Full Length Research Paper

Ways of increasing the total factor productivity of cement industry for economic development: A case study in Iran and other selected countries (1990 to 2007)

Mohammad Ja‘farzadeh* and Farz Aliov M.

Baku Architecture University, Baku- Azerbaijan.

Accepted 16 January, 2012

Man has always thought of efficient utilization of available potentials and sources. Today this subject drives more serious attention compared to the past. Limited available resources, increasing population and growing human needs and demands of those involved make the economy, politics and management and community organizations increase productivity in its priority programs. Productivity has positive effect on phenomena such as competition in international markets, equitable distribution of income, raising living standards, economic development and even political power of a government. However, the study in this field requires knowledge about its development process. So far there has been no comparison of total factor productivity factor in Iran with other countries in the cement industry with regard to position and valuable role in the economy. This research should be considered a step toward eliminating the deficiencies outlined. In this study, using the relative index of total factor productivity factor, the relative total factor productivity factor in Iran and Turkey, South Korea and the United States has been evaluated and analyzed between the years (2007 to 1990) in the cement industry. Also, using panel data approach, the effect of macro and institutional factors such as the role of government, the degree of openness, inflation, and human capital on total factor productivity factor is evaluated. The findings indicate that there is a wide gap between total factor productivity of Iran's cement industry and that of the United States and the trend is not a proper one. This is an alarm for Iran's policy makers and planning managers to plan and utilize proper policies and take necessary actions to close or reduce this wide gap. It is also adversely shown that interference of the government may negatively affect the total factor productivity but, developed human resources and an open economic environment will have positive effect on the productivity. It is also noted that inflation has an adverse effect on total productivity.

Key words: Total productivity, cement industry board data, equal purchasing power.

INTRODUCTION

Today, to achieve economic development, through increased productivity is considered one of the most outstanding productivity economic Objectives of countries, such that industrial and growing countries have gained a significant part of their production growth through this way. This is why these countries increase the quality of life and it owes its productivity to increased productivity. Reports published by the organizations of productivity also show that in developing countries the role of productivity in their economic growth has proven more significant every year.

On the other hand, due to the prominent position and role of cement industry in the country’s economic development the evaluation and analysis of productivity have a beneficial value.
Statement of the problem

The term productivity means different things to different people. Such as efficiencies while maintaining costs at a constant level of inputs. A person as a producer defines productivity in a way different way from a consumer. We may define productivity as the optimum use of the sources to achieve increased production with a constant amount of sources. All countries whether developed or developing have realized the significance of the productivity as the main requirement for economic growth and competition superiority in global markets.

Researchers believe that the degree of the development of countries from the point view of economy depends on their ability in the utilization of the available sources and tools to achieve their economic objectives. The development of productivity not only means the optimum utilization of resources but it also refers to the coordination between economic, social and political structures of the society. Economists emphasize the importance of productivity in the development process of countries. Experience in developed countries has revealed that growth and dynamic trend in industrial section plays a very important role in the development of other sections.

Cement industry is considered to be one of the most effective factors of a country's development process and it is due to this remarkable importance that makes this study important. Among the productivity indicators, total factor productivity (TFP) measures the output in terms of input, work and investment (Dollar and Wolff, 1993, 1995) the higher the TFP, the better is the economic function.

There are two different methods for reviewing the total productivity: parametrical and non parametrical. Parametrical investigation was first introduced by Robert Solo in 1957. Robert Solo related America's productivity growth to the development of technology and technological knowledge based on his intensive study. Solo's findings could explain some economic events which were unexplained before; therefore, other scientists tried to complete his theory and resolve its shortcomings. One of the shortcomings raised against Solo's theory was that according to this theory the production function which showed the highest output versus the pooling of input elements only compared those units which were active during the two study intervals. This approach is not valid for inactive units.

Consequently, Solo's growth theory can only be considered as the outcome of technological variations. Nishimizu and Page (1982), by removing the activity condition of the units under investigation, proved that the influencing factors on total factor productivity may be quoted as: Performance improvement utilization of various types of input resources and technological variations.

Significance of the study

The level of productivity in industrial production is one of the most important criteria which determine the ability of an industry to achieve partial advantages in domestic and foreign levels. In other words the growth of productivity is one of the fundamental prerequisites for level of competitiveness of an industry and a measure of its success in ever increasing global competitiveness due to decreased price of the items produced resulting from production cost reduction. Consequently demand for the product will sharply increase and the competition power will increase international markets. This in turn will lead to production expansion and optimum utilization of production capacities. On the other hand the volume of new industrial investments will rise and more advanced technologies will be employed.

Due to descending nature of the output it is not possible to achieve output growth through continuous growth of the input in the long term. Growth capacity indicator reveals the economical governments of a country from the view point of optimum utilization of the resources.

This study aims to give a clear picture of the cement industry in the countries studied and help the country to allocate the required resources for this high potential industry.

Objectives of the study

1) Evaluating and comparing TFP between Iran and selected countries.
2) Review of strategies to increase productivity in selected countries and Iran.

Hypotheses

1) Total factor productivity in selected countries in the cement industry, is the same.
2) Government consumption expenditure is one of the factors affecting total factor productivity in the cement industry.
3) Degree of openness is one of the factors affecting total factor productivity in the cement industry.
4) Human capital factors affect total factor productivity in the cement industry.
5) Inflation is one of the factors affecting total factor productivity in the cement industry.
Methods
The type and method of reviewing the hypotheses or answering questions are: (descriptive, experimental, content analysis, documentary, historical and ...). In this study, descriptive approach has been used to evaluate the hypotheses.

Subjects
Population studied, cement industry in Iran, Turkey, South Korea and the United States during the period 1990 to 2007.

Data collection sources
The formal reports of the following centers have been used in this study:
1) Iran's statistical centre
2) Statistical centers of the countries studied
3) The organization of cooperation and economic development
4) Global tables of Penn.
5) World Bank.

Analysis procedure
In this study, first using a relative productivity index, the total factor productivity among the countries studied is obtained. Then using panel data methods the difference among the factors determining the relative benefit obtained is tested. Excel and Eview's software were employed for this purpose.

a) Total factor productivity which may be defined as the amount of change in the output for a given increment of the total input (Abtahi and Kazeni, 2000).
b) Purchasing power parity: Purchasing power parity between the currencies of two countries may be defined as the amount of currency of the country B and/or A having the same purchasing power of the unit of currency of the country A and/or B. (Moghadam and Valizadeh, 2006).
3) Panel data:
Using panel data is one of the efficient methods in economical evaluations and its application is ever increasing in various economical subjects. In this method the observations of isolated cuts are combined for several time periods, and the heterogeneity of the discrete units is taken into consideration. (Hsiao, 1966).

The nodal used for reviewing the effective factors on total factor productivity of economic growth is the primary result of increased inputs and improved total factor productivity. But the growth of inputs is not sustainable in the long run. So focusing on total factor productivity and its influencing factors and thus improving productivity methods are a means to better understand economic growth. Although, the importance of total factor productivity in economic performance has been expressed, the factors influencing productivity of total factor, at least in theory, have not been paid much attention, the concept of total factor productivity in the literature, many of which dealt with economic growth have been analyzed. Senhadji (1999) states that, many of the empirical literature seek production growth but a small number of them seek influencing factors on the productivity total factors. Thus in the wake of some research groups factors affecting total factor productivity have been the lack of a theory in this field, the theory of economic growth and the production function is used.

Thus in the studies, which intended to study the influencing total factors due to the absence of theoretical foundation in this subject, economical growth theories and production equation have been applied instead. Collins and Bosworth (1996) have used the framework of growth accounting which also includes human resources to study the effect of influencing factors in productivity improvement or loss. The production equation considered valid in this approach is as follows:

\[ Q = AK^\alpha (HL)^{(1-\alpha)} \]  

(1)

The growth of output per worker equation \( (q/f) \), the pooling of physical capital per workers growth \((k/l)\), growth training for each worker \((h)\), and total factor productivity growth \((a)\) is decomposed.

\[ q/f = a(k/l) + (1 - \alpha)h + \alpha \]  

(2)

On the other hand, assuming that training is the most important factor for human resources, based on neoclassic standard form, Borrow (1991) and Borrow and Lee (1994) had studies on the developed and developing countries for the interval of 1960 to 1985 and revealed that the growth has a negative impact on expenditure of the government (except for defense and education expenses). The idea is that government expenditure lowers the level of the savings resulting in reduced labor output.

Another method for estimating productivity is applying a production equation employing known inputs such as work for A and B capital along with additional inputs such as the degree of openness and the government. It is believed that they affect the growth through total productivity. Knight et al. (1993) is among the researchers who adopted this method. They defined a Cab-Douglas equation which as:

\[ Y_t = k_{t}^\alpha H_{t}^\beta (A_{t}L_{t})^{1-\alpha-\beta} \]  

(3)

A is a factor indicating level of technology and economic efficiency (total factor productivity) and it is assumed that it depends upon openness of economy \( (\theta_y)\) (F) and the level of constant government investment \( (\theta_g)\) (P) as follows:

\[ A_t = A_0 e^{\beta F} F^{\beta r} \]  

\[ P_t = \alpha \]  

Where \( A_t \) the level of technology is in the period of \( t \) and \( \alpha \) is the rate of technology progress. Knight et al. (1993) believe that the development of technology in national economy is often realized through the import of goods of a capital nature and government has a role in the efficiency of the production sector. They consider the government and the degree of openness in addition to human resource variable in their empirical economical studies. Motley (1998) reduces their jobs by introducing the inflation as a factor which reduces the rate of technology change. Motley tries to prove that the rate of growth in the gross production of an individual worker depends only on the rate of the change of technology; therefore, any effect on sustainable growth resulting from inflation is through the technological charge.

Miller and Aupadhyay (2002) in their study of the element of total factor productivity defined the production function as a function of conventional inputs, work force, capital, human resources and other productivity parameters. Then they conclude an equation for assessing the factors affecting total productivity.

This equation covers variables such as: Human resources, ratio of exports to gross, national production and trade (as a substitute
for degree of openness) and the inflation rate. Khan (2006) has also
derived the following empirical relationship for assessing the total
factor productivity factors:

\[ TFP_t = x_i \beta_t + \mu_t \]  

(4)

Where TFP is total factor productivity and \( x_i \) is the resulting
vector of affecting factors of total factor productivity. These factors
include the rate of inflation degree of openness of human resources
and the controlling variables.

Hence in this study based on what was said assume that the
most important and key factors on total factor productivity are:
Government size, degree of openness, human resources and rate
of inflation. The equation used is as follows:

\[ TFP_{it} = \alpha_{it} + \beta_1 G_{it} + \beta_2 O_{it} + \beta_3 H_{it} + \beta_4 lnf_{it} + \varepsilon_{it} \]  

(5)

Where \( TFP_{it} \) is the partial productivities of country \( i \) in industry \( j \) in
the year \( t \).

\( G_{it} \) is the size of government of country \( i \) in the year \( t \).

\( O_{it} \) is degree of openness of economy of country \( i \) in the year \( t \).

\( H_{it} \) is the human resource variable of country \( i \) in the year \( t \).

\( lnf_{it} \) is the inflation rate of country \( i \) in the year \( t \).

We use the data collected in section 2-3 for calculating TFP.

THE METHOD OF TABULATED DATA

In the method of tabulated data, the economical unit for a time
section (for a small business or a country) is evaluated in the
course of time. In fact, this estimation method is a pooling of time
series and sectional time data methods. The information and
statistical data provided by these methods only give a good
knowledge for economical models, but they provide valuable
findings concerning policy making and planning Gujarati\(^10\) (2006)
states that regardless of the different names given to the tabulated
data all point to the movement of time sections in the course of
time. The researchers obtain more information from the tabulated
data and therefore, the degree of freedom increases. This can
reduce the alignment among the descriptive variable (Hsiao, 1986).

The superiority of the tabulated data models over sectional time
models is due to the fact that by applying these models the
researchers have more flexibility in exposing the individualistic
behavior of the events during the course of time. One of the most
important advantages of the application of the tabulated data model
is its ability to control the heterogeneous characteristics and
considering the events one by one. While in sectional time and time
series models heterogeneities are not controlled and there are
deviation risks in the results obtained by these methods (Baltagi,
1997).

The framework of the tabulated data model is as follows:

\[ Y_{it} = \alpha_i + \beta_1 X_{1it} + \beta_2 X_{2it} + U_{it} \]

\[ U_{it} = \mu_i + \vartheta_{it} \]  

(6)

Where

\( i = 1,2,\ldots,n \)

\( t = 1,2,\ldots,t \)

\( n \) is the number of countries (sections) and \( t \) is the number of
observations in the time series. \( \mu_i \) is the invisible or hidden variable
which is also called hidden part or hidden Heterogeneity, and
denotes the differences in characteristics of section time model. It is
assumed that it has been normally distributed among all
observations with an average amount of zero and a constant
variance and with no interdependency (Davoodi and Shahmoradi,
2004).

Pooling\(^10\) and Panel\(^11\) are the two methods used for the
evaluation of tabulated data. In the pooling method the data or only
piled up and the vertical distance from the origin of the coordinates
is the same for all sections. It is also assumed that the residual
sentence can explain all difference of sections and time. In this
case the model can be evaluated by ordinary least square method
(OLS)\(^12\) (Baltagi, 1997) but when there are heterogeneities or
individual differences there panel method is used.

Leamer F-test\(^13\) is used for assessing whether panel or pooling
method has been used in evaluation of tabulated data model. In
Leamer F-test the sameens assumption of the ordinate (pooling method)
and non-identical assumption of the ordinate (panel method) is measured as follows:

\[ F^* = \frac{R^2_{UR} - R^2_R}{(N-1)} \left( \frac{1 - R^2_{UR}}{(NT - N - K)} \right) \]  

Where

\( R^2_{UR} : R^2_{UR} \) Method is constant effects

\( R^2_{R} : R^2_{R} \) is pooling Method

\( K \) = the number of descriptive variables

\( N \) = the number of sectional cuts

If the (measured) of the table are larger degrees of freedom, the
hypothesis of zero cross using panel data methods would be good
or else using methods data pooling is better.

If \( F^* \) (the measured \( F \) is greater than the \( F \) which is obtained from
the table of degrees of freedom \( NT - N - K \) and \( N - 1 \)) then null hypothesis is rejected and panel method is applied
otherwise data pooling method is more appropriate.

Also when applying panel method, there are two alternatives for
estimation: Constant effect model\(^14\) and random effect model\(^15\).
Haussmann test\(^16\) developed in 1978 can help to decide which
model to use. Haussmann test, in fact, is the test of individual
effects and explanatory variables hypotheses being non-correlated
and, which is based on the estimates of generalized least squares
(GLS)\(^17\) and is consistent with null hypothesis but it is inconsistent
with the opposite hypothesis. In other words in random effect
model, which uses generalized least squares, the null hypothesis
shows the compatibility of the coefficients while the other method
proves the opposite (Hsiao, 1986).

The null hypothesis of Haussmann test shows that the estimates
of the random effect model and constant effects model do not

---

\(^{10}\) Pooling

\(^{11}\) Panel

\(^{12}\) ordinary least square method

\(^{13}\) Leamer F Test

\(^{14}\) constant effect model

\(^{15}\)random effect model

\(^{16}\) Haussmann test

\(^{17}\) GLS
Mohammad and Farz

Table 1. A look at the countries studied.

<table>
<thead>
<tr>
<th>Year</th>
<th>Iran</th>
<th>Turkey</th>
<th>South Korea</th>
<th>U.S.A.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1990</td>
<td>54</td>
<td>56</td>
<td>43</td>
<td>250</td>
</tr>
<tr>
<td>2006</td>
<td>70</td>
<td>73</td>
<td>48</td>
<td>280</td>
</tr>
<tr>
<td>Population (in millions)</td>
<td>745150</td>
<td>0'783560</td>
<td>0'099260</td>
<td>9699090</td>
</tr>
<tr>
<td>Area</td>
<td>4540</td>
<td>4160</td>
<td>7690</td>
<td>22940</td>
</tr>
<tr>
<td>Gross national income</td>
<td>9800</td>
<td>8410</td>
<td>22990</td>
<td>44070</td>
</tr>
</tbody>
</table>

Table 2. The hypotheses of Levin, Lee Chu and Hardy.

<table>
<thead>
<tr>
<th>Test</th>
<th>Null hypothesis</th>
<th>The opposite hypothesis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Levin et al., 2002</td>
<td>Existence of similar root (inconsistency)</td>
<td>Lack of unit root</td>
</tr>
<tr>
<td>Hardy, 2000</td>
<td>Absence of similar root (consistency)</td>
<td>Existence of unit root</td>
</tr>
</tbody>
</table>

Table 3. Consistency of variables.

<table>
<thead>
<tr>
<th>Equation</th>
<th>$ln k_{cjt} / l_{cjt}$</th>
<th>$ln l_{cjt}$</th>
<th>$ln k_{cjt} / l_{cjt}$</th>
<th>$ln y_{cjt} / l_{cjt}$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Statistics</td>
<td>-6/00</td>
<td>-1/01</td>
<td>-3/30</td>
<td>-0/31</td>
</tr>
</tbody>
</table>

Source: Findings of the study.

show a significant difference. The Haussmann function has a free distribution of $\chi^2$. If the null hypothesis is rejected, it means that random effects model is not appropriate and constant effect model shall be used (Gujarati, 2005).

A look at the countries studied

In this study, data from four countries: Iran, Turkey, South Korea and the United States were used for the defined variables. Turkey as a neighboring country with an economic capacity similar to Iran, South Korea as a newly emerging industrialized country and the United States the leading country in the world economy are intended. Table 1 shows the most prominent features in these countries:

In the study period South Korea has higher productivity compared to Iran and Turkey while in most of the industrial fields its productivity proves lower than America.

The findings show that there is a wide gap between productivity of Iran and the selected countries. Considering the capital, energy and human resources of Iran compared to South Korea and considering the fact that the total factor productivity is an indication of a country’s economic status and a measure of its capability to optimized utilization of resources, it is concluded that resource utilization in cement industry of Iran is not satisfactory and the management of this industry does not follow a proper trend.

Test of relative difference in the productivity of industry hypotheses

In order to examine the hypothesis of existence of differences in productivity of the countries studied and for supporting the findings the following equation has been used for productivity measure:

$$\ln y_{cjt} / l_{cjt} = \beta_0 + \beta_2 t + a_i \ln k_{cjt} / l_{cjt} + a_2 (\ln k_{cjt} / l_{cjt})^2 + \gamma \ln l_{cjt} + \epsilon_{cjt}$$ (8)

For this we examine two models:

Model 1 is shown in Equation 8 (variable output)
Model 2 is shown Equation 12-3 where $\gamma = 0$ (constant output).

Model one is more flexible because of absence of constant output, while Model 2 assumes the existence of constant output. Before making any estimates it is necessary to test the consistency of all variables used in the estimates. This is because of the problem of forged regression in case of inconsistence of variable concerning time series data as well as tabulated data. But contrary to what is considered to be normal for time series data, it is not possible to apply Augmented Dickey- Fuller Test (ADF) for combined data\(^{18}\), and it is necessary to apply Hardy Z-test\(^{19}\) or

\(^{18}\) Augmented Dickey- Fuller Test(ADF)
\(^{19}\) Hardy Z-test
Levin et al. (2002) t-stat test for measuring resultant consistency of all variables.

Here, for test consistency (absence of similar root) combined data of Levin et al. is used. The result of this test is shown in Table 2.

As the results obtained Table 3 show that variable $y_{cjt} / l_{cjt}$ is similar in levels. Variable $k_{cjt} / l_{cjt}$ in the first difference-level is significant. The second set of variables, that is, $k_{cjt} / l_{cjt}^2$ in the cement industry was is similar. Unlike the three afore-mentioned variables, the variable $l_{cjt}$ in the cement industry in the first difference is similar.

So now we can evaluate the model and can estimate the desired results. Thus the GLS method is used.

All the constant effects pertaining to each country (total factor productivity indicator) shown in Tables 4 and 5 are significant at 0.96 level. And comparing total factor productivity with America, we see that America stands ahead of the other countries. South Korea is the second and Iran and Turkey come after South Korea.

It may be pointed out that when constant output is assumed for model 2 the resulting productivity compared to model 1 is higher. So the assumption that total factor productivity in cement industry is identical among the countries is rejected.

Although the findings of this method is not comparable to the productivity indicator it may be stated that these findings support the results obtained from total factor productivity indicator showing the superiority of USA among these countries and Korea follows America.

Determining factors for total productivity

Here the most important determining factors of total factor productivity consisting four fundamental indicators namely: expenses of the government, the degree of openness of the economy, human resources and inflation rate are examined.

As mentioned before, before attempting an estimate, one must examine the consistency of all variables to avoid forged regression. Levin, Lee Chua’s test is also used here for consistency test of tabulated data. The result of such examination is shown in Table 6.

As shown in Table 7 only the variable G (government expenses) is not in consistent level which is consistent in the first difference level.

In the beginning, for specifying the estimate model the two test methods, Leamer Haussmann, are used. The null hypothesis which shows constant or combined coefficients is rejected, therefore Panel model is used by adopting Haussmann test over the factors influencing the industry results indicates the rejection of null hypothesis on random effects model. Making it necessary to apply constant effects model for the estimation.

FINDINGS

Findings of the study as depicted in Table 7 which denotes that the coefficients of the four variables, expenses of the government, degree of openness, human resources and inflation rate are significant. Coefficients of two variables – the government spending and inflation were negative, and they were - 0.04 and - 0.07 respectively which shows they are significant. The difference indicates that the change per unit in any of these two variables, assuming other variables of the model constant, decreases in the total factor productivity of Cement Industry, 0.04 and 0.07 respectively, is calculated. On the other hand, the coefficients of two variables, degree of openness and human capital were positive, 0.24 and 0.83 respectively and were significant. This indicates that per unit change in one of these two variables, assuming other variables of the model constant, 0.24 and 0.83 reductions respectively, in total factor productivity of cement industry is calculated. Therefore it should be said that improving human capital, a more open economy, reducing inflation and reducing government’s spending can increase total factor productivity in the cement industry.

Review of findings with regard to efficient variables

Government expenses

Degree of openness: The coefficient of the variable degree of economic openness is positively significant in total factor productivity.

Human resources: The findings indicated that improved human resources are positively significant total factor productivity.

Inflation: Inflation is negatively significant total factor productivity.

CONCLUSION AND RECOMMENDATIONS

It can be said that increasing productivity in a country is achieved by the efforts of all people, all organizations and especially families and all of a nation. Productivity growth is not all that comes through orders from above. The effect of fundamental variables such as expenditure of government, the degree of economic openness, human resources and inflation upon total factor productivity was investigated. It was found out that all of the factors can create differences in total factor productivity of cement industries in the subject countries. The findings of the study may be summarized as follows:

1) The assumption that total factor productivity of the cement industry in the selected countries is identical is rejected. These exists fundamental differences in cement industry among the Iran turkey South Korea and the United States.

2) According to the literature the difference of productivity determines partial advantages in global trade. Therefore, every country enjoys partial advantage proportional to its total factor productivity in the global market. But, what brings about these differences? Considering limitation of the resources, population growth, ever increasing demands and serve competence in global economy it is impossible to remain and survive in the field of global economy without productivity.
**Table 4.** Estimation of productivity total factors compared to those of the U.S. =100. Model 1 variable criterion output.

<table>
<thead>
<tr>
<th>Industry country</th>
<th>Iraq</th>
<th>Turkey</th>
<th>South Korea</th>
<th>U.S.A.</th>
<th>( R^2 )</th>
<th>Watson long run statistics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total factor productivity</td>
<td>57</td>
<td>2.29</td>
<td>49</td>
<td>2.63</td>
<td>68</td>
<td>2.44</td>
</tr>
</tbody>
</table>

Source: Project findings.

**Table 5.** Model 2 Constant criterion output.

<table>
<thead>
<tr>
<th>Industry country</th>
<th>Iraq</th>
<th>Turkey</th>
<th>South Korea</th>
<th>U.S.A.</th>
<th>( R^2 )</th>
<th>Watson long run statistics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total factor productivity</td>
<td>59</td>
<td>2.61</td>
<td>52</td>
<td>3.93</td>
<td>75</td>
<td>2.22</td>
</tr>
</tbody>
</table>

Source: Project findings.

**Table 6.** Review of the stability of total productivity factor and affecting factors

<table>
<thead>
<tr>
<th>Levin Lee Chua’s test</th>
</tr>
</thead>
<tbody>
<tr>
<td>First level difference</td>
</tr>
<tr>
<td>-</td>
</tr>
<tr>
<td>-7.09</td>
</tr>
<tr>
<td>-</td>
</tr>
<tr>
<td>-</td>
</tr>
<tr>
<td>-</td>
</tr>
</tbody>
</table>

Source: Project findings.

improvement strategy. The lower efficiency and productivity in cement industry of the country can be corrected by training of qualified managers. This is due to the fact that the problem is rooted in lack of optimal use of resources. By developing management courses capable managers will be trained so that they will be capable of working with higher efficiencies.

Currently more than 80% of the managers in the cement industries are not qualified for the purpose. As necessary conditions are not present and future managers of this industry need to have the required managerial qualifications for the industry it is suggested that an M.A. degree program be designed in the field of cement industry management in our universities. Since management course has appeared in academic global education system, we have witnessed variety of disciplines such as: government management, industrial management, commercial management, financial management insurance management etc. which are provided in universities at B.A., M.A. and doctorate levels and thousands of students are accepted yearly in these study programs. It should be noted that the aim is to cover different branches of management.

Although there is no limitation for graduates of other disciplines to study masters or doctorate programs in management, there has been a tendency among the technical graduates to participate in specific management course intending to obtain income earning skills. The general understanding and acceptance of the necessary of industrial development of the country as the transition phase towards post industrial position is an important achievement of the recent years which has been reflected in the country’s development vision document and the forth development plan rule and it is necessary to insist the imple-
mentation of these two documents. Based on findings of this study the inflation if not controlled can reduce the total factor productivity in cement industry therefore controlling the inflation rate is inevitable if one desires to achieve industrial development. 

Although current production of cement is insufficient for consumers’ actual needs, due to the new conditions prevailing market the following measures should be on the agenda:

1) Implementation of necessary facilities for cement exports
2) Marketing to attract customers abroad
3) Culture for proper application and classified types of cement

There is no doubt that without consensus and joint venture, a qualified resource supply is not possible. So harmony of universities, Ministry of Industries and Mines, Cement Industry Association seems essential to review and provide strategies.

REFERENCES


Table 7. The estimate of the interference of G, O, H, and inflation on total productivity factors.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Total factor productivity</td>
<td>-0.04</td>
<td>-4.98</td>
<td>0.24</td>
<td>4.17</td>
<td>0.83</td>
<td>6.58</td>
<td>-0.07</td>
<td>-2.21</td>
<td>0.97</td>
</tr>
</tbody>
</table>

Source: Project findings, the significant coefficients at 0.95 levels are underlined.