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Minimum Wage and Employment: Evidence from Urban Manufacturing in Shanxi Province

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ABSTRACT
This paper estimates the effect of minimum wage increases on the employment of the urban manufacturing industry in Shanxi Province. This paper uses the monthly minimum wage standards the number of employees in the urban manufacturing industry to analyze their changes and uses empirical methods to study the relationship between them. The relationship between them is estimated from two stages, long-run and short-run. In the long run, cointegration test results show that the minimum wage growth has a positive impact on urban manufacturing employment. However, in the short term, the error correction model shows that the minimum wage growth has a negative impact on urban manufacturing employment.

Keywords: *minimum wage, employment, manufacturing, Shanxi Province.*

1. INTRODUCTION

Since the implementation of Chinese "Minimum Wage Regulations for Enterprises" in 1993, the minimum wage system has played a role in many aspects, such as ensuring the basic lives of all workers and their family members, and promoting fair competition among enterprises. Enterprises must follow this system, and the wages paid to employees should be higher than the regional minimum wage standard. Shanxi Province established a minimum wage standard for the first time in 1995, and four levels of minimum wage standards are applicable to different regions of the province according to the economic situation. The highest level of monthly minimum wage was 200 yuan. The most recent change was in 2017, when the highest level was 1,700 yuan. During this period, it has experienced more than ten upgrades, and it will be upgraded every one to three years.

The "Shanxi Province Work Report 2020" lists high-end equipment manufacturing, new material industries, and new energy automobile manufacturing as key industries for Shanxi Province. But at present, there are still many pressing problems in the labor market in Shanxi Province, such as irrational labor structure and low levels of human capital. Therefore, the minimum wage system, an important labor market regulation tool, will play an effective role in the development of the manufacturing industry.

At the end of the 18th century, the theory of survival wages was formed and developed. It considers that the wages of workers were at least equal to the minimum living expenses of them and their family members, which provides a theoretical basis for the formulation and widespread implementation of the minimum wage system. According to the cost-benefit theory, as who provides wages, enterprises hope to maximize profits through reasonable allocation of factors. The increases in the minimum wage lead to increases in labor costs of enterprises, and enterprises may adjust the allocation of factors to reduce the number of hired workers, resulting in unemployment[1].

Scholars study the influence of minimum wage on employment, and a large number of studies have built theoretical models to discuss the relationship between them[2]. There are also a lot of empirical studies, and the statistical methods used are different. The multiple regression model with multiple control variables is widely used[3]. The data used are mostly panel data, and the conclusions are different[4]. The difficulty in drawing a unified conclusion may be caused by differences in minimum wage standards and labor market conditions in different regions. Therefore, it is meaningful to use different models and relevant data from different regions to conduct empirical research. Numerous domestic and foreign studies on different industries have also come to different conclusions. Even the minimum wage standards in the same region have different impacts on employment

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in different industries[5]. This may also be due to differences in the development of different industries and labor market conditions. Therefore, it is necessary to do in-depth research on this topic in different industries and in different regions.

This paper analyzes the changes in the minimum wage standard and the development of the urban manufacturing industry in Shanxi Province in recent years. And the long-term and short-term effects of the minimum wage increase are estimated by measurement.

The paper proceeds as follows. Section2 presents the historical background on the minimum wage increases and the development of the urban manufacturing industry in Shanxi province. Section3 describes the data analyzed. Section4 presents our empirical methods. Section5 presents the results. Section6 discusses the results. Section7 concludes.

2. THE MINIMUM WAGE INCREASES AND THE EMPLOYMENT IN SHANXI PROVINCE

Shanxi Province divides four types of regions according to economic development and consumption levels. Among them, the minimum wage is the highest in the first type of region. the annual minimum wage is calculated using the monthly minimum wage in the first type of region. Figure 2 shows that the minimum wage standards in Shanxi Province increase year by year. Only the minimum wage standards in 2001 and 2003 remain unchanged, while the annual wage growth rates from 2011 to 2017 have a relatively obvious downward trend, and the rates of wage growth slow down.

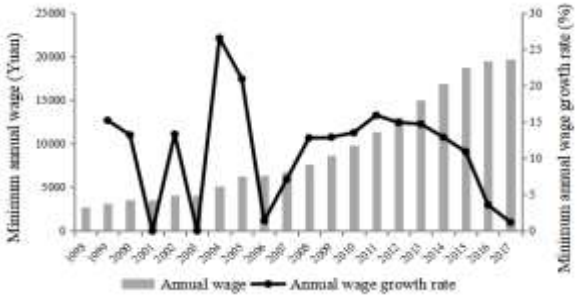

Figure 1 Changes in minimum wages

As shown in Figure 2, in recent years, due to factors such as industrial transformation and the development of technology, there has been a decrease in the employment in urban manufacturing in Shanxi Province, especially the decline between 1998 and 2004. So, the government in Shanxi Province adjusted manufacturing policies to promote the development of manufacturing and the improvement of the quality of manufacturing employment. Affected by this, the decrease in the number of urban manufacturing employment in Shanxi Province began to slow down.

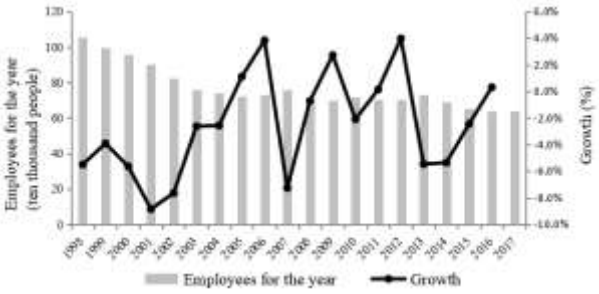

Figure 2 The number of employees for the year and its growth

3. DATA RESOURCE

In order to study the impact of the minimum wage in Shanxi Province on the employment in the urban manufacturing, the employment in the urban manufacturing in Shanxi Province is used as the dependent variable, and the minimum wage in Shanxi Province is used as the independent variable. At the same time, other variables such as fixed asset investment and average wage that affect the dependent variable are added as the control variables.

The factors affecting employment mainly include labor demand, labor supply and labor resource allocation methods. Among them, the factors that can be obtained and directly affect the number of the employment in the manufacturing in Shanxi Province are selected as the control variables, which are the fixed asset investment and the average wage in the manufacturing industry in Shanxi Province. Fixed asset investment is an indicator that reflects the structure, scale and development speed of fixed asset investment. Fixed asset investment may affect manufacturing employment through several channels such as the investment process, the formation of production service units, and the stimulation of related industries. Average wage refers to the amount of monetary wages earned by employees in a unit during a certain period of time. It can be used to reflect the wage level of all workers.

This article collects time series data as samples. The data of employees (E) in the urban manufacturing of Shanxi Province are obtained through the "Shanxi Statistical Yearbook" over the years. These employees mainly include individuals who are 16 years of age and above and are engaged in manufacturing labor and obtain operating income and labor remuneration in all cities and towns in Shanxi Province. Through the "China Industrial Statistical Yearbook" the data of Shanxi Province's manufacturing fixed asset investment (IFA) are obtained, and though the "China Labor Statistics Yearbook" the data of the annual average wage (AW) of the urban manufacturing industry in Shanxi Province are obtained. The impact of price factors on fixed asset investment and average wage data is eliminated in the same way as the minimum wage data.

The minimum wage (MW) data of Shanxi Province are collected from the notice of the Shanxi Provincial

People's Government on the adjustment of the minimum wage over the years. Considering that the last time Shanxi Province adjusted the minimum wage standard in 2017, the variable data from 1998 to 2017 is selected as the research object. The minimum wage standards in Shanxi Province since 1998 are divided into four grades. This article selects the highest grade as the research object. Since the minimum wage is not adjusted every year, and the month of each adjustment is different, enterprises also adjust the amount of wages according to the minimum wage standard. So the annual wage is calculated with the monthly minimum wage, as the "annual minimum wage". The wage calculated in this way is the nominal wage, and the actual wage can better reflect the living conditions of the workers, so the Consumer Price Index is used to get real wages.

Eviews 9.0 software is used to carry out unit root test, co-integration relationship test and establish error correction model, and deduce the long-term and short-term equilibrium model of the impact of the minimum wage in Shanxi Province on the number of urban manufacturing employees. After using the unit root test method to test the stationarity of time series data, the cointegration relationship test is used to obtain the long-term relationship between variables, and the error correction model is used to estimate the short-term dynamic relationship between variables.

4. EMPIRICAL METHODS FOR ESTIMATING THE EFFECTS OF MINIMUM WAGE INCREASES

The time series of macroeconomic variables is often not stable, but when the variable series is not stable, the use of OLS in empirical research usually leads to spurious regression. Therefore, before using the four sets of variables, the stationarity is tested. In this study, the unit root test was used to confirm the stationarity of the variable series. Commonly used unit root tests include ADF test, PP test, etc. In this study, ADF method is selected to test the four sets of variables. The four sets of variables are taken as natural logarithms and are represented as LnE, LnMW, LnIFA, LnAW. ADF test is performed on the variables after taking the natural logarithm. The null hypothesis is that the variable sequence has unit root, which means that it is unstable, and this variable sequence cannot be used to obtain credible empirical results.

The use of direct regression for non-stationary variable series is likely to lead to pseudo-regression problems, and the use of variables differenced for regression may lose the useful information contained in the original series. Therefore, in order to solve the above problems, a cointegration test is expected to be used. Only when the two conditions of the same order single integer and variables are linearly combined into a stationary sequence can the variables become cointegrated. Cointegration test methods include EG test method, Johansen test method, and so on. In this study, EG test method is selected for testing.

When there is a cointegration relationship between variables, the error correction model can be used to express the short-term relationship. The long-term stable relationship between variables is actually maintained under the continuous adjustment of the short-term dynamic process. Therefore, the cointegrated time series variables have an error correction mechanism, which can reflect short-term adjustment behavior[6]. When the equation has the characteristics of first-order autocorrelation, it is necessary to introduce the lag term of the equation independent variable and the equation control variable, and the error correction model can be obtained.

5. ANALYSIS OF THE EFFECTS OF MINIMUM WAGE INCREASES

The ADF test was performed on the four groups of sequences ΔLnE, ΔLnMW, ΔLnIFA, and ΔLnAW after the first-order difference. The test results show that the null hypothesis can be rejected, that is, the four sets of sequences do not have unit roots and the sequence is stable. At this time, the four sets of variable sequences are all first-order single-integration, and the next cointegration test can be performed. The three items in the type of test successively indicate whether there are constant items, time trend, and lag order in the ADF test.

Table 1. Result of unit root test

Variable	Type of test	Value of ADF	Critical value (5%)	AIC	SC	DW	Result
LnE	(c,0,0)	-2.736	-3.030	-3.834	-3.734	1.782	Unstable
LnMW	(c,0,0)	-0.503	-3.030	-2.373	-2.274	1.898	Unstable
LnIFA	(c,0,0)	-1.426	-3.030	-3.812	-3.795	3.225	Unstable
LnAW	(c,0,0)	-1.566	-3.030	-3.139	-3.04	1.913	Unstable
ΔLnE	(c,0,0)	-3.073	-3.040	-3.507	-3.408	1.926	Stable
ΔLnMW	(c,0,1)	-3.512	-3.052	-2.325	-2.178	1.937	Stable
ΔLnIFA	(c,0,0)	-7.294	-3.040	-3.991	-3.892	1.113	Stable
ΔLnAW	(c,0,0)	-3.584	-3.040	-2.991	-2.892	1.702	Stable

The EG test is used to observe the long-term relationship between variables. Regression estimation is performed on the model. During the regression process, the insignificant variable, LnAW, is eliminated, and the long-term equilibrium relationship between the variables appears as follows:

$$LnE=0.263LnMW-1.254LnIFA+11.161 \quad (1)$$

$$-2.273384 \quad -3.993686 \quad -8.632787$$

$$R^2=0.866912 \quad DW=1.267562$$

At the same time, the residual sequence et can be obtained from the regression results, and the unit root test of et is performed. The test results are shown in Table 4. The test results of the residual sequence indicate that the residual sequence does not have a unit root and is stable. Therefore, the above Equation (1) is reasonable.

Next, the lag terms of the independent variable and the control variable are added to the equation. In addition, since the residual sequence et does not have a long-term trend, adding the residual of one period to the equation can obtain an error correction model. After removing the insignificant variable fixed asset investment, the error correction model is approved at a significance level of 10%, as shown below:

$$D(LnE)=0.162D(LnMW_{t-1})-0.372e_{t-1}-0.033 \quad (2)$$

$$-2.091953 \quad -2.009494 \quad -1.854351$$

The residual sequence et is obtained, and the result of testing et shows that the residual sequence has no unit root and is stationary, so the above equation is reasonable.

6. ANALYSIS OF MY ESTIMATES' RESULTS

This study has shown that in the manufacturing industry in Shanxi Province, the minimum wage has different effects on employment in long-term and short-term effects.

In the long-term, manufacturing companies can change all factors of production including labor and capital. When the minimum wage increases, the cost of labor hired by manufacturing companies rises. So, in the long-term, companies may purchase or construct fixed assets such as machinery and equipment to replace labor[7]. Therefore, the growth of fixed asset investment in manufacturing has a negative impact on manufacturing employment. One possible explanation is that there may be a buyer monopoly in the labor market in Shanxi Province, and the current minimum wage standard in Shanxi Province is below the wage level at the equilibrium point between the labor supply level and the marginal income level of labor, so within a certain range, the minimum wage level has a positive impact on manufacturing employment.

In the short term, it is difficult for manufacturing companies to replace labor through fixed asset investment. Therefore, the impact of fixed asset investment in manufacturing on employment is not significant. However, due to the monopolistic labor market in Shanxi Province, the current minimum wage level has increased it may also have a positive impact on manufacturing employment in the short term[8].

The impact of the above conclusions can be analyzed from multiple angles. From the perspective of enterprises, under the dual factors of higher minimum wage levels and hiring more labor, the labor costs of manufacturing companies are likely to increase. Enterprises upgrade their technological level and increase production efficiency, or transform to an industry with higher profit margins[9].

7. CONCLUSION

This paper analyzes the development and present condition of the minimum wage. The minimum wage standards in Shanxi Province were implemented in 1995. They have been continuously improved and adjusted many times, but the adjustment slowed down in recent years.

Through empirical testing, the long-term and short-term relationship between the minimum wage in Shanxi Province and the number of employees in the urban manufacturing industry in Shanxi Province is obtained. The independent variable, the dependent variable, and the control variables are tested for stability to ensure the reliability of the results. It is found that the natural logarithms of the four variables are first-order single and can be tested for cointegration. In the regression process, the insignificant variable, manufacturing average wage, is eliminated, and the residual sequence obtained is stable. Through the cointegration test, the long-term equilibrium relationship between the variables is obtained. Then in the process of establishing the error correction model, the insignificant variable, fixed asset investment in the manufacturing, is eliminated. Taken together, in the long run, there is a positive impact of minimum wage on the employment in urban manufacturing, while there is a negative impact of the fixed asset investment in manufacturing on the employment in urban manufacturing. In the short run, there is a negative impact of minimum wage on the employment in urban manufacturing, while the effect of fixed asset investment in manufacturing on the number of employed persons in urban manufacturing is not significant.

In the future, research on the relationship between the minimum wage and employment in Shanxi Province can

be further improved. Changes in the minimum wage standard may more directly affect regional low-income laborers, such as migrant workers and informal employment groups. Considerably more work will need to be done to determine on these groups[10]. And the scope of the minimum wage includes all industries, It can also be considered to do further research on the impact of the minimum wage on employment in other industries[11]. And the employment in the urban manufacturing industry in Shanxi Province may also be affected by the development and employment of other regions or other industries, and factors in other regions and other industries can be taken into consideration. It is suggested that the association of these factors and employment is investigated in future studies.

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