

# 02 Influence of Education and Gender on Occupational Income In China

——A statistical analysis report based on SPSS

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## Abstract:

In a city, resident’s annual income plays a very important role in the distribution of social resources. By studying the distribution of urban incomes, we can better understand the social structure and the urban operation system, thus exploring more urban problems. This study focuses on the relationship between citizens’ income and their gender, and the level of education, and tries to find personal factors that affect the income of urban residents. According to the data analysis, the higher the individual’s education level is, the higher the occupational income is. Furthermore, Men with the same qualifications earn more than women.

**Key word:** *education, occupational income, gender difference, Crosstab analysis, SPSS*

## 01 Introduction

Ensuring fairness in the urban income distribution system is a key factor in maintaining social equity and voicing for those underrepresented. As a city planner, understanding factors that influence occupational income can help us understand the social structure and the system for distributing resources more deeply, thus better manage and operate the city.

In addition, with the continuous reform and development of higher education, with the current social situation still been shadowed by the financial crisis, more and more people are faced with the dilemma of further study and employment. It is widely accepted that people’s income is closely related to their academic qualifications. University diplomas are more valuable, and high school leavers are less and less popular in the labour market. However, there is no quantitative analysis to study the current situation in China, where education is expending rapidly and society is also developing rapidly: what impact does education have on individual’s professional income? And in the economic downturn, is occupational development restricted by gender?

This paper attempts to use the data of real social surveys to analyse and study the relationship between individual’s education level and their professional income in Chinese society, and the impact of gender on income. It is hoped that the relationship between academic qualifications, gender, income, and other influences will be studied through real data, and the relationship between individual efforts and personal achievements will be appropriately explained.

## 02 Literature Review

### >> 2.1 Research survey by Nanjing University of Finance and Economics:

The income and education data of occupational groups in four major cities of Beijing, Shanghai, Nanjing and Taizhou were collected. The variance analysis method was used to study the correlation consequence of academic qualifications on occupational income and to analyse its mathematical model.

The conclusions show that: (1) High education in modern society is an inevitable trend. If economic conditions allow, it is more appropriate to have further education. (2) Should not pursue high academic qualifications blindly, people with high academic qualifications and low ability will still be eliminated when they go to work.

### >> 2.2 Research survey by Dalian University of Technology:

Using the 2004 China Industrial Economic Census data to test the difference in the average wages of workers with different academic qualifications, and pay attention to the possible impact of the gender of workers on wages.

The test concluded that: (1) high school education, college degree and university degree have a positive impact on the wages of workers, and this effect is relatively stable and gradually enhanced, and the impact of postgraduate education on the wages of workers is difficult to determine; (2) After using the educational score method to measure the average academic qualifications of the enterprise, the test showed that the ratio of female employees may have a negative impact on the per-capita wages paid by the enterprise, if the average academic qualification of the employees is assumed to be the same. And the positive impact of average employee education on per capita wages may diminish as the ratio of female employee increases.

## 03 Methodology

In this paper, 7510 data samples were studied using SPSS-based data analysis. The main research process is defined as follows:

### Step 1 Define variables and raise hypothesis

Define the independent and dependent variables of this study, and propose three original hypotheses about income, gender and the level of highest education.

### Step 2 Validate datasets

Define default values, set continuous variables and run frequency analysis to filter out invalid data and missing data to determine the validity of the datasets.

### Step 3 Study relationships between annual income and the level of highest education

- a. Take crosstab analysis of the level of highest education and annual income, to test the raised hypotheses
- b. Study further the distribution of incomes from different education level and at the same time supplement the hypotheses

### Step 4 Study relationships between annual income, gender and level of highest education

- a. Use independent T- test and Pearson correlation analysis to compare the relationship between gender and income, to test hypotheses.
- b. Conduct crosstab analysis and study the impact of gender on people’s income within groups with the same education level, divide the samples by their level of highest education into the high school and below, university degree, and the postgraduate and above, and study the impact of gender difference on income in the three groups.

### Step 5 Conclusion and suggestions

The above data are analysed and summarized to draw conclusions, so as to provide suggestions for reducing social inequality in income distribution, reducing the rate of unemployment and improving citizen's income level.

04 Source of Data

The data source for this study was the 2012 national statistics of the Chinese General Social Survey (referred as CGSS2012 thereafter). CGSS started in 2003 and is the earliest national, comprehensive and continuous academic survey project in China. It systematically and comprehensively collects data from multiple levels of society, community, family and individual. At present, CGSS data has become the most important source for studying Chinese society.

05 Variables and Hypothesis

>> 5.1 Research sample:

Use the CGSS2012 census data to study the relationship between the following variables. As is shown in the Table 1 above, the level of highest education, gender are defined as independent variables, annual income is defined as dependent variable, and age is defined as other variable. This study mainly looks into the correlation among the two independent variables and the dependent variable.

Type	Name	No.of samples	Valid samples
Independent	Level of highest education	7510	7510
Independent	Gender	7510	7510
dependent	Annual income	7510	6972
Other	Age	7510	7509

Table 1: Variable description

>> 5.2 Research hypothesis

- **Hypothesis 1:** Personal education has a positive impact on income, the higher the education, the higher the income.
- **Hypothesis 2:** Relevance of relationship between men’s academic qualification and income is higher than that of women.
- **Hypothesis 3:** Average income of men and women with same level of education is the same, and the income distribution is roughly the same as well.

06 Data Analysis

>> 6.1 Validate the data

Define default values and then use the Select Cases function in SPSS to select working people (including farming) from the sample to create a new data set for further studies. This paper defines the variable for the level of highest education as the continuous variables in Figure 1, in the same way, record the annual occupational income and define the variable as the continuous variable in Figure 2.

Run frequency analysis on several variables to validate and understand the basic information of the data, as is shown in Table 2, Table 3, and Table 4.

In Table 2, Frequency refers to the number of males and females in the dataset; Percentage refers to the proportion of people of different genders in the total population, expressed as:

Percentage =  $\frac{\text{the number of males/females}}{\text{the number of the whole dataset}}$

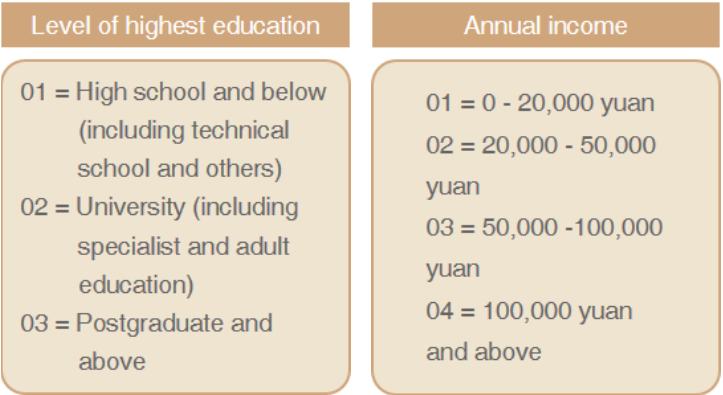


Figure 1 continuous variable of the level of highest education

Figure 2 continuous variable of the annual income

Gender	Frequency	Percentage	Effective percentage	Cumulative percentage
Male	4304	57.3%	57.3%	57.3%
Female	3206	42.7%	42.7%	100%
Total	7510	100%	100%	-

Table 2: Validation of gender data

Effective percentage filter out the default value and missing data, while cumulative percentage calculates the percentage of the cumulative frequency within male and female intervals. From the table, it can be seen that the ratio of male to female samples is not equal, with more men and fewer women.

In Table 3, Frequency refers to the number of people with different education level in the dataset; Percentage refers to the proportion of people with different education level in the total population, expressed as:

Percentage =  $\frac{\text{the number of people with different education level}}{\text{the number of the whole dataset}}$

Highest education	Frequency	Percentage	Effective percentage	Cumulative percentage
High school and below	6142	81.8%	81.8%	81.8%
University	1320	17.6%	17.6%	99.4%
Postgraduate and above	48	0.6%	0.6%	100%
Total	7510	100%	100%	-

Table 3: Validation of highest education data

The table shows that the overall academic qualifications of the sample are relatively low, with 81.8% of them having an education at the high school level or below, and the number of undergraduate and postgraduate students accounted for less than 20% of the total samples. There are only 42 people having a master degree in the sample of 7510 people, accounted for about 0.6% of the total samples.

In Table 4, Frequency refers to the number of people with different occupational income, Percentage refers to the proportion of people with different education level in the total population, expressed as the formula below, and cumulative percentage only calculates the percentage of the cumulative frequency within the continuous intervals, filtering out those not reported.

Percentage =  $\frac{\text{the number of people with different occupational income}}{\text{the number of the whole dataset}}$

Annual income	Frequency	Percentage	Cumulative percentage
0 – 20K	4579	61%	65.7%
20K – 50K	1817	24.2%	91.7%
50K – 100K	466	6.2%	98.4%
Above 100K	110	1.5%	100%
Sub total	6972	92.8%	-
Not responded	538	7.2%	-
Total	7510	100%	-

Table 4: Validation of annual income data

As is shown from Table 4, a total of 4,253 people have an annual income between 0 and 20K yuan, accounting for 61% of the total samples, while only 105, about 1.5%, of the people have an annual income above 100K. As can be seen from the table, the overall income of the samples is concentrated in the range of 0 - 20,000 yuan, and the income gap between individuals is large.

>> 6.2 Correlation between income and the level of highest education

Crosstab analysis was conducted between the level of highest education and annual income to study their data correlation, as is shown in Table 5. First, the chi-square test showed that the significance level (refers as Sig thereafter) of the cross analysis was 0.00<0.05. This indicates that there is an obvious correlation between annual occupational income and the level of highest education. Therefore, pile-up histograms (Figure 2) were made according to the cross analysis to more clearly show the relationship between education background and income.

Annual income	level of highest education			
	High school and below	University	Postgraduate and above	Total
0 – 20K	75.2%	24.1%	8.5%	65.7%
20K – 50K	20.7%	50.3%	38.3%	26.1%
50K – 100K	3.4%	20.5%	34.0%	6.7%
Above 100K	0.7%	5.2%	19.1%	1.6%
Total	100.0%	100.0%	100.0%	100.0 %

Table 5: Correlation between income and level of highest education



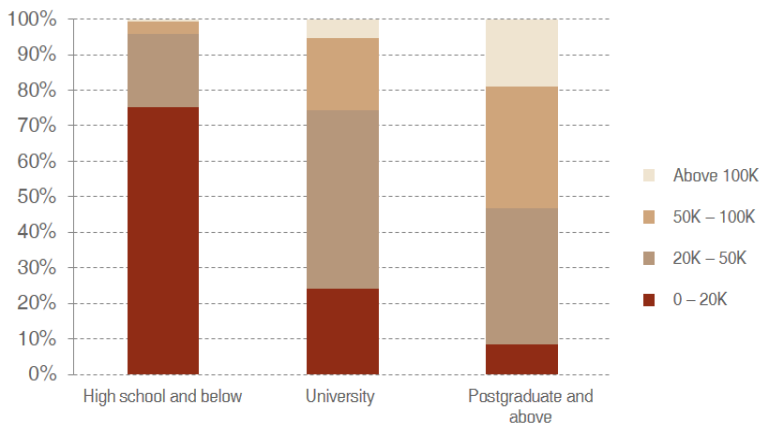


Figure 2 the relationship between education background and income

Figure 2 shows that more than 70% of people with education level of high school or below have an income within the range of 0-20K; 50% of people with a college degree have an income within the range of 20K-50K yuan; while the mainstream income of people with a postgraduate degree or above is within the range of 20K-50K and 50K-100K yuan. In addition, the proportion of people to get ultra-high income (100K) is increasing with the increasing of their level of highest education. Therefore, hypothesis 1: Personal education has a positive impact on income, the higher the education, the higher the income is tenable.

>> 6.3 Correlation between income, gender and the level of highest education

The data association between the three variables: income, education level, gender was studied by crosstab analysis. First, an independent T- test was performed on the sample data using SPSS to check whether there is a gender difference in individual income. From the Levene test of homogeneity of variance, Sig = 0.00<0.05 indicates that Hypothesis 3 is not valid, which means there is a gender difference between average income of people with same education, and so is with the income distribution.

According to the Pearson correlation analysis, the value of women is 0.836, while for men is 0.747, therefore the correlation between income and female employee is stronger than that of male. Therefore, the higher is a woman's education, the higher is her income, and the greater is the positive correlation between the two. Hypothesis 2: Relevance of relationship between men’s academic qualifications and income is higher than that of women, is not valid. To compare the gender difference, list the annual income and the level of highest education of male and female within one table, as is shown in Table 6

Gender	Income	Level of highest education			
		High school & below	University	Postgraduate & above	Total
Male	0 – 20K	68.40%	19.50%	7.10%	59.40%
	20K – 50K	26.00%	51.60%	42.90%	30.60%
	50K – 100K	4.70%	21.90%	28.60%	7.90%
	100K+	0.90%	7.10%	21.40%	2.10%
	Total	100.00%	100.00%	100.0%	100.0%
Female	0 – 20K	84.70%	30.20%	10.50%	74.30%
	20K – 50K	13.30%	48.60%	31.60%	19.80%
	50K – 100K	1.70%	18.60%	42.10%	5.00%
	100K+	0.30%	2.60%	15.80%	0.80%
	Total	100.00%	100.00%	100.0%	100.0%

Table 6: income, gender and level of highest education

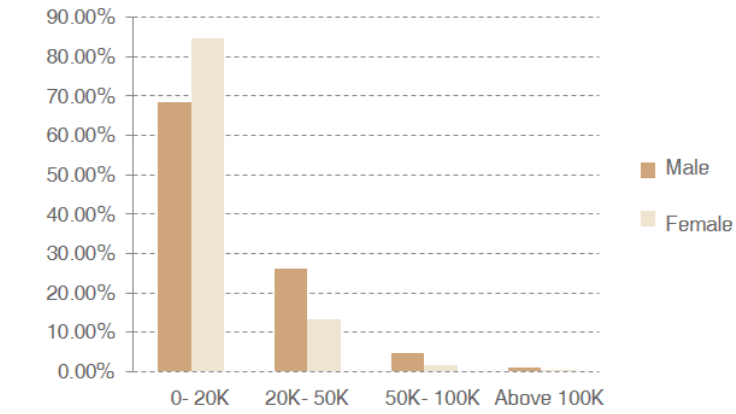


Figure 3 Annual income with high school education

As can be concluded from the table above, the proportion of woman (74.30%) having low income (0 – 20K) is much larger than that of men (59.40%), which indicates the low income of woman in the workplace. In addition, men have an advantage when it comes to earning high and ultra-high income (50K above), with the proportion of 10%, while that of women is only 5.8%.

In order to carefully study the impact of gender differences on income under the same educational background, histograms of the incomes of men and women with different education levels were drawn and shown in Figure 3, Figure 4 and Figure 5 respectively.

It can be learned from Figure 3, that in the group with the highest education of high school, though most people's income falls within the range of 0-20K yuan, the proportion and the number of women who falls into the low-income (0-20K yuan) group is quite larger than that of men, and 31.6% men succeeded in obtaining relatively higher income (more than 20K yuan). Compared to only 15.3% women who achieved an annual income above 20K yuan, the proportion for men is obviously much higher than for women. This indicates that among people educated up to high school education, the income distribution of men is higher than that of women.

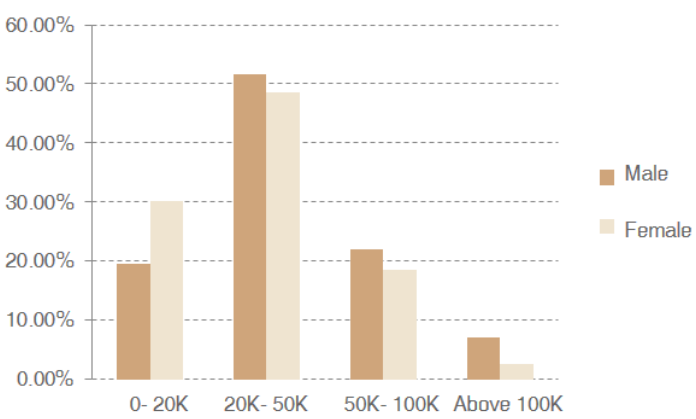


Figure 4: Annual income with university education

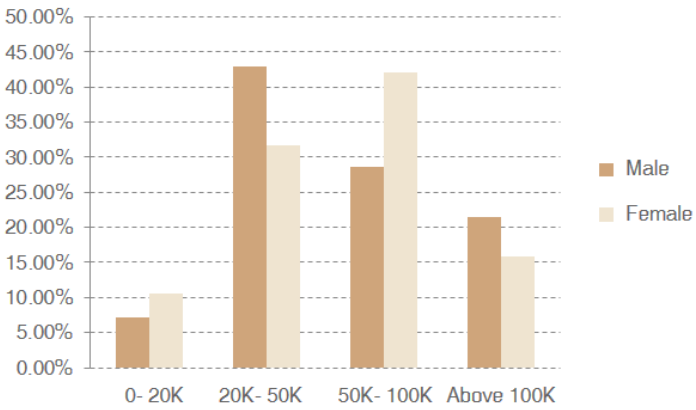


Figure 5: Annual income with postgraduate degree

As is shown in the Figure 4, although a large number of women with bachelor degree have their main income fall between 20K-50K (48.6%), having a higher income level than women with a high school education, women’s proportion in low-income range (0-20K) is still as high as 30.2%, and the proportion is only 19.5% for men with the same degree. Also, only 21.2% women achieved a high income (above 50K), far lower than 29% for men. This indicates that among people with college degrees male income is distributed into a higher range than female income, hence hypothesis 3 is invalid.

It can be seen from Figure 5 that the main income of people with a postgraduate degree falls into the ranges of medium (20K to 50K) and high (50K to 100K yuan). In addition, people with a postgraduate degree are more likely to earn ultra-high income (more than 100K yuan).

It is worth mentioning that for the first time, the proportion of female postgraduate students earning a high income which exceeds that of men, although the proportion is still lower than that of men in terms of middle income and ultra-high income. In addition, more female postgraduate students (10.5%) than men (7.10%) earn low (0-20K) income.

This indicates that there is a certain correlation between postgraduate education, higher income of women, and the decrease of gender difference in income. Therefore, in the group with postgraduate education, the income distribution of men is not necessarily higher than that of women

07 Conclusion and Suggestions

The higher the degree, the higher the income. This shows that personal effort and personal achievement are closely related, going for further education may be the right choice, especially in the economic downturn.

Men's education has a stronger correlation to income than women's. That is to say, the effect of higher education on higher income is more obvious for men.

The average income of men with the same educational background is higher than that of women. Additionally, with a same of level education, distribution interval for men's income is higher, which indicated that gender inequity in income still exists, therefore the workplace environment needs to be improved, so that men and women can enjoy the same rights, including equal pay for similar work.

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