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The Impact of Skill Labor on Growth Using Growth Accounting Approach in Iran

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Abstract: Improvement of the quality of human forces is one of the most important issues in developing countries; for, more production and higher quality are enhanced by efficient workforces; therefore, employing suitable policies for optimized use of specialized and skilled human forces has significant importance. The present research studies the effects of skilled workforce on economic growth during 1978-2009 by using time series data. Since this research uses the accounting approach for growth, accuracy of determining the shares, quantity of factors and general productivity; thus its results are more applicable than similar researches. The results reveal that although there are positive and significant relations, its share from economic growth in Iran is trivial.

Key words: Growth accounting · Skilled labor · Human capital

INTRODUCTION

The significant differences between economic growth rate of industrial countries and the developing countries have led to the attention paid by economists to the growth factors and causes. Workforces, capital assets and technical changes are among important effective factors on growth. With respect to the fact that in developing countries. Skilled workforces cause significant increase in economic development, this category has received attention of economists in developing countries. According to the definition, when one says a person is skilled it means that the person is capable of doing a suitable job that matches his skills. Therefore, skill is a term used for special acts that are performed to complete a job. According to lepak and Snell, for human partners that are distinctive and very important, firms use internally-oriented knowledge-based employment mode [1-3]. In present study, high skilled workforce consists of individuals with university degrees and the rests are low skilled workers. The difference of this research and other researches is calculating the share of each one of the growth factors by using the accounting of growth. The period subject of study is 1978-2009 and the territory is limited to Iran. Growth accounting is an approach in economics to measure the quantity and share of various factors that have effects in economic growth and indirectly studies the cause of progress in productive as a remainder in economy [4-6]. In the studies by using growth accounting as an approach, So low's expanded production factor has been used. There are two methods for calculating the share of factors from economic growth: First method: To use data and information of countries within the framework of growth accounting without applying the econometric estimations; and second method is to use regression estimations in the beginning and then by using the equation of accounting of growth, the share of inputs from growth is calculated [7]. Due to limitation in data, this study has used the second method for calculating the share of each input. In present research, after an introduction, the history of research, the research methodology, estimation, conclusion and suggestions are given.

Literature Review: Soderbum and Till [8] in their study, titled "Health and Economic growth" with its efficiency (calculation) concluded that human capital, while having positive and significant relations with growth, could increase total factors productivity. Abbas [9] in his paper made a comparative analysis between two developing countries of India and Pakistan during 1970-1994. In his paper he concluded that in calculating the growth of human capital as a production factor (by using the rate of enrolling in elementary, secondary and higher education schools as human capital index), elementary school enrollment had a positive and significant effect on the economic growth of -only- India. In addition, human capital by using the index of enrollment in secondary

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school course had positive and significant effects on the economic growth of both countries; however, measuring human capital by using rate of enrolling in higher education programs had positive effects on the economic growth of Pakistan while its effects on economic growth of India was negative.Constantina and Stenjus [10] studied the effects of human capital on economic growth by using non-linear methods. Their results showed that increase in human capital in non-linear form associated with direct foreign investment led to growth increase in average income countries. Those findings were independent from their effects in countries with high revenue. Belton *et al*. [11] studied the models of growth in China with respect to the difference in skills of workforce, physical capital and substructure capitals. The results showed that human capital had positive effects on growth and the effects of education as a human capital index on growth was higher than other capital indexes. Elvin [12] in his paper showed that governmental and private investments and tax policies had positive effects in growth of Indonesia; however, governmental and private investments by aiming at improving human capitals had more positive effects on economic growth of Indonesia. He also showed that in the models of growth in isolation, the public policies that aim at investment increase in human capital and skills of workforce, more growth was achieved in comparison with tax reforms.

Data and Model: The number of people who had higher education in year 1355 was 433392 that increased to 4330850 in year 1385. This result shows 8% growth annually in the number of people with higher education.

Table 1: The population possesses higher education between the years 1355 - 1385

Average growth	Population with higher education	Year
5.8	433392	55
12.4	769783	65
5.7	2467777	75
8.1	4330850	85

Source: Researchers calculations and statistics center the other hand, the number of people considered as active population increased from 279680 in year 1355 to 3689505 in year 1385

Table 2: The active population with higher education

Average growth	Active population with higher education	Year
6.5	279680	55
10.7	530396	65
9.7	1460762	75
9	3689505	85

Source: Researchers calculations and statistics centerAlso, the participation rate of higher educated workforce was about 63.3% in year 1355 that increased to 85% in year 1385

Table 3: Unemployed population having higher education

Average growth	Unemployed population with higher education	Year
4	11365	55
6	331110	65
20.4	58145	75
12.3	373513	85

Source: Authors findings

In case of unemployment situation, statistics indicates that, the number of graduated people in year 1355 was 11000 that inclined to 373000 in year 1385. In fact, unemployment rate of higher educated people increased from 4% in year 1355 to 12% in year 1385.Since the goal of growth accounting is to calculate the share of each production factor, following stages should be taken:

Stage 1: Calculation of factors coefficient by using econometric methods

Stage 2: Calculation of degree of employing each one of the factors in each year - Estimation coefficient of stage (1) x number of using that factor in each year.

Stage 3: Calculation of share of each factor of growth in each year - Amount obtained from stage 2: GNP per year Source: Authors findings

Stage One: Calculation of factors coefficient by using ordinary square methods.In order to assess the effects of skilled workforce on economic growth, the Cup-Douglas expanded function with fixed output is used that in most important empirical studies such as Denison, Azava, Aro, Lucas and Vladimir Box. Due to having desirable form and since its linear form estimates the stretch directly, the Cop Douglas functions has extraordinary attraction for estimation and is analyzed as follows:

$$Y = f(A, K, L, H) \quad (1)$$

In which, Y is the function of high skilled work force (H) and low skilled workforce (L) and K is the fixed capital. The total factors productivity (TFP) is measured by A. In present study, high skilled workforce consists individuals with university degrees and the rests are low skilled workers. If equation 1 is derived and the sides are divided into Y, we will have:

$$\frac{Y^O}{Y} = g^0 + \frac{F_K.K}{Y}\cdot\frac{K^0}{K} + \frac{F_H\cdot H}{Y}\cdot\frac{H^0}{H} + \frac{F_L\cdot L}{Y}.\frac{L_0}{L} \quad (2)$$

In which, Fk is the final production of capital, FH is final product of skilled workforce, FL is final products of unskilled workforce and the point on variables show the derivatives of variable to time.

$$g^0 \frac{Y^0}{Y} - [V_K \frac{K^0}{K} + V_H \frac{H^0}{H} + V_L \frac{L^0}{L}] \quad (3)$$

$$V_K + V_L + V_H = 1 \quad (4)$$

Assuming the existence of information on model's variables, its parameters could be estimated. This function could be estimated for a country in time series analysis. The estimation could be done in the level or rate of variables growth. Based on the estimation coefficient and the method of accounting of growth, the share of factors from economic growth could be calculated [13-17]. First, the production stretch of industries is formulized as:

$$LnY = \alpha + V_K \ln K + V_H \ln H + V_L \ln L \quad (5)$$

In which, Ln and å are the normal logarithms and the disorder part of equation' respectively. The Solo's remainder is an index for total factors productivity (TFP).

Estimation Result: Using time series data in econometric is based on the assumption of variables reliability. A time series variable is stable when the average, variance and its self-correlation coefficients keep constant in time. If the variables of time series which are used in estimating coefficients of unreliable models, despite lack of relationship or concepts between the model's variables, it might show the coefficient of determining R^2 is high and the statistics t and F show strong and significant relations among variables of the model. This phenomena is called spurious and misleads the research by causing improper implication on significance, intensity and the direction of relations among variables. Based on this, information on reliability or unreliability of model's variables is necessary. Those variables include: In this paper, the Diki-Fuller method is generalized and the stability of the model's variables is tested. By using E-views software, the Dicki-Fuller test is generalized for concerned variables. Based on the results of this test, the Ln(Y), Ln (K) and Ln(H) do not have single root and are stable in as much that the statistics value of Dicki Fuller of these variables is higher than the critical values and Dicki Fuller in 1% level; however, the Ln L variable in significant 5% level has single root.

Table 4: Calculation of Coefficient

Variable	Estimation Coefficient	Normal Coefficient
α	-0.03	01/0-
LNL	1.76	69/0
LNH	0.23	09/0
LNK	0.53	21/0

Source: Authors findings

Observing the pre-assumption of variables stability in employing econometric methods becomes associated with problems when the differentiation of first rank of time series variables is used When the differentiation is used to estimate model coefficient, valuable information is lost on the level of variables while the economic theories are not expressed based on variables differentiations but based on the long -term relations among variables levels. The efforts of econometric scientist in addressing this problem led to development of a new method called collective method so based on that method, with no fears of false regression, the model coefficients could be estimated based on variables levels. economic concept of its accumulation; that when two or more variables of time series are linked based on theoretical fundamentals to form a long term balance equation, although those time series might have unreliable process, they follow each other fairly well in the course of time and show how the differentiation between them remained reliable. In order to study the accumulation relations, the remaining sentence single root is performed. The results showed the static condition of regression remainders in level and one could conclude that there is a long term balance relation among the variables of a model.

The model is estimated by using ordinary least square (OLS) methods in the variables levels. The results are as follows:

$$\text{Ln Y} = -0.04 + 0.21\text{LnK} + 0.09\text{LnH} + 0.69\text{LnL} + (-0.13)\,\text{Dum} + \text{AR1} \quad (6)$$
$$R^2 = 0.85 \quad {}^{-}R^2 = 0.82 \quad DW = 1.74 \quad F = 64.27$$

With respect to the Durbin-Watson statistics, after applying AR, the model isn't with self-correlation of disorder sentences.

Based on results of White heterogeneous variance test, the HO hypothesis based on variance analogy is accepted. Now for accumulation test, the remainder sentence reliability test is performed by using Dicki-Fuller single root test. With respect to the Dicki-Fuller extended reliability test statistics, the remainder sentence is reliable model or in another word it is a collective of zero rank.

Table 5: Growth Accounting using Second Method in IRAN

	Share of Growth in First Plan 1989-1993	Share of Growth in Second Plan 1994-1999	Share of Growth in Third Plan 2000-2004	Share of Growth in Four Plan 2005-2009	Quantity of Growth in First Plan 1989-1993	Quantity of Growth in Second Plan 1994-1999	Quantity of Growth in First Plan 2000-2004	Quantity of Growth in Four Plan 2005-2009
Skill labor	13.1	32.8	14.8	4.28	0.6	0.29	0.4	0.5
Un skill labor	19.7	56.8	31.05	0.98	4.8	2.24	3.47	4.5
Fixed Capital	18.6	17.29	21	27	1.47	0.68	1.05	1.3
Productivity	48.59	-6.91	33.15	67.7	0.13	0.01	0.11	0.3
Share of Whole	100	100	100	100	-	-	-	-
GDP in IRAN	-	-	-		7	3.2	5.03	6.6

Source: Authors findings

Based on this, the above-mentioned model is collected and its variables have long-term balance relations. Now, with no fear of false regression, one could analyze the results: The validity of model fitness based on F statistics was more than 99%.With respect to the logarithmic nature of model, the coefficient shows the stretch of that variable; therefore, the Ln(H) coefficient shows the stretch of skilled workforce and reveals that each percent of increase in amount of skill work, by assuming other factors are constant, there will be 9 percent growth in GNP. The coefficient obtained for physical capital logarithm is 21 percent, showing that each percent increase in forming actual fixed national capital increases GNP 21 percent.

In the same way, the unskilled workforce had significant and positive effects on GNP as far as each percent increase in number of unskilled workforce led to increase in 69 percent GNP. The determined and adjusted confident ($^{-}R^2$) is approximately 0.85, showing the model has high explanatory power. In addition, the F statistics that changes significance of equation is completely significant.

Calculation of Share of Factors by Using Accounting of Growth in First, Second, Third and Fourth Development Plans: Before analyzing the share of production factors in economic growth, we try to briefly explain about growth trend of both GDP and factors associated with production. Economic growth rate fluctuated dramatically between 1355 and 1357 estimated about 8.5%. During war years, growth fell to negative points. However during the first development plan it experienced an increase. Although growth amount substantially dropped within second development plan years, it followed again its ascending trend during the third plan period. is Annual average growth of GDP, between 1368 and 1386 is equal to 5.4.The share of capital income after slight decrease during the second plan, continued its ascending trend, in such a way that the average share in capital income growth during development plans is about 20.9. This factor on average accounts for 4.5 of growth. The least capital income comes from the second development plan, because in this period, the larger proportion of growth was associated to workforce rather than capital income. 2- Skilled workforce during development plans accounts for 16.2 of growth. As in the second development plan duration, the average growth of GDP is lower than other plans and regarding to the ratio of skilled workforce application to average growth of GDP, the share of workforce in this duration is higher than other durations. On the other hand, setting connection between training and quality of workforce was one of the governmental policies through this period. However, the proportion associated to this factor is the smallest one that influenced the growth amount during fourth development plan. The reason comes from this fact that, along with an increase in the number of skilled workforces, the average growth of GDP experienced considerable increase relatively. Thus its share in growth is trivial. 3- In case of unskilled workforce, it is to say that the average share during the development plans account for 27.1% of total growth. The least and the most happened during the second and the fourth development plans respectively. It is due to two reasons, the first stems from an increase in the number of employees between the year 1357 and the year 1386 that caused an increase in the number of both skilled and unskilled workforces. The second reason is related to slight growth of GDP during the second plan period versus its considerable growth during fourth plan that resulted in a substantial raise in GDP's share during the second duration versus its trivial share in the fourth plan period. Also, its average is equal to 3.75 and because of an increase in the number of employees; it followed an ascending trend after the second plan duration.4- Because

there is a fluctuation in annual growth of economic factors, the total productivity proportion from the year 1358 to the year 1379 fluctuated surprisingly. Also total productivity possesses unsteady nature and is influenced by short-duration policies. During second plan, its share and its amount is negative, because other factors influenced the amount of growth substantially, whereas, after the second plan it went along an upward trend. As other factors in the fourth duration plan account for small amount of growth, workforce share in this plan is not considerable.

CONCLUSION AND SUGGESTIONS

Since skilled workforces have a high share of growth in industrial and developed countries, this research studies the effects of this factor on growth and its share from growth in Iran during 1978-2009 by using accounting of growth. This paper has been divided into introduction in first chapter, history of research in second chapter and research methodology in the third chapter. In fourth chapter, with respect to the estimation of model and calculation of share of factors by using accounting of growth, the research hypotheses have been analyzed. The results of paper on relationship between skilled workforce and economic growth and by considering statistics analysis and results obtained from economic models show that there is positive relationship between specialized forces and growth. To test the significant of parameters, the T test has been used. The quantity of T statistics shows that the above-mentioned coefficients are significant in 93% level; therefore, there is a positive and significant relationship between skilled workforce and economic growth. On the other hand, the relationship between low skill work force and economic growth is positive and significant. It should be noted that the share of skilled workforce from growth should be higher. Based on results of the paper and with respect to increasing expansion of working forces, it is suggested that, first, since many employees possess skills that do not fit their job, the experts should establish a bilateral relationship between work and skill; second, since some acquired skills in developing countries show the income gap of people higher than expectations, by taking some measures, the unskilled and low skilled people should acquire more training and education; and third, since higher education has significant share in improving individual abilities, the university graduates work force should be in recruitment top priority list.

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