



Working together
www.rcis.ro

Revista de Cercetare si Interventie Sociala

ISSN: 1583-3410 (print), ISSN: 1584-5397 (electronic)

EDUCATION EQUITY IN SPECIAL EDUCATION TRANSFER PAYMENTS TO LOW-INCOME GROUPS

Yanmin SHAO, Wei LIU, Ming JI

Revista de cercetare și intervenție socială, 2019, vol. 65, pp. 163-186

<https://doi.org/10.33788/rcis.65.11>

Published by:

Expert Projects Publishing House



On behalf of:

„Alexandru Ioan Cuza” University,
Department of Sociology and Social Work
and
HoltIS Association

REVISTA DE CERCETARE SI INTERVENTIE SOCIALA

is indexed by Clarivate Analytics (Web of Science) -

Social Sciences Citation Index

(Sociology and Social Work Domains)

Education Equity in Special Education Transfer Payments to Low-income Groups

Yanmin SHAO¹, Wei LIU², Ming JI³

Abstract

Under the “Chinese-style” decentralization system, transfer payments have not only become the major source of funding for most local governments to provide public services, but also become important policy tools for higher levels of government. Education transfer payment is an important institutional arrangement to narrow the educational investment gap and promote education equity. Therefore, the establishment of a standardized special transfer payment system for compulsory education is the guarantee for promoting education fairness for low-income groups. The Gini coefficient of education not only reflects the role of education in promoting economic growth and social development, but also an important indicator of the fairness of education. The Gini coefficient of education in various provinces in China shows that there is a clear gap between our country and the developed countries in education. There is also a serious gap between high-income and low-income groups. This paper uses the non-recursive structural equation method as the background to reform the rural compulsory education funding guarantee mechanism. It combines the Gini coefficient of education and the data of 423 counties in five provinces in central China in 2017. The results show that the embedding of “prize excellence” mechanism in the system of compulsory education transfer payment can inspire the government to shift resources toward basic education. In this way, a fair and efficient special transfer payment system can be established to ensure the fairness of education for low-income groups.

Keywords: education transfer payment; low-income groups; educational fairness; Gini coefficient of education.

¹ School of Marxism, Jilin University, CHINA. E-mail: shaoym@jlu.edu.cn

² School of Marxism, Jilin University, CHINA. E-mail: weiwei_19891219@163.com

³ Center for China Public Sector Economy Research; School of Marxism, Jilin University, CHINA. E-mail: jiming23@jlu.edu.cn (*Corresponding author*)

Introduction

Transfer payments are an important part of modern fiscal governance. Non-designated general transfer payments can play a role in balancing the inter-regional fiscal capacity. Special-purpose transfer payments can better guide and standardize local government behaviors. They must not be neglected. On the one hand, the proportion of balanced funds in general transfer payments is too small, which has little effect on balancing regional fiscal capacity (Finnigan, *et al.*, 2015; Erola, Jalonen, & Lehti, 2016). On the other hand, considerable parts of the special transfer payments are divided administratively, showing “small, scattered, chaotic” features. On the one hand, the central government emphasizes the improvement of the growth mechanism of the general transfer payment, and on the other hand, it vigorously rectifies special transfer payments.

In 2005, the central government’s special subsidy for compulsory education in the province only accounted for 0.95% of the total expenditure on compulsory education in the provincial budgets, while the provincial-county special education subsidy only accounted for less than 4% of the county’s total fiscal education expenditures (He, 2018). We take the case of arrears of teachers’ salaries as an example. Since 2001, the central government has allocated 5 billion yuan of teacher salary each year, but it still cannot completely solve the problem of teachers’ wage arrears. As wages are too low, the number of teachers, especially primary and secondary school teachers is decreasing. The consequence is that the teacher-student ratio is seriously out of balance and the quality of education is declining (Schleicher & Zoido, 2016). The average funding for education in the eastern provinces and cities of China is 3.1 times that of the western region. Judging from the sources of education funding and expenditure structure, the proportions of fiscal education funds, tuition and fees, social donations, other education funds, and social resources for running schools in western provinces are respectively 76.35%, 9.05%, 3.50%, 10.31%, and 0.63%. In the eastern region, this ratio structure is 66.98%, 12.30%, 4.498%, 13.89% and 2.29%. (Guo & Zou, 2015) The expenditure on education for primary school students in the East is 1.8 times that of the West. Improving the level of investment in compulsory education is a long-term task for our country. At present, financial departments at all levels manage Chinese education funds. In the case where the fiscal budget system is not perfect, not only general transfer payments can be allocated in proportion to the regulations, but also special transfer payments are often misappropriated and misappropriated (Perna, 2016). According to the Intelligence Development Institute of the Shanghai Academy of Sciences, the cost of education finance and primary education in 491 national poverty-stricken counties in China has analyzed (Rich & Jennings, 2015). The results show that the country’s annual subsidy of tens of millions of yuan for impoverished counties does not seem to benefit greatly from rural primary schools that are particularly poor. In the view of many education finance scholars, the issue of education equality and equality

of educational opportunities is, in fact, largely a question of equitable education finance. Modern finances must not only satisfy the balance of the budget, but also pay attention to social fair and harmonious development. The fairness of education finance is the best embodiment of education fairness. Fairness is not a natural attribute of education, and education cannot automatically achieve fair results (Cochran-Smith *et al.*, 2016; Cortes, Gallego, & Maldonado, 2016). The only way to achieve educational equity is education equity. This is also a direction of education finance reform in many modern countries.

Literature Review

The research on Chinese compulsory subsidy program for compulsory education has started since the 1990s. For example, the World Bank designed a system of compulsory education subsidy for impoverished areas for 592 poor counties in China. Luo Xiaohua obtained a game analysis between the central government and the local government: The central government must establish an effective incentive and supervision mechanism and take the degree of effort in local compulsory education investment as an important basis for determining the amount of transfer payments. MO and BE were measured based on the perception of students. In addition to students, also market, community, decision-makers and academic management, are suggested as major challenges for HE and must be taken into account for competitive advantage. Chinese current compulsory education financial transfer payment system includes general transfer payments and special transfer payments. General transfer payments include tax return and transitional transfer payment (Cross *et al.*, 2018). After the “Compulsory Education Law” has promulgated in 1986, the central government began to implement special transfer payments for compulsory education in economically difficult areas and areas inhabited by ethnic minorities. The influence of prior academic background (i.e. acquired knowledge, and study and time management skills) explains the outcomes of some students, especially those who drop out due to academic reasons (Berlanga, Figuera, & Perez-Escoda, 2016). With the reform of Chinese compulsory education management system, the central government has paid more and more attention to the special transfer of compulsory education from provincial governments. Both general transfer payment and special transfer payment include education payment items. The study on China’s compulsory subsidy program for compulsory education has started since the 1990s when the World Bank’s (1998) “Primary Education Subsidy for Poverty-Stricken Areas” system has designed for 592 poor Chinese counties. Later research shows that an effective education transfer payment monitoring mechanism can better promote education development and narrow the education gap.

Research Design

Data Source

As far as government education functions are concerned, ensuring that everyone has the same opportunities for education and improving the income distribution by improving the educational opportunities of disadvantaged groups such as the underprivileged and thereby maintaining education equity is a major reason for government intervention in education. At the current level of economic development in our country, the government's public education resources are scarce and education resources are scarce. Faced with this resource shortage, how to achieve equitable education finance involves the equitable distribution of public education resources (Goldrick-Rab *et al.*, 2016). Judging from the study of fairness in compulsory education finance, at least the following principles are widely accepted in philosophy:

1. *Principle of Distribution Equity*. That is, each student receives an equal distribution of resources, that is, the amount of public education funding received by students receiving public funds is the same regardless of their abilities.

2. *Fiscal Neutrality*. "The difference in the expenditure on public education for each student cannot be related to the wealth of the district." This principle has become a legal principle in some countries. Its practical implication is that although the degree of affluence in each region is different, the legal refusal to use this as a basis has led to a disparity in the average student's education funding in different regions.

3. *Adjusted for special needs*. That is, pay more attention to and give financial allocation to ethnic minority or students of different races, students scattered in remote areas and living areas, poor students, and physically and mentally handicapped students.

4. *The principle of the resources flow from rich areas to poor areas*. This is the criterion for countries to judge whether the financial allocations for education are fair at this stage (Melguizo, Sanchez, & Velasco, 2016). It is considered to be fair and consistent with this flow of resources, or to contribute to the realization of this flow, and vice versa. The improvement of school material conditions and the improvement of teachers' ability can be reflected largely by the level of public education expenditure.

Therefore, the fairness of public education expenditure is to explore equal educational opportunities from the perspective of educational expenditure. Since public education expenditure is an important part of education finance research, the above criteria for the fairness of education finance should be followed. (Bulman, Eden, & Nguyen, 2017) According to the above criteria for judging the fairness of education finance, the fairness of public education expenditure can be divided into two levels:

1. Everyone in the education system should be given the same opportunity to enjoy public education spending, especially in the compulsory education stage. All children can enter the school to receive education, and receive roughly equal government public education expenditure. This is consistent with the first and second principles of education financial fairness, and it can be considered as fairness of expenditure based on the principle of equality.

2. In the process of receiving education, the government's public education expenditure should reflect the compensation effect for those students who are disadvantaged in the economic, social or cultural aspects. This is in line with the third and fourth principles of equitable financial education. It can be considered as fairness based on the difference principle (Chaudry & Wimer, 2016). At the stage of compulsory education, it has reflected in efforts to narrow the disparities in expenditure between different regions and student groups. Public education expenditure should be skewed toward disadvantaged student groups or regions. The government should provide financial assistance to children and adolescents who are unable to attend school because of family financial difficulties.

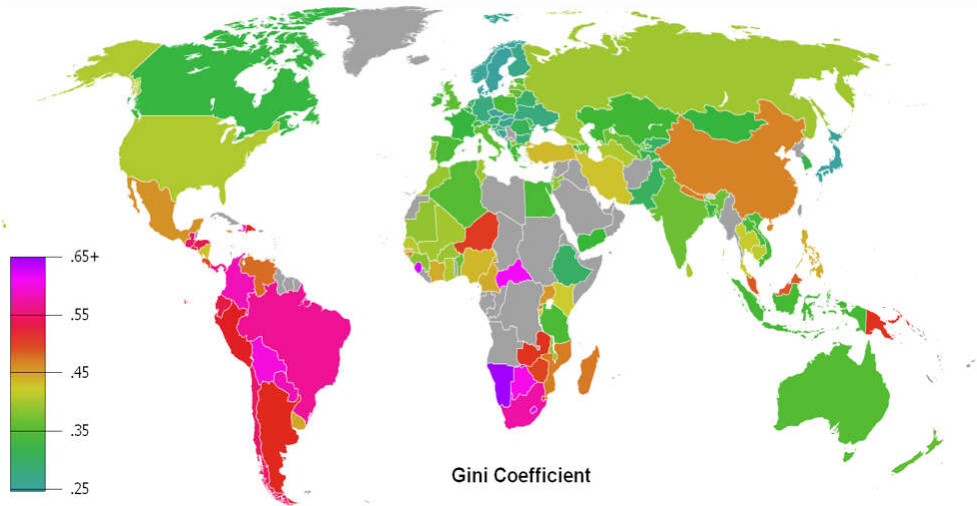


Figure 1. The division of Gini coefficient section of world education

In recent years, the Chinese government has taken various measures to improve the fairness of education in our country. In order to reflect the status of education fairness in China, this paper uses the demographic data of each region in China Statistical Yearbook by gender and educational level as the basis to calculate the per capita schooling years and Gini coefficient for education in mainland China. The Gini coefficient of education in the world is shown in *Figure 1*. The calculation method for the average number of years of education per capita is to divide the population aged 6 and over by the difference in the number of years of education, and then to weight them according to the ratio of different populations to the total

population, in order to obtain per capita income. The formula for the number of years of education (also known as per capita human capital stock) is as follows:

$$H_t = \sum_{i=1}^n x_i h_i \tag{1}$$

The formula for the Gini coefficient is:

$$G = 2 \left[\sum_{i=1}^n \left(y_i \sum_{i=1}^n x_i \right) \right] - \sum_{i=1}^n y_i x_i - 1 \tag{2}$$

Among them, H_t is the per capita human capital stock of t years, H_i is the education period of the i . x_i is the percentage i in the total population. G is the Gini coefficient, y_i is the percentage of the total number of years of education in the i population that has served in the region. The n in this article is divided into 5 levels (Packness, *et al.*, 2017; Mok, 2015). Among them, one refers to illiteracy, the number of years of education 0. Two refers to the primary school, the number of years of education 5. Three refers to junior high school, the number of years of education 9. Four refers to high school, the number of years of education 12. Five refers to college degree and above, the number of years of education 16. The calculation results by provinces and cities according to equations (1) and (2) are shown in *Table 1*:

Table 1. Per capita education time and education Gini coefficient in Chinese provinces

Province	Per Capita Education Time	Gini Coefficient of Education	Province	Per Capita Education Time	Gini Coefficient of Education
Beijing	10.5425	0.2157645	Hubei	7.5	0.2815131
Tianjin	9.2929	0.2356949	Hunan	7.6528	0.2571033
Hebei	7.8689	0.23503772	Guangdong	8.04	0.2416045
Shanxi	8.1192	0.2247472	Guangxi	7.2611	0.2590452
Inner Mongolia	7.9443	0.2830848	Hainan	7.7996	0.2606674
Liaoning	8.4731	0.2267197	Chongqing	6.9682	0.2915337
Jilin	8.1636	0.2315663	Sichuan	6.4032	0.318407
Heilongjiang	8.1714	0.237669	Guizhou	5.972	0.3491696
Shanghai	9.8861	0.2281595	Yunnan	5.9006	0.344438
Jiangsu	7.8454	0.2766322	Tibet	3.3089	0.5349268
Zhejiang	7.2538	0.296695	Shaanxi	7.7503	0.2726448
Anhui	6.7031	0.3256875	Gansu	6.4957	0.3545206
Fujian	7.1787	0.2983491	Qinghai	6.4158	0.3996491
Jiangxi	7.1261	0.2735789	Ningxia	7.0413	0.3393199
Shandong	7.4327	0.2823203	Xinjiang	7.8537	0.2758575
Henan	7.6987	0.2460143	National	7.4967	0.281490

From *Table 1*, we can see that there are obvious negative correlations between the per capita education years and the education Gini coefficient. The higher the per capita education period is, the lower the education Gini coefficient is. The state of education in China has obviously improved, but the level of education per capita is still relatively low. There is also a big gap between the educational equity of our country and the developed countries (Goldrick-Rab, *et al.*, 2016; Cahalan *et al.*, 2018; Khan *et al.*, 2016). In general, the per capita educational years and Gini coefficient of education in the eastern provinces with relatively developed economies are better than those in the central and western provinces are. The central provinces are also better than the western provinces. Among them, Tibet has the highest inequality, with a Gini coefficient of 0.5349268. It can be seen that the degree of unfairness in education is closely related to the level of economic development. There are also serious imbalances between urban and rural areas in China and different family backgrounds (Levin, 2017). As far as urban-rural imbalances are concerned, the problem of unfair education for children in rural areas is obvious. There is a big gap between the education development in urban and rural areas in China. The comparison of educational resources in each province is as follows.

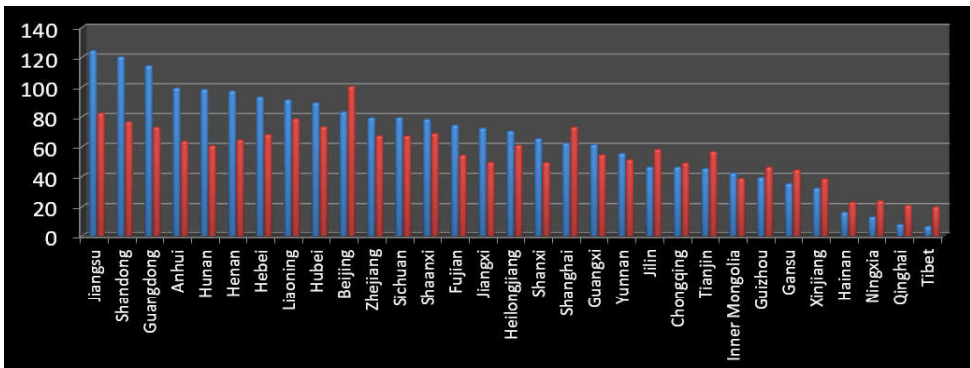


Figure 2. General Situation of Education in China

The education funds in rural primary and secondary schools are seriously inadequate. They face many difficulties in the teaching environment, teaching facilities, and teachers' allocation. This has led to unfair education opportunities for rural children. The survey data of the Institute of Education and Economics of Peking University shows that the distribution of quality higher education opportunities in China is more inclined to the stratum where the socio-economic background is at an advantage. There are also imbalanced issues in different stages of education. Judging from the Gini coefficient based on the school enrolment ratio, the degree of education disparity between provinces in China has increased with the improvement of education level, and the fairness of education access in compulsory education, high school, and university has dropped in turn (Snilstveit

et al., 2015; Hjorth et al., 2016). Although the degree of equal opportunity for enrollment in compulsory education is high, the input to education is very different. Although there is relatively little difference in the investment in university education between provinces, the opportunities for enrollment are very uneven. Because of the unfairness of education in our country, the role of education in promoting economic growth and social justice is severely limited. The unfairness of education in the region has led to an imbalance in economic growth among regions. This has led to excess supply in developed regions and a serious shortage of supply in backward regions, which is not conducive to upgrading the overall industrial structure of the country. The unfairness of education in urban and rural areas has led to a continuous decrease in the educational level and cultural quality of rural children. Unbalanced education between different family backgrounds can easily lead to the gap between the rich and the poor in society, and it is not conducive to social harmony and stability.

Evaluation and Measurement

Suppose there are two regions with the same level of economy. Each region has one local government, namely G_1 and G_2. The capital in the economy is held privately and the total amount is K, which can flow across regions without cost. The total economic output of each region is $F_i = f(k_i, I_i), i = \{1, 2\}$, k_i is the amount of capital flowing into region i. I_i is the infrastructure investment provided by local governments in region i. F_i has the nature of a normal production function:

$$\frac{\partial F_i}{\partial k_i} > 0, \frac{\partial F_i}{\partial I_i} > 0, \frac{\partial^2 F_i}{\partial k_i^2} < 0, \frac{\partial^2 F_i}{\partial I_i^2} < 0, \frac{\partial^2 F_i}{\partial k_i \partial I_i} > 0 \tag{3}$$

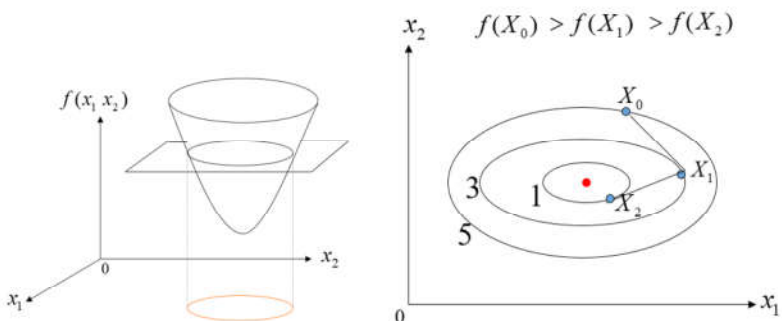


Figure 3. The basic idea of the optimization problem

We use the basic idea of optimization to study government behavior. (Figure 3) The local government G_I is taxed locally, the tax rate is t_i , and the fiscal revenue obtained is $t_i F_i$. The fiscal expenditures of local governments include two items, one is to provide infrastructure investment I_i (considered as constructive public goods), and the other is to provide public goods for local residents (such as science, education, culture, and other investments). The utility acquired by the local residents from s . Therefore, the utility function of local governments can be written as:

$$U_{G_i} = \lambda F_i + v(s_i) = \lambda f(k_i, I_i) + v(s_i) \tag{4}$$

s.t. $s_i + I_i = t_i F_i = t_i f(k_i, I_i)$

Before studying the optimization options of local governments, consider the social optimal situation as a benchmark to facilitate comparative research. The optimization problems faced are:

$$\max_{I_i, k_i, s_i} U_{sp} = \sum_{i=1,2} \lambda F_i + v(s_i) \tag{5}$$

s.t. $k_1 + k_2 = K \quad I_1 + I_2 + s_1 + s_2 = t(F_1 + F_2)$

Solving the above optimization problem gives Proposition 1.

For ease of writing, define:

$$f_1 = \frac{\partial f\left(\frac{K}{2}, I\right)}{\partial I}, h(I) = tf\left(\frac{K}{2}, I\right) - 1 \tag{6}$$

Proposition 1: The social optimal equilibrium is symmetric equilibrium. $I_1 = I_2 = I^{FB}, s_1 = s_2 = s^{FB}, k_1 = k_2 = K / 2$, In addition, the optimal value satisfies $\lambda f_1 F B = v'(s^{FB})(1 - t f_1 F B)$ where $s^{FB} = h(I^{FB})$ is the budget balance constraint faced by the planner when symmetric equilibrium is used.

Although local governments in Region 1 only care about the interests of the region, they must consider the interactive response of local governments in Region 2 when investing in infrastructure. Optimization issues can be expressed as:

$$\max_{I_1, s_1} U_{G_1} = \lambda f(k_1, I_1) + v(s_1) \tag{7}$$

s.t. ; $I_1 + s_1 = tf(k_1, I_1) \quad \frac{\partial f(k_1, I_1)}{\partial k_1} = \frac{\partial f(k_2, I_2)}{\partial k_2} \quad k_1 + k_2 = K$

Because the regions are the same, consider the symmetrical equilibrium

solution. Define $f_k = \frac{\partial f(k, I)}{\partial k} |_{k=K/2}$. To ensure that the solution of the first-order condition in the symmetric equilibrium is the maximum solution, suppose

$f_k = \frac{\partial k_1}{\partial I_k}$. Then the equilibrium of local government competition has the following properties: $I^{SB} > I^{FB}, s^{SB} < s^{FB}$.

Compared with social optimization, local governments invest more in infrastructure, while basic public services provide less. In the socially optimal situation, social planners care about the overall interests of the two regions and androgenize negative externalities.

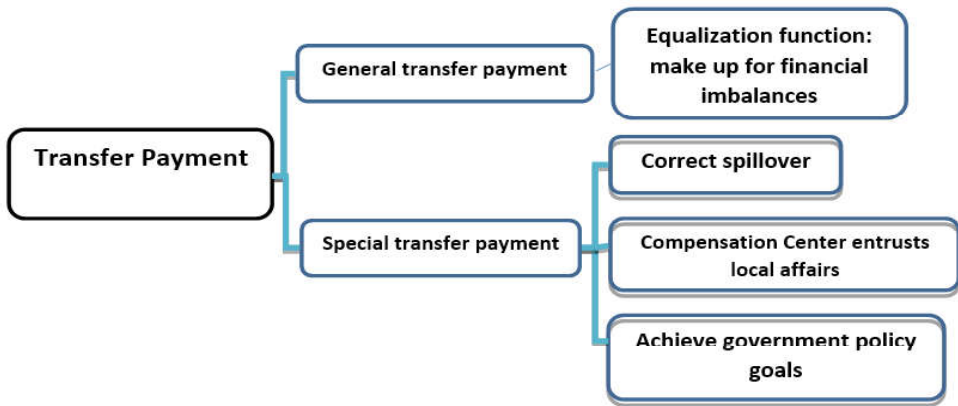


Figure 4. Transfer payment framework

Since the provision of public services is insufficient, the central government can alleviate this problem through special transfer payments (Figure 4). Specifically, the central government collects revenue from local governments, and then transfers these funds to local governments to provide local basic public services through a “special fund-specific” approach. There are two rules for centrally distributing special transfer payments. One is “helping the weak”. If there is less than one area in one area, then there will be more transfers. The other type is “rewards,” which control the differences in regional characteristics. In a certain area, there are more than in another area, indicating that the degree of financial efforts is relatively high, and then it will obtain a larger amount of transfer.

That is: $v'(s_1 + s_1^T) = v'(s_2 + s_2^T)$ (8)

According to the property of the function, there must be $s_1 + s_1^T = s_2 + s_2^T$

And because $s_2 + s_2^T = 2T$

$$\text{So } s_1^T = T + \frac{s_2 - s_1}{2} \quad (9)$$

It can be seen that the more basic public services are put into the region, the less the central transfer payment will be obtained. Therefore, the mechanism by which local governments influence s_1^T through I_1 is relatively complex and the overall effect depends on the marginal returns of infrastructure investment. The mathematical expressions are given in *Lemma 1*.

$$\text{Lemma 1: In symmetric equilibrium, } \frac{\partial s_1^T}{\partial I} = \frac{1}{2} \left[1 - t \left(2f_k \frac{\partial k_1}{\partial I_1} + f_1 \right) \right] \quad (10)$$

According to Lemma 1, we can see that if the marginal income from education investment is large, increasing investment in education will reduce transfer payments in the region. The reason is that investment in education has increased a bit; attracting a lot of capital inflows, and the other party's fiscal revenue has fallen more. The number of public services provided by the other party decreased more, while the local government received less central grant because of the inflow of more capital, the increase in fiscal revenue, and the less or even increased education provided. After the local government G_1 anticipates the central government's transfer payments, the optimization problems it faces can be expressed as:

$$\begin{aligned} \max_{I_1, s_1} U_{G_1} &= \lambda f(k_1, I_1) + v(s_1 + s_1^T) \\ \text{s.t. } I_1 + s_1 + T &= tf(k_1, I_1); \\ s_1^T &= T + \frac{s_2 - s_1}{2}; \frac{\partial f(k_1, I_1)}{\partial k_1} = \frac{\partial f(k_2, I_2)}{\partial k_2}; k_1 + k_2 = K \end{aligned} \quad (11)$$

Under the “weakening” rule, if the marginal revenue of education investment is large, such as the early stage of economic development, the increase in regional investment in education will reduce the transfer payments in the region, which reduces incentives for local investment. At this time, the central government has improved the distortion of local fiscal expenditure structure through education transfer payments and has really helped local governments. If the marginal revenue of infrastructure investment is not very large, such as during the more developed economy, the increase of regional infrastructure investment will increase the transfer payment in the region. Therefore, the investment infrastructure of local governments not only competes for mobile capital, but also competes for central subsidies. The involvement of the Central Government will increase the distortion of the fiscal expenditure structure.

When the central government allocates funds to try to reward those regions where there is a large investment in education, we model this rule as follows: The amount allocated by the central government to Region 1 is. The amount of region 2

is $s_1^T = \frac{s_1}{s_1 + s_2} 2T$, l_1 may reduce s_1^T , but it will attract capital inflows in Region 2 and

reduce, so the overall effect on transfer payments is uncertain, depending on the extent to which $s_1 + s_2$ have decreased. Specific mathematical expression sees Lemma 2.

Lemma 2: In symmetric equalization,

$$\frac{\partial s_1^T}{\partial I} = \frac{T}{2s^{**}} \left[t \left(2f_k \frac{\partial k_1}{\partial I_1} + f_l \right) - 1 \right] \quad (12)$$

Comparing Lemma 1 with *Lemma 2*, we can find an interesting conclusion, that is, under the two rules; the impact of increasing local government investment in education on the region is reversed. This is because the rules for allocating transfer payments are reversed. Therefore, according to the “weakening” rule, local transfer payments should be increased, and according to the “reward premium” rule, local transfer payments should be reduced. When the marginal return on investment in education is very large, the conclusion is similar. In considering the impact of investment in education on transfer payments, the optimization problems faced by local governments are:

$$\begin{aligned} \max_{I_1, s_1} U_{G_1} &= \lambda f(k_1, I_1) + v(s_1 + s_1^T) \\ \text{s.t.} \quad I_1 + s_1 + T &= f(k_1, I_1); s_1^T = \frac{s_1}{s_1 + s_2} 2T; \\ \frac{\partial f(k_1, I_1)}{\partial k_1} &= \frac{\partial f(k_2, I_2)}{\partial k_2}; k_1 + k_2 = K \end{aligned} \quad (13)$$

According to the above analysis, in the early stage of economic development, the marginal revenue of education investment is very large, and the “weakening” rule should be adopted. In the more economically developed period, adopting the “weakening” rule will increase the distortion of local fiscal expenditure structure, so the central government should adopt the “reward for excellence” rule. Taking the special subsidy for rural compulsory education implemented in central China in the early 21st century as an example, we examine the real-time transfer payment rules and effects.

Empirical test

Take the special subsidy for rural compulsory education in the five central provinces as an example. The comprehensive advancement of the reform of the guarantee mechanism for compulsory education funding in rural areas provides an opportunity for us to study the special transfer payment for education and the fairness of education. At the end of 2005, the State Council proposed to gradually include rural compulsory education in the scope of public finance protection, establish central and local sub-projects, and share the proportion of rural compulsory education funding mechanisms. This paper selects the central region as the research object in the region, specifically including the five provinces of Henan, Hubei, Hunan, Jiangxi, and Shanxi, and the data comes from the “2017 National Prefectural County Financial Statistics”. To eliminate some counties (cities) with relatively serious data missing, this paper finally selected 423 counties in five provinces. According to the previous theoretical construction, the payment of compulsory education transfer will affect the fairness of local education.

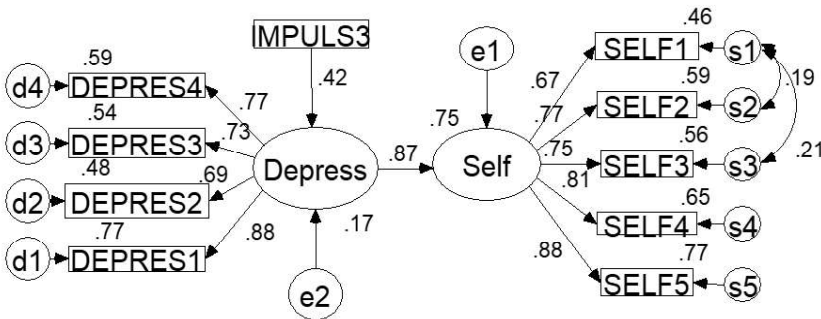


Figure 5. Structural equation model

At the same time, the fairness of local education will in turn affect the distribution of transfer payments (through the “weakening” or “excellent” mechanism), so transfer payments and education there may be a two-way causal relationship between fairness. One tool for resolving this two-way causality is the non-recursive structural equation model (Figure 5). The cross-section data used in this paper, including financial variables and other economic variables, has a strong temporal stability in theory, so it has strong confidence in the results of non-recursive structural equation estimation. The effect decomposition model and influencing factors in the structural equations are shown in Figures 6 and Figure 7.

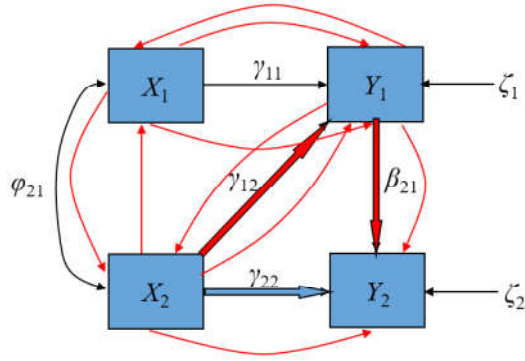


Figure 6. Effect decomposition

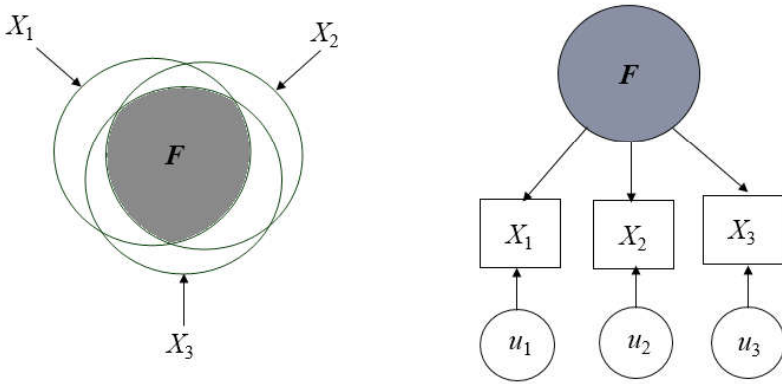


Figure 7. Effect Factor Structure

Basic model setting

$$\begin{aligned}
 Y_i &= \beta_i X_i + W_i \beta_{2i} u_i \\
 X_i &= \gamma_i Y_i + Z_i \gamma_{2i} v_i
 \end{aligned}
 \tag{14}$$

Among them, Y_i is the special subsidy for per capita compulsory education (logarithm), X_i is the local self-owned per capita educational expenditure (logarithm). In addition, considering that the central subsidy requires local support, the average matching ratio in the central region is about 6:4 (central: local). W_i and Z_i are a series of control variables related to regional characteristics, including per capita GDP, urbanization rate, population density, whether or not revolutionary old districts, ethnic minority settlements, per capita general transfer payments, local per capita budgetary fiscal revenue, and fiscal self-sufficiency rate and so on. See *Table 2* for the meaning of variables and statistical descriptions.

Table 2. The meaning of variables and statistical descriptions

Variable	Variable description	Observed value	Mean	Standard deviation	Min	Max
Ltranspc	Compulsory education subsidy	423	-4.08	0.36	-5.88	-3.11
Ledupc1	Education expenditure logarithm	423	-1.58	0.34	-2.42	-0.51
Ledupc2	The number of education expenditures after subsidizing compulsory education	423	-1.67	0.36	-2.55	-0.53
Ledupc3	The number of education expenditures after deducting local support	423	-1.75	0.39	-2.66	-0.54
Lgdppc	Per capital GDP logarithm	423	5.91	0.80	4.32	9.47
Urban	Urbanization rate of population	423	5.10	0.78	1.91	6.93
Ldpop	Population density	423	0.06	0.24	0.00	1.00
Fisdec	Financial self-sufficiency rate	423	0.37	0.48	0.00	1.00

In the previous theoretical analysis, it has pointed out that the economic effects of different transfer payment rules (ie, the degree of local education investment efforts) are related to the marginal income of education. According to the previous model, the hypotheses of the effect of transfer payment rules and different transfer payment rules on local autonomous education expenditures were proposed. Hypothesis 1: Under the control of a series of regional characteristics, if the subsidy for per capita compulsory education is negatively related to the level of local average educational expenditure, that is, the lower the level of local education services. The higher the subsidy for higher levels of compulsory education, if, $\beta_i < 0$, the special subsidy rules are generally “help the weak.” On the other hand, if $\beta_i > 0$, the rules for special grants are generally “outstanding.” According to the assumption of our theoretical model, the “excellent” transfer payment rules should be more conducive to the promotion of educational equity, and thus put forward the hypothesis 2. Hypothesis 2: If the transfer payment rule is “helping the weak,” it is easy to induce the local government’s fiscal moral hazard, and urge local governments to deliberately lower the level of education services and win more education transfer payments. Therefore, transfer payments will lead to a decrease in local autonomous education expenditure and a decline in the fairness of education.

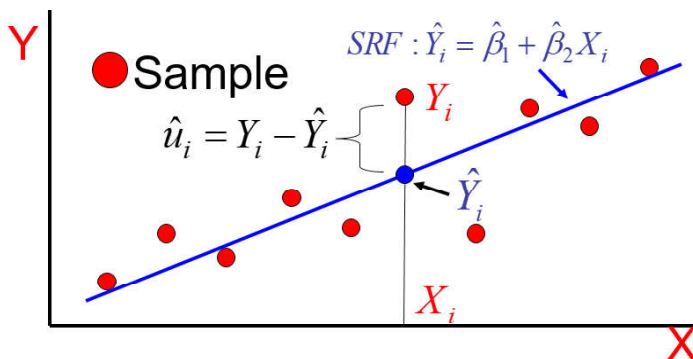


Figure 8. Method of ordinary least squares

First, the complex endogenous problems are ignored, and the possible setting of each equation in the structural equation model is detected by a single equation OLS regression analysis. OLS regression analysis structure has shown in Figure 8. The results obtained by the OLS regression cannot be used as the basis for the final causal inference, but only provide some reference information for the next non-recursive structural equation setting. Here only take the leducc2 indicator of local education efforts as an example.

Table 3. Transfer payment decision rules and incentive effects (OLS)

Variable	Ledupc1	Ledupc2	Ledupc3	ltranspc4	ltranspc5	ltranspc6
Ledupc2				0.209***	0.210***	0.213***
ltranspc	0.428***	0.431***	0.439***			
lroad	0.093**	0.093**	0.090**	-0.031		
ltranspc*lroad	-0.085					
llocrcvpc	0.192**	0.196**	0.250***	0.032		
lgtranspc	0.089***	0.089***	0.077***	-0.006		
lgdppc	0.113**	0.115**	0.118**	-0.148**	-0.137**	-0.130**
ldpop	-0.099***	-0.097***	-0.078***	0.037	0.29	0.031
urban	0.062	0.069		0.421***	0.431***	0.496***
fisdec	0.295	0.273		-0.089	0.028	
red				0.069***	0.068***	0.068***
min				0.056	0.058	0.059
constant	-4.087***	-4.165***	-4.468***	-1.923***	-2.548***	-2.606***
Observations	423	423	423	423	423	423
R-squared	0.601	0.600	0.598	0.834	0.833	0.833

From Table 3, we can find that (1)-(3) is the incentive effect model of transfer payments for local education expenditure, and (4)-(6) are the decision models for transfer payment rules. First, the coefficients of the core dependent variable ltranspc in (1)-(3) are always significant at the 1% level, and the coefficients of the core dependent variable ledupc2 in (4)-(6) are also significant at the 1% level.

The symbols are in line with the theoretical expectation: the higher the stock of infrastructure is, the lower the education income is, and the stronger the incentive for local education investment. Finally, remove the other inconspicuous other dependent variables in the respective models, and (3) and (6) become the starting point for the modeling of the next structural equation.

Empirical Results Based on Non-recursive Structural Equations

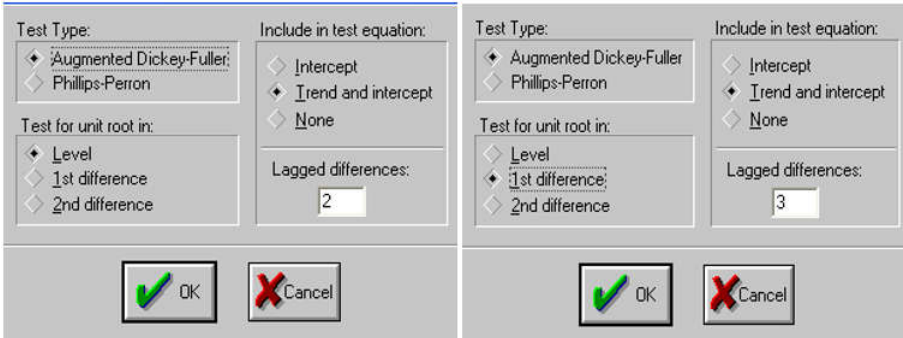


Figure 9. The operating interface of the ADF method

The ADF (asymptotic distribution free) (Figure 9) method does not assume the joint normal distribution assumption. Under the non-normal distribution, reasonable point estimates and standard deviations can still be obtained. That is to say, when the normal distribution assumption is violated, the ADF method can obtain more than the maximum likelihood method. Based on the previous OLS regression analysis, Figure 1 shows the non-recursive structural equation diagram of the interaction between *ledupc* and *ltranspc* (Wee, 2016). The illustration shows that there is a cyclic feedback relationship between *ledupc* and *ltranspc*, and the disturbances of these two endogenous variables are correlated. We will first estimate the direct effects between variables and then consider the indirect effects due to the cyclic feedback process. Adding direct effects and indirect effects, we can get the total effect of mutual influence between variables. Its structure is shown in Figure 10.

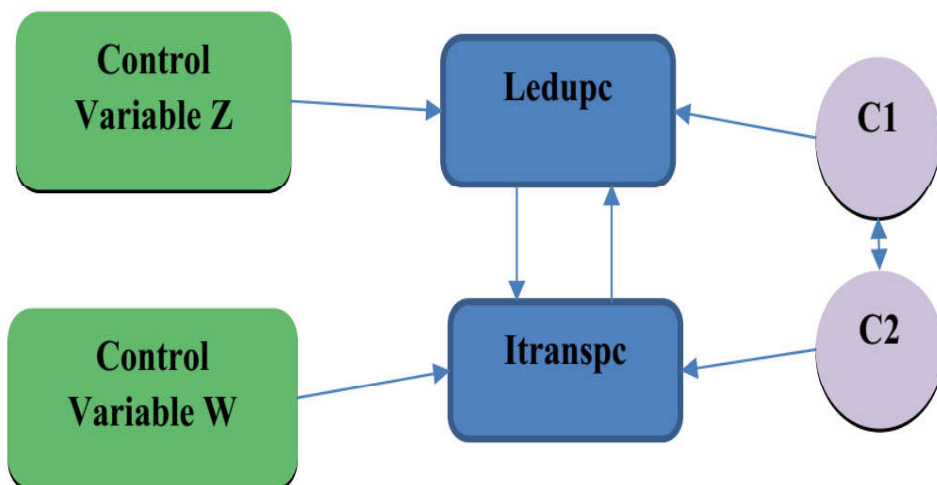


Figure 10. Non-recursive Structural Equations of Educational Transfer Payment and Educational Fairness

Table 4 reports the interaction between education fairness and transfer payments. The direct effect shows that there is a significant two-way causal relationship between rural compulsory education subsidies and local per capita educational expenditures. On the one hand, the superior compulsory education subsidies can effectively incentivize the local government’s education investment (about 0.5 in elasticity). Even after deducting local supporting factors, the special subsidies for compulsory education still have a significant incentive effect on local investment, which is consistent with the “special Subsidy effective hypothesis.” After controlling a series of local characteristics, counties with high levels of self-employment education will receive more transfer payment awards, increase the amount of self-owned education expenditure by 1%, and increase the amount of transfer payment acquisition by 0.26%-0.28percentage. This effectively restricts the local government’s fiscal moral risk behavior. For example, special subsidies for compulsory education affect local self-education expenditures, and the level of local education expenditures in turn affects higher-level transfer payment awards, thereby affecting the fairness of local education (Zipin *et al.*, 2015). In this cycle, the total effect of the special subsidy for compulsory education on local education expenditure will be obtained. The effect of special grant *ltranspc* on local education spending *ledupc2* was calculated. The direct effect coefficient was 0.488 and the total effect coefficient was 0.562. The difference between the two was indirect effect.

Table 4. Structural Transfer Equation Estimation Results for Educational Transfer Payments and Educational Equity

Variable	Direct-effect1	Direct-effect2	Direct-effect3	Total-effect1	Total-effect2	Total-effect3
Education Equity	Ledupc1	Ledupc2	Ledupc3	Ledupc1	Ledupc2	Ledupc3
Ledupc1				0.156***		
Ledupc2					0.152***	
Ledupc3						0.147***
ltranspc	0.478***	0.488***	0.494***	0.553***	0.562***	0.567***
llocrcvpc	0.232***	0.247***	0.260***	0.268***	0.285***	0.298***
lgtranspc	0.062***	0.069***	0.075***	0.072***	0.080***	0.086***
lgdppc	0.094**	0.115***	0.132***	0.030	0.049	0.065
ldpop	-0.077***	-0.084***	-0.090***	-0.07***	-0.076***	-0.082***
urban				0.235***	0.242***	0.247***
red				0.031***	0.031***	0.032***
min				0.038**	0.040**	0.041**
Special Education Grant	ltranspc	ltranspc	ltranspc	ltranspc	ltranspc	ltranspc
Ledupc1	0.283***			0.327***		
Ledupc2		0.269***			0.310***	
Ledupc3			0.260***			0.298***
ltranspc				0.156***	0.152***	0.147***
llocrcvpc				0.076***	0.077***	0.077***
lgtranspc				0.020***	0.022***	0.022***
lgdppc	-0.142***	-0.148***	-0.152***	-0.134***	-0.134***	-0.135***
ldpop	0.036***	0.038***	0.039***	0.016	0.017	0.017
urban	0.426***	0.431***	0.436***	0.492***	0.497***	0.500***
red	0.056***	0.056***	0.056***	0.065***	0.064***	0.064***
min	0.069**	0.071***	0.072***	0.080***	0.082***	0.083***
Chi-square	10.383	12.008	13.7			
RMSEA	0.061	0.069	0.076			
CFI	0.994	0.993	0.991			
SRMR	0.007	0.007	0.008			

The basic conclusions are as follows: (1) the competition among local governments under capital flows will lead to distortion of local fiscal expenditures. A well-designed special transfer payment is a necessary means to ease or even eliminate distortions in local government expenditure behavior; (2) On the one hand, the special transfer payment system depends on the level of economic development (ie, the marginal return on education investment). When the economy is relatively backward, the “weakened” type of special transfer payment is relatively effective; when the level of economic development is high, “privileged premium” type special transfer payment is relatively effective; (3) The empirical research shows that embedding incentives at different levels in the design of the special transfer payment system can inhibit the local government’s fiscal moral hazard and encourage local governments to cooperate with the central government’s intentions to achieve education; (4) The theoretical analysis of this article only

examines the situation under regional homogeneity. Although this highlights the nature of the problem, it has to consider the inter-regional heterogeneity in reality. The design of special transfer payment system should take into consideration the region. In addition, different provinces have different stages of economic development. Some developed provinces should adopt the “excellent award” rule when designing transfer payments below the provincial level, and some backward western provinces should adopt the “weakening” rule. At the same time, the transfer payment rules are not static and need to be adjusted in time according to the stage of socio-economic development; (5) Education-specific transfer payments may become a breeding ground for political rent seeking due to mismanagement and design flaws. This is widely criticized. However, special transfer payment for education has the function that general transfer payment does not have. If the design is good, special transfer payment can correct local fiscal expenditure behavior and improve education fairness. Therefore, on the one hand, it is necessary to consolidate the over-dispersed existing education-transfer payment projects. On the other hand, reasonable incentive mechanisms should be embedded in the special transfer payment system to better play its role.

Discussion

The basic conclusions are as follows: (1) the competition among local governments under capital flows will lead to distortion of local fiscal expenditures. A well-designed special transfer payment is a necessary means to ease or even eliminate distortions in local government expenditure behavior; (2) On the one hand, the special transfer payment system depends on the level of economic development (ie, the marginal return on education investment). When the economy is relatively backward, the “weakened” type of special transfer payment is relatively effective; when the level of economic development is high, “privileged premium” type special transfer payment is relatively effective; (3) The empirical research shows that embedding incentives at different levels in the design of the special transfer payment system can inhibit the local government’s fiscal moral hazard and encourage local governments to cooperate with the central government’s intentions to achieve education; (4) The theoretical analysis of this article only examines the situation under regional homogeneity. Although this highlights the nature of the problem, it has to consider the inter-regional heterogeneity in reality. The design of special transfer payment system should take into consideration the region. In addition, different provinces have different stages of economic development. Some developed provinces should adopt the “excellent award” rule when designing transfer payments below the provincial level, and some backward western provinces should adopt the “weakening” rule. At the same time, the transfer payment rules are not static and need to adjust in time according to the stage of socio-economic development; (5) Education-specific

transfer payments may become a breeding ground for political rent seeking due to mismanagement and design flaws. This is widely criticized. However, special transfer payment for education has the function that general transfer payment does not have. If the design is good, special transfer payment can correct local fiscal expenditure behavior and improve education fairness. Therefore, on the one hand, it is necessary to consolidate the over-dispersed existing education-transfer payment projects. On the other hand, reasonable incentive mechanisms should be embedded in the special transfer payment system to better play its role.

Conclusion

Our local government has assumed the primary responsibility for compulsory education. However, in the distribution of financial resources, since the implementation of the tax-sharing fiscal system, the concentration of financial resources of the central and provincial governments has become more apparent. This has led to the asymmetry in the distribution of responsibility and financial resources among governments at all levels. The solution to asymmetric financial responsibility and financial asymmetry between governments at various levels is fiscal transfer payments. Under the current fiscal system, due to the great differences in the guarantee of funding for compulsory education in various localities, the establishment of a standardized special transfer payment system is used for compulsory education. It is a fundamental guarantee for narrowing the differences in the investment in compulsory education across the country and is an important condition for guaranteeing the educational equity of low-income groups.

First, the distribution of special transfer payments for compulsory education has obvious ability to support the weak. As a whole, the higher the level of economic development is, the lower the share of special transfer payments for compulsory education is. Second, special transfer payments for compulsory education have generated incentives for local governments to increase. The demonstration effect of the investment in compulsory education, the greater the share of special transfer payment for compulsory education, the faster the input of compulsory education in the region will increase. However, the current special compulsory payment for compulsory education still has the following areas to be improved. The ability to support the special transfer payment of compulsory education shows a trend of shrinking with the expansion of special transfer payments. All these indicate that there is room for improvement in the beneficial positioning of transfer payments. The special transfer payment for compulsory education encourages the economically underdeveloped areas to use more financial funds for compulsory education, promotes balanced investment in compulsory education, and ensures the fairness of education. However, from the results of the survey, the negative effects of this incentive mechanism have gradually emerged, and the lack of strength in local financial growth will bring about a “demonstration effect” weakened.

Therefore, the special transfer payment system for compulsory education should be affixed to actual development, and to the greatest extent guarantee the fairness of people's education at all levels. This can also constrain the financial decision-making behavior of local governments.

Acknowledgement

Humanity and Social Science Youth foundation of Ministry of Education of China: Research on the Practices and Theoretical Innovation of Improving People's Wellbeing in the New Era (18YJC710023); Major Projects of National Social Science Fund of China: The philosophy of Shared Development and China's Practice (15ZDC005); Major Projects of Social Science Fund of Jilin University: Research on Supply-side Reform of China's Basic Public Service System (MKSLL39)

References

- Berlanga, V., Figuera, P., & Perez-Escoda, N. (2016). Academic Performance and Persistence of Study Bursary Holders. *Revista de Cercetare si Interventie Sociala*, 54, 23-35.
- Bulman, D., Eden, M., & Nguyen, H. (2017) Transitioning from low-income growth to high-income growth: is there a middle-income trap?, *Journal of the Asia Pacific Economy*, 22(1), 5-28. doi: 10.1080/13547860.2016.1261448
- Cahalan, M., Perna, L. W., Yamashita, M., Wright, J., & Santillan, S. (2018). *Indicators of Higher Education Equity in the United States: 2018 Historical Trend Report*. Pell Institute for the Study of Opportunity in Higher Education.
- Chaudry, A., & Wimer, C. (2016). Poverty is not just an indicator: the relationship between income, poverty, and child well-being. *Academic Pediatrics*, 16(3), S23-S29. doi: 10.1016/j.acap.2015.12.010.
- Cochran-Smith, M., Ell, F., Grudnoff, L., Haigh, M., Hill, M., & Ludlow, L. (2016). Initial teacher education: What does it take to put equity at the center?. *Teaching and Teacher Education*, 57, 67-78. doi: 10.1016/j.tate.2016.03.006.
- Cortes, D., Gallego, J., & Maldonado, D. (2016). On the design of educational conditional cash transfer programs and their impact on Non-education outcomes: the case of teenage pregnancy. *The BE Journal of Economic Analysis & Policy*, 16(1), 219-258. doi: 10.1515/bejeap-2014-0162.
- Cross, J.R., Frazier, A.D., Kim, M., & Cross, T.L. (2018). A Comparison of Perceptions of Barriers to Academic Success Among High-Ability Students From High-and Low-Income Groups: Exposing Poverty of a Different Kind. *Gifted Child Quarterly*, 62(1), 111-129. doi: 10.1177/0016986217738050.
- Erola, J., Jalonen, S., & Lehti, H. (2016). Parental education, class and income over early life course and children's achievement. *Research in Social Stratification and Mobility*, 44, 33-43. doi: 10.1016/j.rssm.2016.01.003.
- Finnigan, K.S., Holme, J.J., Orfield, M., Luce, T., Diem, S., Mattheis, A., & Hylton, N.D. (2015). Regional educational policy analysis: Rochester, Omaha, and Minneapolis' inter-district arrangements. *Educational Policy*, 29(5), 780-814. doi: 10.1177/0895904813518102.

- Goldrick-Rab, S., Kelchen, R., Harris, D. N., & Benson, J. (2016). Reducing income inequality in educational attainment: Experimental evidence on the impact of financial aid on college completion. *American Journal of Sociology*, 121(6), 1762-1817.
- Guo S, & Zou J. (2015). Study on Fiscal Transfer Payment System Reform in China - Based on the Perspective of a New Road to Urbanization. *Modern Economy*, 6(8), 871-880. doi: 10.4236/me.2015.68082.
- He, C. (2018). The Impact of Per-Capita Transfer Payment on the Stabilization of Local Fiscal Expenditure. *American Journal of Industrial and Business Management*, 8(5), 1101-1112. doi: 10.4236/ajibm.2018.85076.
- Hjorth, C.F., Bilgrav, L., Frandsen, L.S., Overgaard, C., Torp-Pedersen, C., Nielsen, B., & Boggild, H. (2016). Mental health and school dropout across educational levels and genders: a 4.8-year follow-up study. *BMC Public Health*, 16(1), 976-991. doi: 10.1186/s12889-016-3622-8.
- Khan, M.E., Hazra, A., Kant, A., & Ali, M. (2016). Conditional and unconditional cash transfers to improve use of contraception in low and middle income countries: A systematic review. *Studies in Family Planning*, 47(4), 371-383. doi: 10.1111/sifp.12004.
- Levin, H.M. (2017). The economic payoff to investing in educational justice. In: *Schools in Transition* (pp. 161-188). Brill Sense. doi: 10.1007/9789463008273_014.
- Melguizo, T., Sanchez, F., & Velasco, T. (2016). Credit for low-income students and access to and academic performance in higher education in Colombia: A regression discontinuity approach. *World Development*, 80, 61-77. doi: 10.1016/j.worlddev.2015.11.018.
- Mok, K.H. (2015). Higher education transformations for global competitiveness: Policy responses, social consequences and impact on the academic profession in Asia. *Higher Education Policy*, 28(1), 1-15. doi: 10.1057/hep.2014.27.
- Packness, A., Waldorff, F. B., dePont Christensen, R., Hastrup, L. H., Simonsen, E., Vestergaard, M., & Halling, A. (2017). Impact of socioeconomic position and distance on mental health care utilization: a nationwide Danish follow-up study. *Social Psychiatry and Psychiatric Epidemiology*, 52(11), 1405-1413. doi: 10.1007/s00127-017-1437-2.
- Perna, L.W. (2016). Throwing down the gauntlet: Ten ways to ensure that higher education research continues to matter. *The Review of Higher Education*, 39(3), 319-338. doi: 10.1353/rhe.2016.0016.
- Rich, P.M., & Jennings, J.L. (2015). Choice, information, and constrained options: School transfers in a stratified educational system. *American Sociological Review*, 80(5), 1069-1098. doi: 10.1177/0003122415598764.
- Schleicher, A., & Zoido, P. (2016). Global equality of educational opportunity: Creating the conditions for all students to succeed. *Journal of Social Issues*, 72(4), 696-719. doi: 10.1111/josi.12190.
- Snilstveit, B., Stevenson, J., Phillips, D., Vojtkova, M., Gallagher, E., Schmidt, T., ... & Eyers, J. (2015). *Interventions for improving learning outcomes and access to education in low-and middle-income countries: a systematic review*. Retrieved on de <http://www.3ieimpact.org>.

- Wee, C.J.W. L. (2016). East Asian pop culture and the trajectory of Asian consumption. *Inter-Asia Cultural Studies*, 17(2), 305-315. doi: 10.1080/14649373.2016.1184428.
- Zipin, L., Sellar, S., Brennan, M., & Gale, T. (2015). Educating for futures in marginalized regions: A sociological framework for rethinking and researching aspirations. *Educational Philosophy and Theory*, 47(3), 227-246. doi: 10.1080/00131857.2013.839376.