Higher Educational Expansion Policy, Educational Attainment and Urban Income Disparity: Evidence from China

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Abstract. Since 1999, China has implemented an educational policy of expanding enrollment in universities, which may lead to two opposite effects on income disparity. On the one hand, educational expansion increases the overall number of university students, which may result in a higher proportion of the employment of highly educated people in the total employment of people with education at all levels. Thus, it can narrow the income gap. On the other hand, educational expansion may lead to a decline in the rate of return on higher education, and families in less developed regions are more sensitive to it. As a result, university expansion appears to reduce the proportion of university students from poorer areas and broaden income gap. This paper aims to use a micro data of China Health and Nutrition Survey (CHNS) to study the effect of educational expansion on educational attainment of students from cities in different hierarchy and further test its impact on income disparity. The results show that educational expansion increases educational attainment in China, thereby reducing the income disparity; From the perspective of different urban hierarchy, because of the educational expansion policy, educational attainment in Beijing, Tianjin and Shanghai is far higher than that in other provincial capitals and prefecture-level cities. The higher the urban hierarchy, the greater the income disparity reduced by educational attainment.

1. Introduction

Faced to economic development and employment, China began to implement educational reform policy in 1999: greatly expand the enrollment of ordinary universities and colleges. The statistics show that in 1988, the number of enrollments in ordinary universities and colleges is 1.084 million, while in 2008, the number is expanded to 5.99 million. From 1998 to 2008, the enrollment number has nearly fourfold with annual growth rate of 22%. It is obvious that this policy directly leads to dramatic educational expansion. However, it is still uncertain that whether educational expansion policy can improve educational equality and reduce income disparity.

In theory, educational expansion may have two effects on income distribution. Firstly, expansion directly leads to a higher proportion of the employment of highly educated people in the total employment of people with education at all levels. An increase in individual income can reduce the per capita income disparity in return. On the other hand, educational expansion greatly increases the number of university graduates, which may reduce their rate of return. Families in less developed regions are more sensitive to the rate of return, thus such expansion appears to reduce the proportion of university students from less developed regions and broaden income gap. From the perspective of empirical study, foreign scholars seldom study educational expansion, since it rarely occurs at abroad. The educational expansion is an exogenous educational scale under the special national situations of China. Domestic scholars have not done many quantitative researches on the educational expansion policy. Several outstanding researches in this field include (LI 2004), (Ding 2006), (Ning 2008), (Gu 2009), (Liu 2009), (Xu 2012), (Li 2014) and (Hu 2015). These studies have made meaningful exploration on the impact of educational expansion on equality, but they are value and limited. Some of these studies did not directly focus on the impact of educational expansion. Some of these studies did not distinguish between the impact of educational expansion itself and the impact of other contemporaneous events. Some of these studies did not have nationally representative data.

To address these problems, this paper aims to use a micro data of China Health and Nutrition Survey (CHNS) to study the effect of educational expansion policy on educational attainment of students from cities in different hierarchy and further discuss the change in income disparity brought by such policy.

2. Background

In 1999, Chinese government led the largest and longest educational expansion. The annual enrollment growth rate averaged 29.2% in the five years from 1999 to 2003, and remained at 12.8% in 2005. As shown in Fig 1 (Luo,2014), China's enrollments of ordinary colleges and universities, enrollment rate of school-age population (the number of 18-year-olds) and enrollment rate of senior school students have increased rapidly since 1999. The enrollments of ordinary colleges and universities increased from 1.08 million in 1998 to 5.68 million in 2007. Although the government vigorously implemented educational expansion policy, their corresponding investment in education did not keep pace with it, thus the expansion was accompanied by a series of social problems such as higher university educational cost (including the tuition), lower educational quality, a lower employment platform for university students and higher unemployment. (Huang 2005; Wen 2005; Wu 2009). At the same time, the Ministry of Education also reflected on the educational expansion policy. Questioned by the society and academic circles, the rate of expansion has dropped to less than 10% after 2005. It is worth noting that our educational expansion varies greatly in different regions. As shown in Fig 2, in some eastern regions such as Beijing, Tianjin, Shanghai and Jiangsu, where the economy is developed and educational opportunities are more, the educational expansion is relatively large (measured by absolute value); while in western less developed regions such as Qinghai, Ningxia and Guizhou, the expansion is relatively small. The uneven expansion has further widened income disparity in different regions.
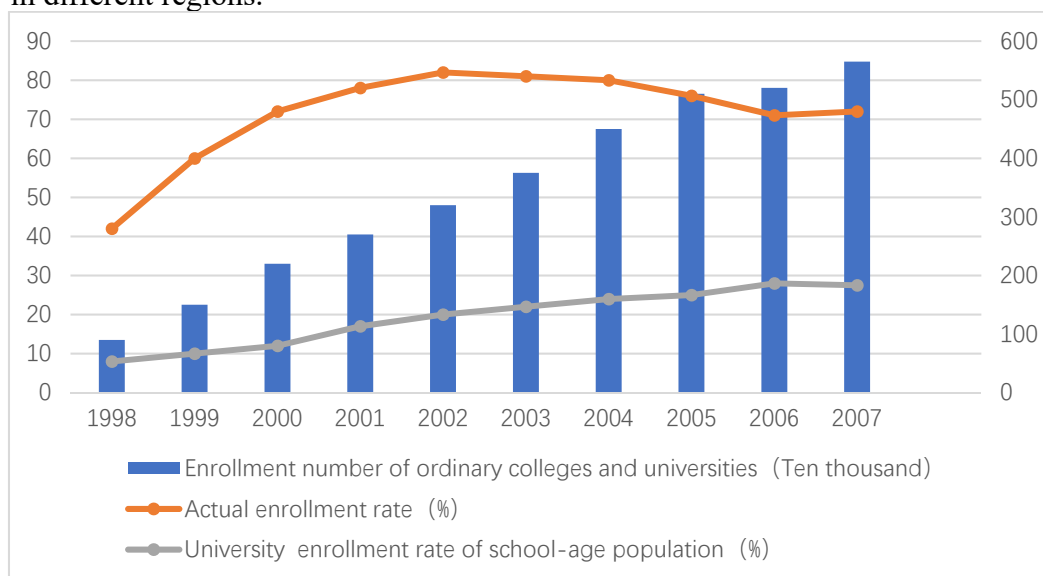

Fig. 1. Enrollment number of ordinary colleges and universities, Actual enrollment rate, University enrollment rate of school age population (ten thousand, %) from 1998 to 2007.
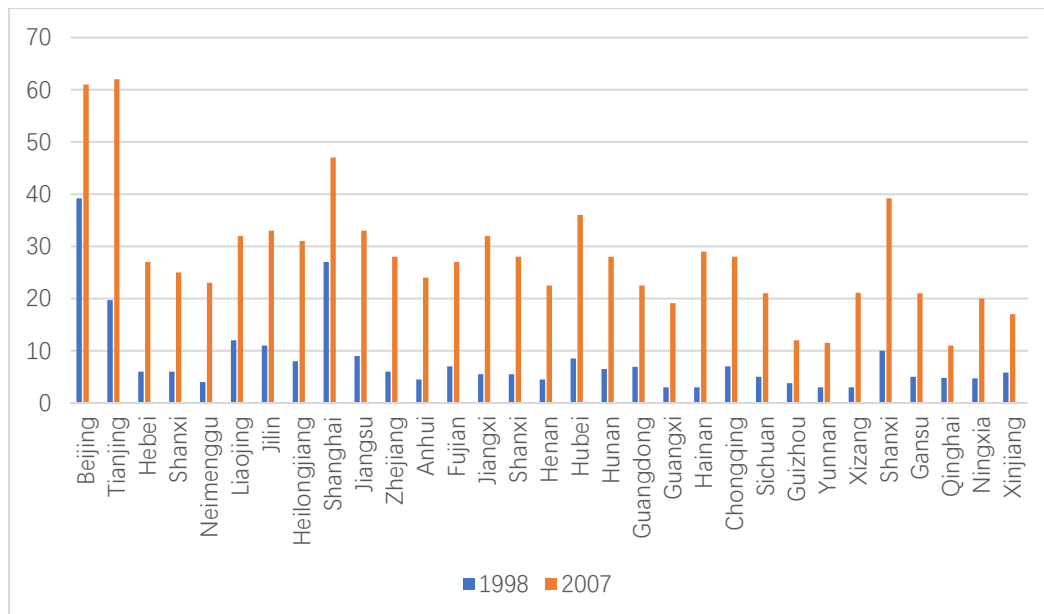
Fig. 2. University enrollment rate (%) of school-age population in provinces in 1998-2007.

It is noted that with the implementation of educational expansion policy, China's higher education has stepped from elite phase to popular phase, which leads to lower rate of return in higher education (Martin1973; Li 2014). At the same time, the statistics show that among nearly 5 million college graduates in 2007 nationwide, there are still 1 million unemployed in January, 2008. China's educational expansion policy is mired in controversy because of the decline in return rate of higher education and the increase of employment market pressure.

3. Theoretical Background and Literature Review

Scholars always focus on the impact of more opportunities of higher education on economic growth and income disparity so that there have been a great number of theoretical discussion and empirical analyses. As early as 1974, Boudon (1974) pointed out that families in high social class have more access to education than families in low social class and the access to education is closely related to cities where they live. If the demand for higher education is saturated for superior families, inferior families may have more access to education due to educational expansion. A subsequent study by Robert (1980) and Knight (1983) had the same conclusion. In 1993, Raftery (1993) analyzed the changes in the effect of social origin on educational transitions for the 1908-56 birth cohorts. He drew a conclusion that overall class differences in educational attainment declined, but class barriers were not removed. Raftery proposed the hypothesis of maximally maintained inequality and the explanation of it is that education diffuses from the upper class to the lower class, that is, educational opportunities can be allocated to the next class only when the demand for higher education is saturated for wealthy families. Therefore, Raftery believed that in a quite long period, the overall educational inequality will inevitably increase with the expansion of enrollment, and the duration of such situation depends on the inherent social class differentiation. Breen (1997) believed that educational attainment is closely related to family backgrounds, that is, individuals from different family backgrounds determine their choices of educational investment. For example, compared with poor families, wealthy families are stronger to face risks brought by uncertainties of educational investment. Thus, it is assumed that educational attainment is determined by individual's family background. Simon (2003) studied the effect of income from the perspective of overlapping generations. He believed that human capital of the previous generation can directly affect the human capital investment of the offspring, which leads to differences in human capital accumulation of the offspring. This mechanism will continue to play a role with the generational shift. An empirical study by Devereux and Fan (2010) concluded that educational expansion in the UK increases educational return rate by about 8% for men and women respectively. Hu and Hibel (2014) calculated the change of investment return in

higher education and the educational equality of expansion by the microdata of CGSS 2003 and CGSS 2010. It is found that the main reason of the inequality is the social class of parents. After educational expansion, all social classes benefit from it and the investment return increases year by year. By microdata of China Health and Nutrition Survey (CHNS), Luo (2015) made an empirical analysis and concluded that educational expansion can strengthen educational equality in high-income and middle-income groups. According to China's national conditions, family educational investment in fact is related to two factors. On the one hand, regional disparity and income inequality make the alternative allocation of educational opportunities significant in regions and stratum (Wan 2018). On the other hand, educational expansion greatly reduces educational return rate and the concomitant increase of tuition fees makes it difficult for poor families to afford.

Educational expansion definitely benefits more families, and more students have access to higher education. The most direct and important result of the expansion is a significant increase of highly educated labor force, which directly improves the human capital quality and increases its stock. Generally, the larger the human capital stock and the higher the quality, the higher the labor productivity. When market mechanism decides labor supply and demand, the larger the highly skilled human capital, the higher income-return the workforce will get (Schultz 1960). Therefore, human capital quality and stock owned by labor force are one of the important factors of income disparities between laborers under the market economy system. In other words, educational attainment is highly likely to bring higher salaries to laborers, thereby reducing the income disparity.

4. An Empirical Analysis of the Impact of Educational Expansion Policy on Educational Attainment and Income Disparity

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4.1 Modeling and Data

This paper makes use of micro data of China Health and Nutrition Survey, an international collaborative project between the Carolina Population Center at the University of North Carolina at Chapel Hill and the National Institute of Nutrition and Food Safety at the Chinese Center for Disease Control and Prevention. The data is from 1989, 1991, 1993, 1997, 2000, 2004, 2006 and includes many provinces such as Liaoning, Heilongjiang, Jiangsu, Shandong, Henan, Hubei, Hunan, Guangxi and Guizhou, covering more than 12,000 samples. It is designed to collect information about income, education, nutrition, health and so on. Mainly focused on the impact of urban hierarchy on access to higher education in the context of educational expansion, this paper selects the data of "residence before the age of 14" as the proxy variable of cities where individual takes college entrance examination. Two explained variables are set. One is "acceptance of higher education" (higher education includes undergraduate course and junior college), which mainly evaluates differences in the number of opportunities for higher education. Another is "acceptance of undergraduate course and above", which mainly controls the quality of higher education opportunities. Firstly, a simple descriptive statistical analysis of the variables in this paper is conducted. As shown in Table 1, basic statistics of related data variables such as sample size mean, maximum, minimum and standard deviation are given. Mean value and standard deviation of these indexes are compared. We found the discrete degree of data is not high and regression analysis can be carried out.

Table 1. Descriptive statistical analysis.

Heading level	Mean	SD	Min	Max	Sample size
Categorical variables					
Acceptance of higher education (yes=1; no=0)	0.528	0.500	0	1	883
Acceptance of undergraduate course and above (yes=1; no=0)	0.240	0.427	0	1	883
Policy implementation (affected by educational expansion) (yes=1; no=0)	0.258	0.438	0	1	883
Residence before the age of 14 is Beijing, Tianjin or Shanghai (yes=1; no=0)	0.189	0.392	0	1	883
Residence before the age of 14 is a provincial capital (including Chongqing) (yes=1; no=0)	0.316	0.465	0	1	883
Residence before the age of 14 is a prefecture-level city (yes=1; no=0)	0.495	0.500	0	1	883
Gender (Male=1; Female=0)	0.520	0.500	0	1	883
Nationalit（the Han nationality=1; others=0）	0.960	0.195	0	1	
Continuous variables					
Father's education years	8.792	4.255	0	19	883
Father's occupation（ISEI）	45.587	17.833	19	88	750

This paper aims to evaluate the effect of educational expansion policy from two aspects: educational attainment and income disparity. Therefore, in order to analyze the trend of effect on the basis of data, traditional logistic binary choice model is chosen to statistically analyze the data in Table 1, investigating the impact of educational expansion on individuals' educational attainment from families in cities of different grades and internal relationship between income disparity. Based on logistic binary choice model, it can be described as follows:

$$Logit(Y_i)=\beta_0+\beta_1 X_i+\beta_2 S_i + \beta_3 X_i \cdot S_i + \gamma Z_i + \varepsilon_i. \tag{1}$$

In equation (1), Y represents whether the individual I accepts education. Its value is binary choice variable and it follows logistics distribution. X_i represents backgrounds of families in cities of different grades who accept higher education. For example, the residence before the age of 14 is Beijing, Tianjin, Shanghai, provincial capitals or other prefecture-level cities. Gender, father's degree of education and father's occupation are also included. The cross term $X_i \cdot S_i$ is used to describe the impact of educational expansion on individuals in cities of different grades. Z_i is another control variable.

4.2 Empirical Result

Table 2 is a regression analysis of whether individuals accept higher education (higher education includes junior college, undergraduate course and above). From the significance of regression (1), individuals who live in Beijing, Tianjin, Shanghai and provincial capitals before 14 are more likely to receive higher education; when father's education year, father's occupation, gender and nationality are added to regression (2) to control variables, the opportunities to receive higher education in Beijing, Tianjin and Shanghai are increased significantly, while opportunities in provincial capitals are non-significant. Control variables---father's education year and occupation play a positive role; The effect of policy implementation on whether individuals in cities of different grades receive higher education is significantly positive at the level of significance of 5% and 10% respectively. From symbols and significance of regression (3) and (4), whether with or without control variables, educational expansion policy plays a significant role for individuals in Beijing, Tianjin, Shanghai, provincial capitals and other prefecture-level cities to receive higher education. Due to educational expansion, individuals in Beijing, Tianjin and Shanghai are 1.5 times more likely to receive higher education than individuals in provincial capitals, while individuals in provincial capitals are twice more likely to receive higher education than individuals in ordinary prefecture-level cities. After adding control variables, the significance in Beijing, Tianjin and Shanghai increases, while the significance in provincial capitals and prefecture-level cities decreases. In terms of the overall

samples, educational opportunities are prone to families in Beijing, Tianjin, Shanghai, provincial capitals and families whose fathers have higher education degree and good occupations.

Table 2. Acceptance of higher education (higher education includes junior college, undergraduate course and above).

	(1)	(2)	(3)	(4)
Policy implementation	1.324***	1.115***		
	(0.174)	(0.196)		
Residence before the age of 14 is Beijing, Tianjin or Shanghai	0.319*	0.546**		
	(0.193)	(0.218)		
Residence before the age of 14 is a provincial capital (including Chongqing)	-0.346**	-0.231		
	(0.160)	(0.181)		
Residence before the age of 14 is a prefecture-level city	omitted	omitted		
Father's education years		0.123***		0.121***
		(0.022)		(0.022)
Father's occupation (ISEI)		0.008*		0.008*
		(0.005)		(0.005)
Gender		0.058		0.074
		(0.160)		(0.160)
Nationality		0.001		0.048
		(0.425)		(0.424)
Beijing, Tianjin, Shanghai*policy implementation			2.557***	2.569***
			(0.529)	(0.608)
provincial capitals (including Chongqing) *policy implementation			1.592***	1.334***
			(0.320)	(0.355)
prefecture-level cities*policy implementation			0.898***	0.667***
			(0.211)	(0.234)
Constant term	-0.154	-1.665***	-0.205***	-1.658***
	(0.106)	(0.503)	(0.079)	(0.496)
Pseudo R^2	0.063	0.112	0.065	0.114

(The values in parentheses are standard errors. *** represents $p < 0.01$; ** represents $p < 0.05$; * represents $p < 0.1$)

Table 3 is a regression analysis of whether individuals accept undergraduate course and above, which aims to investigate the impact of educational expansion on educational attainment. Regression (5) and (6) show that whether with or without control variables, educational expansion has a positive effect on whether individuals acquire bachelor degree or above. Whether individuals in Beijing, Tianjin, Shanghai and provincial capitals obtain bachelor degree or above is not significant. Regression (7) shows that the implementation of educational expansion policy plays a positive role in Beijing, Tianjin, Shanghai, provincial capitals and prefecture-level cities. Opportunities for educational attainment increase in all areas. Due to educational expansion, individuals in Beijing, Tianjin and Shanghai are nearly 3 times more likely to have opportunities for educational attainment than individuals in ordinary prefecture-level cities, while individuals in provincial capitals are twice more likely to receive higher education than individuals in ordinary prefecture-level cities. Added control variables, regression (8) shows the same trend. Therefore, it can be seen that opportunities for education are prone to Beijing, Tianjin, Shanghai and provincial capitals. Individuals in ordinary cities have far fewer opportunities to receive bachelor's degree and above than individuals in developed cities. Educational expansion is prone to families whose fathers have long education years and good occupations.

Table 3. Acceptance of undergraduate course and above.

	(5)	(6)	(7)	(8)
Policy implementation	1.040***	0.841***		
	(0.169)	(0.190)		
Residence before the age of 14 is Beijing, Tianjin or Shanghai	0.264	0.364		
	(0.208)	(0.229)		
Residence before the age of 14 is a provincial capital (including Chongqing)	-0.189	-0.300		
	(0.190)	(0.215)		
Residence before the age of 14 is a prefecture-level city	omitted	omitted		
Father's education years		0.111***		0.111***
		(0.026)		(0.026)
Father's occupatio (ISEI)		0.126**		0.012**
		(0.005)		(0.005)
Gender		-0.111		-0.077
		(0.179)		(0.179)
Nationality		-0.556		-0.522
		(0.444)		(0.442)
Beijing, Tianjin, Shanghai*policy implementation			1.562***	1.437***
			(0.312)	(0.331)
provincial capitals (including Chongqing) *policy implementation			1.320***	1.059***
			(0.268)	(0.230)
prefecture-level cities*policy implementation			0.664***	0.469*
			(0.224)	(0.246)
Constant term	-1.469***	-2.474***	-1.475***	-2.525***
	(0.130)	(0.542)	(0.079)	(0.537)
Pseudo R^2	0.043	0.088	0.100	0.089

(The values in parentheses are standard errors. *** represents $p < 0.01$; ** represents $p < 0.05$; * represents $p < 0.1$).

5. Conclusions on Empirical Results

5.1 An analysis of the effect of educational expansion on educational attainment in cities of different grades

According to empirical results, educational expansion policy has different impact on cities of different grades. Educational attainment in China varies in different cities, which is closely related to unbalanced development of different regions. Different proportion of educational investment among regional government also plays an important role in educational attainment. At the same time, it should be noted that there is preferential policy of government on educational investment in developed cities, which is called the theory of government preference. Such preference makes the unbalanced educational attainment more significant in cities of different grades. From the Table 4, the results show that educational expenditure and educational development scale in Beijing, Tianjin, Shanghai and provincial cities are superior than those in underdeveloped cities and regions, which makes educational policy more effective in high-level cities. Due to educational expansion policy, Beijing, Tianjin, Shanghai and provincial capitals are more likely to get opportunities to receive higher education than other prefecture-level cities.

5.2 An analysis of effect of educational expansion on income disparity

In general, from 1988 to 2007, educational expansion played a significant role in urban income disparity. In China, educational expansion narrowed urban income gaps (Yu 2001). However, from the perspective of cities of different levels, the higher the city level, the larger the effect of income disparity brought by educational expansion. With the educational expansion, income disparity in Beijing, Tianjin and Shanghai reduces significantly, followed by provincial capitals, while in prefecture-level cities income disparity changes little. From educational return rate in different educational levels, as shown in Table 4 (Zhang 2016), educational return rate in junior colleges and undergraduate course is the highest among all levels of education, and educational return rate increases as the educational level rises. Therefore, when more and more people receive higher education, urban income disparity will reduce. It is believed that for high-level cities, educational

expansion helps more people to receive higher education, which is beneficial to narrow the urban internal income gap. However, the policy plays a limited role in prefecture-level cities in lower class.

Table 4 Annual educational return rate in different educational levels (%).

		Junior school	Senior school; Special secondary school	Junior college	Undergraduate	Postgraduate
Salary growth rate (%)	Relative to basic level	4.3	24.2	44.3	68.4	124.3
	Relative to the previous level	3.2	19.1	16.2	35.6	33.
	Annual Educational return rate (%)	1.4	6.0	5.1	7.9	10.0

The results are basically consistent with those of Hu & Hibel (2014). They believe that educational expansion can improve income inequality, but the relationship between education equality and income disparity in the society is not a simple linear relation, that is to say, higher education popularization does not necessarily mean a reduction in income disparity. An empirical research of Luo (2015) supports that in developed regions, educational expansion indeed can alleviate educational inequality among families with different income. When the opportunities for higher education is saturated for high-income families, low-income families have more access to higher education, thereby improving educational inequality.

6. Conclusions

On the basis of micro survey data, this paper aims to examine the impact of China's educational expansion on educational attainment of students from different levels of urban families. In general, educational expansion in ten years played a significant and positive role in educational attainment. On the one hand, Chinese residents are easier to receive higher education. On the other hand, it is of great significance to improve social equality.

By traditional logistic binary choice model, this paper analyzes whether educational expansion has effect on educational attainment and income disparity, focusing on differences in cities of different levels. The main conclusions are as follows: educational expansion reduces income disparity but the degree of effect is closely related to urban hierarchy. With educational expansion, higher-class cities have more access to education, which narrows internal income disparity in cities. As China's political and economic centers, Beijing, Tianjin and Shanghai benefit most in this policy, followed by other provincial capitals. In the context of educational expansion, inequality exists in educational attainment among cities of different grades, which is certainly related to government preference--- government provides more educational resources and opportunities for high-class cities. Such inequality also has connections with China's household registration system and college entrance examination system. Different from other countries' college entrance examination system, China's system has an important characteristics--- household registration system, that is, students must register and be accepted in their domicile places. At the same time, college entrance examination in China does not use the same paper in different provinces. Cities with "low college admission score and high acceptance rate" such as Beijing, Tianjin and Shanghai contrast deeply with western regions with "high college admission score and low acceptance rate" such as Gansu province. As a result, students in Beijing, Tianjin and Shanghai are easier to attain education resource. Because of they can get more resource in their own area, and the effects of household registration and college entrance examination system

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