The results show that the regional differences (reg) has a significant negative effect on the starting point fairness (SPF), indicating that the higher regional differences, the lower starting point fairness, and vice versa. The interactions between regional differences (reg), employment inequality(inequ₂), public infrastructure inequality(inequ₄) have significant negative effects on the starting point fairness (SPF), indicating that the higher regional differences, the higher negative effects of employment inequality and public infrastructure inequality on the starting point fairness (SPF). Or the higher employment inequality and public infrastructure inequality, the higher negative effect of regional differences on the starting point fairness (SPF).

Opening-up, its interaction items and starting point fairness.

The models 5-1 and 5-2 in Table IV reflect the regression results of the opening-up (open), education inequality(inequ₁), employment inequality(inequ₂) and its interaction items with the starting point fairness (SPF).The results show that the opening-up(open) and the starting point fairness (SPF) have a significant inverted U-type relationship. It indicates that with the improvement of the opening-up, the starting point fairness is gradually increasing, but after the opening-up to a certain level, the starting point fairness is decreasing. The reason may be that in the initial period of the opening-up, China mainly open to "low-end" areas such as the labor-intensive production, which is obviously conducive to the development of labor-intensive industries or sectors (such as township enterprises). It can provide a large number of employment opportunities for low-skilled workers (rural surplus labors), thereby increasing their income and reducing income inequality. But with the deepening of China's opening-up, some "high-end" sectors such as capital-intensive and technology-intensive industries or sectors provide more jobs for highly skilled workers, thereby widening the income gap between highly skilled and low skilled workers. At this point, deepening opening-up may widen income inequality.

From the absolute value of regression coefficient of policy bias, urban-rural differences, regional differences, and opening-up in models 2 to 5, it can be seen that the negative effect of urban-rural differences on the starting point fairness is the highest, and the negative effect of policy bias on the starting point fairness is the second higher. The negative effect of regional differences on the starting point fairness is relatively small.

V. CONCLUSIONS AND POLICY IMPLICATIONS

This article designs the evaluation indexes of starting point fairness, and puts forward the measure method of starting point fairness. Based on the panel data of 31 provinces from 1985 to 2017, the article conducts a statistical measure of starting point fairness and econometric analysis of the determinants of starting point fairness in China. The research results and policy implications are as follows.

TABLE IV. ESTIMATION RESULTS OF THE DETERMINANTS OF STARTING Point Fairness

Explanatory Variable	Model 1 (Basic Model)	Model 2-1 (Policy Bias)	Model 2-2 (Policy Bias)	Model 3-1 (Urban-rural Differences)	Model 3-2 (Urban-rural Differences)	Model 4-1 (Regional Differences)	Model 4-2 (Regional Differences)	Model 5-1 (Opening-up)	Model 5-2 (Opening-up)
c	0.9999***	0.9996***	0.9995***	1.0002***	1.0020***	1.0079***	1.0173***	1.0002***	0.9979***
inequ1	-0.1336***	-0.1313***	-0.1336***	-0.1352***	-0.1337***	-0.1245***	-0.1132***	-0.1365***	-0.1341***
inequ2	-0.3585***	-0.3584***	-0.3583***	-0.3581***	-0.3586***	-0.3362***	-0.3394***	-0.3586***	-0.3587***
inequ3	-0.1267***	-0.1272***	-0.1250***	-0.1265***	-0.1264***	-0.1268***	-0.1270***	-0.1271***	-0.1269***
inequ4	-0.2697***	-0.2695***	-0.2694***	-0.2696***	-0.2698***	-0.2689***	-0.2685***	-0.2691***	-0.2701***
Inequ5	-0.1115***	-0.1114***	-0.1113***	-0.1114***	-0.1161***	-0.1115***	-0.1116***	-0.1117***	-0.1109***
poli		-0.1214*	-0.1223*						
poli*inequ1		-0.0801**							
poli*inequ3			-0.0845**						
ur				-0.2113**	-0.2105**				
ur*inequ1				-0.0862**					
ur*inequ2					-0.1137**				
reg						-0.0894*	-0.0863*		
reg*inequ2						-0.0804**			
reg*inequ4							-0.0722**		
open								0.0598**	0.0595**
open2								-0.1533*	-0.1487*
open*inequ1								-0.0476**	
open*inequ2									-0.0687**
adj-R2	0.9812	0.9905	0.9908	0.9807	0.9811	0.9769	0.9787	0.9753	0.9782
Prob-F	0.0000***	0.0000***	0.0000***	0.0000***	0.0000***	0.0000***	0.0000***	0.0000***	0.0000***

^b. Note: ***, **, * indicate significant regression factors at levels of 1%, 5% and 10%, respectively.

A. Conclusions

Conclusion I: China's starting point fairness is quite fair generally, showing an upward trend.

The results show that the starting point fairness has increased from 0.565 in 1985 to 0.8017 in 2017, that is, from relatively unfair to very fair, which is generally on the rise. Among them, 1985-1987 was relatively unfair (mainly due to the low equity of employment and public infrastructure), 1988-1997 was relatively fair, 1998-2016 was quite fair, and 2017 was very fair.

Conclusion II: China's education equity and public health equity are very fair generally. Public infrastructure equity is quite fair. Public natural resources equity is relatively fair. Employment equity is relatively unfair. All of them show an upward trend.

The results show that the mean of educational equity, employment equity, public health equity, public infrastructure equity and public natural resources equity in China from 1985 to 2017 were 0.8202, 0.5879, 0.8384, 0.7140 and 0.6706, respectively. The education equity and the public health equity are very fair. The public infrastructure equity is quite fair. The public natural resources equity is relatively fair. The employment equity is relatively unfair (mainly due to the low

level of equity in the number of vocational training institutions for job-seekers per 1,000 people). Among them, the educational equity was quite fair in 1985-1993 and very fair in 1994-2017, which was in a steady rise in general. Employment equity was relatively unfair in 1985-2002, 2004, and 2008-2009 (mainly due to the low level of equity in the number of vocational training institutions for job-seekers per 1,000 people), and in other years it was relatively fair, which was in a steady rise in general. Public health equity was very fair generally, except for a few years. Public infrastructure equity was relatively unfair in 1985-1989 (mainly due to the low level of equity in public transport vehicles per 10,000 people and per capita communication infrastructure). In 1990-1995, it was relatively fair. In 1996-2016, it was quite fair. And in 2017, it was very fair. The public natural resources equity was quite unfair in 1985-1987 and relatively unfair in 1988-1993, 1996 (mainly due to the low equity in per capita water resources). In 1994-1995, 1997-1999, it was relatively fair. In 2000-2017, it was quite fair.

Conclusion III: Education inequality, employment inequality, public health inequality, public infrastructure inequality, and public natural resources inequality have significant negative effects on the starting point fairness.

The results show that the higher education inequality, employment inequality, public health inequality, public infrastructure inequality, and public natural resources inequality, the lower starting point fairness, and vice versa. The negative effects of employment inequality and public infrastructure inequality on the starting point fairness is the highest. The negative effect of education inequality and public health inequality on the starting point fairness is the second higher. The negative effect of public natural resources inequality on the starting point fairness is relatively small.

Conclusion IV: Policy bias, urban-rural differences, and regional difference have significant negative effects on the starting point fairness. The opening-up and the starting point fairness have a significant inverted U-type relationship. Policy bias, urban-rural differences, regional differences and opening-up have further widened the negative effects of education inequality and employment inequality on the starting point fairness.

The results show that the higher policy bias, urban-rural differences, and regional differences, the lower starting point fairness, and vice versa. The opening-up and the starting point fairness have a significant inverted U-type relationship. The negative effect of urban-rural differences on the starting point fairness is the highest, and the negative effect of policy bias on the starting point fairness is the second higher. The negative effect of regional differences on the starting point fairness is relatively small. The interactions between policy bias, education inequality and public health inequality have significant negative effects on the starting point fairness, indicating that the policy bias further widen the negative effects of education inequality and public health inequality on the starting point fairness. The interactions between urban-rural differences, education inequality and employment inequality have significant negative effects on the starting point fairness, indicating that the urban-rural differences further widen the negative effects of education inequality and employment inequality on the starting point fairness. The interactions between regional differences, employment inequality and public infrastructure inequality have significant negative effects on the starting point fairness, indicating that that regional differences further widen the negative effects of employment inequality and public infrastructure inequality on the starting point fairness. The interactions between opening-up, education inequality and employment inequality have significant negative effects on the starting point fairness, indicating that the opening-up further widen the negative effects of education inequality and employment inequality on the starting point fairness.

B. Policy Implications

The above results provide important policy implications: In order to achieve the starting point fairness (right equal and opportunity equal), government must ensure that all members of society have equal right according to law (right to life, education, employment, vote and be elected, etc.) and equal opportunity (participation opportunity, development opportunity and sharing opportunity). The policies of education, employment, public health, public infrastructure and public natural resources must achieve rational allocation of resources,

reduce inequality, eliminate policy biases and further narrow the urban-rural and regional differences.

The first step is to promote equity in employment opportunities. The results show that the employment equity is the lowest among all the second-level indicators of the starting point fairness. The employment inequality has a significant negative effect on the starting point fairness. Employment is the foundation of people's livelihood and affects the vital interests of all workers. The government has an important responsibility in promoting employment equity. First, the government should provide complete information on employment. In the employment system, all high-quality jobs should be open to all members of society. Second, the government should develop the vocational training institutions, provide targeted vocational training for vulnerable groups, promote their labor ability and reduce opportunity inequality. Third, the government should improve the open recruitment system and the supervision mechanism of the recruitment process, avoid "background" and "relationship", correct all kinds of discriminatory recruitment practices, and ensure the competition equity in the employment market. Fourth, the government should abolish all kinds of policies and regulations that are not conducive to the flow of labor force. In particular, barriers to employment in administrative departments and state-owned monopoly enterprises should be broken down to provide equity employment opportunity, especially those in rural, remote, poor and ethnic-minority areas.

The second step is to promote equality in education opportunities. The results show that education inequality has a significant negative effect on the starting point fairness. In order to narrow the gap of education between urban-rural and regions, it is necessary to strengthen education equality and provide equal access to education, especially for rural residents, low-income persons and vulnerable groups. It is recommended that the state implement 12 years of compulsory education and use the money wisely. The government should increase educational expenditure, guide educational resources and stimulate teachers to rural, remote, poor and ethnic-minority areas. At the same time, the government should increase support for vocational education, provide workers with diversified vocational education and skills training.

The third step is to promote equality in public resources allocation. The results show that inequality of public health, public infrastructure and public natural resources have significant negative effects on the starting point fairness. Public resources are the most basic objects in income distribution. Whether or not the distribution of public resources is equity determines to a large extent whether or not the starting point is fair.

Since the rural, remote, poor and ethnic-minority areas are naturally disadvantaged in the process of economic development, to achieve the starting point fairness, the government should increase public health expenditure, expand the coverage of health services and guarantee the basic health services of the bottom groups. The government should also speed up the construction of public infrastructure such as transportation, water conservancy and electric power communications in poor

areas, achieve the equity of public health and public infrastructure in urban-rural and regions. This is an important way to improve the starting point fairness.

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