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Unequal education, poverty and low growth—A theoretical framework for rural education of China

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Abstract

This paper constructs an intertemporal substitution educational model based on endogenous growth theory and examines the rural education, farmer income and rural economic growth problems in China. It shows that the households originally with the same economic endowment but different education endowment take different growth routes, the income difference between low- and high-income families can be enlarged as they take different educational growth routes, and the low-income family has the chance to get into the "poverty trap". In the mean time, urban and rural, developed and underdeveloped rural areas, as they take the different education growth routes the difference of economic growth tend to be expanded for the flow of high-quality labor and different industrialization, and they also have the risk of "poverty trap". The key to solve this problem is the active public policies that promote the equal education, rational income and equilibrium development.
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1. Introduction

At present China is undergoing the transformation from agricultural society to industrial society. Among the 1.3 billion population rural resident accounts for 800 million, as the labor flowing between urban and rural and different regions, rural labor force increasingly becomes one of the most important creators of wealth and the main factor for the economic development. As a result, the education and the quality of rural residents become highly related to the social economic development and have been paid more attention than the overall problems in rural areas in China. This article tries to build up a theoretical framework of rural education to study the dynamic relationship between the equality of rural education, income distribution and economic growth and explain the importance of equal and harmonized development of rural education and rational distribution of educational resources on the economic growth, income distribution and social welfare, and therefore,

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provide policy suggestions to promote the equal education and rural development.

2. Literature

Most existing studies on education, human capital and income distribution have focused on effects of education distribution on income distribution. Concerning income distribution with human capital model Schultz (1960), Becker (1964) and Mincer (1974) concluded that per capita education level for the overall population and the state of education distribution will play an important role on income distribution. Normally unequal education and income inequality are positively related, however, the increase in average education level can have positive or negative influence on income inequality, which depends on the yield change of education. There are a large number of empirical studies on the relationship between education and income inequality; most of them show that there exists a close relationship between education and income inequality, increase in education level will lower the inequality of income, and however, unequal education will exacerbate the income inequality. Becker (1964), Chiswick (1971), Tinbergen (1972), Winegarden (1979), Gregorio and Lee (2002), etc. using either U.S data or cross-country data worked out that education level, inequality in education, etc. can have substantial influence on income distribution; increase in average education level and decrease in unequal education will conduce to the improvement of income distribution; factors of education (such as higher average education level, relatively equal distribution of education, government expenditure on education, etc.) will play the important role in changing income distribution.

The research on the impact of education or human capital on economic growth mainly comes from new economic growth theory. As the main pioneer of the new economic theory, Lucas (1989) succeeded to human capital theory by Becker (1964) distinguished two kinds of human capital accumulations (or skill acquirement)—education and learning by doing, emphasized that human capital accumulation can be an important source of sustainable growth. The basic viewpoint of Lucas states that growth is mainly driven by human capital accumulation; therefore, the difference of growth rates of all countries can be attributed to the different speed of human capital accumulation of these countries. Barro and Sala-i-Martin (1995) based on the cross-countries data of 1965–1985 carried out a regression analysis between average growth rate and several macroeconomic variables including education level, proportion of public education investment to GDP, etc. and found that education level (average year of education) is significantly correlated to the following growth, there is a remarkable effect of public education investment on economic growth.[1] Another point of view is concerning the relationship of economic growth and human capital stock. Benhabib and Spiegel (1994) with Solow growth model from Mankiw, Romer and Weil (1992) and integrating the assumptions[2] of technical innovation, human capital and economic growth by Nelson and Phelps (1966) pointed out that the difference of growth rate between countries does not largely come from the speed discrepancy of human capital accumulation as pointed by Lucas, but rather comes from the different stock of human capital, which in turn affects the ability of innovation and overtaking the technology of the more developed countries. Azardis and Drazen (1990) further pointed out that the threshold effects of education will lead to a stable route of low economic growth, that is, inadequate past education investment will make against technique attainment of next period and reduce the economic growth. Ceroni (2001) constructed an intertemperal substitution model and demonstrated that low-income family may have a desire of higher education return, unequal distribution of original education and human capital may result in multi-equilibrium including poverty trap.

Existing literature has demonstrated that there are causalities between education and economic growth, economics growth and income distribution, education and income distribution, and there may be an interrelationship among the three factors of education development and its distribution, economic growth and income distribution. In fact, "low-development trap" pointed out by foreign scholars has demonstrated a double track causality between education and growth and involved a

[1] The proportion of public education investment increased by 1.5% from 1965 to 1975 and at the same time the average growth rate had been raised by 0.3% per year.

[2] The speed of technical innovation and the speed of transmitting (or accepting) existed innovation have a significant influence on economic growth; the stock of human capital also plays a role on these two speeds; the influence of (previous) education level on current growth rate becomes quite obvious.

poverty trap of education and income distribution, which are both interacted. This article will explore the interrelationship among the three factors theoretically.

3. A theoretical framework

Under the background of dual education investment system of urban and rural, the rural development funds for education largely comes from rural family investment on education for their children, therefore, rural education has been characterized by more endogenous feature and becomes the endogenetic outcome of social economy. This article starts from endogenous growth theory to construct a simple dynamic model concerning unequal education, income distribution and regional economic growth, which could be used to explain the income difference of rural citizen and the changes of economic growth in different areas in China.

3.1. Basic assumptions for the model

(1) There exist continuous cross-generation families in rural area, among which each individual has two stages: the first stage accepting education and the second stage working and raising children. The education level of all individual that born in period $t+1$ lies on the education investment from the family and society. Namely,

$$h_{t+1} = \log \gamma e_t + h_t, \tag{1}$$

where, e_t is family education investment, γ is efficiency rate of fund using, human capital can be inherited, then $\gamma e_t > 1$, when $\gamma e_t \leqslant 1$, $h_{t+1} = h_t$.

(2) Whether the expenditure on children's education by family is consumption or investment has been debated at all the times, commonly researchers take it as a kind of investments, however, in fact parents in China spending on education more stem from the love for their children, hoping their children to upgrade their education level, and enjoy the special glory and satisfaction. Therefore, this paper considers the utility gains from spending on children's education by parents as more like consumption. Suppose the utility function of parents lies on consumption by themselves and their children's education level, namely,

$$u = \log c_t + \eta(h_t)h_{t+1}, \tag{2}$$

$$\eta(v) = 0 \leqslant \eta(h_t) < 1,$$

where c_t is the consumption level of the individual in t time, which is an ordinary concave function, $\eta(h_t)$ is the external effects of children's education level on their parents, that is, the psychological satisfaction gains from the upgrading of children's education by their parents, which is the increasing function of h_t. In general, well-educated parents will have more deeper understanding on education and take it as more importance, when parent's education is lower than v, because of their shallow understanding or low-income with which only can barely support the family, they could not get any utility from their children's education.

(3) There are two ways of area division: with the first way the total rural area can be divided into several regions: rural within developed area as high develop leading? region; rural within underdeveloped area as low-developed lagging? region, each of them is consisted of two groups of homogeneous family, high-education family h with ρ proportion and low-education family l with $1-\rho$ proportion; the difference between high-developed region i and low-developed region j lies in the magnitude of ρ, in general $\rho^i > \rho^j$, the different combination of h, l and ρ reflects the inequalities of education between and within the regions; with the second way the whole economy can be divided into two regions: rural and urban, taking the rural as low-developed region while the urban as high-developed region, all other parameters have the same meaning as before, the different combinations of h, l and ρ reflect the education inequality between rural and urban regions.

(4) The production function characterized as Lucas function (Lucas, 1989), namely,

$$y_t = A h_t^{\alpha} k_t^{1-\alpha}, \tag{3}$$

which is the same as income function of household, A is the technological progress of the country or regions, the total output of the region is obtained by simple addition of the output from all individual households within the region, therefore, regional per capita output is

$$\bar{y} = A\bar{y}_t = A\left[\rho y_l + (1-\rho)y_h\right]. \tag{4}$$

For the present rural residents in China, family income from household operations is still the main source of their household income, therefore, rural resident can be considered as both producer and consumer, their income function is the same as their

production function, the additional capital for next period is determined by a certain proportion of current output, taking this proportion as m, with no depreciation we have,

$$k_{t+1} = my_t + k_t. \tag{5}$$

3.2. Discussions for different situations

Considering the effect of labor flow and the influence on the development of education and economy by public investment, we take different situations to discuss.

3.2.1. Within closed economic regions, education invested by the private

Because of the closure between regions, labor and capital could not flow; with no government education completely depends on family investment.

The representative parents of rural family within a country is pursuing utility maximization, that is,

$$\max \quad u = \log c_t + \eta(h_t)h_{t+1}, \tag{6}$$

$$\text{s.t.} \quad h_{t+1} = \log(re_t) + h_t,$$

$$c_t = (1-m)y_t - e_t.$$

Through building Hamiltonian function and differentiating on e_t, we can get the best equilibrium education expenditure of the family: $e_t^* = \frac{A\eta(h_t)(1-m)h_t^{\alpha}k_t^{1-\alpha}}{1+\eta(h_t)}$, the education expenditure for children from the family depends on the education level of parents, the human capital of $t+1$ is

$$h_{t+1} = \log \frac{\gamma A\eta(h_t)(1-m)h_t^{\alpha}k_t^{1-\alpha}}{1+\eta(h_t)} + h_t \tag{7}$$

Suppose at the starting period (t-1) all families have a same capital k_0, just as the initial stages of rural reform in China all the families had almost the same condition, however, the human capital of the families is different at the beginning, $h^h > h^l$, at period t, the situations of high-education family h and low-education family l have been changed.

$$y_t^h = Ah_t^{h\alpha}k_0^{1-\alpha} > y_t^l = Ah_t^{l\alpha}k_0^{1-\alpha}. \tag{8}$$

The family with high-education has stronger capacity of production and the ability of management; as a result gets more income. When all the two kinds of families have made their best decisions, the family income in $t+1$ is

$$y_{t+1} = A\left[\log \frac{\gamma A\eta(h_t)(1-m)y_t}{1+\eta(h_t)} + h_t\right]^{\alpha} \times [my_t + k_0]^{1-\alpha}, \tag{9}$$

whether the income difference between high-education family h and low-education family l in period $t+1$ being expanded or shrunk can be made clear by comparing the changes of income disparity of the two groups of family:

Since $\eta(h_t^h) > \eta(h_t^l), y_t^h > y_t^l$, then

$$\log \frac{\gamma A\eta(h_t^h)(1-m)y_t^h}{1+\eta(h_t^h)} > \log \frac{\gamma A\eta(h_t^l)(1-m)y_t}{1+\eta(h_t^l)},$$

$$(1-m)y_t^h > (1-m)y_t^l. \tag{10}$$

$$\frac{h_{t+1}^h}{h_{t+1}^l} = \frac{\log \frac{\gamma A\eta(h_t^h)(1-m)y_t^h}{1+\eta(h_t^h)} + h_t^h}{\log \frac{\gamma A\eta(h_t^l)(1-m)y_t^l}{1+\eta(h_t^l)} + h_t^l} > \frac{h_t^h}{h_t^l},$$

$$\frac{y_{t+1}^h}{y_{t+1}^l} = \frac{[h_{t+1}^h]^{\alpha}[my_t^h + k_t^h]^{1-\alpha}}{[h_{t+1}^l]^{\alpha}[my_t^l + k_t^l]^{1-\alpha}} > \frac{y_t^h}{y_t^l},$$

So

$$\frac{y_{t+1}^h}{y_t^h} = \frac{[h_{t+1}^h]^{\alpha}[my_t^h + k_t^h]^{1-\alpha}}{[h_{t+1}^l]^{\alpha}[my_t^l + k_t^l]^{1-\alpha}} > \frac{y_{t+1}^l}{y_t^l}.$$

Therefore, we can get the following inference:

Inference 1: under the situation of closed regional economy and education being invested by the private, the families with the same original economic endowments but different educational endowments may take different growth routes, the disparity between low- and high-income families will be increasing as they take different growth routes of education, namely, "relative poverty trap".

Furthermore, when low-income families with the income can hardly support their basic subsistence, the education level of parents is at v, the education expenditure could be 0, $h_{t+1} = h_t$, $k_{t+1} = k_t$, and their income curve becomes a straight line, which is "the absolute poverty trap".

3.2.2. China rural is composed of all individual closed regional economy, the education being invested by the private

Next, we will compare the economic growth rate between regions under the situation above, here the difference between the high-developed region i and

the low-developed region j lies in the number of high- and low-education families.

Suppose the growth rate function of variables as $g(x)$, the total regional output and average output as followings,respectively:

$$\bar{y} = \rho y_l + (1-\rho) y_h \tag{11}$$

Per capita outputs of high- and low-developed region can be expressed by the followings:

$$\bar{y}_t^i = \rho^i y_t^l + (1-\rho^i) y_t^h,$$

$$\bar{y}_t^j = \rho^j y_t^l + (1-\rho^j) y_t^h. \tag{12}$$

Since $\rho^i < \rho^j$,

As proved previously, $g(y^h) > g(y^l)$

Then $g(\bar{y}^i) > g(\bar{y}^j)$

Therefore, we can get another inference:

Inference 2: under the situation of separation between the individual regional economies, the difference of per capita output between high- and low-development region becomes larger and larger as they take different growth routes of education,[3] namely low-development trap.

3.2.3. Semi-open regional economy, with no surplus labor, education being invested by the private

Semi-open regional economy indicates that labor can flow between regions, but the flow has only been confined to those from high-education families, and there are a variety of restrictions for those from the low-education families. If there is a proportion ψ of high-quality educated labor of the population N in the low-development region flowing to the high development region, then the human capital stock and average human capital for the high-development region will be:

$$\begin{aligned} \tilde{H}^i &= H^i + N(1-\rho^j)\psi h^h > H^i, \\ \tilde{\bar{h}}^i &= \left[\frac{\rho^i}{1+(1-\rho^j)\psi}\right] h^l, \\ &\quad + \left[\frac{1-\rho^i+(1-\rho^j)\psi}{1+(1-\rho^j)\psi}\right] h^h > \bar{h}^i, \end{aligned} \tag{13}$$

and that for the low-development region will be:

$$\begin{aligned} \tilde{H}^j &= H^j - n(1-\rho^j)\psi h^h < H^j, \\ \tilde{\bar{h}}^j &= \left[\frac{\rho^j}{1-(1-\rho^j)\psi}\right] h^l, \\ &\quad + \left[\frac{(1-\psi)(1-\rho^j)}{1-(1-\rho^j)\psi}\right] h^h < \bar{h}^j, \end{aligned} \tag{14}$$

since $g(\bar{h})$ is the determinant for the growth rate $g(y)$ of regional economies, therefore,

$$g(\tilde{y}^i) - g(\tilde{y}^j) > g(y^i) - g(y^j). \tag{15}$$

Inference 3: under the conditions of semi-open economy, the spill-over effects of high-quality labor flow make the disparity of regional economic development further enlarged, and as the flow of high-quality labor the development of low-development region becomes more difficult.

3.2.4. Semi-open urban and rural economy, with surplus labor, education being invested by the private

According to the dual-economic model of Lewis–Fei–Ranis (Lewis, 1954; Fei & Rains, 1961; Ranis, 2004), there exist a large number of surplus populations in the form of covered unemployment in rural area of China, as the double-heavy industrializations[4] carries on in China, the expansion of both industrial sectors in rural and urban areas will absorb large number of rural labor. Here the semi-open regional economy means that cities have opened their labor market to rural laborers, but those laborers are faced with a lot of restrictions such as household registration system, etc. set by the cities. This is a prevailing phenomenon in many cities of China, for example, the restrictions on household registration and educational background, which have brought out a heavy dispute for a long time, result in that laborers from rural area could get income from the cities but could not be accepted by the cities. Suppose that except for the efficient working force among the total population

[3] About the regional differences the traditional new classical theory, based on the assumption of the diminishing marginal return of factors, gives out the explanation that because of capital scarcity in less developed regions, the marginal return of the capital is relatively high, which will induce the capital flowing from developed regions to less developed regions and obtain higher speed of development, therefore, the difference between developed and underdeveloped regions will be reduced gradually and result in the convergence of economic development. The new growth theory, represented by Romer (1990) and Lucas (1988), internalizes the knowledge and techniques into the model of economic growth, suggests that the more economically developed the countries and regions, the more advantage of human capital will possess and the more increasing marginal return will be appeared, therefore, the quicker economic development will be; in contrast, the less developed the regions, the less human capital stock will be, therefore, the less economic growth will be for they can not get the increasing marginal return.

[4] Namely, double industrializations of rural and urban areas.

there is an n proportion of surplus population including those from both high- and low-education families, the education structure of the surplus population has the same features as that of total population, of which there is $1-\rho$ proportion of labor force possessing high-education level that can flow into urban and rural industries. Since the industrialization of high-development regions is quicker than that of low-development regions, there is an even smaller proportion of labor force flowing into industry in the low-development regions, therefore, under the condition of no labor flow the relationship of the average incomes of high- and low-development regions between the situations with and without rural surplus population is given as followings:

$$(\bar{y}')_t^i = (1-n)\bar{y}_t^i,$$
$$(\bar{y}')_t^j = (1-n)\bar{y}_t^j, \tag{16}$$

when there exists labor flow,

$$(\bar{y}')_t^i = (1-n)\bar{y}_t^i + n\theta^i w(h_t),$$
$$(\bar{y}')_t^j = (1-n)\bar{y}_t^j + n\theta^j w(h_t), \tag{17}$$

of which, $w(h_t)$ is the income gains by labor flow, θ is the ratio of labor force flowing into industry.

The difference is given by

$$(\bar{y}')_t^i - (\bar{y}')_t^j = (1-n)(\bar{y}_t^i - \bar{y}_t^j), + n[\theta^i w(h_t^i) - \theta^j w(h_t^j)], \tag{18}$$

since $\theta^i > \theta^j$,

then

$$(\bar{y}')_t^i - (\bar{y}')_t^j > (1-n)(\bar{y}_t^i - \bar{y}_t^j). \tag{19}$$

Next we will consider the human capital accumulations of high- and low-education families. If there is no labor flow the families with no work will keep their original education level, their average human capital accumulation equations are

$$(\bar{h})_{t+1}^h = (1-n)h_{t+1}^h + nh_t^h,$$
$$(\bar{h})_{t+1}^l = (1-n)h_{t+1}^l + nh_t^l. \tag{20}$$

When there is labor flow, at the equilibrium situation the high-quality labor remained in agriculture and those labor transferred into industries will get a same pay, the same behavior function will also lead to a same investment of education.

$$(\bar{h}')_{t+1}^h = h_{t+1}^h,$$
$$(\bar{h}')_{t+1}^l = (1-n)h_{t+1}^l + nh_t^l. \tag{21}$$

Obviously, labor flow has expanded the difference, furthermore, if the cities could get a surplus of $f(h_t) - w(h_t^j)$ from each household migrated from countryside, the development of rural education will also promote the development of the cities. Therefore, we have the following inference

Inference 4: the progress of industrialization increases the difference of development among the rural regions and the inequality of education within the regions, and there is a spillover effect on the cities from rural education.

3.2.5. Low-income family being subsidized for education by government public finance

Within above model, we have analyzed the poverty and low development resulted from the original education inequalities between rural families and regions, and at the same time the poverty and low development also give rise to the inequality development of education. Since education, especially compulsory education bears a strong externality and possesses the features of quasi-public goods, when discussing the countermeasures to the inequalities, we first introduce government under the situation of closed economy, where the only function of the government is to collect the income tax from the high-income citizen within the popedom and provide the education subsidies for low-income families. Suppose the tax rate stipulated by the government is τ, the average subsidy for low-income families is $\bar{E}_t$, then,

$$\bar{E}_t = \left[\frac{(1-\rho)(1-\tau)y_t^h}{\rho}\right]. \tag{22}$$

The human capital accumulation equations for the two kinds of families are

$$h_{t+1}^h = \log\left(re_t^h\right) + h_t^h,$$

$$h_{t+1}^l = \log\left[r\left(e_t^l + \bar{E}_t\right)\right] + h_t^l. \tag{23}$$

By setting up Hamiltonian function and differentiating on e_t, the optimal education expenditures of the families at the equilibrium condition are given as

$$e_t^{*h} = \frac{(1-\tau)\gamma A\eta(h_t^h)(1-m)h_t^{h\alpha}k_t^{1-\alpha}}{1+\eta(h_t^h)}, \tag{24}$$

$$e_t^{*l} = \frac{(1-m)A\eta(h_t^l)h_t^{h\alpha}k_t^{1-\alpha} - \bar{E}_t}{1+\eta(h_t^l)},$$

And the trend of income difference between the two kinds of families in the period $t+1$ can be expressed as

when

$$\frac{h_{t+1}^h}{h_{t+1}^l} = \frac{\log \frac{(1-\tau)\gamma A\eta(h_t^h)(1-m)y_t^h}{1+\eta(h_t^h)} + h_t^h}{\log \frac{\gamma A\eta(h_t^l)(1-m)y_t^l + \eta(h_t^l)\bar{E}_t}{1+\eta(h_t^l)} + h_t^l} < \frac{h_t^h}{h_t^l}, \tag{25}$$

$$1 > \tau > 1 - \frac{e^{h_t^h}\gamma A\eta(h_t^l)(1-m)k_t^{l\alpha}h_t^{l1-\alpha}}{\left\{e^{h_t^l}(\frac{\eta(h_t^h)}{1+\eta(h_t^h)}\gamma A(1-m) - e^{h_t^h}\frac{(1-\rho)\eta(h_t^l)}{\rho[(1+\eta(h_t^l)]}\right\}k_t^{h\alpha}h_t^{h1-\alpha}}.$$

It can be seen from the above equation that the education difference begins to converge at the time, the high-development regions (with smaller ρ) could reduce the difference of education at a smaller price (with τ tax rate) but the low-development regions at a higher price, even in the special situation (with a too smaller ρ), and could not get the τ required by the equation. The convergence rate of income $\frac{y_{t+1}^h}{y_{t+1}^l} = \frac{[h_{t+1}^h]^\alpha[my_t^h+k_t^h]^{1-\alpha}}{[h_{t+1}^l]^\alpha[my_t^l+k_t^l]^{1-\alpha}} < \frac{y_t^h}{y_t^l} = \frac{(h_t^h)^\alpha(k_t^h)^{1-\alpha}}{(v_t^l)^\alpha(k_t^l)^{1-\alpha}}$ depends on the role α of human capital in the economic development.

The public policy within the closed economic regions can make the income difference and the education inequality between the two kinds of families to converge, however, if the economy of the low-development regions is too poor (with a too large ρ), it could be helpless. Furthermore, when we extend our consideration to cover all the regions and consider the labor flow under the semi-open economy, it will be found quite difficult to solve the problems of education and income difference within the regions stemming from original endowment and labor flow, and the problem of development disparity between the regions if we carry out an independent education subsidy policy in each region. However, if we carry out a countrywide uniform education tax financing policy, that is, to tax the high-income families and at the same time to subsidize the low-income families within the country, and select the adequate tax rate, the differences could be adjusted and the balanced development could be realized. Therefore, another inference can be obtained:

Inference 5: Adequate public education policy can result in equal education, reasonable income and balanced development.

3.3. Verification of the inferences and their enlightenments for rural education in China

Not only is the equal education the basic rights endowed by the law for the citizen but the balanced development of education and the rational distribution of educational resources, through efficient allocation of human capital, have a far-reaching influence on economic growth, income distribution and social welfare, and furthermore affecting the long-run development and prosperity of a country or region. Based on the endogenous growth theory this paper has built an intertemporal substitution education model to examine the rural education, farmer income and rural economic growth of China and demonstrated that families with the same original economic endowment but different education endowment may take different growth routes, by which the income difference between high-income family and low-income family will be expanded, the low-income family has a risk to be plunged into "poverty trap". Meanwhile, the difference of per capita output between city and countryside, rural high- and low-development areas and high- and low-development regions will be enlarged as they take different growth routes of average education and industrialization with the high-quality labor force flowing out, there exists a possibility to be dropped into a "low development trap". Therefore, the key to solve these problems is to take an active public policy to realize equal education, reasonable income and balanced development.

According to the real situation in China, as shown by Table 1, on the one hand, the differences of education and the opportunity of occupational training between the different income groups were quite significant, which had been enlarged from 1986 to 2002(show in Fig. 1), the growth rate of education year was over 1% for both high and second high income families, while that for low-income family was below 1%; there was also a difference in average growth rate of occupational training opportunities for them. There was a close relationship between educational development and family income during the same period; the difference of per capita educational expenditure was remarkable among the rural families grouped by income. In 2002 the educational expenditure of high-income family was 3.66 times that of low-income family. The gap tends to be enlarged in the view of development trend. During the period of

Table 1
Education and economic development

	Per capita income (Yuan)			Per capita education year			Opportunity of occupational training (%)		
	1986	2002	Average growth rate per year (%)	1986	2002	Average growth rate per year (%)	1986	2002	Average growth rate per year (%)
High-income	1756.58	12028.60	12.78	5.72	6.71	1.00	0.14	0.21	2.57
Second high-income	857.94	4554.36	11.00	5.49	6.49	1.06	0.09	0.15	3.24
Middle income	625.24	3195.35	10.73	5.20	6.15	1.05	0.08	0.12	2.57
Low income	465.45	2346.25	10.64	4.77	5.57	0.97	0.06	0.09	2.57
Second low income	299.09	1426.75	10.26	4.37	5.08	0.94	0.05	0.07	2.13

Notes: the grouping data of 1986–1999 are from *the data collection of national rural social economic modal survey* (1986–1999), the data of 2000-2002 are directly got from the rural fixed observation office, which is grouped by five equal-part division according to family income rank of all the observation points of Agricultural Ministry of China. Here the per capita value added is calculated according to the employed, which is larger than that according to the population, and the per capita education year is modified according to the ratio of teacher to students; the average growth rate per year is calculated by the way of geometric mean.

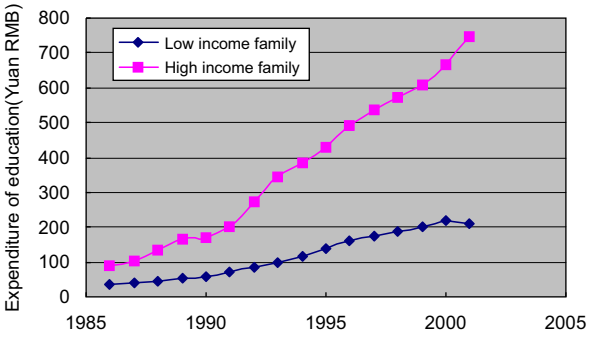

Fig. 1. Educational expenditure of different income groups in the rural areas.

1986–2002 the growth rate of education expenditure was 15% each year for the high-income family, while that was 11% each year for the low-income family. Income difference was an important factor to induce unequal education expenditure, furthermore, led to an inequality of education development. On the other hand, the outcome of unequal education was certainly the gradually expanding of income difference of rural families, in 1986 the per capita income of rural high-income family was 5.87 times that of low-income family, while in 2003, the number reached to 8.43, the income change presented a feature of polarizing increase. Education difference could both push up the expansion of income difference and be enlarged as the unbalanced income growth; there was a risk for the low-income family to drop into "poverty trap".

Education is of great importance to the economic growth of rural area, the regional difference of rural education and rural-urban educational difference are also the important factors of unbalanced economic growth. Wu and Zhang (2005) found that the rural education of China presented an obvious feature of regional differentiation; there was a remarkable difference between the regions and the difference tended to increasingly expand. Zhang (2003) also found that there was a significant gap between the rural and cities and the rural-urban difference presented an expansion trend. It can be seen from the Table 4 that from 1993 to 2003 the difference of education between rural areas and between the rural and cities had been increased gradually and the average growth rate each year was also different. The deterioration of unequal education would certainly enlarge the development difference between different rural areas and that between the rural and cities. In 993 per capita value added of rural high-developed area was 3.05 times that of less developed area and the ratio of per capita value added of cities to countryside was 3.54, in 2003 the numbers reached to 3.5 and 4.37, respectively, the expansion of difference was quite distinct (Table 2).

What is the influence exerted on rural education by the unbalanced economic growth? Education process per se is a kind of social production process, which is the integration of process, result, input and output, the development difference of education is highly correlated to the level of economic development. Wei and Yang (1997) pointed out that regional unbalanced economic development could give rise to a severe unbalance of education input

Table 2
Education and economic development

	Per capita value added			Per capita education year		
	1993	2003	Average growth rate per year (%)	1993	2003	Average growth rate per year (%)
Rural high developed area	4079.38	14270.45	13.34	6.86	7.68	1.13
Rural less developed area	1337.93	4077.40	11.79	6.17	6.74	0.90
Cities	15887.58	60637.55	14.33	7.45	9.21	2.14
Rural area	2925.37	10196.59	13.30	6.57	7.41	1.22
West six provinces	826.85	2334.79	10.94	5.76	6.48	1.18

Notes: the per capita value added is calculated according to the employed, which is larger than that according to the population, and the per capita education year is modified according to the ratio of teacher to students; the average growth rate per year is calculated by the way of geometric mean. West six provinces include Shanxi, Ningxia, Qinghai, Guizhou, Gansu and Yunnan.

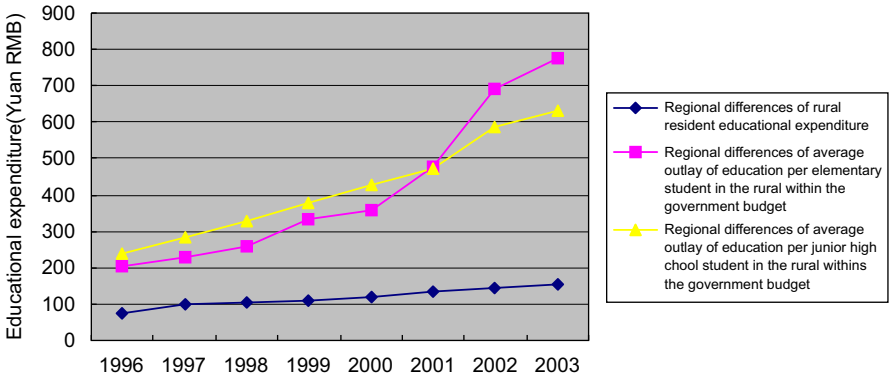

Fig. 2. Regional differences of rural educational investment.

between regions, which will inevitably cause unequal opportunities of education development between regions. It can be seen from the Fig. 2, from 1996 to 2003 there was a tendency of expansion for both regional differences of private investment (per capita education expenditure) on rural education and public investment[5] (average outlay of education per student within the government budget). It is shown in Fig. 3 that similar to regional differences, the urban and rural differences of education investment from the public and private are shown the trend of increase, especially there is a sharp increase in the difference of personal education expenditure, it is the regional difference of education inputs that results in the unequal development of education.

The development of education is determined by the education inputs decided by economic development, which in turn is affected by the accumulation and distribution of the human capital that is determined by education development. Yang (2000) indicated that economic backwardness results in inadequate supply of education; the unbalanced economic and cultural developments again give rise the huge regional difference, urban and rural difference and polarization between the bourgeoisie and the proletariat. Azardis and Drazen (1990) have proven that there exists "low-development trap" among the human capital accumulation and educational investment. The direct outcome brought by the regional differentiation of social economy and the polarization between urban and rural areas is the regional difference, urban and rural difference of educational investment from the society, the expansion of education difference

[5]Here we use the average student of ordinary middle school and primary school rather than high school since there are a lot of rural areas with no high school. All the data we used here are from *the educational statistical year book* and *statistical year book of China*.

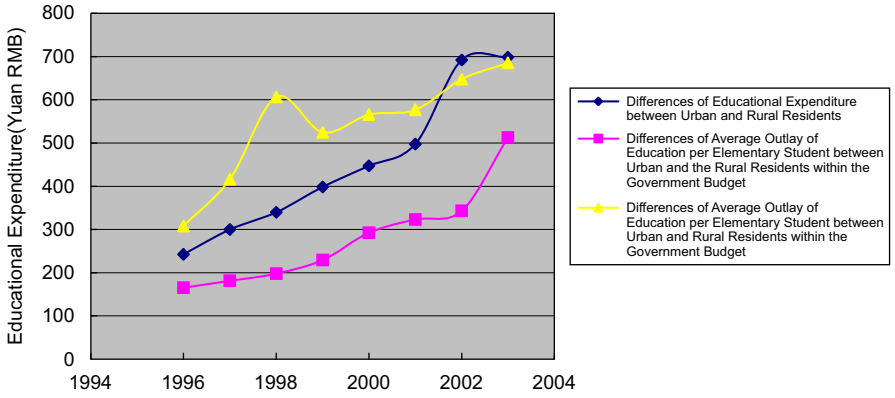

Fig. 3. Differences of education investment between urban and rural residents.

exacerbates the regional difference of development, and such a difference can further enlarge the regional education difference. It is true as shown in the Table 3, the per capita value added and the growth rate of average education of the most underdeveloped west six provinces are obviously lower than that of other regions, there is a risk for these backward regions to be dropped into a low-development trap. To ultimately solve the problem of economic development difference and reach the aim of balanced development, one of the keys is to coordinate the developments of rural education in different areas. The idea and measurements of supporting the poor by education must be put forward to change the situation of unequal distribution of educational resources and avoid low-development trap. Supporting the poor by education means that by the way of enhancing the education level and professional skills of all rural residents, especially those from backward rural areas, to promote the local economic development. It is not only significative for the education itself for it will have a long run and fundamental influence on economic society but more important than supporting the poor by economic way. According to the current situation and features of rural education it is imperative to strengthen the supporting the poor by education and enhance the efficiency of supporting the poor in China.

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