



Testing Efficiency Wages Hypothesis in Manufacturing Industries of Iran

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Matani Reza

Mohammadhosseinpour Maryam, matani.reza2018@gmail.com

ABSTRACT

The main objective of this study is to examine the efficiency wage theory for Iranian factory industries in the 2-digit International Standard Industrial Classification (ISIC) level in 2001-2011. According to the efficiency wage theory, which is in fact one of the New Keynesian Economists Theories in labor market, reduction of wage is not explainable even under stagnation conditions. This is because; with reduction of wage, the best laborers leave their job and this can decrease workforce productivity. Therefore, in this theory, there is direct correlation between wage and productivity. In other words, efficient wages can enhance productivity. In this study, panel data regression has been used to test the said theory. The results obtained from estimating different models show that efficiency wage theory is not confirmed for Iranian industries. In other words, higher wages can improve productivity and efficiency of laborers in factory industries of Iran.

Keywords: efficiency wage theory, productivity, Iranian factory industries, panel data



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1. INTRODUCTION

There have been some studies on relationship between wage and efficiency in manufacturing industries of Iran. The major difference between present study and previous one is considering the prominent role of human capital in making the wage-efficiency connection. In other words, it is assumed that the relation between wage and productivity in manufacturing of Iran is subjected to the human capital level. In industries with educated labor force, productivity stimulation by wage is more effective (Motameni et al., 2016). Although the importance of the relation between age and productivity has been clearly considered in advance economic studies, its complication is the main issue in industrial relations (Tae et al., 2010; Jafari Samimi & Rezaian Koochi, 2014). Development of this hypothesis not only is related to economics theories but also to the specific conditions of Iran, in which, bargaining power of unskilled labor is weak in market due to general unemployment and small share of industry in employment; hence, those industries that employ such labors have no incentive to increase wages. For instance, numerous unskilled and uneducated labors who work in garment production workshops are satisfied with wages lower than minimum legal wage (Rahmani & Mazaheri Marbari, 2014).

Economic, social, political, and legal aspects of labor's wage have been always considered by economy policy makers. Obviously, these approaches have been differently used in systems and these factors are naturally addressed in wage policies besides the labor demand-supply mechanism in determining wage level. There are various theories in this scope. According to the theory of new Keynesians that is based on the Efficiency Wage Theory, wage reduction is not justifiable even in stagnation, because they think that reduction in wage leads to reduction in labor's productivity. Therefore, there is a direct relationship between wage and productivity in accordance with this theory. The objective of this study was to test the hypothesis of efficiency wage in Iran. Efficient wage in different sectors of industry obtained from data of 2002-2011.

2. THEORETICAL LITERATURE AND BACKGROUND

There have been some studies conducted about the effect of real wage variable and service compensation on increase in labor productivity as well as economic growth; these studies have been conducted based on the efficient wage theory. According to this theory, when



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an economic firm pays a higher wage than clearing wage in a perfect competitive market, this leads to increased incentive of staffs, increased labor productivity and higher profitability (Sepehrdoost & Zamani Shabkhaneh, 2016). Contrary to traditional wage theories, efficiency wage theory introduces high wages a driving force for high productivity of labor force. This theory not only provides logical and economic explanation for wages flexibility downward that is confirmed by New Keynesians School but also believe that a higher wage than the market wage paid by some companies is reasonable, because those workers who receive higher wages have higher efficiency. According to the efficiency wage theory, increase in wage higher than the average level of wages, the most productive labor force will be employed. In this case, Solow explains that wage should be calculated in a way that elasticity of employees' attempt relative to wage is equal to 1. He expressed that increase in wage leads to increase in productivity of employees affecting their attempts (Azvaji & Amini, 2008). All of efficiency wage theories are based on the assumption that labor' productivity is subjected to the received wage rate (Kazerooni & Mohammadi, 2007). According to the wage-efficiency models, increasing the wage level higher than the market clearing wage rate would lead to increased productivity of human resources and organizations' productivity due to various reasons that can be classified to two models:

A) The incentive-driven "shrinking model" in which, increased wage level leads to higher incentive of human resource to keep their job and try to promote their productivity in order to avoid being fired.

B) "Gift exchange model" in which, increasing wage changes the relations between employees and employer so that employees have more sense of belonging to employer trying to increase their productivity (Muhlau & Lindenberg, 2003).

Majority of New Keynesians economists emphasize on efficiency wage theories and apply this method to explain failure of the market-clearing mechanism. Proponents of this theory believe that high wages increase labor's productivity; therefore, effect of wages on worker's productivity can explain failure of firms to reduce wages despite the extra labor force supply even if wage decrease had led to reduction in firm's wage bill. If theories are right, productivity of labor and firm's profit will be decreased (Sepehrdoost & Zamani Shabkhaneh, 2016). The first efficiency wage assumes that high wages would



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reduce staffs replacement. Workers leave their jobs to find better job in other firms or change their profession and transfer to other sectors of country. The higher wage the firm pays to its employees, the more their incentive to remain in firm. The firm can reduce work-leaving frequency paying higher wages spending less time to employ and train new staffs. The second efficiency wage theory believes that average quality of labor in a firm depends on the wage paid to employees. If a firm decreases wages, the best employees will leave the job to find another position; therefore, the firm will have less-productive employees with fewer options. Firm can avoid risky selection or improve average quality of labor force and increase labor's productivity by paying wages higher than equilibrium level.

Third efficiency wage theory explains that high wage improves workers' attempt. According to this theory, firms cannot control work attempt of employees completely and employees should make decision to work hard or avoid it; they can pursue such risk until being fired and the firm should make workers to work harder by paying high wages. There higher the wages, the more the cost of being fired for employees will be. A firm encourages employees to work harder regarding the increased productivity paying higher wages (Romaguera, 1991).

3. RESEARCH BACKGROUND

Yang and Debeaumont (2010) conducted a study entitled "Pay as incentive or pay as reward?" they used Gok method to test linear path between payment and productivity in three mining, manufacturing, and public sectors besides industry subsectors in Taiwan economy and indicated that pay as incentive behaviors (efficiency wage) and pay as reward (classic theory) are valid in economy of this country.

Mahlberg and colleagues (2012) carried out a study to examine aging, productivity and wages in Austria. They studied industry sector in Austria's economy according to statistical data of 2002-2007 using panel data method. The obtained results showed a positive relationship between role of experienced employees and productivity while there was not any significant relation between role low-experienced employees and productivity; moreover, no more wages had been paid to experienced employees based on the applied estimation model.



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Tamasauskiene and Stankaityte (2013) evaluated the relationship between wage and labor productivity in economic sectors of Lithuania during 2005-2010. Results obtained from this evaluation indicated a higher regional difference in labor productivities than the wage. Correlation coefficient between wage and labor productivity in various economic activities and regions was analyzed and it was concluded that difference in wages was higher than labor productivity.

Macphersona and colleagues (2014) proved that efficiency-wage rate finally was more efficient than keeping the wage equal to market clearing rate contrary to employers' vision.

Jafari Samimi and Rezaian Koochi (2014) examined the hypothesis of efficiency wage in Iran's Basic Metal Industries. According to efficiency wage theory, high wages would increase labor productivity; in fact, there is a positive relation between wage and productivity. Results obtained from panel data indicated a significant reverse relationship between two important variables of wage and labor productivity; it means that these two variables have negative effect on each other. Therefore, it can be stated that efficiency wage hypothesis was no confirmed in Iran's Basic Metal Industries. Accordingly, higher wages led to lower productivity of labors in Iran's Basic Metal Industries. Rezaee and colleagues (2015) studied the role of wage management in employees' productivity and efficiency in media organizations. Findings of study indicated a positive and significant relationship between salary and benefits, welfare facilities and services, bonuses and productivity of employees working in media organizations. Sepehrdoost and Zamani Shabkhaneh (2016) examined the effect of compensation on labor productivity in industrial cooperatives of Iran. For this purpose, they used Cobb-Douglas model to examine effects of wages paid to employees (10 employees and more) on their productivity in industrial cooperatives of Iran during 2006-2011; they also applied regression analysis and panel data of 30 industrial cooperatives of Iran to find out which one of compensation (wages) or other pays have higher effect on labor productivity. Results obtained from this study showed the positive and significant effect of compensation on value added of industrial cooperatives of Iran, while study of separate effects of wage and other payments showed the more positive effect of paid wage to employees on labor productivity compared to other payments.



4. HYPOTHESES

Some of mentioned studies answered the questions raised in present paper, but some other questions remained without answer and presented as research hypotheses. According to conducted studies, the hypothesis and model of research designed as:

Hypothesis: wage hypothesis is efficient in manufacturing industry of Iran.

5. METHODOLOGY

This was a casual study carried out in framework of panel data model using library method as data collection tool. The data published by Statistical Center of Iran, Statistical Yearbook, Ministry of Industry, and information published by Central Bank during 2002-2011. Data analysis was done through 1. Descriptive and analytical based on the selected countries, descriptive statistics, table, and diagram; 2. Inductive modeling based on the experimental studies in framework of econometrics models. To estimate the specified model, panel data were applied. For this purpose, F and Hausman tests as were used to select the best method for model estimation among panel methods including combined least squares (PLS), Fixed Effects, Random Effects; the next step was data analysis based on the selected model. Data analysis and description was done through Excel Software. To estimate model through panel data, Eviews Software was used.

6. VARIABLES AND MODEL

In this research, the effect of variables wage, value added, human capital, and fixed capital on labor productivity was examined. The applied model in this research was specified based on the theoretical literature and similar studies of Wadhvani & Wall (1991) and Levine (1992):

$$\log \text{prod}_{it} = \beta_1 + \beta_2 \log \text{WR}_{it} + \beta_3 \log \text{VA}_{it} + \beta_4 \log \text{HC}_{it} + \beta_5 \log \text{K}_{it} + U_{it}$$

$$i = 1, 2, \dots, N$$

$$t = 1, 2, \dots, T$$

$$\beta_2 > 0, \beta_3 > 0, \beta_4 > 0, \beta_5 > 0, \beta_6 > 0$$

Where, *i* and *t* indicate industry and year, respectively. The applied variables are as follows:



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Loprod_{it} : logarithm of labor productivity of industries, logWR_{it} : logarithm of real wage of industries, logVA_{it} : logarithm of value added of industries, logHC_{it} : logarithm of human capital of industries, logK_{it} : logarithm of real fixed capital of industries, U_{it} : model residual.

7. TREND OF VARIABLES DURING THE RESEARCH PERIOD

The trend of variables (real wage, real value added, human capital, fixed capital, and labor productivity) has been examined based on the average level of each industry during 10 years to compare industries.

1. Real wage of various industries in Iran (2002-2011)

Real wage is one of fundamental variables. Geometric mean of real wage in 12 industries during 10 years has been illustrated in figure 1; of these industries, non-metallic mineral industry (15%), food and beverage industry (14.5%), and motor vehicle and trailer manufacturing industry (14%) have the highest real wage, respectively so that they cover 43.5% of total real wage of sample industries. In fact, the mentioned industries that allocate 25% of total industries to them have 43.5% share in paying real wage. In contrary, paper and paper products industry (1%) and coke coil production and oil refinery industries (1.7%) have allocated the lowest real wage rate to themselves among the studied industries during 10 years; these industries only cover 2.7% of real wage of studied industries. In fact, the two mentioned industries that form 17% of total industries only have 2.7% share in real wage.



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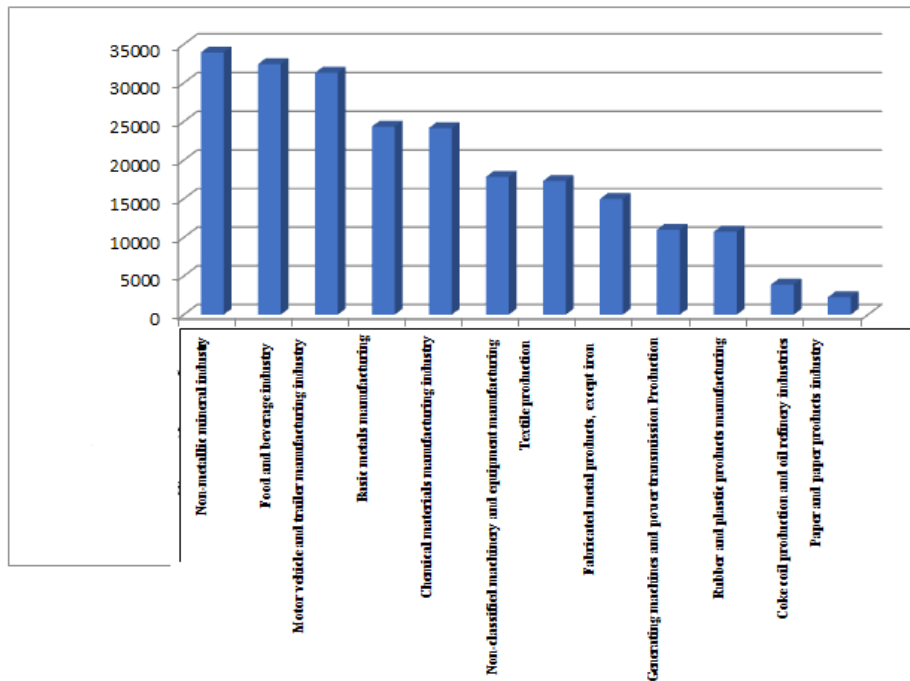


Figure 1. Real wage of different industries in Iran (2002-2011) million rial

Reference: Researcher's calculations

2. Real value added of various industries in Iran (2002-2011)

Figure 2 demonstrates geometric mean of real value added of each industry during 10 years. Accordingly, Chemical materials manufacturing industry (18.5%), Basic metals manufacturing (17.2%), and Motor vehicle and trailer manufacturing industry (16.8%) had the highest real value added, respectively; the mentioned industries allocated 52.5% of total real value added of studied industries to themselves. In fact, the mentioned three industries that cover 25% of total industries have more than two times of this contribution in real value added. In contrary, Paper and paper products industry had the lowest real value added (1%).

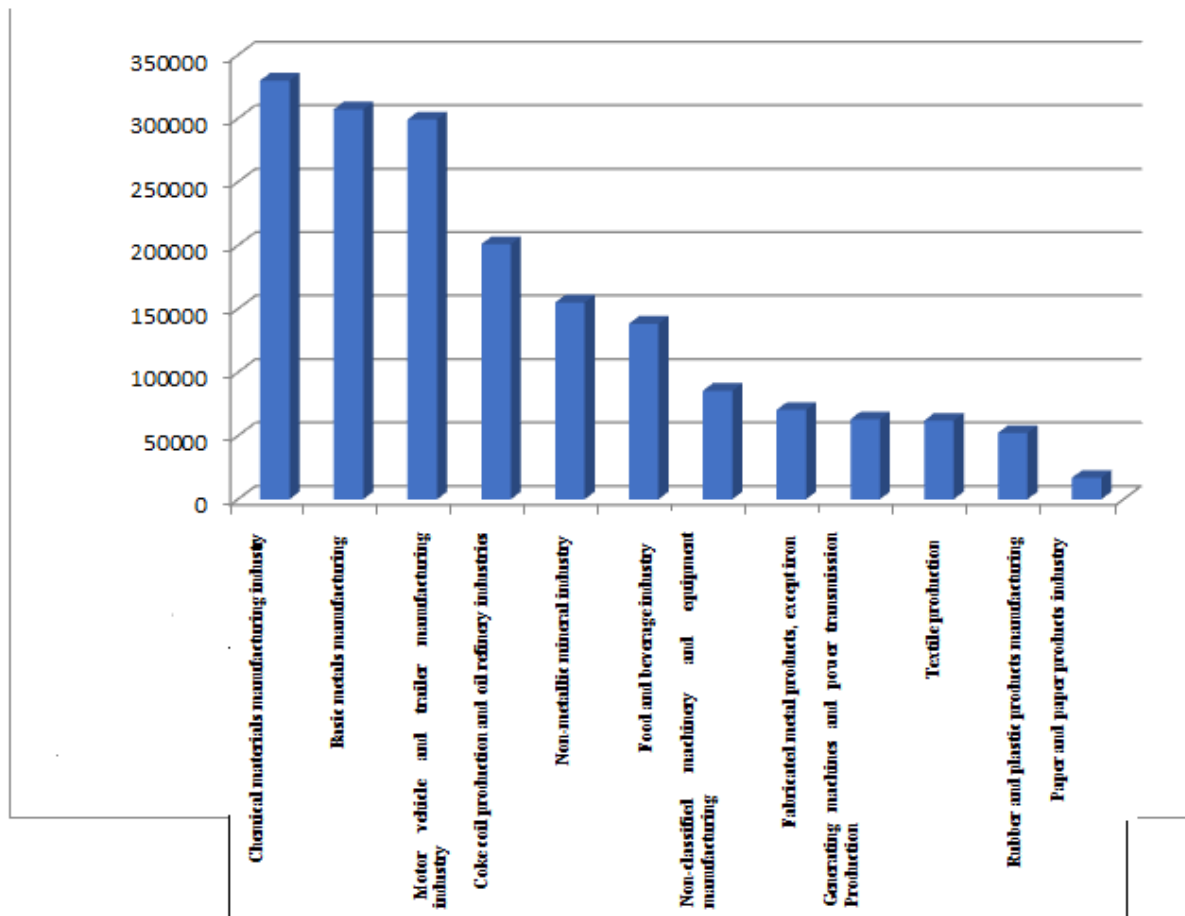


Figure 2. Real value added of different industries in Iran (2002-2011) million rial

Reference: Researcher's calculations

3. Human capital of various industries in Iran (2002-2011)

Figure 3 demonstrates geometric mean of human capital of 12 industries during 10 years. Accordingly, Coke coil production and oil refinery industries (10.7%) had the highest human capital level, while Food and beverage industry (6%) besides Non-metallic mineral industry (6%) had the lowest human capital. According to statistics, human capital of these industries has experienced minor change compared to other variables.



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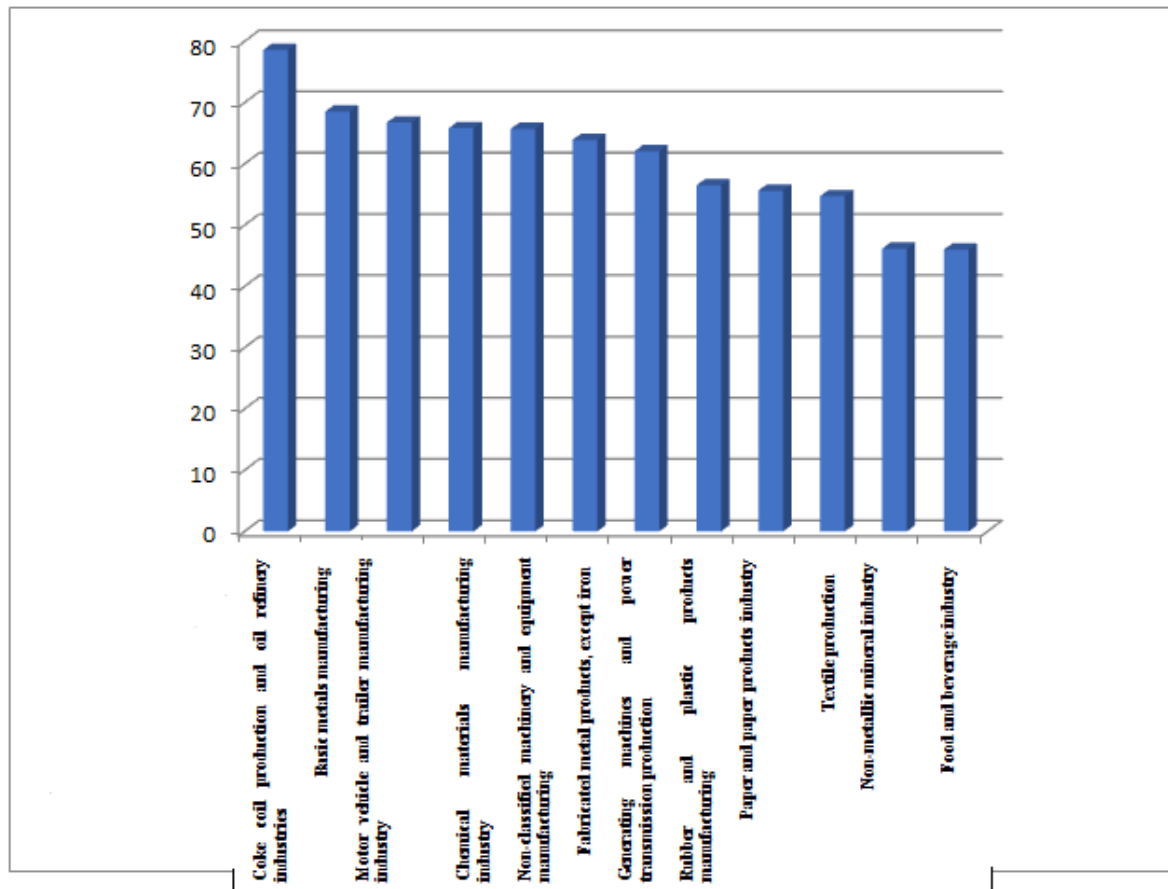


Figure 3. Human capital of different industries in Iran (2002-2011) %

Reference: Researcher's calculations

4. Real capital of various industries in Iran (2002-2011)

Figure 4 demonstrates geometric mean of real capital of 12 industries during 10 years. Accordingly, Chemical materials manufacturing industry (22.1%), Basic metals manufacturing (17.5%) had the highest real capital allocating 40% of real capital share to them. In fact, the mentioned two industries form 17% of total industries having almost 2.5 times higher than this contribution in real capital. In contrary, paper and paper products industry had the lowest contribution (1%) in real capital.

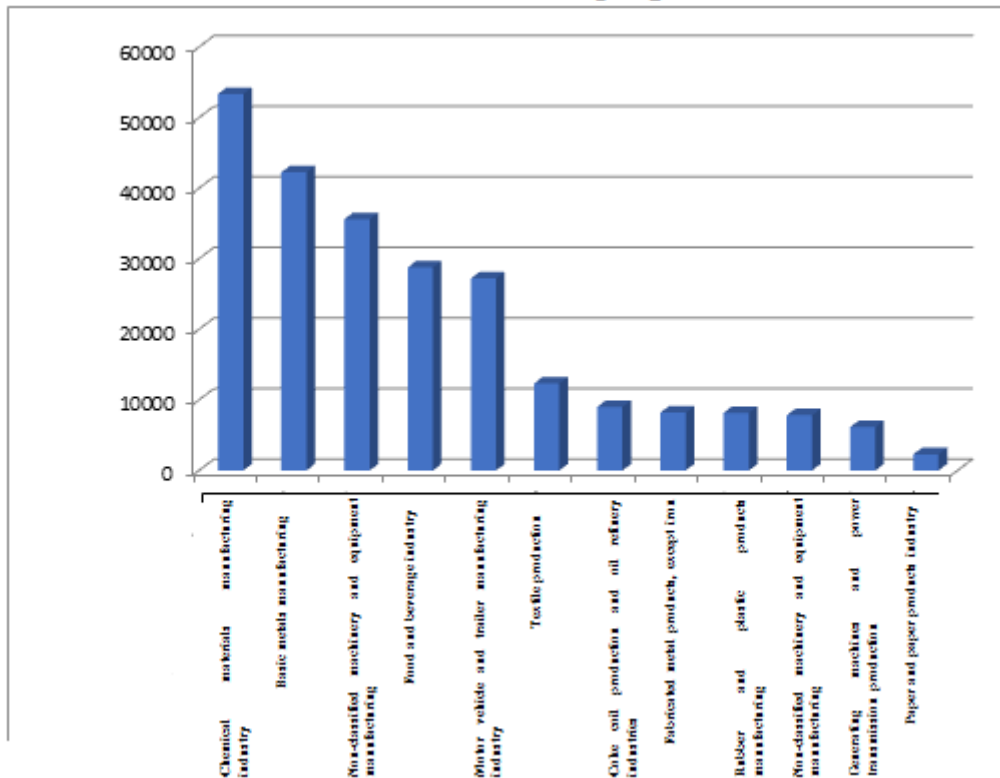


Figure 4. Real capital of different industries in Iran (2002-2011) Million Rial

Reference: Researcher's calculations

5. Labor productivity of various industries in Iran (2002-2011)

Figure 5 demonstrates geometric mean of labor productivity of 12 industries during 10 years. Accordingly, Coke coil production and oil refinery industries (36.7%) had the highest rank in labor productivity with a significant difference compared to other industries. In fact, the mentioned industry forms 8% of total industries having almost 4 times higher than this contribution in real capital. In contrary, 5 industries including textile production, Food and beverage industry, Paper and paper products industry, Fabricated metal products, except iron, and Non-metallic mineral industry had the total 12% contribution in labor productivity; in other words, these industries form 42% of sample industries with only 12% contribution in labor productivity.



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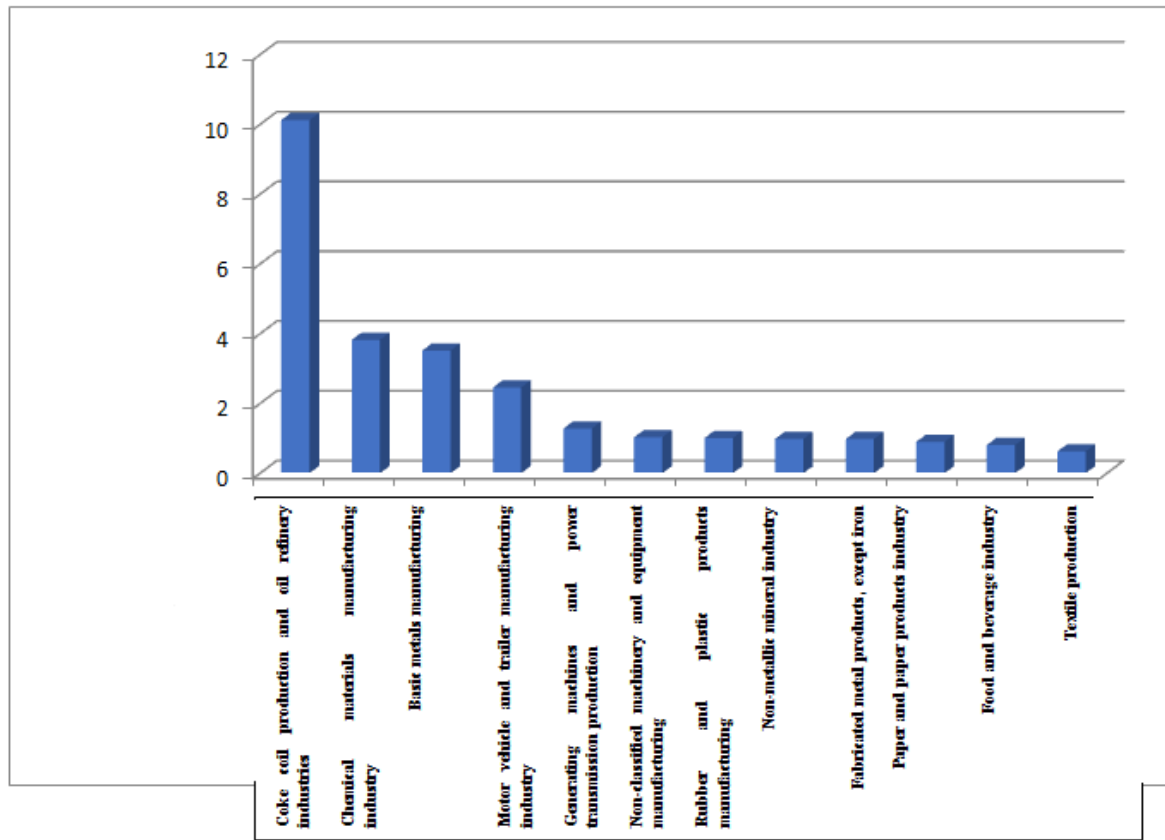


Figure 5. Labor productivity of different industries in Iran (2002-2011) per capita

Reference: Researcher's calculations

6. MODEL ESTIMATION

To examine the relationship between independent variables and labor productivity, the model was tested within 4 steps in accordance with considered pattern. At first step, real wage was selected as independent variable and labor productivity as dependent variable. At second step, variable of real value added was added to real wage. At third step, variable of human capital was added to two previous independent variables and finally, variable of real fixed capital was added to the model at the last step to evaluate effect of independent variables of model on labor productivity.

1. Model estimation using dependent variable of labor productivity logarithm

Heterogeneity test F was applied in this research to examine model through panel data. According to the results obtained from χ^2 value of Hausman test of model, there were fixed effects between industries. Presented results and interpretation of them in model estimation are described in table 1.



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Table 1. Model estimation results using fixed effects method

Independent variable		Dependent variable: logarithm of labor productivity							
		Model (1)		Model (2)		Model (3)		Model (4)	
		Coefficients	T value	Coefficients	T value	Coefficients	T value	Coefficients	T value
Fixed coefficient	C	1.06	1.66	-8.5611	-11.327	-16.586	-12.335	-15.075	-12.078
Logarithm of real wage	log WR	-.0631	-.095	-.12455	-3.2177	-.08798	-2.6740	-.08883	-2.9967
Logarithm of real value added	log V A	*	*	.880033	14.5970	.850061	16.7528	.979293	18.6784
Logarithm of human capital	log H C	*	*	*	*	1.9545	6.6768	1.6613	6.2296
Logarithm of real fixed capital	log K P	*	*	*	*	*	*	-.18954	-5.0349
R ²		.718398		.906448		.934857		.947624	
F		22.74736		79.00466		107.6315		125.4426	
D-W		1.771689		1.956128		1.510852		1.54082	
H-Test		.165690		138.41647		129.65034		105.4381	



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Results of model estimation based on the panel data of 12 industries during 2002-2011 are demonstrated in table 1. According to table 1, the estimated model has high fit and fundamental indicators of regression including determination coefficient, expected signs of coefficients and significance of overall regression coefficients indicated good fit of regression. Therefore, the obtained results contributed to economic analyses. Results of estimation through panel data method indicated a negative and significant relationship between two variables of wage and labor productivity. In other words, the model showed that one unit (1 Million Rial) increase in wage led to about 9% reduction in labor productivity. The estimated F value proved significance of the model. In accordance with model's coefficient of determination, 94% of changes in labor productivity were explained by independent variables of studied industries. Therefore, variable of wage had a negative significant effect on labor productivity. Moreover, variable of value added had positive significant effect; human capital had positive significant effect and fixed capital had negative significant effect on labor productivity.

2. CONCLUSION AND RECOMMENDATIONS

This study was conducted to test the Efficiency Wage Hypothesis (EWH) for manufacturing industries of Iran in two-digit International Classification (ISIC) during 2002-2011. Results obtained from study indicated a significant but reverse relationship between two important variables of wage and labor productivity in selected industries of Iran; it means that these two variables affect each other negatively. According to this theory, high wages lead to effective performance of workers. Nevertheless, relevant findings were not matched with panel data test evaluated by EWH; hence, hypothesis of this study was rejected. In other words, higher wages have led to lower productivity of labors working in manufacturing industries of Iran. High level of unemployment in Iran's labor market is the main reason for such mismatch with efficiency wage theory. Therefore, political finding of this observational study suggests that government should reduce unemployment and companies should pay wages higher than the current wage in competitive market since these efforts are effective methods to increase productivity.

3. RESEARCH CRITICISMS

Many of large industries of Iran are under the control or ownership of government that has allocated the major part of staffs of this sector to it. There is usually any connection



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between employment level, monetary wage rate and labor productivity in large governmental industries so that such relationship is only bureaucratic and formal. Therefore, labor force does not have incentive to improve his productivity.

Another criticism is related to sticky wages theory; in this case, employers cannot pay higher wages to labor within a certain time and there is not a real equilibrium in employment market, while other employers can pay higher wages so they do this and gain higher profits.

Another criticism explains that if a firm can pay higher wage as efficiency wage, other firms also can do this and it leads to general increase in wages and unemployment rate. In addition, it should be noted that market is not always perfectly free and governmental interferences in this market besides increasing the pensions of unemployed workers make this increasing trend worsen.

Unemployment due to high wages is another criticism considered about the efficiency wage. Such wage higher than the equilibrium rate shows itself in lower employment and higher unemployment rates. Considering the supply-demand curve in labor market, it should be noted that efficiency wage leads to labor's supply surplus. People who tend to take these jobs are satisfied with lower wages, but they cannot take these jobs; hence, efficiency wage may lead to increase in unemployment rate. If a manager decides on employing labors and paying efficiency wage to them, 10 labors will supply labor force instead of 5 workers. However, the employer only employs workers with higher productivity; in this case, some others do not want to supply work force at previous wage levels and will remain unemployed.

4. RECOMMENDATIONS

1. Making incentive and reward policies for workers to stimulate them and use their maximum work capacity
2. There should be more accurate and serious observation over labors' performance; however, such problem exists in governmental sectors.
3. Encouraging industrial firms to employ more labor forces with academic educations, because increase in number of skilled labor force leads to increase in human capital and improved productivity



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4. Firms should be encouraged to use methods regarding labor productivity promotion such as promoting technology level through R&D costs and teaching in production, using unemployed capacities of firms, etc.
5. According to the obtained results and economic problems of Iran, some policies should be made to make wages matched with productivity level of labor force. In this regard, labor law and wage system, management and rewarding system can be corrected besides fundamental privatization.

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