INVESTIGATING THE RELATIONSHIP BETWEEN WAGES AND PRODUCTIVITY OF HUMAN RESOURCES IN SMALL AND AVERAGE FOOD INDUSTRY OF Khorasan Province (1996-2010)

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Abstract. The relationship between wages and productivity of human resources is an important issue in modern organizations. This article focuses on this issue in small food industries of Khorasan Province. We try to offer a mathematic function, examining productivity of human resources. The results show that 1% increase in wages leads to 68% increase in productivity of human resources. This result can be utilized in decision-makings of those industries at microlevel.

Keywords: Wage, productivity, human resources, small and medium food industries

INTRODUCTION

The most important problem, extant in most economic activities of industrial section, is the shortage of productive resources such as expert human resources as well as financial and physical resources (Kazerooni and Mohammadi, 2007). Optimum allocation of productive resources among productive sections of the country is necessary but not possible. In such conditions, utilizing scarce resources and accessing to the fast economic and industrial growth depends on regarding the promotion of productivity factors at different levels. Based on scholars’ idea about human resource such as Saebi (2001), Gardner et al. (2003), West and Berman (2012), human resource is the most important factor in an organization after the advent of IT technologies. Thus, the relationship between workers’ wage and economic development was first introduced at micro economic level and along with industrial growth in different types of wage systems adopted with work productivity. In such systems, a part of wages or all of it is related to individual or group productivity. These systems have a role in outcome-based wages in all group work contracts. Wage and productivity are two important economic phenomena at micro and macrolevels considered by economists and policy makers. This correlation is highlighted regarding motivation creation in work resources via wages and promotion of work resources at microlevel. While, at macrolevel, it is mostly concerned with establishment, inflation control, and avoidance from risky circles and utilizing work resources from wages coming from productivity increase in a way that if wages grow less than work productivity, work resources won’t increase that much; Then, economic growth reduces and in that case recession will be inevitable. Experimental evidences especially in the late 20th century confirm these assertions. Thus, studies show that based on work laws in Iran, the wages of work force are mostly paid traditionally. For example, based on Iran’s Constitution (Act 41 of Work Laws), Supreme Work
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Council is obliged to identify minimum workers’ wage for all the workers and their families across the country based on their minimum basic needs and inflation. These changes are minimum wages along with primary criteria of changes in workers’ wage. However, in Iran, revolutions of work market and productivity of work force are not matched, leading to the increase of corporational cost for the work force. At the same time, productivity of work force has a slow growth and their gap shows mismatch of these variables in production and decision-makings of corporations in employment or dismiss of work force. This article attempts to examine the relationship between wage and productivity of work resources. Statistical population is small and medium food industries in Khorasan Province. The reason for this selection is considerable role of them in GDP of Iran (~18%) and high employment rate. Required data was gathered using formal statistics of Statistics Department. To analyze data, Microfit software was used.

Small and medium industries

Nowadays, small and medium industries play important roles in the development of economic and social systems of every country. As a result, they are concerned by the government officials. Although 95% of productive units lie in small and medium industries, they don’t have a significant role in GDP growth and suffer from many shortages (Bidakhti and Zargar, 2011); while, developed countries concern and support those companies with much budget. Advances of new technologies in production and communication create revolutions in industrial capabilities, distribution mechanisms, and structural combination of the corporations, maximizing their productivity (Yeyoung and Zang, 2005). There are 25 million small corporations in America which have over 50% of work force in private section. These corporations provide about half of GDP of USA and 96% of total export of this country. Learning trend in those industries is faster and they train capable managers. Also, exiting from competition by these countries imposes little damage on economy. Small and medium industries in recent years play an important role in economic and industrial development of southwest Asia, west and east Europe in a way that most of these countries have focused on developing their small industries. In Iran, small industries (i.e. workshops with less than 50 workers) account for 91.8% of industrial units and 42.5% of the staff are employed in those industries. Accordingly, determining productivity determinants of these industries in Iran has gained great importance. The shortage of economic, financial, and managerial knowledge in the time of foundation makes a worker do some tasks beyond his expertise in the organization. Also, for the lack of supportive and effective authorities, small industries can't affect environmental changes which increase their vulnerability. Financial provision for these companies is more difficult than large companies. Especially, banks impose difficult conditions on smaller companies regarding interest rate or loans. Providing human resources is a common problem in these corporations since many experts tend to work in larger companies and may leave them after gaining necessary education and experience.

For many advantages and capabilities of small and medium industries, many countries support them sufficiently to increase their productivity. So, various facilities and rules are created in different countries one of which is creating a good growth environment for their development. A responsible organization for such affairs is Department of Small Industries and Towns of Iran under supervision of Mining and Industry Ministry which support them.

Definitions and concepts of small and average corporations

Industries can be divided into large, medium and small types (Vasant, 2003). Regarding economic conditions of different countries, there are different definitions for them. Many of
these definitions focus on the number of the staff and their financial turnover. For example, the companies with the personnel below 500 people are called small companies while this definition is under 10 people in Germany. The companies with 10-499 people are considered medium companies (Small Industries Department, 2004). Based on the criteria of EU, small and medium companies are defined based on staff number and annual capital turnover. Then, companies with the staff below 250 people whose annual financial turnover doesn’t exceed 40 million Euros are medium companies. In Asia, for classifying small and medium companies, different criteria are used some of which include staff number, asset value, annual financial turnover, capital rate, and etc. In our country, small companies have less than 50 staffs. In Iran, there is no consensus on the definitions of small and medium companies and each company offers its own definition. Based on the definitions of Industry and Mining Ministry, corporations with less than 50 workers are regarded small and medium companies. Statistics Center of Iran introduces the businesses with less than 50 people as small and medium corporations and refers to the others as big industrial factories. Central bank of Iran considers businesses with below 100 people as the small and medium corporations.

Definition of productivity

Officially, the term "productivity" first appeared in 1766 by Quizni. One century later, Litter defined it as the "ability of production". Early (1900) defined it as the relationship between productivity and used tools for yielding that productivity. Farhang (1900) defines it as a definite ratio of product to one or more production factors. Also, productivity is defined as production per capita of labor resource (Kazerooni and Mohammadi, 2007). Moreover, Bakhshali and Mojtabahed (2005) refer to productivity as the efficient usage of resources (work, capital, energy, and etc) in producing different services and products. From the other hand, international organizations and institutes such as Labor Department and Productivity Organization of Europe have done wide researches on productivity. According to the authors of this study, productivity is the result of human attempts in accessing efficiency and effectiveness elements. A productive organization seeks to use facilities optimally to achieve its goals. Capital productivity, labor, and all production factors are considered in studying human resources. Examining the correlation between productivity and wages in the industries of Iran, Kazerooni and Ahmadi (2007) concluded that there is no significant correlation between them. In another study by Suri and Ebrahimi (2010), a correlation was found between productivity and wages in a way that increasing wages enhances productivity. Then, industries’ owners increase wages to make for their services. Analytic comparison of traditional wages and efficiency wages showed that both models have positive effects on productivity (SCS site, 2008). But efficiency theories have more positive results. Also, Standard Studies Center of Canada (2008) studied the effects of wages on productivity, concluding that 37% of the productivity has increased from 1985-2005, the most important factor of which is wages. Additionally, global productivity organization published in 2012 referred to improper growth conditions of real wages regarding inflation conditions in developed countries. It concluded that despite productivity growth of human resources, wage increase has been trivial. Also, Patra worked on the relationship between productivity and wages in the industries. He concluded that final productivity theory reminds that there is a negative correlation between monetary wage and real wage in a way that when monetary wage decreases, real wages reduces. This happens for the increase of purchase ability of money that occurs with cost decrease. Finally, he believes that the connection between productivity and wages guarantees the promotion of human resource performance.

METHODOLOGY

The present study is an analytic survey using descriptive methods with applied goals. Statistical population is small and medium food industries of Khorasan Province.
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Data gathering and analysis methods
Used statistics of this study is according to the formal data of Statistics Department whose analysis was by Microfit software.

Productivity indices
Regarding input types used in production process different productivity indices are defined. They can be divided into partial and general productivity indices. In the former the relationship between output and one input is considered. While, in the latter the relationship between output and whole inputs is concerned.

Productivity indices of work resources
To measure productivity of work resources in one economic level, the ratio of added value to employees’ number can be used. In case there is some information about done work, hours or paid work hours, they can be used in fraction instead of employees’ number and increase productivity of work resource. Productivity of labor resource is the most common measure used in one economy, industry, and productive unit. The reason for that can be high portion of labor resource cost in value of many products and existence of the information about the input of labor resource in comparison with statistics and information of other inputs like capital.

Capital productivity index
To measure capital productivity in one section of economy, the ratio of added value to capital inventory is used. In calculating this index, first added value and inventory value of fixed capital is transformed from current price to fixed prices of the base year. Then, capital productivity to fixed price ratio results by dividing added value to capital inventory.

Total factor productivity index (TFP)
TFP refers to the ratio of outputs to inputs, revealing production average per each unit of production resources. This index shows the sum of the shifts of work and capital resource productivity.

\[ TFP = f(K, L, M, T, I, P, X, F) \]

Where, \( K \) is capital, \( L \) is human resource, \( M \) is management, \( T \) is technology, \( I \) is infrastructure factors, \( P \) is planning, \( X \) is social and cultural factors, and \( F \) is different facilities (Mirjalili and Heydarpour, 2006). To measure this ratio, different methods exist which will be referred later.

Measurement method of productivity
In this study, productivity index i.e. the ratio of volume or goods/services output value to one or some input factors is used. This method is based on application of divigia index. In this method, total productivity index of the factors is defined in the following form:

If linear homogeneity hypothesis or fixed productivity is used regarding scale, then,

\[ TFP = \frac{V_t}{K_t^\beta L_t^\alpha} \]

Then, \( \beta = 1 - \alpha \). In conditions of full competition, each factor is paid as much as final productivity. \( \alpha \) and \( \beta \) refer to productive elasticity towards capital and labor. Thus, in conditions
that statistical information about portions of production factors doesn’t exist, $\alpha$ and $\beta$ can be used in estimating productivity of total factors (Jangdaghi, 2010).

**Examining the trend of human resource productivity indices in food industry of KhorasanRazaviProvince**

The first step in examining productivity is calculating added value. For this purpose it is enough to deduce inputs or products 'value from outputs or raw materials. Obviously, to remove inflation effects, prices should be balanced based on the indices of central bank. Fig.1 shows the trend of added value from 1994-2010, adopted from formal statistics publications of Iran, balanced by price base of 2004, announced by Central Bank of Iran (CBI site). Other information and analysis of this study are shown in Fig .1.

![Value Added](image)

**Figure 1.** Added value.

As seen in Fig 1, added value in mentioned period has had much volatility with low growth.

**Labor resource productivity**

This ratio shows that how much added value exist for each employee in industrial section. To calculate this index, added value is divided into the number of work resource. In other words,

$$LP_t = \frac{V_t}{L_t}$$

Where, $LP_t$ is Labor productivity, $V_t$ is added value (to the fixed price), and $L_t$ is work force number. Statistics of added value (to the fixed price of 2004) and employed population are adopted from Statistics Center of Iran.

Fig.2 shows the trend of employed human resource in small food industries.
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As seen in Fig. 2, the trend of human resource number has been fixed in this period. In such conditions, productivity measurement will be more real.

**Human resource productivity**

Human resource productivity results from dividing added value to human resource number. Fig 3 shows this trend.

This index has undergone a fixed trend with negative growth in some years.
Model of the study

Here, we need to examine if there is a significant relationship between wages and productivity of human resources.

Estimation of productivity function

To examine the relationship between variables, ARDL method is used. It examines if there is a long-term relationship between pattern variables or not. This method has some advantages over other methods. Variables don't need to be static and can be combined. Also, it can be used for the studies with few observations (Narian, 2005). Additionally, long-term and short-term relationship between dependent variable and other explanatory variables are estimated simultaneously (Jandaghi, 2010). One model of ARDL is as Equation 1.

Equation (1).

\[ \Omega(L, p)y_t = \alpha_0 + \sum_{i=1}^{k} \beta_i(L,q_i)x_{it} + \delta w_t + \mu_t \]

Where, \( y_t \) is dependent variable, \( \alpha_0 \) is intercept, \( \beta_i \) is vector of fixed variables like dummy variables or exogenous variables with fixed lags. Long-term equation is written as Equation 2.

Equation (2).

\[ y_t = \alpha_0 + \sum_{i=1}^{k} \beta_i x_{it} + \delta w_t + \vartheta_t \]

Function estimation and result analysis

This section has different steps. First, to measure statistic variables, unit root test of Dickey and Fuller are examined. Second, long-term convergence is tested. Third, long-term and short-term coefficients are estimated. Another statistics used for this study is time series data. In this method, time series are considered static. In the regressions based on time-series, \( R^2 \) (determination coefficient value) is very high although there is no significant relationship among variables. This shows the status of spurious regression, implying that both variables of time-series (dependent and explanatory variables) depict severe trend towards time (with ascending and descending movements). Then, high \( R^2 \) results from time variable not real correlation between variables. Then, static states of the variables need testing. The first step in analyzing static states of time series is drawing variables chart in times. If they have ascending and descending trends, they won't be static. For making sure about this point, unit root test of Dickey and Fuller is used. In this test, null and main hypotheses are defined as follows:

\[ H_0 \]: Time series are not static
\[ H_1 \]: Time series are static

If the value of calculated statistics exceeds critical value of DF, \( H_0 \) is rejected and time series becomes static. We show static time series by \( I(0) \), implying that it is full of zero order. Accordingly, if a time series is full of first order or higher, time series is non-static.

Table 1. The results of unit root using ADF test.

<table>
<thead>
<tr>
<th>Variables</th>
<th>With intercept ADF</th>
<th>With trend ADF</th>
<th>result</th>
</tr>
</thead>
<tbody>
<tr>
<td>LnLP</td>
<td>-0.52</td>
<td>-4.02*</td>
<td>static</td>
</tr>
</tbody>
</table>

* shows 10% significance level.
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Critical values for ADF statistics with intercept and trend are -3.33 and -4.19 at 5% significance level.

**Integration test**

Integration refers to a long-term balance relationship among variables. If time series is non-static, regression may be spurious. Thus, long-term integration test is required. If time series is integrated, regression is significant (Gajarati, 2010). This study uses integration test of Benreji et al. (1998). Null and main hypotheses are as follows:

\[
H_0: \text{There is no integration.} \\
H_1: \text{There is integration.}
\]

For this test, number 1 should be deducted from the sum of coefficients with laps of dependent variable and divided into the sum of its standard deviation.

**Table 2. Results of integration test.**

<table>
<thead>
<tr>
<th>Values of critical values for t statistics</th>
<th>10%</th>
<th>5%</th>
<th>1%</th>
</tr>
</thead>
<tbody>
<tr>
<td>(\rightarrow) sig level</td>
<td>I(0)</td>
<td>I(1)</td>
<td>I(0)</td>
</tr>
<tr>
<td>(\downarrow) variable number</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.88= Calculated t for model</td>
<td></td>
<td></td>
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</tbody>
</table>

Table 2 shows the results of integration test for the model. In this model, calculated t is -5.88 whose absolute value is above upper limit (at significance level of 1%, 5%, and 10%). Thus, there is a long-term balanced relationship between labor force productivity and its determinants.

**Estimating long-term and short-term coefficients of patterns**

When a long-term balanced correlation was proved, the equation was estimated using ARDL. The results of estimating long-term and short-term coefficients of the model are shown in

**Table 3. The results show that all parameters are statistically significant.**

Thus, a 1% increase in wages (w) increases productivity of labor force about 68%. Although the effects of payments are positive in short term, it is not significant. Comparing short term and long-term coefficients shows that short-term coefficients are smaller than long-term...
In this table, determination coefficient of $R^2$ and F statistics are also shown. Determination coefficient is a criterion by which good fitness can be estimated. The higher $R^2$, the more selected independent variables can explain the changes of dependent variables. Here, $R^2 = 0.98$ which means that 98% of productivity changes of labor force are explained by wages. Also, the value of $F$ statistic that reveals significance of regression is 43.15. Based on the above result, it is concluded that productivity of work force is positively correlated with wage and payment rate. With 1% increase in wages, productivity increases by 68%.

CONCLUSION

Fast and complex revolutions in previous years with accelerating globalization trend make different societies to prepare themselves for accepting revolutions. What was considered as an economic advantage was holding big companies. It was supposed that the larger the companies, the more dynamic the economy grows. This trend was prevalent for some years. But, latest revolutions and population pressures, momentary innovations, complexity of managerial processes necessitate immediate and emergency decision-making, resulting from small and medium corporations. Different studies in different countries have shown that productivity of small and medium industries in developed countries does not come from attention to productive resources but it comes from improvements of managerial system and human resources. This study aimed to examine the relationship between wages and productivity rate. Reviewing the concepts of small and medium corporations in the literature, theoretical foundations of the study were extracted. Based on the results, there is a close and positive correlation between wages and productivity of work force in a way that with 1% increase in wages, 68% productivity increase results.

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Equation 3:

$$\Delta T = 0.80T + 0.24 + 0.27$$

Equation 2: $d = 0.78T + 0.05 + 0.4d$

Equation 1: $y = 2.5x + 2.4x + 3.7$

Fitting estimated long-term coefficients in the following formula yields the final conclusion:

$$y = 1.2x + 0.4x + 2.4x + 3.7$$

The result agrees with the findings of Sandahaji and Montenegro (1998, 1999) and Ri (1995).
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