Re-discussion on the rationality of high income of monopoly industries: Evidence from the employer-employee matched data

Nie Haifeng, Yue Ximing*

Industrial income differential is the most important cause of the public dissatisfaction with the income inequality in China. The high income of monopoly industries is now the typical one of the massive income inequity phenomena. But objectively speaking, not all high income of monopoly industries is unreasonable. The income differential caused by employees' education level is reasonable in a certain range. Measuring and analyzing the high income of monopoly industries should be based on taking various elements such as employees' education level and working age into account. By the decomposition method, the wage gaps between monopoly and competitive industries are decomposed into the reasonable part and the unreasonable part. The results show that, on the average level, nearly half of the average wage difference between monopoly and competition industry is unreasonable, which is caused by monopolization. From the view of income levels, the income gaps between monopoly industry and competitive industry get widened as the income quantile increases. Specifically, at the quantile points of 10%, 50% and 90%, the income gaps are 9.4%, 52% and 60.6% respectively and the proportions of the unreasonable part are 26%, 71%and 72 0 o respectively. Using the employer-employee matched data, we overcome the problem of missing variables and make the estimates of unreasonable parts of the high income of monopoly industries more reliable.

Keywords: salary differential, Oxaca - Blinder decomposition, decomposition of quantile distribution

1. The introduction

Income inequality, one of the major social problems in today's China, is the object of public concern and anxiety. According to the data released by the national bureau of statistics, our country's residents' income gap, measured by the Gini coefficient, has begun to fall since 2008 when it peaked after the reform and opening up. By 2014, the gap problem has been alleviated for 6 years in a row. However, public concerns and dissatisfaction about China's income inequality have not been lessened

* Nie Haifeng (email: niehf@mail.sysu.edu.cn), associate professor with doctoral degrees, Lingnan Academy of Sun Yat-sen University of China. Yue Ximing (email: yue@ruc.edu.cn), professor and doctoral supervisor, Financial and Monetary Institute of Renmin University of China.

as a result.[1] After careful inspection, observation and consideration into the causes, we can find that the public's dissatisfaction with the current income inequality problem in our country stems mainly from income unfairness instead of the income gap. In current China, the phenomenon of income inequality can be seen everywhere. What is worse, at present, China's income inequality phenomenon is mostly associated with the government. Some of them are even the direct result of government policy. Official corruption, unfair high income in monopoly industries, unfair opportunities for employment, unequal administration in enjoying public service between urban and rural residents, preferential policies for more investment into and school entrance for metropolitan education and regressive taxation system are illustrations of injustice all related to the government and the government policy. These factors, without being regulated, while enlarging the income gap, will damage the fair value orientation of the whole society, and even threaten social stability. This suggests that the key to solve the income inequality problem at present in our country lies first in solving the problem of income unfairness and second in narrowing the income gap. In the future, with the increase of governmental input into social security and the rise of unskilled workers' wages, the income gap of those residents in our country are most likely to be narrowed, but if income unfairness phenomenon is not to be corrected obviously, public concerns and dissatisfaction about income inequality will not disappear automatically.

High-income monopoly industries are currently one of the primary embodiments of income unfairness. Considering such factors as ruling foundation, national security and national economy, such industries as oil, railways, electric power, telecommunications and banks are endowed by CPC (China Communist Party) and the government the monopoly power, while private capital is restricted and prohibited into related fields. CPC and the government establish by themselves or allow monopoly enterprises to set up high prices for products and services provided by them. By doing so, huge economic benefits are transferred from consumers. The interests of monopoly industries, at the expense of increased consumer consumption, are mainly turned into high profits in monopoly industries, high income and welfare of practitioners and high on-the-job consumption of high executives in monopoly industries. In addition to this, it can be seen from many corruption cases in recent years that the monopoly by state-owned enterprises is an important channel to transport interests to authorities and officials, thus is an important foundation of official corruption.

The high income of monopoly industries comes from the managerial authority of monopoly enterprises endowed by the government instead of the result of enterprises' winning in market competition. It exists at the cost of consumers' increased

[1] Income distribution has been a hot point of grassroots' concerns, which can be demonstrated by a survey conducted by people.com on the hot points for NPC and CPPCC in 2015 whose result shows income distribution is one of the top ten hot points. The following website can be referred: http://npc.people.com.cn/GB/28320/392528/index.html.

expenditure and decreased welfare, thus is obviously unjustified. At this point, the public reach consensus. But, is all the high income of those practitioners in monopoly industries unreasonable? In other words, what is the proportion of the reasonable part of their high income? First, this paper will explain why such questions are raised. From a certain sense, if we simply think all the high income of monopoly industries is unreasonable, it must be wrong. According to the calculation of the 1% sample data in 2005, the average years of education of financial industry (one of the monopoly industries) is 13.5 years, while this figure for the competition industries of manufacture and resident service is 9.6 years. The nearly 4-year gap between the two means that it is reasonable to have a salary gap between the two industries in a certain range. In addition, the salary gap caused by the factor of work experience should also be seen as reasonable. It is also unreasonable to neglect these factors and think all the income of monopoly industries as unreasonable. Such thinking, if exists, is neither objective nor helpful for the solution of problems. The right approach is, on the basis of full consideration given into reasonable factors like education and work experience for the salary gap, observation and measurement are conducted for the proportion of unreasonable high income in monopoly industries. This is the very purpose of this paper.

It is beneficial to divide the high income of monopoly industries into two parts-reasonable and unreasonable for a correct comprehension of the public on the high income of monopoly industries. Moreover, such research is obviously also of some significance for making policies. In document named “Decision” concerning the third plenary session of the 18th Central Committee of CPC, the issue of salary of some principals of state-owned enterprises has been specially mentioned and stipulated as follows: "state-owned enterprises should add the proportion of market-oriented recruitment, identify appropriately and strictly regulate the state-owned enterprises’ managerial personnels’ salary, administration and consumption for corresponding post and business consumption”. Then, the political bureau of the CPC central committee passed The Reform Bill of Central Administered SOE Administrators’ Salary System which includes special stipulations and limits for the salary of the administrators of the enterprises regulated the Central Committee and ministries. This also renders as reference for other related State-owned enterprises that will formulate relevant schemes aiming for reasonable salary distribution, increase and adjustment stable for SOEs. With the comprehensive deepening of reform towards marketization, many industries have free entry and exit. However, central government-owned enterprises and other state-owned enterprises, bearing important responsibility in the development of national economy, have all sorts of administrative and economic restrictions, causing a large part of the income gap to be derived from the industry monopoly. Therefore, researching into the role of monopoly in affecting the income gap, especially the gap against high income, will allow us to know clearly about the source factors for income

gap and to make proper policies.

So far, studies related to high income issues in monopoly industries have been universal and numerous, so the literature review of here merely confine to the measurement and analysis on the rationality of the high income of monopoly industries. Judging from the data sources, research so far is divided into two categories: studies using household data and analysis using the data from enterprises; The former can be represented by researches conducted by Yue (2010), Du (2010)[1] and Yue and Cai (2015), while the latter can be illustrated by Yu and Zhang (2013), and Yu and Zhang (2013); In terms of research methods, apart from Yue and Cai (2015), there is no exception for all the other researches to focus on the rationality of the average salary gap between monopoly and competition industries by employing Oaxaca-Blinder decomposition method. Different from the above method, Yue and Cai (2015) use Machado-Mata decomposition method based on the regression of multiple quantiles to measure the proportion of reasonable and unreasonable salary gap between monopoly industries and competitive industry. On the estimated results, apart from some individual documents, these studies are consistent in research results - most of the high income of monopoly industries' practitioners is unreasonable and exists due to monopoly. For example, according to the estimates made by Yue (2010), the vast majority of decomposition results show that more than 70% of the high income in monopoly industries is unreasonable. Two studies using enterprises' data also draw roughly the same conclusions. In addition, analysis results of the studies conducted by Yue and Cai (2015) demonstrate that the proportion of the unreasonable part of high income is positively proportionate to the income level. This means the higher the practitioners' income is, the higher the proportion of unreasonable income of the monopoly industries is.

Previous researches do have certain defects like a limited range of data. As mentioned above, previous studies either use data from the household survey, or from business surveys, with the former including only the practitioners' information of individual attributes and the latter containing only the information at enterprise levels. In other words, income analysis using household survey will be unable to review the influence of their enterprises on their income. On the contrary, those employing surveys conducted by enterprises will not be able to consider the effect of such actors of individual attributes as gender, age and education on their income. Different from previous research, this paper use enterprise-employee matching data, namely, a kind

[1] According to Du (2010), the unreasonable part of the high income in monopoly industry is estimated to be one third, which is obviously lower than the figure from other studies. The reason for this cannot be known by a glance. In using data, Du (2010) and Yue (2010) as well as Cai (2015) are similar, that is, the subsamples on by sample survey on population all belong to the 1% of in 2005. However, the research by Du used only samples from Beijing City and other researchers used national samples. In addition, on the definition for practitioners, monopoly industries and competition industries, there are some differences between researches by Du and others.

of data including both information on individuals and the enterprises employees are working in. Thus it has significant advantages and is more reliable. In addition to the advantage of the data, this article will also inspect and analyze the share taken by the unreasonable part of the high income of monopoly industries practitioners from the perspective of average value and income distribution (i.e., quantile decomposition). Decomposition results of this paper can be summarized as follows. At the average levels, with the increase of quantiles, the salary gap between monopoly industries and competition industries is gradually increasing. When quantiles are at the levels of 10%, 50% and 90%, the monopoly industries revenues are 9.4%, 52% and 9.4% higher than competition industries respectively. The proportion of the unreasonable part of the income gap, also rises with the rise of quantiles. More specifically, the proportions of unreasonable part are 26%, 71% and 26% respectively. This conclusion is consistent with previous studies basically. In other words, the conclusion that high income of monopoly industries is basically unreasonable is undoubtable.

2. The research methods

The purpose of this study is to analyze the contribution by industrial monopoly to the salary gap. In the literatures, the research about the salary gap is comparatively mature, which can be seen from decomposition based on the average (Oaxaca, 1973; Blinder, 1973; Cotton, 1988; Neumark, 1988) to the decomposition of the income distribution (Machado and Mata, 2005; Firpo, Fortin and Lemieux, 2009), showing that each decomposition method gives a new perspective for research questions.

When measuring unreasonable part in the high income of monopoly industries, Oaxaca-Blinder decomposition is a method widely applied. Oaxaca-Blinder decomposition is based on regression analysis, which means the salary of each industry is jointly determined by both individual characteristics and the returns of characteristics. Different industries have different individual characteristics distribution and return coefficients, thus we can use the differentials on different industries' characteristics distribution and the return coefficients, and decompose their income differentials. The salary decision equation estimated by this paper not only controls the characteristics of individual human capital, but also controls the operating characteristics of the enterprises as employers. According to human capital theory, individuals' income is severely affected by one's education age, position and professional skills, but the wages of workers are also closely related with the enterprises' operating conditions. This paper uses enterprise-employee matching data, making this paper able to estimate the individual salary income and control the characteristics of the enterprise at the same time, which solves the problem of lacking information Oaxaca-Blinder decomposition can identity salary determination mechanism for different industries, compares the differentials between sources of the

average salary of different industries and determined the unreasonable part of income of the monopoly industries compared with competition industries. In constructing counterfactual distribution, the rate of returns of competition industries is usually used as a standard. The characteristics of the monopoly industries' individuals and the rate of returns of competitive industries are used to calculate the proportion of the reasonable income for not being in monopoly industries. For constructing counterfactual distribution of the income of individuals working in monopoly industries, there are also other structures, thus in decomposing the contribution of salary gap by different factors, there are other decomposition methods. For instance, when calculating the contribution by individual attributes, monopoly industries returns can be used, while calculating the contribution of the rate of return, the average of individual attributes in competition industries is used. Such decomposition is called inverse decomposition, using the rate of returns in monopoly industries as reasonable rate of return for individual characteristics in composing counterfactual distribution. Using these two kinds of decomposition methods, reasonable and unreasonable parts of the income gap are usually not completely the same. As to which one is more accurate to estimate real reasonable and unreasonable parts of the income gap, the answer lies in the estimated returns of which one in the two groups is closer to that of the competitive labor market. For the two groups of monopoly industries and competitive industries in this paper, the labor market in competition industries is likely to be closer to that of the competitive labor market, so the decomposition based on rate of returns of competitive industries may be more ideal. But when explaining decomposition results, in order to verify the stability of the decomposition results, the paper presents the decomposition results of two kinds of decomposition methods at the same time. As there is attribute variables in explanatory variables, there will be a problem of selecting which one group of dummy variables as a reference group. Selecting different reference groups will produce tremendous differential in decomposition methods, which is called index issue. As to index issue, there have been many explorations and studies in literature, of which Cotton(1988), Oaxaca and Ransom is the most typical one. This paper also presents the decomposition made by Cotton and Oaxaca and Ransom. In estimating the unreasonable part of the high income in monopoly industries, the results produced with various methods are basically identical.

Oaxaca-Blinder decomposition focuses on the source of the differentials of the average income distribution, but there may be great differential in density and distribution of the income distribution of monopoly industries and competition industries at different levels. If consideration is given to monopoly industries' practitioners' characteristics and the differential of their income when according to the elemental rate of returns in competition industries, we need to take the affecting factors at different levels in counterfactual distribution into account. DFL decomposition methods have already noticed the differential of income distribution

at different locations, but it has not directly taken the differential of elemental rate of returns of income distribution at different locations into consideration. Moreover, DFL decomposition methods need to estimate the weighting function. If there are errors between estimated equation and real equations, the explanation for the results will also be affected.

The approach used by Machado and Mata (2005) and Melly (2005) is to estimate the distribution of counterfactual income on the basis of conditional quantiles. However, the elemental rate of returns for estimating the equations of conditional quantiles can only affect conditional quantiles. The differentials among conditional quantiles belong to those on income distribution with certain characteristics, while differentials among unconditional quantiles are the reflections of those among real income distribution. The quantiles of real income are not only affected by equations of conditional quantiles of conditional variables, thus the size of rate of returns is not a direct function of quantiles, which are nonlinear functions comparing corresponding variables of characteristics with income distribution. Unconditional quantiles need to be estimated by integrals. Firpo (2009) uses the concepts of Recentered Influence Function (RIF decomposition) in statistics to develop a decomposition method based on the regression of unconditional quantiles. This method enlarges the decomposition method of Oaxaca-Blinder, making decomposition of the differential on the unconditional distribution of income distribution possible. The core of decomposition is to estimate the income's role in determining the characteristics of equations and rate of returns and to use the rate of returns in competition industries as well as the characteristics of monopoly industries to estimate the counterfactual income of monopoly industries, dividing the differentials of the income distribution in monopoly industries into two parts - reasonable characteristics' effects and unreasonable structural effects.

This thesis uses such methods comprehensively, inspecting the salary differential between monopoly industries and competition industries and its source and analyzing the contribution of different rates of returns caused by monopoly in income inequality.[1]

3. Data description

This article uses the enterprise-employee matching data in 2009 collected and sorted by the Research Institute of China's income distribution, Beijing Normal University. As to the definition of monopoly industries, we took the methods adopted by Yue (2010) for reference, using two-digit industry code to divide monopoly industries and competition industries, with the former including 10 industries - oil and gas,

[1] Detailed introduction on various decomposition methods can be referred to Fortin, Lemieux, Firpo (2011) and Guo (2011).

tobacco manufacturing, oil processing and coking and nuclear fuel processing, railway transportation, water transport, air transport, postal services, telecommunications and other information transmission services as well as the financial industry and the latter containing 14 categories including the wholesale and retail groups, construction groups, as well as manufacturing. All the 14 kinds of manufacturing parts belong to light industry. Metals, equipment manufacturing, machinery in the manufacturing sector in Yue *et al*. (2010) were not included in the competition in the industry but listed as in other sectors. This is because these industries include the military enterprises that cannot be distinguished from military industry enterprises. Data In this paper do not include that of military enterprises. Wang and Whalley (2014) calculated the concentration index of Chinese manufacturing companies, compared the manufacturing concentration of manufacturing in China and the United States. They found that the concentration of Chinese manufacturing industry between 2002 and 2007 was less than that of the U.S. companies, so it is rational to classify the metals, equipment manufacturing, machinery sectors as competition industries.[1] Comparing the data by Yue (2010), the monopoly industries in this article do not contain oil and gas industry, and competition industries do not include accommodation catering industry and residents' service as well as other services.

Table 1
The number and distribution of enterprises and practitioners of different industries

Categories of industries	Number of enterprises		Numbers of practitioners	
	Monopoly industries	Competition industries	Monopoly industries	Competition industries
Manufacturing	26	497	12503	104448
Production and supply of electricity, gas and water	132	0	29000	0
Construction industry	0	332	0	41535
Transportation, storage and postal service	37	0	17474	0
Wholesale and retail	0	611	0	52987
Financial industry	103	0	15297	0
Total	298	1440	74274	198970

For monopoly industries we observed and gathered information about 74274 individuals of including 298 enterprises. While for competitive industry, the information comes from 198970 employees of 1440 enterprises. The information

[1] Metal, equipment manufacturing and machinery sections include 15 industries with two digits like chemical raw materials and chemical products' manufacturing industry, metal and non-metal manufacturing industry and equipment manufacturing industry. Comparison under the condition of different definitions between the characteristics of enterprises in competition industry and individual characteristics shows that the results are all similar. Usage of the data analysis for an enlarged scope of competition industry shows that the analysis on the income gap between monopoly industries and competition industries will produce no substantive differences. Due to the space here is limited, we would not report on the analysis on stability.

about the distribution of enterprises and employees of both monopoly and competition industries are shown in table 1. There is information about the characteristics of enterprises and business operation in this paper. We compared the performance and characteristics of monopoly industries and competitive industries in table 2. According to the subordinate relations among enterprises, we divided them into three types: enterprises regulated by the central government or provincial government, enterprises regulated by cities and counties, and other enterprises. Monopoly enterprises belong to a relatively higher level, of which 20% belong to the central government or provincial government, while only 8% of competition industries belong to the central government or provincial government. 55% of monopoly industries belong to cities or counties, while the figure of competition industries is 46%. So there are more enterprises that do not belong to any authority or government below county levels. According to the type of registration, the enterprises are divided into domestic-funded enterprises, enterprises funded by Hong Kong, Macao and Taiwan and foreign enterprises. This article combines enterprises funded by Hong Kong, Macao and Taiwan and foreign enterprises into one group, so all the enterprises are divided into domestic and foreign enterprises. As for monopoly, domestic enterprises take up a higher proportion, for 93% of them are domestically funded. But in competition industries, there is an even higher proportion of foreign enterprises. As for the scale of enterprises, there are two types of enterprises that is above medium scale and small enterprises. The differential on distribution between monopoly industries and competition industries from the perspective of scale is not quite huge, for 25% of the monopoly industries are those with a scale above medium level, which is close to 26%, the figure for competition industries. The number of staff is also a frequent index to measure the scale of enterprises. It can be seen from the table 2 that the scale of enterprises in monopoly industries is larger than the number of staff for an average year in competition industries. Viewed from the median, the number of staff for an average year in monopoly industries is 121.5, while the figure for enterprises in competition industries is 66.

Data in this thesis also include the sales, profit and incremental of enterprises. We use the average number of employees in an enterprise to calculate the average operation index and compare the operational performance between monopoly industries and competition industries. From table 2 we can see that there are great differentials in operation situations among enterprises in monopoly industries. Although the proportion of the losses of enterprises in monopoly industries is quite high, the proportions of average profit and average incremental are all higher than the corresponding index in competition industry. The percentage for enterprises with losses in monopoly industry is 7.8 thousand yuan, while the median of the average profit in enterprises of competition industries is 3.5 thousand yuan; the median of the average sales in monopoly industries is 336.1 thousand yuan, while the median for the average sales in monopoly industries is 326 thousand yuan. The average incremental

is also a measurement on enterprises' operation situation. The median of the average incremental in monopoly industries is 53.4 thousand yuan, while the median of average incremental in competition industries is 36.6 thousand yuan. As the incremental of financial industry is not calculated and there is lack of data about enterprises' incremental, the number observed on average incremental is less than other indexes of enterprises.

Table 2
Comparison of the operating characteristics of monopoly and competitive industries

		Regulated by central or provincial government	Affiliated cities	Domestic enterprises	Large and medium enterprises	Annual Staff number	Amount of loss	Profit per capita (ten thousand yuan)	Sales per capita (ten thousand yuan)	incremental per person (ten thousand yuan)
Mnonopoly industries	Median	0.00	1.00	1.00	0.00	121.50	0.00	0.78	33.61	5.34
	Average	0.20	0.55	0.93	0.25	333.47	0.33	1954.90	7881.92	29.28
	Standard deviation	0.40	0.50	0.26	0.43	715.32	0.47	33,466	133982	91.21
	Figure oberved	298	298	298	298	298	298	298	298	190
Competition industries	Median	0.00	0.00	1.00	0.00	66.00	0.00	0.35	32.60	3.66
	Average	0.08	0.46	0.85	0.26	230.85	0.25	15.21	204.40	13.52
	Standard deviation	0.27	0.50	0.35	0.44	787.72	0.44	450.55	3076.23	61.94
	Figure oberved	1440	1440	1440	1440	1440	1440	1440	1440	972

For different positions, the forms to pay salaries are also different, thus hourly salary is a reasonable index for income. The data includes the annual income and working hours for each employee, thus we calculate the hourly pay for each employee. From table 4 we also can see that the average hourly salary for employees in monopoly industries is 23.18 yuan, while this figure for competition industries is 17.52 yuan, with the former higher than the latter by 32.3%. Judging from income distribution, table 3 gives us the levels of income at the levels of quantiles of 90 and 10 as well the median of 10 in the distribution of the logarithm of hourly salary. Whether at the lower part or higher part, the income of monopoly industries is higher than that of competition industries. The quantile of 10 in monopoly industries' income is 1.81, but 1.72 in competition industries. The quantile of 90 in monopoly industries' income is 3.68, but this figure for competition industries is 3.11. The inequality in practitioners' income in monopoly industries is more serious than that of competition industries. The square deviation and gene coefficient of monopoly industries' income are 0.62

and 0.16 respectively, while these figures for competition industries are 0.39 and 0.14 respectively.

Table 3
Distribution characteristics of logarithmic hourly wage of different industries

	Quantile of 10	Medians	Quantile of 90	Square deviation	Gene coefficient
Monopoly industries	1.81	2.73	3.68	0.60	0.16
Competition industries	1.72	2.26	3.11	0.39	0.14

In this thesis, the data also include the informant about individual employee's social characteristics like gender, education, position and professional skills. Thus we can compare the social characteristics of the employees between monopoly industries and competition industries. From table 4 we can find the proportion of males higher than competition industries. In monopoly industries the percentage of males is 68%, while in competition industries the percentage is 52%. The practitioners in competition industries tend to be younger with an average age of 35.44, while the average age of practitioners in monopoly industries is 36.75. The academic degrees of the practitioners in monopoly industries are higher, of whom 42% own degrees above junior college and receive education for an average of 12.92 years, while in the competition industries practitioners owning degrees of or above junior college account for 25% and receive education for an average of 11.82 years. From perspectives of positions and skills, 72% of them are at the management positions or have qualifications for professional skills in monopoly industries. However, in competition industries, such figure is only 57%. The proportion of personnels attending labor union is higher than that of competition industries. 88% of the employees in monopoly industries are members of labor union, while only 72% attend labor unions in competition industries. From the perspective of regional distribution, there is no big difference in the regional distribution between monopoly industries and competition industries. Both industries have 80% of their employees working in eastern region with only 5% working in western region. The employment rate of monopoly industries is higher than competition industries, which is consistent with the proportion in domestic enterprises in monopoly industries. For the scale of enterprises they are employed, the proportion of being employed by enterprises above medium levels is there than monopoly industries. 70% are employed in enterprises above medium level in competition industries while 59% is the figure for monopoly industries.

Viewing at the income gap between monopoly industries and competition industries loggers, the revenue of the former is higher than that of the latter. But the social characteristics such as education, gender, age are different from that of competition industries, so does the operation situation of the two. Therefore, when analyzing the income gap between the two, differentials of individual human capital and the characteristics of enterprises they are working in must be considered.

Table 4
Statistics description of individuals' social characteristics for different industries

	Monopoly industries		Competition industries	
	Average	Square deviation	Average	Standard deviation
Logarithm of salary	2.77	0.78	2.36	0.63
Hourly salary (yuan/ hour)	23.18	40.39	17.52	160.48
Proportion by males	0.68	0.47	0.52	0.50
Age	36.75	8.74	35.44	9.00
Proportion by those with degrees above junior college	0.42	0.49	0.25	0.43
Years of receiving education (year)	12.92	2.46	11.82	2.47
Management and technological personnel	0.72	0.45	0.57	0.49
Member of labour union	0.89	0.31	0.72	0.45
Eastern region	0.82	0.39	0.80	0.40
Western region	0.05	0.22	0.04	0.20
Domestic enterprises	0.85	0.35	0.77	0.42
Large and medium enterprises	0.59	0.49	0.70	0.46
Number observed	74274		198970	

4. Main results

4.1. Decomposition of average income

The aim of this paper is to measure the proportion of unreasonable part of the high income of monopoly industries. Oaxaca-Blinder decomposition methods can respectively identify the system to determine salary for different industries and compare the origins of the average income gap among different industries to identify the unreasonable part of the revenue of monopoly industries against competition industries.

Table 5 demonstrates a regression model of the salary equations and estimates the equations to determine the salary of both monopoly industries and competition industries. As a comparison, we compare the features of the enterprises that the controlled employees are working in and the estimates of the social characteristics of the individual employee. It can be seen that there are differentials on the factors affecting the rate of returns between the monopoly industries and compassion industries. On the rate of returns of human capital, the income gap between female and male in monopoly industries is smaller than competition industries. In monopoly industries, the salary of male is higher than that of female by 9.3%, while in competition industries this figure is 19%. However, in the monopoly industries,

the rate of returns from education is higher. For each increase of one year spent on education, the income for monopoly industries increases 16% and the income of competition industries increase 8.4%. The salary of monopoly industries increases with the increasing of age, which is presented with the shape of an inverted 'U', while competition industries are still in a phase where the salary increases as the age grows larger. Regardless of monopoly or competition industries, the salary of practitioners in the eastern and central regions of China is relatively higher. In competition industries, both the management position and owning professions' certifications can bring the increase of salary, but in the monopoly industries, owning professions' certificates and the management position do no bring obvious advantages. When the characteristics of enterprises is added, in the equation to determine the salary of monopoly industries R-squared value increases by 15%, while the figure in monopoly industries is 9%. This shows that the characteristics of enterprises can truly affect the income of their employees. From the perspective of the characteristics of enterprises, no matter what kind of the enterprises they are - monopoly industries or competition industries, the salary of the unprofitable enterprises is decreasing. But the income of the practitioners in monopoly industries and competition industries is sensitive with different degrees to the scale and levels of profit of an enterprise. The sales can only measure the scale of enterprises. In competition industries, income of the practitioners working in an enterprise with a higher sale per capita is relatively higher. By comparison, in monopoly industries, the large scale of enterprises does not bring any advantage. In monopoly industries, the income of the employees in enterprises with a profitable level is also higher, but in the competition industries, where the coefficients of the rates of returns for profit is negative, meaning the income of practitioners in enterprises with a high profit is not so high. This result may be caused by the period that the data was in. In the year of 2009, affected by the financial crisis, the profit of manufacturing industries decreases, but the salary of employees did not change due to the limit of contracts, making the profit and salary per hour is negatively correlated, and increased labor cost may also cause profit to decrease. As the data in thesis is cross sectional, we cannot distinguish from these two explanations. But monopoly industries and competition industries perform differently under either case to the two.

Table 6 shows the result of estimating the reasonable and unreasonable income gap of both monopoly industries and competition industries. The average salary per hour in monopoly industries is higher than that of competition industries by 41%. Taking the coefficients of the rate of returns from the salary in competition industries, of the average salary gap between monopoly industries and competition industries, 51.63% can be justified by the individual characteristics and business operation characteristics of both monopoly industries and competition industries, while the rest 48.37% represents the part that cannot be explained. If we take the efficient of the rate of returns in monopoly industries as the elemental rate of returns in counterfactual

distribution, the proportion taken by reasonable part of the salary gap drops by 19.20%. In contrast, the share taken up by unreasonable part rises to 80.80%. The differential of the two results may partly because of index that has been mentioned in this paper. This thesis also reports other two results for decomposition, in which the unreasonable part of the salary gap between monopoly industries and competition industries remains at levels of 63% and 72%. This demonstrates that even if the scale, profit status and profit level of enterprises are controlled, there is still salary gap between competition industries and monopoly industries and a big proportion of it cannot be explained by the differential of the practitioners' characterises.

Table 5
Regression result by OLS

	(1)	(2)	(3)	(4)
Logarithm of salary per hour	Monopoly industries	Monopoly industries	Competition industreis	Competition industreis
Male	.093*** (.0053)	.084*** (.0052)	.19*** (.0026)	.18*** (.0026)
Year of education	.16*** (.0011)	.15*** (.0011)	.084*** (.00063)	.083*** (.00063)
Age	.081*** (.0021)	.084*** (.002)	.004*** (.0011)	.0076*** (.0011)
Square of age	-.00079*** (.000028)	-.00083*** (.000027)	.000014 (.000016)	-.000021 (.000016)
Eastern region	.48*** (.0068)	.31*** (.0076)	.19*** (.0053)	.22*** (.0059)
Centra region	.15*** (.0087)	.039*** (.0088)	-.032*** (.0058)	.019** (.0064)
Management personnel	-.093*** (.0079)	-.071*** (.0078)	.26*** (.0044)	.26*** (.0043)
Professional qualifications	-.1*** (.0055)	-.079*** (.0053)	.054*** (.0027)	.044*** (.0026)
Per capita profits		.00053*** (.000017)		-.00039*** (.000044)
Per capita sales		-.00013*** (4.2e-06)		.00006*** (6.5e-06)
With or without losses		-.34*** (.0055)		-.23*** (.003)
Constant term	-1.5*** (.042)	-1.2*** (.041)	.89*** (.022)	.85*** (.022)
N	74274	74274	198970	198970
R^2	.27	.31	.22	.24

Note: Inside the brackets were standard deviation and asterisk stands for significance. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table 6

Oaxaca-Blinder decomposition of the salary gap between monopoly industries and competition industries

	Monopoly industries	Competition industries	Salary gap	Explicable part	Inexplicable part	Share taken by explicable part (%)	Share taken by inexplicable part (%)
Characteristics of individuals and enterprises included							
Reference to competition industries	2.77	2.36	0.41	0.21	0.20	51.63	48.37
Reference to monopoly industries	2.77	2.36	0.41	0.08	0.33	19.20	80.80
Oaxaca and Ransom	2.77	2.36	0.41	0.15	0.26	36.52	63.48
Cotton (1988)	2.77	2.36	0.41	0.11	0.30	28.02	71.98
Only characteristics of individuals included							
Reference to competition industries	2.77	2.36	0.41	0.21	0.20	51.97	48.03
Reference to monopoly industries	2.77	2.36	0.41	0.15	0.26	35.85	64.15
Oaxaca and Ransom	2.77	2.36	0.41	0.17	0.24	40.74	59.26
Cotton (1988)	2.77	2.36	0.41	0.17	0.25	40.23	59.77

Note: Individual characteristics include gender, year of education, age, age's square, eastern region, central region, management personnel or not, with or without professional qualifications, variables of enterprises' characteristics including

The findings of this paper is similar to that of the research by Yue (2010) who uses the data from household surveys to analyze the reasonable and unreasonable part of the salary gap between monopoly industries and competition industries and finds unjustified part of the salary gap between monopoly industries and competition industries contributes more than 48%. In comparison, this paper also inspects the influence of controlling human capital on the salary gap between monopoly industries ad competition industries. From table 6 we can also see the changes on the proportion of unreasonable part of the salary gap between monopoly industries and competition industries when there is only control on human capital. But no matter what decomposition methods we use, there is no reversion on the ratio between unreasonable and reasonable parts. In the salary gap, inexplicable part still takes up a key share. Monopoly is still an important source of the salary gap between industries.

4.2. Decomposition of the salary gap by quantiles

Oaxaca-Blinder decomposition methods provide both the parts of explicable and

inexplicable parts in the differential of the average value of the salary distribution. But in the whole income distribution, apart from the average income, there is differential in the income distribution at different locations. In this paper, DFL decomposition technology is used and the method of weighting is used to compose counterfactual distribution in order to compare the reasonable and unreasonable part of the salary at different locations. The idea of DFL decomposition methods is similar to that of Oaxaca-Blinder decomposition framework and aims to decompose the salary gap into effects on characteristics and structures. Effects on characteristics are changes of income distribution caused by the distribution differential of those variables of characteristics determining income among different industries, while the structural effects refer to the effects caused by the differential on rate of returns on characteristics caused by different income levels from different industries, thus are the inexplicable part of the salary gap. By using the rate of returns of complete competitive industries, we can calculate the counterfactual distribution which is produced when characteristics distribution likens monopoly industries but income is calculated according to the rate of returns in accordance with competition industries. Figure 1 and 2 demonstrate the comparison among monopoly industries, competition industries and counterfactual distribution.

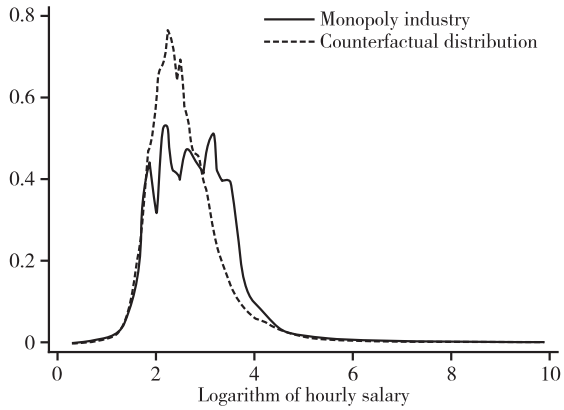

Figure 1. Distribution of monopoly industries'salary and counterfactual salary

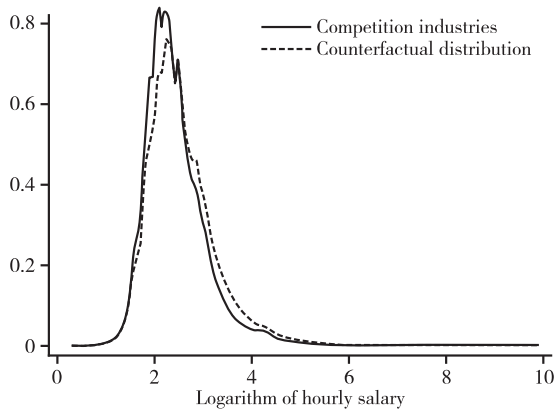

Figure 2. Distribution of competition industries'salary and counterfactual salary

Figure 1 shows that compared with counterfactual distribution in competition industries, the income of monopoly industries is close to that of the low income, but it has a bigger density at the part of high income, and its distribution is shifting towards the right. Figure 2 shows that when the individual characteristics of monopoly industries acquire income in accordance with the rate of returns in competition industries, counterfactual distribution is similar to that of competition industries.

Table 7 gives us the information of the decomposition of the different on structure and characteristics according to different statistical features as well as their contribution proportion to the salary gap between monopoly industries and competition industries. On the gap of the average value between monopoly industries and competition industries, the proportion between the explicable and inexplicable parts is similar to the result of table 6, but the inexplicable proportion by DFL decomposition is higher. The income inequality of monopoly industries is higher than that of competition industries. We can see from table 7 that monopoly industries are higher than competition industries from both perspectives of variance and Gini coefficients. When decomposed as gap on structure and characteristics, contribution rate of inexplicable part to the inequality exceeds 65%, meaning that the inequality among industries comes mostly from different rates of returns instead of differential on the distribution of practitioners' characteristics and enterprises' operation characteristics.

Table 7
Salary gap calculated by DFL weighting method

	Monopoly industries	Counter-factal figure	Competition industreis	Gap among industries	Structural gap	Characteristics' gap	Share of the inexplicable (%)	Share of the explicable (%)
Average value	2.77	2.50	2.36	0.41	0.28	0.13	67.38	32.62
5 quantiles	1.68	1.61	1.57	0.11	0.07	0.04	62.85	37.15
10 quantiles	1.81	1.78	1.72	0.10	0.03	0.07	31.27	68.73
25 quantiles	2.16	2.05	1.96	0.20	0.12	0.09	57.37	42.63
median	2.73	2.38	2.26	0.47	0.35	0.12	73.95	26.05
75 quantiles	3.27	2.86	2.65	0.63	0.42	0.21	66.46	33.54
90 quantiles	3.68	3.32	3.11	0.58	0.36	0.21	62.99	37.01
95 quantiels	4.07	3.67	3.46	0.61	0.40	0.22	64.56	35.44
Square deviation	0.60	0.46	0.39	0.21	0.14	0.07	67.35	32.65
Gene coefficient	0.16	0.14	0.14	0.02	0.01	0.01	67.97	32.03

It can be seen from the differential on quantiles of income distribution in Table 7 that income of monopoly industries is higher than the income of competition industries that is corresponding to quantiles. With the improvement of income, the salary gap

between monopoly industries and competition industries is enlarging. At 10 quantiles of the income distribution, the income of monopoly industries is higher than competition industries by 10%. At the median, the income of monopoly industries is higher than completion industries by 47%. At 90 quantiles, the income of the monopoly industries is higher than competition industries by 58%. Viewing from the source of income gap, at the place where the low income distributes, gap caused by characteristics account for an important proportion of the income gap, while at the place where high income distributes, structural gap accounts for a key proportion. At 10 quantiles, explicable part accounts for 37.01% of the salary gap. Thus, the differential at the lower part of income between monopoly industries and competition industries is mainly due to the differential on the individual characteristics of the practitioners and enterprises, while the differential on the higher part of the income comes largely from the differential of the mechanism to determine the elemental rate of returns from salary among industries.

4.3. Robustness test

It can be seen from table 1 that, there are great differentials on the density and distribution of the income distribution between monopoly industries and compassion industries at different income levels, thus concerning only about the gap between the average value will neglect the differential and source of income distribution at different levels. DFL methods have taken the differential of income distribution at different levels into account, but excluding the differential on the elemental rate of returns for income at different places of income distribution. Mated and Mata (2005) proposed a regression model for conditional quantiles, supposing the equations to determine income at different quantiles with different income distributions between monopoly industries and competition industries. First, we should estimate equations to determine income for different quantiles in accordance with conditional quantiles' model. Then we use the elemental rate of returns for different quantiles that have been estimated. For the features of monopoly industries' practitioners, we can compose the counterfactual distribution under the assumption that those elemental features of monopoly industries acquire income in accordance with the elemental rate of returns from competition industries and then compare the gap between the income distribution of monopoly industries and counterfactual distribution. Finally we can get the influence caused by the inexplicable factors of different elemental rate of returns and those explicable factors of different distributions of practitioners' characteristics in producing the gap between monopoly industries and competition industries.

The method adopted by Machado and Mata (2005) as well as Melly (2005) is to estimate counterfactual income distribution on the basis of conditional quantiles, but the elemental rate of returns estimated by conditional quantiles is only a function of conditional quantiles. Quantiles are non-linear functions of the variables of

characteristics, thus the rate of returns is not the result of the direct influence on the quantiles of incomes distribution by corresponding variables of characteristics. The RIF decomposition method developed by Fire (2009) on the basis of unconditional quantiles' regression enlarges the decomposition from average value to the whole salary distribution, replace the regression of conditional quantiles through unconditional quantiles, in order to decompose the characteristics' gap and the structural gaps of elemental rate of returns to the variable of various characteristics.

Table 8

Decomposition of conditional quantiles for the salary gap between monopoly industries and competition industries

	Original gap	Estimated gap by models	Gaps on characteristics	Structural gap	Percentage of explicable part (%)	Percentage of inexplicable part (%)
5 quantiles	0.11	0.04	0.07	-0.02	153.81	-53.81
10 quantiles	0.09	0.10	0.07	0.03	73.61	26.39
25 quantiles	0.20	0.26	0.10	0.16	37.76	62.24
Medians	0.46	0.47	0.14	0.33	28.88	71.12
75 quantiles	0.63	0.60	0.17	0.44	27.39	72.61
90 quantiles	0.57	0.63	0.18	0.46	27.93	72.07
95 quantiles	0.62	0.61	0.16	0.44	27.05	72.95

Note: individual characteristics' variables include gender, years of education, age, age square, eastern region, central region, management personnel or not, with or without professional qualifications. Enterprises' characteristics' variables include whether there are losses, per capita profit and per capita sales.

This paper uses two decomposition methods-conditional quantiles and unconditional quantiles - to examine the income gap at different levels of income distribution between monopoly industries and competition industries and its source. Table 8 shows the income gap estimated by the conditional quantiles' model by Melly (2005). As the quantiles of income increase, the income gap between monopoly industries and competition industries is gradually being enlarged. At the lower part of the income (10 quantiles), income of monopoly industries is only higher than that of competition industries by 10%, while at the median part, such figure is 47% and at the higher part of 90 quantiles, the number is 63%. After decomposing the gap of income between monopoly industries and competition industries into characteristics gap caused by different distribution of practitioners' features and structural gap due to different elemental rates of returns for different industries, it can be seen that the income gap at the lower part of income mainly comes from the explicable part, while at the middle and higher part of income, the income gap largely comes from inexplicable part caused by elemental rates of returns. At the lower part of income (10 quantiles), the inexplicable part of the income gap takes up only 26.39%, while at the median part, such figure reaches 71.12%. At the higher part of income (90 quantiles), such number

reaches 72%. These results are similar to those in table 7 where at the higher part of high income distribution, inexplicable part takes an increasingly large share.

Table 9

RIF decomposition of quantiles for the salary gap between monopoly industries and competition industries

	Original gap	Gap estimated by models	Characteristics' gap	Structural gap	Percentage of the explicable (%)	Percentage of the inexplicable(%)
Average value	0.41	0.41	0.21	0.2	51.63	48.37
10 quantiles	0.1	0.1	0.15	-0.05	149.14	-49.14
25 quantiles	0.2	0.22	0.2	0.01	93.67	6.33
Medians	0.47	0.47	0.26	0.21	55.47	44.53
75 quantiles	0.63	0.63	0.17	0.46	27.26	72.74
90 quantiles	0.58	0.58	0.21	0.37	36.44	63.56

Note: Individual characteristics' variables include gender, years of education, age, age's square, eastern region, central region part, management personnel or not, with or without professional qualifications. Enterprises' characteristics include with or without losses, per capita profit and per capita sales.

Table 9 gives us the RIF decomposition results of unconditional quantiles by Firpo (2009). From the first two columns it can be seen that the differential between the income gap estimated by RIF equations and the gap of quantiles from original data as well the gap with average value is quite small. The income gap of quantile 10 of the unconditional quantiles between monopoly industries and competition industries 0.10, while the income gap estimated by RIF decomposition methods is 0.10. At the quantile of 90 of high income, the income gap of quantiles of original data is 0.58, while that gap estimated by RIF methods is 0.58. At different levels of income distribution, we can see the source of the income gap estimated by RIF and the estimated results by conditional quantiles in table 8 are quite similar. For 10 quantiles of low income, 149% of the income gap comes from explicable characteristics' gap, while at the medians of the income, the explicable part of the income gap drops to 55%. At the quantiles of 90 of the high income, the proportion of the part originating from explicable factors in the income gap drops to 36.44%. Thus, with the improvement the income distribution, the proportion caused by inexplicable part grows higher.

In a word, judging from the decomposition of the income gap at different income distribution levels, as the location of income distribution moves higher, the income gap between monopoly industries and competition industries is increasing, so does the proportion of inexplicable part from income gap. At the part of low income where the income of monopoly industries and competition industries distributes, the income gap is mainly caused by gaps on the characteristics of practitioners and enterprises, while at the part of high income where income distributes, the income gap is mainly produced by inexplicable factors such as elemental rates of returns.

5. Conclusions

Income gap between industries is one source for the differentials on income and also the result of barriers preventing labor force from flowing into the market and restricted access. As China's labor market is growing mature, the obstacles for free allocation of labor force are becoming less gradually. With gradual realization of the reform of household registration system and the overall plan for national social security and medical system, factors limiting the flow of labor force among regions gradually decrease, making a national market for labor forces gradually take shape. However, the barriers and limitations among industries lead the factors affecting the entrance and exit of industries to become an emergent problem. Only by allocating labor forces among different industries freely can the distortions on resource allocation caused by limiting labor forces become less and less, quickening the free flow of talents and providing new motivation for China's economic transformation and sustainable development.

This paper analyses the influence of industrial monopoly on income gap, that is, the average income of monopoly industries is higher than competition industries. Analysis on the gap at different income distribution levels demonstrates that the higher the income is, the larger the income gap between monopoly industries and competition industries is. Using the equations for salary determination, this paper analyses both the explicable and inexplicable parts of the income gap between monopoly industries and competition industries. We find that the inexplicable part of the income gap increases after enterprises' characteristics and individual factors are controlled, which can be deemed as improvement and supplement for missed factors analyzing enterprises in literatures. Furthermore, using the decomposition method of quantiles' regression we inspect the proportion of inexplicable part in income gap at different income distribution levels. At low income part, explicable part takes up more shares of the income gap, while at the high income part, the proportion occupied by explicable part decreases. Thus, industrial monopoly is more beneficial for those who earn a high income than low income earners. The index of income inequality of monopoly industries is higher than that of competition industries, implying that there is no trend of balanced income in monopoly industries.

Promoting income fairness among industries is a key component in income distribution strategy. The barriers for labor force's flow caused by monopoly enlarge the income gap among different industries, cause income inequality and increase the separation among people. At a certain period, there are reasonable historical factors for monopoly. Thus, administration on the income gap among industries must give full play to both the government and market. From the perspective of government, we must strengthen the transformation of governmental functions, giving its role of supervision into full play. The source of high income in industrial monopoly is monopoly profits,

so strengthening the supervision and regulation on monopoly industries' profits and market behaviours would control the profit level reasonably. By strengthening checks on anti-monopoly behaviours of monopoly industries, fair operation of the market would be promoted and enterprises' market behaviour would be regulated. Rational supervision on pricing by monopoly industries would not only curb monopoly profits but also lesson the operation cost of other related enterprises in the market, add economic visor and reduce the losses on efficiency caused by monopoly pricing. Second, we should gradually improve the proportion and perfect the mechanism for the bonus of state-owned enterprises, increase governmental fiscal income, and add civil expenditure or transfer payment through the government in order to rationally use monopoly profits. From the perspective of market, with the advances on the Internet and newly-emerging technologies, changes happen to industrial structures and barriers. Therefore, while reducing unnecessary administrative approval, the government should explore the regulation on negative list and regulate industries by classifying them, remove confinement and restricted access unsuitable to economic situations and give the market a bigger role to play in allocation resources.

Moreover, regulating monopoly industries is also one of the key elements when reforming state-owned enterprises. While building a reasonable mechanism for enterprises' salaries, we should perfect the supervision mechanism for enterprises' performance and strengthen the regulation and management on enterprises' operation by external organizations. Bringing the Party into full play when supervising and regulating monopoly industries would make up for the insufficient factors of motivation and coordination in the administration framework of state-owned enterprises and perfect the inspirational constraint mechanisms in supervision management and assessment as well as evaluation. Meanwhile, we should promote reforms on the state-owned enterprises for mixed ownership, give private economy proper rights for administration, gradually abandon the old outlook that state-owned shares are golden ones and change ways of handling matters in the hope of promoting state-owned enterprises' reform towards marketization, attracting private capital and forming new behaviour subjects in market economy.

References

Blinder, A. S. (1973). Wage Discrimination: Reduced Form and Structural Estimates. *Journal of Human resources*, *8* (4) 436-455.

Cotton, J. (1988). On the decomposition of wage differentials. *The Review of Economics and Statistics*, *70* (2), 236-243

DiNardo, J., Fortin, N. M., & Lemieux, T. (1996). Labor market institutions and the distribution of wages, 1973-1992: A semiparametric approach. *Econometrica*, *64* (5), 1001-1044.

Du, X. (2011). The income gap between China's monopoly industries and competition industries: A research based on micro data in Beijing. *Nankai Economic Studies (Nankai Jingji Yanjiu)*, 5, 111-124.

Firpo, S., Fortin, N. M., & Lemieux, T. (2009). Unconditional quantile regressions. *Econometrica 77* (3), 953-973.

Fortin, N., Lemieux, T., & Firpo, S. (2011). *Decomposition methods in economics*. Handbook of labor economics 4, North Holland, 1-102.

Guo, J., Jiang, L., & Lu. L. (2011). Review on the decomposition methods of salaries' differentials. *China Economic Quarterly (Jingjixue Jikan)*, *10* (2), 363-414.

Machado, J. A., & Mata, J. (2005). Counterfactual decomposition of changes in wage distributions using quantile regression. *Journal of applied Econometrics*, *20* (4), 445-465.

Melly, B. (2005). Decomposition of differentials in distribution using quantile regression. *Labour Economics, 12* (4), 577-590.

Neumark, D.(1988). Employers' discriminatory behaviour and the estimation of wage discrimination. *Journal of Human resources*, *23* (3), 279-295.

Oaxaca, R. L., & Ransom, M. R. (1994). On discrimination and decomposition of wage differentials. *Journal of Econometrics*, *61* (1), 5-21.

Wang, J., & Whalley, J. (2014). Are Chinese markets for manufactured products more competitive than in the US? A comparison of China–US industrial concentration ratios. NBER Working Paper, No. 19898.

Yu, L., & Zhang, J. (2013). Empirical studies into the effect of china's monopoly industries' income distribution. *Research on Financial and Economic Issues (Caijing Wenti Yanjiu)*, 1, 24-29.

Yu, L., & Zhang, M. (2013). Empirical studies into monopoly and the factors influencing the industrial income gap. *Research on Economics and Management (Jingji Yu Guanli Yanjiu)*, 10, 15-22.

Yue, X., & Cai, M. (2015). Studies into the degree of irrationality of high income in monopoly industries. *China Industrial Economics (Zhongguo Gongye Jingji)*, 5, 5-17.

Yue, X., Li, S., & Sicular, T. (2010). Explorations into the high income of monopoly industries. *Social Sciences in China (Zhongguo Shehui Kexue)*, 3, 77-93.