African Journal of Business Management Vol. 6(3), pp. 1034-1040, 25 January, 2012
Available online at http://www.academicjournals.org/AJBM
DOI: 10.5897/AJBM11.1800

Full Length Research Paper

Productivity and relative prices in the industries sector of Iran

Ali Besharat[1*], Mohsen Amirahmadi[1] and Shahryar Fathi[2]

[1]Department of Economics, Islamic Azad University, Maragheh Branch, Maragheh, Iran.
[2]Department of Economics, Islamic Azad University, Malekan Branch, Malekan, Iran.

Accepted 4 October, 2011

Productivity is one of the most important factor among factors affecting rate of growth and its promotion is one of the main goals of countries. According to the country's fifth development plan; it is predicted that 33.3% of annual economic growth will be provided by improving productivity. Therefore, identifying factors promoting productivity are very important. This paper examines the causal relationship among productivity in the industries sector and some economic variables in Iran, by applying the global equilibrium and econometric techniques. The study explains the concepts and indicators of productivity and describes its role in promoting economic growth. The applied model of the study has been developed by using global equilibrium analysis and econometric techniques to estimate the coefficients of the basic stipulated relation. The results of estimation indicate that factors such as relative prices of industrial products, improving resources quality, and technical progress, influence productivity in the industries sector of the economy. Using data from 1961 to 2009 period, the coefficients of the model were estimated, the main hypotheses were examined and solutions for improving productivity are presented. A global equilibrium approach in productivity is defined and measured, and a new method in factors analyses is introduced.

Key words: Econometrics, global equilibrium, industries sector, productivity, relative prices.

INTRODUCTION

Industrial and mineral activities manufacture and provide commodities for residents of country, raw and basic initial materials for other activities and employment for a relatively large part of labor and other resources. Industries sector produces about 31% of Gross Domestic Product (GDP) - the total national product- and provides 37% of the country's total employment. Like other sectors in the industries sector, optimal use of scarce resources requires the application of resources with the highest efficiency and effectiveness to obtain more productivity. To achieve more output in industries sector which provides basic materials for productive activities and employment for a large number of people, it is essential to identify those factors influencing productivity in this sector and develop policies and plans to upgrade it. In fact; one of the most important affairs of community and economic enterprises is productivity, that is, "doing work properly" and using resources and opportunities correctly for "doing the best and correct works" and producing something that the community needed and wanted. Theories and applied research and experimental studies indicated that productivity affects on GDP and employment growth significantly. Statistics and empirical evidence showed that total productivity of resources and the productivity of labor, are very little and low in comparison with the standards - the world average; so that in recent decade, share of productivity in the economic growth has been less than 31% (Abbasi, 2011), while in developed economies such as Japan's economy, it is above 68%. Therefore, improving efficiency in resource use in production of key sector of society - industries sector has a double significance (Valizadeh, 2009).

A review of previous studies, which are mainly deductive in nature, indicated that the indices of productivity are

*Corresponding author. E-mail: indolandi@yahoo.com.

affected by factors such as foreign investment, economies of scale and export to provide a specific definition of productivity. We have also adopted an inductive model to highlight the influential factors on productivity in industries sector and have provided empirical and deductive evidence to confirm our inductive relations. For more precise analysis and testing hypotheses, a mathematical model was used. Thus, using theories and models - developed by researchers and economic theorists - particularly an econometric model developed and is being used. Using information from 1961 to 2009 period, coefficients of stipulated model were estimated with the interpretation of estimated coefficients; hypotheses about factors affecting productivity, were tested and applications of the results of the study presented.

The object of this study was to investigate effect of relative price of industrial products, improvement of the quality of production factors and management styles and level of technology, on productivity in industries sector. The finding of this study can be of significance in policy making to achieve more productivity in industries sector. They can also contribute to development of planning for more productivity in all economic sectors.

Also, this study is organized to determine the factors affecting productivity in industries and mineral activities. Factors affecting productivity in the industries sector should be identified for developing appropriate policies to enhance productivity in sector. On the other hand, the results of this study could explain the general factors affecting productivity in all economic sectors of the community and economic firms. An economic unit can use the result of this study to develop its activities and obtain more efficiency.

LITERATURE REVIEW

There are some studies about productivity and economic factors affecting it at the aggregate level, or using value added for broad activities and industries. There are fewer industry studies focusing on sectors level, and even fewer discussing the aggregation across industries. There is no serious debate in this literature about the factor analyzing the application of the general equilibrium and global efficiency, and a similar consideration about its future trend (Cao et al., 2009). However, we briefly highlight existent studies. Chow (1993), employing formal data prior to 1980 on the material sectors, deduced that there was mainly no technical progress in 1952 to 1980. Borensztein and Ostry (1996) estimated that total factor productivity (TFP) growth was −0.7% per year during 1953 to 1978, but rose to an average 3.8% per year during 1979 to 1994. Ren (1997) estimates GDP growth at 6.0% during 1986 to 1994. This paper is focused primarily on measurements of real GDP raising data issues that are relevant to our debates here. Also, Hu and Khan (1997) estimate China's TFP growth at 3.9% during 1979 to 1994; this contributed more than 50% to output growth, compared to 33% from capital formation. Woo (1998) estimates GDP growth using value added from all sectors, but instead of using the formal real value added data, he recalculates them using producer price indices. He deduced that, for the period 1979 to 1993, the official growth rate of 9.3% per year is revised to 8.0%, which is then decomposed to labor force growth (1.4%, with no adjustment for changes in labor composition), capital accumulation (4.9%), reallocation effect (0.6%) and TFP growth (1.1%). He also reports a deceleration of TFP growth; from 2.8 to 3.8% per year during 1979 to 1984 to −0.11 to 1.58% during 1984 to 1993.

In another study that does not use the formal GDP data, Woo (1998), using 1979 to 1993 data, deduced some results by modifying formal GDP and decompose value added into factor growth, reallocation and TFP growth. Fan et al. (1999) examined economic growth in China. They divided the Chinese economy in four sectors: 1) agriculture, 2) urban services, 3) urban industrial, and 4) rural enterprises for 1978 to 1995 and estimate that TFP growth gives 4.2% points to the aggregate annual GDP growth. In an earlier paper, Wu (2002) proposed an upward-bias hypothesis that the Chinese formal growth index overstates China's real industrial growth act. Therefore, they conducted a downward correction based on ceremonious physical output data. Maddison and Wu (2003) estimates that GDP growth is about 8.7% for 1992 to 2003; Chow and Li (2002) follow Chow (1993) and estimate a Cobb–Douglas production function, but update the analysis to 1998. They encounter a positive TFP growth of 3.03% in the post-reform period, together with 5.1% growth in capital input and 1.2% growth in labor input to explain the 9.4% overall GDP growth from 1978 to 1998. Young (2003) discusses the problems with the formal estimates of real GDP and uses alternative deflators that Ren (1995) suggested for the primary, secondary, and tertiary sectors. He makes an adaptation for the changing composition of the labor force and estimates that nonagricultural TFP growth was only 1.4% per year compared to the 3.0% using official numbers for 1978 to 1998. He however also indicates that disregarding agriculture makes this a misleading estimate, since that sector is large (25% of GDP in this period) but with rather poor data on inputs (labor, land and capital). He remarks that China's post-reform productivity act of nonagricultural economy is respectable but not outstanding, and concludes that the efficiency gains lie mainly in the agriculture sector.

In more recent papers, Young (2003) and Maddison and Wu (2006) also partake in the same view as Woo (1998) and Ren (1997). They argue that since officials are rewarded for superior act and punished for failing to meet GDP growth target, local officials tend to overstate the growth of output. Maddison and Wu indicate that GDP growth is below the officials. Ren and Sun (2005) use an earlier set of the data to describe and calculate a domar-weighted aggregate of the TFPs for 33 industries. They estimated this aggregate TFP growth to be 3.2% per year during 1981 to 2000. Holz (2006) however finds and shows that estimating time series aggregate functions “yields largely insignificant coefficients, output elasticities are not constant over time,” and thus does not suggest any TFP estimate. On the other hand, Perkins and Rawski (2008) accept the official GDP estimates after 1995, and only slightly revise the growth rate down by less than 1% for the period before 1995. They estimated aggregate TFP growth at 3.8% between 1978 and 2005 and suggest that TFP accounts for 40% of overall growth in three decades of economic reform. Like Ren and Sun, Wang and Yao (2001) also put into account labor quality, distinguishing workers by the number of schooling years. Using various assumptions about labor income shares, they estimate TFP growth to be in the −0.87 to −0.38% per year range for the pre-reform period and in the 1.92 to 2.98 range for 1978 to 1999. That is, the TFP estimates in both Ren and Sun (2005) and Wang and Yao (2001) are somewhere between the low estimates of Woo and Young, and the high estimates of Hu and Khan. There are also other studies using firm level data instead of economy aggregates, including Jefferson et al. (1996, 2000), Groves et al. (1994) and Woo et al. (1994). These studies seem to agree that collectively owned enterprises show much higher TFP growth than state owned ones, but give very different estimates of the actual performance of the state owned enterprises, ranging from positive to negative. Cao et al. (2009) show that analysis at the 2-digit level covering the entire economy cannot be compared to these enterprise level studies, their results also show a wide range of TFP growth, both positive and negative. Cao et al. (2009) estimate productivity growth for 33 industries covering the entire Chinese economy using a time series of input–output tables covering 1982 to 2000. Capital input is measured using detailed investment data by asset and labor input, which uses demographic information from household surveys. They find a wide range of productivity performance at the industry level. They then show how these industry growth accounts may be consistently aggregated to deliver a decomposition of aggregate GDP growth. For the 1982 to 2000 period, aggregate TFP growth was 2.5% per year; decelerating from a rapid rate in the early 1980s to negative growth during 1994 to 2000. According to their study results, the main source of growth during the 1982 to 2000 period was capital accumulation, with a small negative contribution from the reallocation of factors across industries (Besharat et al., 2011).

Using empirical studies, we divided Iran’s economy to two sectors; 1) industrial and 2) non-industrial sectors. We employed industrial economics and welfare economics’ concepts and methods such as; production possibilities frontier, mathematical planning and social welfare function and also global efficiency to specify factors factors affecting productivity in industrial activities. On the other hand, we considered empirical studies about concepts and indices of productivity and finally stipulated some suitable models and estimated all models applying a time series of variables covering 1961 to 2009 periods; and chose two of the best models with well econometric characteristics.

DATA AND METHODS

The study of factors affecting productivity in the Mine and Industries Sector of Iran was an applied-developmental research. It was organized and planned to develop and complete the empirical studies through inducting some inductive derivations and finding power causal bases for empirical and statistical (deductive) observations and studies. We defined the essential variables including dependent variable- productivity in industries sector - and independent variables- relative prices of industrial products, improving resources quality and technical progress- and also we recognized the proper index for them to measure; value added of industries sector, ratio of industrial outputs price on non-industrial products price, governmental investment expenditures, and time index (trend); collected data have been used to estimate the coefficients of stipulated model and test basic hypotheses. The method of data collection and creating information was referring to the statistical population as a whole, and that has been gathered from the following valid data base and sources, namely Central Bank, Planning Organization and Statistic Center of Iran.

To explain the essential relation among productivity and other variables, consider simple and efficient model production possibilities frontier (the border) (PPF). Suppose X_1 indicates the potential production level of industrial products, and X_2 indicates rate of non-industrial products, in this case, the production possibilities curve can be specified and imagined as shown in Figure 1.

According to the definition, at any point on the production possibilities curve (frontier), maximum efficiency and full employment of resources is presumed. Meanwhile, in defining and drawing PPF, it is assumed that the quantity of resources, quality of resources, management styles and level of proven technology available, is given and exogenous. The curve using the concept of implicit function expression is as follows:

$$f\ (X_1, X_2) = 0 \leftrightarrow X_2 = f\ (X_1) \quad (1)$$

Although technical efficiency at all points of the curve (potentially producible combinations) is established, but because of three reasons, use of resources does not lead to the realization of productivity. First, because of some reasons, a part of resources are not employed and suitable employment opportunities not found for them. In this case, society will produce at virtual point (inside curve), and in fact, part of the resources will be wasted. On the other hand, sometimes, despite apparent employment, marginal production is zero and they are really unemployed (implicitly). If so, a part of the resources will be wasted and lower production levels will be realized at a point like K. Low productivity in these two cases due to lack of efficacy or lack of employment resources occurs. On the other hand, technical efficiency in the use of resources may be achieved and the technical efficient combination, such as A, may be produced, but this compound by the society (consumers and users of products), is not optimally known. In this case, things are done correctly, but from the view point of community, are not done “correct and favorable”, because they are not desired and desirable.

To find productive combination - compounds that have both technical efficiency and effectiveness –, we should use the concept of social welfare function. If we put the utility and welfare of the individual, a function of consumption quantity of X_1 and X_2, we will

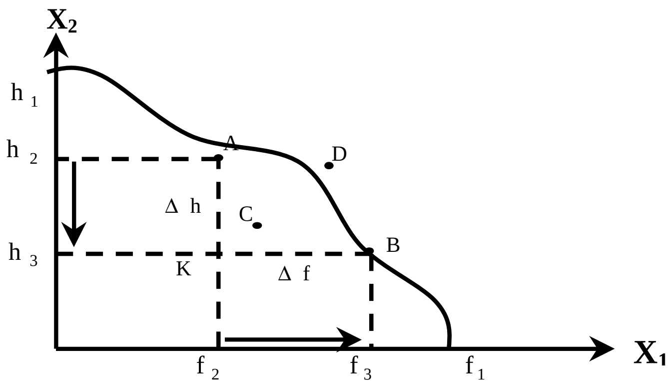

Figure 1. General form of production possibilities frontier (PPF).

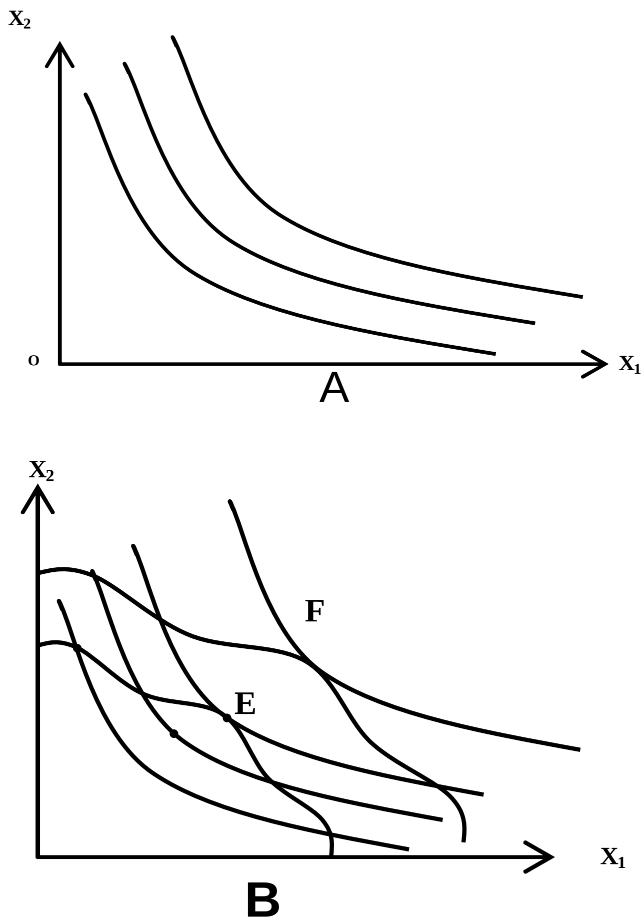

Figure 2. Welfare function levels, indifference curves of society (Part A) and global efficient point E (Part B).

have:

$U_i = f\ (X1, X2);\ i = 1, 2, 3, \ldots, n$ (2)

Now, if we consider the social welfare as a function of individual well-being of individuals, we will have:

$W = g\ (U_1, U_2, U_3, \ldots, U_n)$ (3)

Putting U_i from the relation (2) in relation (3), we will have:

$W = g\ (X_1, X_2)$ (4)

Assigning different values for W, several curves of this function (social welfare) is to be extracted and plotted (Figure 2a).

To find the most desirable producible compounds in society, according to the overall (global) efficiency condition, we should find contact point of the production possibilities curve with the highest social welfare curve (Figure 2b).

Point E shows a combination of two goods that satisfy equilibrium conditions in addition to technical efficiency (being on PPF), the effectiveness condition (and the desirability of the community). The highest productivity will be achievable if such a combination is produced. In fact, (coordinates of) point E on part B Figure 2, is an outcome of solving the following mathematical programming problem:

$\text{Max } W = g(X_1, X_2)$
Subject to $f\ (X_1, X_2) = 0$ (5)

First (necessary) condition for getting the maximum social welfare function W, $W = g\ (X_1, X_2)$, subject to $f(X_1, X_2) = 0$ is that:

$f_1/f_2 = g_1/g_2$ (6)

That is, f_1/f_2 -the slope of PPF- should be equal with g_1/g_2 -the slope of the social welfare function. Since the social welfare function is a mental concept and phenomenon and is not observable and measureable in the real world, we have to use relative price of P_1/P_2 instead of (MU_1/MU_2). So we will have:

$f_1/f_2 = P_1/P_2$ (7)

Placing this condition in PPF function, we will have:

$X_i = h_i\ (P_1/P_2)\ ;\ i = 1, 2$ (8)

That is, the optimal amount of production of each output to achieve the highest possible efficiency is a function of the ratio of two product prices. These mean that, changing the price ratio, the optimum production point (that satisfies the global efficiency conditions) will be change and thus the optimum rate of production of goods will be change.

On PPF, the quantity and quality of resources, level of technology and management styles are assumed constant, changing them, the PPF curve will shift and thus the optimum combination of production will change. Thus, in addition to price ratio, factors i) affecting quality of resources; ii) Improving management styles and; iii) Increasing technical knowledge (technology) are also effective in increasing efficiency. If we put the relative prices of industrial products P_1/P_2 and government expenditures for education and workforce training to improve the quality of the labor force and let investment in the industrial sector I_I as a factor to improve the quality of resources in productive activities, and improving industrial technology and management methods as a function of time t, the following function can be stated:

$X_1 = h_1(P_1/P_2, I_I, t)$ (9)

According to the model that we developed, one of the following models could be used to represent the effect of factors affecting productivity in the industrial sector and evaluate the effect of each factor:

$X_1 = \alpha(P_1/P_2)^{\beta}(I_I)^{\theta} e^{\lambda t + u}$ (10)

Table 1. Estimating results for Equation (12) ($LnX_1 = Ln\alpha + \beta\ Ln(P_1/P_2) + \theta\ Ln\ I_I + \lambda t$), for 1961 to 2009 period data.

Independent variable	Coefficient	Std. error	T-statistic	Sig.
(Constant)	-36.254	5.346	- 6.781	0.000
LRP	0.112	0.037	3.027	0.007
LI_I	0.041	0.018	2.278	0.040
Time	0.039	0.006	6.500	0.000

Dependent variable: Lx_1; Adjust R^2 = 0.913; DW = 1.91.

This function must be estimated linearly. For this purpose, we should compute logarithm of X_1. So we will have:

$$Ln\ X_1 = Ln\ \alpha + \beta\ Ln\ (P_1/P_2) + \theta\ Ln\ I_I + \lambda t + u \qquad (11)$$

Also, assuming a linear relationship between variables we can write:

$$X_1 = \alpha + \beta\ (P_1/P_2) + \theta\ I_I + \lambda t + u \qquad (12)$$

RESULTS AND DISCUSSION

The main hypothesis suggested that changes in the economic variables could not be used as an acting rule by producers and community to earn consistently normal productivity in the economy. In an efficient economy, current as well as past information on the growth of these variables were fully reflected in productivity so that producers were unable to formulate some profitable acting rules using the available information. The main objective of the present paper was to determine the lead and lag relationships between the productivity in Iran and three key economic variables: RP (relative price of industrial goods), technology and management style (t), and factors improving (I_I). In this study, the X_1 was used as a proxy for the productivity in industrial sector of Iran.

The equations were estimated as a "single equation regression model" by ordinary least square and were computed the coefficient applying SPSS. Durbin-Watson statistics and R^2 were used as measure of autocorrelation and unit root problem (Noferesti, 2000). T-statistics were used as a criterion for test about meaningfully of coefficients. The results of the estimation of equations (11) and (12) were presented in Tables 1 and 2. Results of estimation were as:

$$X_1 = -250.635 + 465.364\ (P_1/P_2) + 0.043\ I_I + 926.004t$$
$$(-6.233) \quad (3.018) \qquad (3.308) \quad (7.631) \quad (13)$$

Estimated coefficients were suitable. That is, relative price (RP) had appositive coefficient and if it raises 0.01 industrial sectors, value added will increase about 46.5 units. The critical amount of T-statistics is 3.018. So, we can say that relative price has a meaningful affect on productivity at a 90% level. Also, at a 95% level, governmental expenditures in industrial sector (I_I) has positive and significant affect on productivity. Long-run trend also has positive affect at a 99% on productivity. For more precise results, a logarithmic form of (13) was estimated as:

$$Ln\ X_1 = -36.254 + 0.112\ Ln(P_1/P_2) + 0.041\ Ln\ I_I + 0.0391t$$
$$(-6.781) \quad (3.027) \quad (2.278) \quad (6.500) \quad (14)$$

Estimation results were suitable. That is, relative price (RP) had appositive coefficient and if it rise 1%, industrial sector added value will increase about 0.112%. This amount indicates the elasticity of relative price of industrial goods on productivity. The critical amount of T-statistics is (3.027). So we can say that relative price has a significant effect on productivity at a 90% level. As like RP, at an 85% level, governmental expenditures in industrial sector (I_I), has positive and meaningful effect on productivity. Long-run trend has also positive affect at a 99% on productivity. Estimating the results of this study indicated that:

i. Coefficients of variables were consistent with general theory and researchers' expectation;
ii. DW statistics were between 1.5 and 2.5, so there were no autocorrelation;
iii. Adjusted R^2 were more than 0.94, so regression was meaningful.
iv. T statistics were relatively high and we could say that independent variables had significant influence on dependent variable (Table 1).

Results suggest that the null-hypotheses of this study could be rejected and main hypotheses could not be rejected at 5%. Considering that in the period that the research was studied three distinct periods with very different structural features were detectable, two virtual variables (D_1 and D_2) for detection of structural changes on the coefficients were used in the model. D_1 would be zero for before Revolution and one for after it and D_2 would be zero for before War and one for after it. So the model for estimate would be:

$$X_1 = \alpha + \alpha_1 D_1 + \alpha_2 D_2 + \beta\ (P_1/P_2) + \beta_1 D_1\ (P_1/P_2) + \beta_2 D_2\ (P_1/P_2) + \theta\ I_I + \lambda t + u \qquad (15)$$

Table 2. Estimating results for Equation (13) ($X_1 = \alpha + \beta (P_1/P_2) + \theta I_I + \lambda t$), for 1961 to 2009 period data.

Independent variable	Coefficient	Std. error	t-Statistics	Sig.
(Constant)	- 250.635	40.21	- 6.233	0.000
RP	465.364	154.215	3.018	0.002
I_I	0.043	0.013	3.308	0.000
Time	926.004	121.346	7.631	0.000

Dependent variable: Lx_1; Adjust R^2 = 0.927; DW = 2.12.

D_1 was a virtual variable. Its value would be zero for years before 1978 and one for the years 1978 onwards, to explain the structural changes after the revolution. D_2 was a virtual variable that was zero for the years before 1989 and one for the years 1989 onwards. It explained and tested the structural changes after the war. For the logarithmic model, we would have:

$$LnX_1 = \alpha + \alpha_2 D_2 + \beta Ln(P_1/P_2) + \beta_2 D_2 Ln(P_1/P_2) + \theta LnI_I + \lambda t + u \qquad (16)$$

According to estimation results, D_1 and D_2 had no significant effect on constant and slope of regression equations. So we excluded them from model. The final results suggested that RP (relative price), I_A, and Time (trend) significantly caused changes in productivity at less than the 5% level. In other words, the results suggested that these three variables lead productivity. Moreover, we fail to reject the null hypothesis of non- causality from productivity to variables including I_I, RP and Time at 5% level of significance. So, it seems that there was a unidirectional long-run causality from economic variables to productivity for industries sector of Iran. This implied that the productivity could be used as a leading indicator for future growth in economy in Iran.

Conclusion

In this study, we endeavored to investigate the question: could the productivity act as a barometer for the economy? This was of course an empirical question. The earlier studies that analyzed the nature of the causal relationship between economic variables and productivity had employed the traditional econometric tests. Since it was recognized that the conventional procedure might be inapt, conclusions based on such an approach might yield misleading inferences. So, we had employed the recently developed tests in our study. In general, the findings implied that economic variables were significant in predicting changes in productivity. Thus, it could be claimed that productivity variability was fundamentally linked to economic variables although; the change in productivity, lags behind those economic activities. In other words, while economic variables caused change in productivity, no reverse causality was observed. So, the productivity was not a leading indicator for economic variables, which was inconsistent with the findings that the productivity rationally signals changes in real activities. Moreover, it might be concluded that productivity in industries sector of Iran had been affected at least with respect to three economic variables: PR, I_I and technical progress. According to estimations, 1% increase in relative price of industrial goods affect productivity by 0.112%. On the other hand, 1% rise in governmental expenditure (as a major factor to improve quality of resources), lead to 0.041% increase in productivity (Table 1). These results were agreed with theories and result of empirical studies. By dividing the whole period into three sub-periods, we found that revelation (1978) and war (1979 to 1988) had no significant negative effects on relation of productivity and factor affecting it. Act of this trend can be a subject of future research.

The earlier studies that analyzed the nature of the causal relationship between economic variables and productivity had employed the traditional econometric tests. Since it was recognized that the conventional procedure might be inapt, conclusions based on such an approach might yield misleading inferences. So, we employed the recently developed tests in our study. In general, the findings implied that economic variables were significant in predicting changes in productivity. Thus, it could be claimed that productivity variability was fundamentally linked to economic variables; although the change in productivity lags behind those economic activities. In other words, while economic variables caused change in productivity, no reverse causality was observed. So, the productivity was not a leading indicator for economic variables, and it was inconsistent with the findings that the productivity rationally signals changes in real activities. Moreover, it might be concluded that productivity in industrial sector of Iran had been affected at least with respect to three economic variables: PR, IA and technical progress.

These shortcomings point to a full schedule for future research, but we believe the methods laid out here will prove useful in study of productivity and measuring the sources of growth in the dynamic economies.

ACKNOWLEDGEMENT

Authors express their gratitude to Dr. Davud Kuhi of Complement College.

REFERENCES

Besharat A, Amirahmadi M (2011). The study of factors affecting productivity in the agriculture sector of Iran. Afr. J. Agric. Res., 6(18): 4340-4348.

Borensztein E, Ostry J (1996). Accounting for China's Growth Performance. Am. Econ. Rev., 86: 224–8.

Cao J, Ho M, Jorgenson DW, Ren RS, Yue XL (2009). Industrial and aggregate measures of productivity growth in China. http://www.academicjournals.org/AJAR. 8(22):1475-4991.

CBI (1959-2010), Annual economic reports. Central Bank of Iran. National Accounts' Center. From 1959 to 2010.

Chow G (1993). Capital Formation and Economic Growth in China. Q. J. Econ., 108(3): 809–42.

Chow G, Li KW (2002). China's Economic Growth: 1952–2010. Econ. Develop. Cult. Change, 51: 247–56.

EDDOVCO (2011). Production Possibility Frontiers. Economics Department of D'OVERBROECK'S College Oxford. (Curves, Boundaries) – The Basics Independent Sixth Form.

Fan S, Zhang X, Robinson S (1999). Past and Future Sources of Growth for China.International Food Policy Research Institute, EPTD Discussion Paper. 53.

Groves T, Yongmiao H, McMillan J, Naughton B(1994). Autonomy and Incentives in Chinese State Enterprises. Q. J. Econ., 109(1):185–209.

Holz C (2006). China's Economic Growth 1978–2025: What We Know Today about China's Economic Growth Tomorrow. Mimeo, Social Science Division, Hong Kong University of Science and Technology. 12.

Hu Z, Khan M (1997). Why is China Growing So Fast? IMF Staff Pap., 44: 103–31.

Jefferson G, Rawski T, Zheng Y(1996). Chinese Industrial Productivity: Trends, Measurement Issues, and Recent Developments. J. Compar. Econ., 23: 146–80.

Jefferson G, Rawski T, Li W, Zheng Y (2000). Ownership, Productivity Change and Financial Performance in Chinese Industry. J. Compar. Econ., 28(4): 786–813.

Maddison A, Wu H (2006). China's Economic Performance: How Fast has GDP Grown; How Big is it Compared with the USA, presented at University of Queensland Workshop on "The World Economic Performance.

Nir VS, Hung T (1999). Total Factor Productivity Growth in Japan, South Korea, and Taiwan, University of California, Santa Cruz.

Rawski T(2008),China's Great Economic Transformation, Cambridge and New York, Cambridge University Press. 829–86.

RCIP (2011). The Fifth Five-year Plan. Research Center of Iran's Parlemant, Article 137, Internal Report, 12.

Ren R, Lin LS (2005). Total Factor Productivity Growth in China Industries: 1981–2000. Presented at the 5th Int. Input–Output Conference, Beijing, China.

Valizadeh ZP (2009). Total Factor Productivity, Productivity of Labor and Productivity of Capital Economic Research and Policy Department Central Bank of the Islamic Republic of Iran. 10: 4-7.

Woo, WT (1998). Chinese Economic Growth: Sources and Prospects. In: Fouquin M and Lemoine (eds), The Chinese Economy, Economica, London.

Woo WT, Hai W, Jin Y, Fan G (1994). How Successful Has Chinese Enterprise Reform Been? Pitfalls in Opposite Biases and Focus." J. Compar. Econ., 18(3): 410–37.

Wu H X (2002). How Fast Has Chinese Industry Grown? Measuring the Real Output of Chinese Industry. Rev. Income Wealth, 48(2): 179–204.

Young A (2003). Gold into Base Metals: Productivity Growth in the People's Republic of China during the Reform Period. J. Polit. Econ., 111:1221–61.