# An Analysis on the Disparity of the Private Investment in Human Capital between Urban and Rural Residents in Guangxi

**WU Ding-wei** * , **TAN Jian-xin**

Department of Economics, Guangxi University of Finance and Economics, Nanning 530003, China

**Abstract**   The constant growth of human capital is the essential force of Economic growth. The deep research on private investment in urban and rural human capital in Guangxi is necessary for developing economy and narrowing urban-rural gap. Through the analysis on the historic statistics, it is found that there were disparities total quantity and investment structure of private investment in human capital of urban and rural residents. By using the ELES model, the marginal investment trend, investment demand, elastic income, own-price elasticity and mutual-price elasticity of private investment in human capital of urban and rural residents are analyzed. It is pointed out that income is the key factor that affects the private investment in human capital of urban and rural residents. In Guangxi, the private investment and marginal investment in human capital of urban and township residents are higher than that of rural residents; the own-price elasticity and mutual price elasticity of rural residents' private investment in human capital are all higher than that of urban residents'.

**Key words**   Private investment in human capital, ELES Model, Marginal investment tend, Price elasticity, China

Guangxi is large in disparity between urban areas and rural areas. It is necessary to develop economy to narrow the gap between urban and rural areas as multinational frontier area. Endogenous economic growth theory points out that the basic motive of economic growth is the growth of human capital which depends on investment in human capital. investment in human capital includes governmental and private investment. Governmental investment in human capital depends on governmental policies which is steady. Therefore, to develop the economy and narrow the gap between urban areas and rural areas in Guangxi, it is necessary to make a further research on the private investment in human capital in rural areas.

## 1   Data resources, index selection and research methods

**1.1   Data resources**   *Statistical Yearbook of Guangxi* from 1997 to 2010.

**1.2   Index selection**   Establish ELES mode: the consumption of goods i: $V_i = p_i q_i + \beta_i ( Y - V_0 )$. In the formula, $p_i$ and $q_i$ respectively refer to the price of goods and the basic demands. $\beta_i$ is the marginal consumption trend. $V_0 = \sum_{i=1}^{n} p_i q_i$ is the total expenditure of basic demands, $Y$ is the level of income which economically means that the demands of all kinds of goods by human being; $V_i$, are divided into $p_i q_i$ the basic demands and

the surplus demands $\beta_i ( Y - V_0 )$; $a_i = p_i q_i - \beta_i V_0$; income elasticity of demands: $e_i = \partial V_i / \partial Y \times Y / V_i = \beta_i Y / V_i$; autonomous price elasticity: $e_{ii} = \partial V_i / \partial p_i \times p_i / V_i = ( 1 - \beta_i ) p_i q_i / V_i - 1$; depending price elasticity $e_{ij} = \partial V_i / \partial p_i \times p_i / V_i = - \beta_i p_i q_i / V_i^{[1-3]}$; limited by statistics, the paper measures the private investment in human capital in urban and rural areas with investment in education, entertainment and medicine, which are the amount of private investment in human capital in urban areas (rural areas) = Private investment in education and entertainment in urban areas (rural areas) + Private investment in medical health in urban areas (rural areas)[4].

**1.3   Research methods**   Analyzing the amount and structural disparity of private investment in human capital of Guangxi with qualitative and quantitative analyses; with ELES mode, that is the systematic mode of extension linear expenditure, analyzing the marginal investment trend, investment requirements, incomes elasticity, automatic price elasticity and depending price elasticity of human capital of Guangxi.

## 2   Conclusion and analysis

**2.1   The amount of private investment in human capital in rural areas**   The absolute value of private investment in human capital by citizens in urban areas of Guangxi than that by citizens in rural areas (Table 1 and Fig. 1). From 2000 to 2009, the amount of private investment in human capital by citizens in urban areas of Guangxi is 3.4 times higher than that by citizens in rural areas of Guangxi with even the highest 5 times higher; the disparity of private investment personally between the urban and the rural is from 574.55 Yuan in 2000 to 1 283.85 Yuan in 2008. While, in 2009, it declines a little, the disparity is 1 251.60 Yuan.
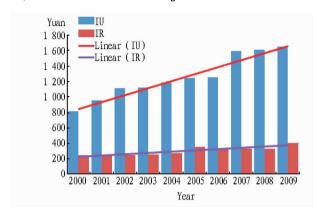
**Table 1　Private investment in human capital of urban and rural residents in Guangxi Province from 2000 to 2009**　　　　Yuan

| Year | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 |
|---|---|---|---|---|---|---|---|---|---|---|
| Urban and township medical care | 228.01 | 253.23 | 241.68 | 322.68 | 366.12 | 381.69 | 401.06 | 542.07 | 529.36 | 538.17 |
| Urban and township education | 585.68 | 2 000 | 869.16 | 797.76 | 816.09 | 866.12 | 850.90 | 1 050.04 | 1 081.54 | 1 111.13 |
| Urban and township sum | 813.69 | 957.81 | 1 110.84 | 1 120.44 | 1 182.21 | 1 247.81 | 1 251.96 | 159 2.11 | 1 610.90 | 1 649.30 |
| Rural medical care | 52.38 | 60.95 | 66.19 | 74.81 | 83.64 | 123.39 | 123.91 | 149.01 | 154.32 | 205.16 |
| Rural education | 186.76 | 174.15 | 173.17 | 175.55 | 178.83 | 226.38 | 198.07 | 172.45 | 172.73 | 192.54 |
| Rural sum | 239.14 | 235.10 | 239.36 | 250.36 | 262.47 | 349.77 | 321.98 | 321.46 | 327.05 | 397.70 |

Note：The statistics came from *Guangxi Statistical Yearbook* from 2000 to 2010.



Note：IU refers to the private investment in human capital of urban residents；IR represents the private investment in human capital of rural residents.

**Fig.1　Private investment in human capital of urban and rural residents in Guangxi Province**

　　The speed of private investment in human capital by citizens in urban areas of Guangxi is faster than that of people in rural areas. From 2000 to 2009, the private investment in human capital by citizens in urban areas has increased from 813.69 Yuan to 1649.30 Yuan, increasing by 102.7% in total with 8.2% a day；the averaging private investment in human capital in rural areas has increased from 239.14 Yuan in 2000 to 397.70 Yuan in 2009, increasing 66.3% in total with averaging 5.8% a day which is 36.4% smaller than increasing degrees of private investment in human capital in urban areas, with 2.4% lower than that of urban areas averagingly.

**2.2　Structure of private investment in human capital both in rural and urban areas**　　From Table 1, the amount of private investment in medical health by citizens in urban areas has increased from 228.01 Yuan in 2000 to 538.17 Yuan in 2009, increasing year by year except there is a little declining in 2002, with an accumulated increasing of 310.16 Yuan, increasing by 136.0%；private investment in education and entertainment has increased from 585.68 to 1 111.13 Yuan, with an accumulated increasing of 525.45 Yuan, increased by 89.7%. The increasing of private investment in education and entertainment has fluctuated, but a little. At the same period, in rural areas, the amount of private investment in medical health has increased from 52.38 to 205.16 Yuan with an accumulated increasing of 152.78 Yuan, increased by 291.7%；the private investment in education and entertainment has increased from 186.76 to 226.38 Yuan in 2005, the highest and then declining in the following two years, which bounced in 2008 with an accumulated increasing of 5.78 Yuan, increased by 3.1%.

　　The results show a fact that the speed of private investment in medical health is faster than that on education and entertainment, suggesting that with the improvement of income, citizens in urban areas are in more needs for medical health than for education and entertainment. The amount of the private investment in medical health by citizens in urban areas than that of citizens in rural areas, but the speed of urban areas is slower than that of urban areas. The former is because that the income of urban areas is much higher than that of citizens in rural areas. The latter is because of the promotion of new-countryside rural cooperative medical systems in recent years in Guangxi, especially in 2008, the overall operation of new-countryside cooperative medical systems in rural areas promotes the investment in medical health by citizens in rural areas. Besides these, the amount and speed of private investment in education and entertainment by citizens in urban areas are larger than that of citizens in rural areas. These facts are influenced usually by the disparity of income between urban areas and rural areas, the free compulsory education in rural areas making the governmental investment in education and entertainment replace the private investment, the disparities of educational infrastructure and teacher resources between urban areas and rural areas and so on resulting higher enrolling in urban school than that of rural areas.

**2.3　Marginal investment trends on human capital in urban and rural areas**　　Through ELES mode, the profile statistics of 2009 are gained（Table 2）. The results show that the basic amount of private investment in human capital per capita by citizens in urban areas in 2009 is 365.9 Yuan, the marginal trend of private investment in human capital is 0.081 341, which means after meets all consumption needs, about 8.1% of the remaining is used in private investment in human capital. Among which, the amount of private investment in medical health is 207.98 Yuan, the amount of private investment in education and entertainment is 157.9 Yuan, 30% higher of private investment in medical health than that on education and entertainment；about 2.1% of the remaining income after meeting all necessary needs in life is used in private investment in medical health and 6.0% is used in private investment in education and entertainment. The proportion shows that the private investment in medical health is lower than that on education and entertainment.

　　At that time, the amount of private investment in human capital in rural areas is 81.8 Yuan, the marginal trend of private investment in human capital is 0.079 349 and about 7.9% of the remaining income after meeting all the necessary needs in life is used in private investment in human capital. Among

which, the amount of private investment in medical health is 32.8 Yuan and the amount of private investment in education and entertainment is 48.9 Yuan, about 34% of private investment in medical health lower than that on education and entertainment. About 4.3% of the remaining income after meeting all necessary needs in life is used in private investment in medical health and 3.6% of the remaining is used in private investment in education and entertainment. The proportion suggests that the private investment in medical health is higher than that on education and entertainment.

**Table 2　Parameter estimation value of ELES model of urban and rural residents in 2009[5-6]**

| Items | $\alpha_i$ | $\beta_i$ | $R^2$ | $p_i q_i$ | $V_i$ estimation value | Actual value | Relative error//% |
|---|---|---|---|---|---|---|---|
| Urban medical and hygiene medical care | 207.985 7 | 0.021 071(0.002 9) | 0.854 | 290.437 7 | 566.885 7 | 538.17 | −0.856 |
| Urban education, culture and entertainment | 157.940 7 | 0.060 270(0.000 2) | 0.952 | 393.780 5 | 1 184.513 | 1 111.13 | −1.974 |
| Urban private investment in human capital | 365.926 3 | 0.081 341(0.000 4) | 0.936 | – | – | – | – |
| Rural medical and hygiene treatment | 32.827 93 | 0.043 268(0.005 6) | 0.945 | 133.652 6 | 205.053 6 | 205.16 | −0.052 |
| Rural education, culture and entertainment | 48.941 25 | 0.036 081(0.000 4) | 0.991 | 133.018 5 | 192.559 5 | 192.54 | 0.010 |
| Rural private investment in human capital | 81.769 18 | 0.079 349(0.000 9) | 0.984 | – | – | – | – |

Note: Data come from Guangxi *Statistical Yearbook* in 2010.

From the table, it can be concluded that the amount of the private investment in human capital by citizens in urban areas is much higher than that by citizens in rural areas; citizens in urban areas are more aware of the private investment than that of rural areas; it is more willing for citizens in urban areas to invest privately on education and entertainment with their remaining income after meeting all necessary needs than on medical health, while citizens in the rural areas to the contrast. It is perhaps the insane systems of medical security in rural areas while results in this phenomenon but in rural areas the nine-year compulsory education is firstly operated.

Analyzing the private investment in human capital of Guangxi in 1996 with ELES mode and comparing them to the statistics of 2009 (Table 3). From 1996 to 2009, the proportion of citizens in urban areas investing privately on education with remaining income after meeting all necessary needs is all the time higher than that on medical health. While compared to the past, the proportion has improved and declined in education and entertainment. The declining trend of marginal private investment in human capital in urban areas shows that in a whole, citizens in urban areas has a declining emotion of private investment in human capital while may be brought by the large reduction of marginal trend investment in education and entertainment by citizens in urban areas.

**Table 3　Marginal investment trend of urban and rural residents in Guangxi from 1996 to 2009**

| | Urban medical and hygiene treatment | Urban education, culture and entertainment | Urban private investment in human capital | Rural medical and hygiene treatment | Rural education, culture and entertainment | Disparity of private investment on human capital in rural and urban areas |
|---|---|---|---|---|---|---|
| 1996 | 0.014 9 | 0.102 0 | 0.116 9 | 0.013 9 | 0.042 1 | 0.055 9 |
| 2009 | 0.021 1 | 0.060 3 | 0.081 3 | 0.043 3 | 0.036 1 | 0.079 3 |
| Odds | 0.006 2 | −0.041 7 | −0.035 6 | 0.029 4 | −0.006 0 | 0.023 4 |

Note: the statistics came from *Guangxi Statistical Yearbook* in 1997 and Table 2.

The marginal trend of private investment in medical health by citizens in rural areas in Guangxi doubles and the marginal trend of private investment in education and entertainment declines a little. And in 1996, a larger part of the remaining income after meeting all necessary needs in life is used by citizens in rural areas to invest privately on education and entertainment, about 3 times more than on medical health. It proves that in the past, citizens in rural areas in Guangxi are more aware of the importance of investing on education and entertainment than on medical health. However, nowadays, private investment tends to be carried out more on medical health which more or less has connection to the operation of rural compulsory education and new-countryside cooperative medical systems. Governmental increasing investment in rural compulsory education replaces some private investment in education and entertainment. With the promotion of new-countryside medical cooperative system, citizens have begun to transfer their private investment in education and entertainment to invest on medical health.

**2.4　The requirements of private investment in human capital**　In 2009, the total amount of averaging consumption per capita is 3 913.05 Yuan in urban areas in Guangxi, cover-

ing 31.91% of the total consumption expenditure. The fact proves that in Guangxi, urban citizens need to pay 31.91% of the total consumption expenditure to meet all basic needs in daily life and 68.09% of the expenditure is used to develop and enjoy life; referring to the disposable income in 2009 in urban areas, the basic consumption level is lower than the lowest household income which can meet all necessary needs of daily life in Guangxi. Among which, the private investment in human capital by citizens covers 17.48% of the consumption expenditure per capita (medical health covering 7.42%, education and entertainment covering 10.06%). The evaluation on the basic consumption of rural citizens is 2 330.24 Yuan, covering 58.35% of the consumption expenditure per capita in the same year. The fact proves that 58.35% of the total expenditure should be paid to meet all the basic needs of life and 41.65% of the total expenditure is used to develop and enjoy life; with reference to the disposable income of rural citizens in 2009, the expenditure level of rural citizens in Guangxi is higher than the lowest household income and lower than the medium household income. The fact shows that except the low-income household, almost all households are capable of meeting basic needs of daily life. Among which, the private investment in human cap-

ital by citizens in rural areas covers 10. 84% of the total consumption expenditure per capita (medical health covering 5.73% and education and entertainment covering 5. 71%). The basic consumption level of rural residents in Guangxi is lower than that of urban citizens and are much lower in the amount of private investment than that of urban citizens in terms of such indexes: the absolute amount of private investment in human capital, the proportion of the averaging consumption expenditure, the proportion of the absolute values of private investment in medical health, education and entertainment. And what's more, the low-income household in rural areas can not meet the basic consumption expenditure with the pure income. So, it is necessary to try hard in improving the income of rural residents and enlarge the poverty-alleviation on those low-income households.

**2. 5 Income elasticity** According to some statistics from *Guangxi Statistical Yearbook* in 2010, the income elasticity of private investment in human capital of urban and rural residents in Guangxi in 2009 are respectively in the following situation. The income elasticity of private investment in urban medical and hygiene treatment is 0. 610 2. And the income elasticity of private investment in urban education, culture and entertainment is 0. 855 0. The income elasticity of private investment in rural medical and hygiene treatment is 0. 839 9. The income elasticity of private investment in rural education, culture and entertainment is 0. 745 8.

The values of income elasticity of demands for private investment in human capital by citizens in urban and rural areas of 2009 are positive, suggesting that with the improvement of income, demands for private investment in human capital by citizens both in urban and rural areas would increase too. Therefore, the improvement in income of residents in urban and rural areas will increase the amount of private investment in human capital. While the values of the income elasticity of these four indexes are smaller than 1. The fact shows that the percentage of the changes in private investment in human capital by residents both in rural and urban areas is smaller than the percentage of the changes in income. In other words, the income elasticity of the demands for private investment in human capital is lacking. The demands by urban residents for private

investment in medical health is much stronger than the demands by rural residents for private investment in medical health. However, it is contrary of education and entertainment. Demands by residents in urban areas for private investment in medical health is much stronger than that on education and entertainment. In other words, private investment in medical health is little influenced by the changes of income, while it is contrary to residents in rural areas.

**2. 6 Elasticities of automatic price and depending price** The price elasticities of medical health and education & entertainment are negative of residents both in rural and urban areas of Guangxi. All of which are normal goods but lacking elasticity. The absolute values of medical health and education and entertainment of residents both in rural and urban areas are large( −0. 376 4, −0. 334 1). It can be concluded that the demands for automatic prices of private investment in medical health are more sensitive than that of private investment in education and entertainment; the absolute values of elasticities of depending prices are smaller, suggesting that the replacement among goods is not strong. In other words, the demands for consumption is little influenced by the changes of prices of another goods. The absolute elasticity values of automatic prices of medical health and education and entertainment of residents in rural areas of Guangxi are large( −0. 467 1, −0. 660 3). It is a fact showing that the demands for automatic prices of private investment in education and entertainment are more sensitive than that of private investment in medical health; the depending prices elasticities of the two are smaller. In other words, the replacement among all kinds of goods is not strong too.

Comparing the automatic prices elasticities of residents both in rural and urban areas, it can be concluded that the demands for automatic prices of private investment in medical health, education and entertainment by residents in rural areas are more sensitive than that of residents in urban areas. Comparing the two automatic prices elasticities of investment, the replacement of the two investment by rural residents are a little stronger than that of urban residents. This is because that rural residents are low in income and more sensitive to the changes of prices in private investment in human capital than that by urban residents.

**Table 4 Own-price elasticity and mutual-price elasticity of urban and rural consumption demand in Guangxi in 2009**

| | Medical hygiene treatment | Education, culture and entertainment | | Medical, hygiene and treatment | Education, culture and entertainment |
|---|---|---|---|---|---|
| Medical hygiene treatment | −0. 376 4 | −0. 028 1 | Medical hygiene treatment | −0. 467 1 | −0. 015 6 |
| Education, culture and entertainment | −0. 025 0 | −0. 334 1 | Education, culture and entertainment | −0. 016 1 | −0. 660 3 |

Note: based on Table 1.

# 3 Conclusion

(1) Residents' income is the key factor influencing the private investment in human capital of residents in rural areas. Levels of residents' income to a large degree decide the levels of private investment in human capital. The averaging income in the low-income group in rural areas of 2009 (1 549. 30 Yuan) is lower than the basic consumption expenditure of rural residents (2 330. 24 Yuan). So, the income can meet the

basic necessary needs of life in rural areas except the low-income group. In order not to influence the private investment in human capital by residents in rural areas, project of poverty alleviation should be focused on people of low-income group in rural areas.

(2) The amount of private investment in human capital by residents in urban areas is larger than that by residents in rural

lation function of the composite index, we calculate out that the overall evaluation index of Natural Forest Protection Project in Southwest China is 83.08. The comprehensive benefit of Natural Forest Protection Project is good. Index of ecological benefit is 56.75; index of economic benefit is 19.05; index of social benefit is 7.28. It indicates that the construction effect of Natural Forest Protection Project in Southwest China is good.

## 4   Conclusion and discussion

This research adopts expert evaluation method and Analytic Hierarchy Process (AHP) to establish the comprehensive-benefit evaluation index system of restoring the degraded natural forest in Southwest China, including 24 indices and 3 layers. The overall objective layer is comprehensive benefit of Natural Forest Protection Project in Southwest China. The criteria layer is economic benefits, social benefits and ecological benefits. The index layer is composed of 24 indices.

We conduct weight analysis on the comprehensive-benefit evaluation index system of restoring the degraded natural forest in Southwest China. Then we get the weight of all evaluation indices in comprehensive-benefit evaluation index system of Natural Forest Protection Project in Southwest China, and conduct consistency test and analyze the results. The results are that the comprehensive benefit of Natural Forest Protection Project in Southwest China is 83.08%, wherein ecological benefits account for 56.75%, economic benefits account for 19.05%, and social benefits account for 7.28%.

Since the implementation of Natural Forest Protection Pro-

ject in Southwest China, it has played significant role in guaranteeing ecological safety of land and improving the ecological environment; laid foundation for economic and social sustainable development; made important contributions to construction of ecological barrier in Southwest China. Due to the limitations in the process of collecting data, it will be impacted by the subjective factors when using Analytic Hierarchy Process (AHP) to determine weight, which will influence the scientificity of the evaluation index system to some extent. Therefore, since the implementation of Natural Forest Protection Project in Southwest China, the all-around and scientific evaluation on the comprehensive benefit is yet to be further researched.

### References

[1] YANG XD. The Benefits evaluation and impact research on the land conversion program in Chinese Western Region[D]. Beijing: Beijing Forestry University, 2004. (in Chinese).

[2] LIU DH, ZHENG XX. Index system of sustainable management based on forest management unit level[J]. Journal of Beijing Forestry University, 2004, 26(6): 44−48. (in Chinese).

[3] ZHOU SZ. Benefit evaluations on natural forest reserves protection project[D]. Beijing: Chinese Academy of Forestry, 2008. (in Chinese).

[4] DU D, PANG QH, WU Y. Modern comprehensive evaluation methods and case selection[M]. Beijing: Tsinghua University Press, 2008. (in Chinese).

[5] SHEN HX, QIAO JQ, QIAO MD, et al. Development and appraisal of the sustainable forest management index system for Erdos forest farm[J]. Forest Resources Management, 2009, 1: 50−51. (in Chinese).

areas, the proportion of private investment by people in urban areas is larger than that of residents in rural areas and the same to the marginal investment trend. All of which are the important factors resulting in great disparities of private investment by urban and rural residents. Therefore, government should change its policies to put more emphasis on countryside from the previous urban areas in the private investment on human capital and focus on the rural human capital.

(3) The automatic price elasticity and depending price elasticity in rural areas of private investment on human capital by residents are larger than that by residents in urban areas. Therefore, keeping the steady of local prices helps a lot in keeping steady of private investment on human capital. And at the same time, the improvement of rural residents' income can help to accelerate the private investment on human capital in rural areas.

### References

[1] LLUCH C, WILLIAMS R. Consumer demand systems and aggregate consumption in the U.S.A.: an application of the extended linear expenditure system[J]. Canadian Journal of Economics, 1975, 8(1): 49−66.

[2] STONE R. Linear expenditure system and demand analysis: an application to the pattern of British[J]. Demand Economic Journal, 1954, 64(255): 511−527.

[3] KLEIN LR, RUBIN H. A constant−utility index of the cost of living[J]. Review of Economic Studies, 1947, 15(2): 84−87.

[4] CHEN ML. Effects of the spillover of human capital on urban-rural gap[J]. Economic Tribune, 2009(10): 8−10. (in Chinese).

[5] DAMODAR N GUJARATI. The Basis of Econometric[M]. Translated by FEI JP, SUN CX. Beijing: China Renmin University Press, 2005. (in Chinese).

[6] GAO TM. Econometric analysis and modeling applications and examples of Eviews[M]. Beijing: Tsinghua University Press, 2006. (in Chinese).

[7] WAN QC. Comprehensive evaluation on urban competitiveness——A case of Xinjiang Province[J]. Asian Agricultural Research, 2009, 1(2): 47−52.

[8] LIANG YQ, HUANG ZY, FENG ZJ, et al. Study on comprehensive benefits evaluation for land consolidation projects based on artificial neural network[J]. Journal of Anhui Agricultural Sciences, 2011, 39(8): 4799−4801. (in Chinese).

[9] HU SH, ZHANG SM, CHEN GZ, et al. Comprehensive evaluation of circular economic development in north Anhui Province[J]. Asian Agriculture Research, 2009, 1(7): 45−48.

[10] HOU L. Life cycle assessment of green buildings based on grey clustering method[J]. Journal of Anhui Agricultural Sciences, 2011, 39(16): 9939−9941. (in Chinese).

[11] WANG XR, SUN X. Construction of comprehensive evaluation indicator system of agricultural investment projects[J]. Journal of Anhui Agricultural Sciences, 2011, 39(15): 4799−4801. (in Chinese).