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EVALUATION OF RELATIONSHIP BETWEEN KNOWLEDGE ACCUMULATION AND CAPITAL EXPENDITURE WITH LABOR PRODUCTIVITY OF TEHRAN STOCK EXCHANGE ACCEPTED FIRMS

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Abstract: *Labor force is the companies' valuable resources which has attracted growing attention with the advance of science and technology. Today, labor productivity is an important base of the companies' productivity and is influenced by such factors as social, economic, political, cultural and etc. The major objective of the present study is to compare the relationship of research and development, education and capital expenditure with the companies' labor productivity based on the technological level existing in the industry. The main hypothesis is that the impact of research and development and training is more than the impact of capital expenditures in high technology industries, while reducing the level of technology, the impact of capital expenditure increases and the impact of research and development and training activities decreases. The sample consists of Tehran Stock Exchange companies (N=120) which has been randomly selected based on a simple stratified method and its financial information over the period 2003-2012 has been analyzed using multiple linear regression model and Eviews software. The results of this study indicate that the research and development activities have not increased the labor productivity; and categorizing companies in terms of the technology level existing in industries have not significantly influenced the results. However, the capital expenditure in all companies, irrespective of technology level, has increased the labor productivity.*

Key Words: *Research and Development, Labor Productivity, Accumulation of Knowledge, Level of Technology, Economic Value Added.*

1. INTRODUCTION

Economic investigations introduce knowledge accumulation as an important innovative indicator. Knowledge accumulation originates from mutual, complicated and dynamic relations among the company internal capacities and external factors. Although research and development are significant in innovation process, they need to be accompanied with sciences obtained from such sources as education

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and scientific investment. The fact that innovation is an important factor in the company performance, has been appropriately considered in developed countries (Legros & Galia, 2011). Studies conducted by Encaoua et al. (2000), Griliches (2000), Griliches and Mairesse (1984), Kleinknecht and Mohnen (2001) have scrutinized the factors influencing innovation and assess the amount of innovative effects on the company performance. The first function of production-science presented by Pakes and Griliches (1984) has also investigated the relationship between invested resources in innovative activities and companies' productivity. Nevertheless, Hall and Mairesse (2006) note that empirical studies regarding the science management is still very young, partly due to lack of required information as well as evaluation concepts in this field. Concerning development models based on research and development (Jones, 1995; Romer, 1990; Grassman & Helpman,1991; Aghion & Hawitt, 1992, 2009) keeping pace with technology is vital for economic growth and investment in research and development increases science production which is significant in log-term production and increased economic growth rate. For instance, expanding capacities of research and development has been an important factor of economic growth in South Korea during the recent decades. Meanwhile attempts done by the government and the private sector have had an undeniable role. Till 1980 research and development activities in the private sector have been done by larger companies, but since 1990 medium and small companies have also invested in this field. As a result of Asian financial crisis in 1997 the amount of investments in research and development has considerably decreased reaching 1113.7 milliard Yuan compared to 1218.6 Milliard; however such decrease was temporal reaching 1192.2 in 1999. Till 1997, 60% of total investments in research and development were done by 20 companies in private sector reaching 55% by 2000, and Investments by small andmedium-sized companies were nearly doubled (Heshmat and Kim, 2011).

2. THEORETICAL FRAMEWORK

In order to be successful in recent dynamic setting environment, companies need to continuously invest a large amount of money in research and development in order to gain competitive advantages (Schilling & Hill, 1998). Review of investigations on research and development usually are based on the assumption that the activities based on research and development play a positive role in the companies' productivity (Griliches, 1979). Now, some discussions regarding the increased efficiency resulting from investment in research and development activities in high-tech vs. low-tech industries have been proposed. Marsili (2001), Von Tunzelmann and Acha (2005), Mairesse and Mohnen (2005) argue that although low-tech industries invest less in research and development activities, such investment has long-term benefits; however, in high-tech companies, such

effectiveness may be in form of some advantages which decrease over time. Based on the argument, the relationship between research, development and productivity growth in high-tech industries is weaker than that of low-tech industries. This argument is in disagreement with findings obtained by the rest of researchers. Findings obtained by Griliches (1979), Klette and Kortum (2004), Janz et al. (2004), Rogers (2006), Loof and Heshmati (2006), Heshmati and Kim (2011) indicate positive role of research and development in companies' productivity, and in most of such investigations the focus is more on a specific high-tech industry and less attention has been devoted to the effect of the industries' technological level on the effectiveness of research & development activities and education on companies' labor productivity. Findings obtained by Freeman(1982), Pavitt (1984), Winter (1984), Dosi (1997), Malerba (2004) suggest that opportunities and technological conditions vary completely from section to section, therefore, mode of relationship between productivity and research & development activities are also influenced by these differences. Although, education in theoretical models is usually defined as the product of school and university, it is a more complicated process with respect to companies' human capital. School is not sufficient in education (Mincer, 1993), being its first step which is completed by informal educations like experience, and formal processes like job trainings. Theory of human capital indicates that companies are not interested in investment in education since its benefits are allocated just to employees (Becker, 1962). However, studies by Bartel (1994), Carriou and Jeger (1997) suggest that education is also beneficial for companies through decreasing direct payments and wages and exercise positive effects on labor productivity. Dearden et al. (2006) investigated data related to British industries during 1983 to 1996. Their findings indicate positive and significant effect of education on productivity of sections in such a way that a 5% increase in employees' education results in a 4% value added per number of employees. Barrett and Oconnell (2001) argue that public education positively affect productivity growth.

Companies expect that instructing employees increases efficiency and makes them cope with technological changes. Education, like research and development, as an investment is taken into account and research on its effects on productivity are growing, however, the results are too different due to cultural varieties, labor market and various evaluative techniques (Legros & Galia, 2011).

There are some programs irrelative to labor force in operational level which can affect labor productivity. Such programs usually influence the company operation thus changing employees' working style and thought. Labor force participation in problem solving and support systems is an example. Total quality management and Continuous improvement programs are also based on employees' participation in improving an activity performance and efficient use of resources. Although such programs emphasize upon the quality, their effects

on labor productivity through better processes, appropriate use of resources, motivating employees can be fantastic (Siebers et al. 2008). Programs related to technological changes and companies & industries' coping with it positively influence labor productivity. Productivity, always, has received more attention on a company-level and becomes more significant due to the increasing role of competition in companies' future activities. In the past, productivity was an internal issue on a company level receiving attention as a part of profitability criteria, known as an important factor of comparing competitors' performance. In other words, competition is known as an important factor in government institutions, private institutions and shops; productivity is an important factor in preparing for a long-term competition (Demeter et al., 2011). Demeter's findings show that difference among countries puts more influences on companies' productivity compared to industrial differences requiring more attention to cultural and social differences; in other words, recently, increased productivity, in addition to corporate executives demand decision makers' attention at the macro-level. Although in the US and other industrial countries like Japan, Germany, level of investment in industries has increased in recent decades (Van Ark, & Pilat, 1993), labor productivity enjoys more dynamicity and its growth increases productivity of the invested capital. Gust and Marguez (2004) investigated information of different industries at an international macro-level in order to determine the relationship between productivity growth and other criteria and found that more attention to the employment of information technology (IT) followed by attention to labor force are more effective in productivity growth. The book "Organization for Economic Cooperation and Development Productivity" (2001) notes that although we can measure capital productivity separately, it is possible to evaluate factors affecting capital productivity through calculating labor force productivity. Results obtained by Bartelsman et al. (1996) indicate a close relationship between other factors affecting labor force productivity. According to above-mentioned the main objective of the present study is: Does difference in technological level of industries influence the quality and amount of relationship between research & development activities, education and capital expenditure with labor productivity of Tehran Stock Companies?

3. RESEARCH BACKGROUND

3.1. External Studies

Griliches (1979) investigated the effects of research& development activities on the amount of productivity. He examined data regarding the expenditure of research & development, number of employees, and the rest of needed information about 100 large manufacturing companies in the US during 1957 to 1977. His findings

indicated the key role of research& development in companies' productivity growth.

Firstly, Pakes and Griliches (1984) used Cobb-Douglas Production Function in order to explore the effects of science on the company performance and it was hypothesized that accumulation of research & development costs are part of science production in companies which result in an increased productivity. The other important research was conducted by Griliches and Mairesse (1984) which was based on the production function and explored data of 133 large companies in the US during 1966 to 1977. Their findings, also, indicated strong relationship between research & development and productivity, although, the relation severity was not the same over time and correlation coefficient was .3 at .05 level of significance. Similar results were found by Griliches (1986, 1995). Cuneo and Mairesse (1983) compared different industries and their findings indicated the existence of difference between companies in the field related to sciences rather than the rest of fields, so that, the effect of research& development activities on companies' productivity was significantly more in science-based companies. Verspagen (1995) put data related to value added, number of employees, capital expenditure, and the amount of investment in research and development in organization for cooperation and economic development member states based on categorization of different industries in a standard production function. Their findings showed that research and development activities have positive effects on companies' outcome, however, no significant effects were found in industries with medium and low technology level. Hall and Mairesse (1995), Harhof (1998), Kwon and Inui (2003) explored the effects of research and development on labor productivity in manufacturing companies and their findings indicated the difference between high-tech and low-tech industries. Harh of investigated 443 German manufacturing companies during 1977 to 1989. The effect of research and development in high-tech industries was significantly higher compared to other companies.

Kwon and Inui investigated the data related to 3830 Japanese companies during 1995 to 1998. Their findings indicated the significant effect of research & development activities on labor productivity, while correlation coefficient in high-tech companies was greater compared to other companies. Tsai and Wang (2004) investigated 156 Taiwanese during 1994 to 2000 found that investment in research and development has significant and positive effects on companies' productivity and this effectiveness is greater in high-tech companies. Ortega-Argiles et al. (2010) investigated European companies with the highest amount of investment in research and development and found that the effect of research and development on productivity increased uniformly from low-tech companies to high-tech ones. In such companies, the effectiveness of capital expenditure had an opposite trend.

Kumbhakar et al. (2011) selected European Union manufacturing industries with the highest level of investment in research and development during 2000 to 2005 and divided them based on the technology level into three categories such as high, medium and low. The results suggested that the effect of research & development activities on labor productivity in high-tech industries was higher compared to the rest of industries. Also it was found that industries with a medium level of technology outperformed low-tech industries. Furthermore, the capital expenditure put reverse effects on labor productivity. Bures and Stropkova (2014) provide review of labor productivity within the context of knowledge society, their finding presents labor productivity may be positively influenced by the existence of the knowledge society in general and influenced by the existence of the knowledge management programs in particular. Addessi et al. (2014) address theoretically and empirically the impact of research& development and innovation activity on the use of external numerical flexibility, using a data set based on a survey of Italian manufacturing firms,they find that extra muros research & development always has appositive effect,while the effect of intra muros research & development is generally null. also the effect of innovation activity is positive in manufacturing firms.

Training employees as a factor affecting human capital has attracted researchers' attention. Dearden et al. (2006) found that increased productivity is resulted from job continuous trainings. Their findings through investigating sample data of British industries showed that 1% increase in job trainings increased value added of every hour of employees' working about .6%. Scicchitano (2010) found that human capital, despite standard models for economic growth, is the result of education and job trainings. In fact, a combination of these two factors is significant in innovation and economic growth. Boothby et al. (2010) investigated Canadian industries and found that acceptance of modern technologies along with job trainings improve labor productivity. Madsen's findings (2010) was similar to Boothby's. Sala and I. Silva (2012) investigated data related to activities of employees' training in European Union industries. Their findings showed that job trainings is an important factor in achieving three strategic goals of the Union in the present decade and help the employees keep pace with the increasing flow of technology. The author concludes that job trainings need to be focused by companies. Finally, Legros and Galia (2011) investigated data related to research and development, innovations, training and gaining ISO 9000 Certification in 1213 French manufacturing companies and found that the all mentioned variables had positive and significant effects on companies' productivity. In general, the all studies conducted in different countries show that those activities increasing labor innovation play a key role in enhancing labor productivity, although, the amount of this effectiveness is different with regard to different level of technology.

Doan and Gente (2014) develop a two-sector specific factor model in which capital is mobile between sectors they assume that the traded (non-traded)sector uses skilled (unskilled) labor for production. The theoretical model reveals that the real exchange rate response to a productivity shock depends on the countries relative abundance of skilled labor. In the long run,the relationship between productivity and real exchange rate may be positive or negative, as suggested by the theoretical model,depending on the country s relative abundance of skilled labor.

3.2. Internal studies

So far, no research has been conducted on the relationship between research& development activities, education and capital expenditure with labor productivity in terms of the level of Industrial Technology in Iran.

4. METHODOLOGY

4.1 Research Hypotheses

Sample companies have been divided into three categories based on Kumbhakar et al. (2011) research as high-tech industries, medium and low-tech industries. Hypotheses have been tested separately in every category. The purpose was to explore the effect of different level of industrial technology on the above-mentioned relationships with labor productivity. The hypotheses are as follows:

1. There is a meaningful relationship between research & development costs and labor productivity in companies with different level of technology.
2. There is a meaningful relationship between employees' training and labor productivity in companies with different level of technology.
3. There is a meaningful relationship between capital expenditure and labor productivity in companies with different level of technology.
4. Relationship between research & development costs and labor productivity in companies with different level of technology is stronger than the relationship between capital expenditure and labor productivity.
5. Relationship between research & development costs and labor productivity in companies with different level of technology is stronger than the relationship between education costs and labor productivity.

4.2. Definition of Research Variables

In studies conducted by Hulten (1991), Jorgenson (1990), Hall and Mairesse (1995), Bonte (2003) and Parisi et al. (2006), the effect of cumulative costs of research &

development and capital expenditure on companies' productivity has been attended. To achieve this goal it is required to calculate the growth rate of research & development costs and capital expenditure compared to the year prior to the desired period of time and depreciation rate. Depreciation rate varies in different categories of industries based on their level of technology. In fact, in industries with higher level of technology, the average product life cycle and its technology level is lower which increases the rate of obsolescence of scientific capital and capital expenditure (Kumbhakar et al. 2011). Depreciation rate employed by Mussgrave (1986), Bischoff and Kokkelenberg (1987), Nadiri and Prucha (1996), Kumbhakar et al. (2011) for capital expenditure, has been estimated as 6%. However, depreciation rate for scientific capital has been considered 15% by Pakes and Schankerman (1986), Hall and Mairesse (1995), Hall (2007) and Kumbhakar et al. (2011).

The amount of the cumulative research & development costs impacts is calculated as following based on a survey performed by Kumbhakar et al. in the base year:

$$K_{t0} = \frac{R\&D_{t0}}{g_{s(k)} + \delta_j} \tag{1}$$

Where $R\&D_{t0}$ is research & development costs, $g_s(k)$ is the growth rate of $R\&D_{t0}$, δ_j is the depreciation rate for k.

The amount of the cumulative capital expenditure impacts is calculated as following based on a survey performed by Kumbhakar et al. in the base year:

$$C_{t0} = \frac{I_{t0}}{g_{s(c)} + \varphi_j} \tag{2}$$

Where $\mathbf{I_{t0}}$ is capital expenditure, $g_s(c)$ is the growth rate of $\mathbf{I_{t0}}$, φ_j is the depreciation rate for C.

The amount of the cumulative research& development costs impacts and the cumulative capital expenditure impacts is calculated as following based on a survey performed by Kumbhakar et al. in the later years:

$$k_t = k_{t-1}(1-\delta_j) + R\&D_t \tag{3}$$

$$I_t + (c_t = c_{t-1}(1-\varphi_j) \tag{4}$$

Having calculated the impacts of cumulative costs of research& development and capital expenditure, their effects on labor force productivity were explored according to the research model:

$$\ln (VA/E)_{ist} = \beta_0 + \beta_1 \ln (k/E)_{ist} + \beta_2 \ln (tr/E)_{ist} + \beta_3 \ln (C/E)_{ist} + \beta_4 \ln (E)_{ist} + \varepsilon \quad (5)$$

4.2.1. Independent Variables

Independent Variables as follows:

- ln $(K/E)_{ist}$=natural logarithm of the cumulative research& development costs impacts for number of employees (i) participating in the industry(s) ranged(t).
- ln$(tr/E)_{ist}$= natural logarithm of the education costs for number of employees (i) participating in the industry(s) ranged(t).
- ln$(C/E)_{ist}$= natural logarithm of the cumulative capital expenditure impacts for number of employees(i) participating in the industry(s) ranged(t).

4.2.2. Dependent Variable

ln$(VA/E)_{ist}$= natural logarithm of the economic value added for number of employees (i) participating in the industry(s) ranged(t).

$$EVA = [\ (1- t) \times EBIT\ ] - [WACC \times capital\ ] \quad (6)$$

The average capital cost or the company's total capital expenditure is the weighted average cost of capital components, where weight or the coefficient employed is the proportion of every items of the used capital. In the sample companies, the equity and long-term liabilities exist as the source of supplying capital (funding) which have been taken into account in calculating the average capital costs. The cost of equity is calculated through Gordon Growth Model.

4.2.3. Control Variable

ln$(E)_{ist}$= natural logarithm of the number of employees(i) participating in the industry(s)ranged(t).

4.3 Population, Sampling and Time Spam

Population of this study includes Tehran Stock Companies which have been divided into three levels like high, medium and low-tech companies based on categorization of Organization for Economic Cooperation and Development and the sample consists of 120 companies selected according to the following guidelines:

1. Companies have not changed their fiscal year during the desired period of time.
2. Companies have not stopped their activity during this period of time.

3. Financial statements and their accompanied notes are available on stock exchange site.

32 high, 45 medium and 43 low-tech companies were selected using a simple stratified random sampling. Financial information of the sample companies during 2003 to 2012 have been investigated and observations and the relevant year have been analyzed using Eviews.

4.4. Data Collection

Data related to current and long-term assets, current and long-term debts, equity, operational profit, tax rate, research& development cost, and education cost of these companies are collected through referring to such sites as Research Management, and Development & Islamic Studies of Tehran Stock Exchange and extracting financial statements. In order to calculate companies capital cost, data related to stock price, cash profit per share and companies' rate of return are gathered from Tehran Stock Exchange data base.

In the next step, the collected data are entered to three separate worksheets of Excel based on the level of technology e.g., high-, medium, and low. In order to calculate the accumulation of science and capital expenditure, related formulas are created in the software and the values are calculated through the collected data, then independent variables and the dependent variable including natural logarithm of information obtained in previous steps are measured.

5. FINDINGS

Having tested hypotheses separately the results are shown in Tables 1 to 3.

Results of Testing Hypotheses in High-tech Industries

Table 1
Estimating linear regression model in high-tech industries

Variable	*Coefficient*	*t-Statistic*	*Probability*
C	2.488	2.175	.033
Ln(K/E)	-.031	-.279	.78
Ln(TR/E)	.047	.449	.65
Ln(C/E)	.83	10.322	.000
Ln(E)	-.113	-.626	.533

Regression Analysis	R-squared	.685
	Adjusted R-squared	.664
	Durbin-Watson stat	1.297
	F-Statistic	32.733
	Prob(F-Statistic)	.000
Residual Normality test	Jarque-Bera stat	2.044
	probability	.359

Based on Table 1, distribution of error sentence shows that jarkbra's statistic equals with 2.044 and its p-value is .0359. Therefore, the distribution is normal at .95. However, Durbin – Watson Statistic is not located between 1.5 to 2.5. This is due to the existence of the correlation among errors which results in incorrect estimations of standard deviations and accordingly incorrect statistical inferences for equation coefficients. In order to investigate the existence of correlation Breusch-Godfrey test is employed. F and Chi square statistics (p-value=.1 and .0947) indicate the lack of any significant self-correlation among equation errors at .95 level of significance. Finally, F statistic (32.73) and p-value (.000) indicate the validity of linear regression model. P-value of natural logarithm coefficient of research & development cost for number of employees is .78 e = which is greater than level of error, therefore, the first hypothesis is rejected at .95 level of significance. P-value of natural logarithm coefficient of education cost for number of employees is .65 which is greater than level of error, therefore, the second hypothesis is also rejected at .95 level of significance. However, p-value of natural logarithm coefficient of capital expenditure for number of employees is .000 which is less than level of error, therefore, the third hypothesis is accepted at the .95 level of significance. Based on the lack of any significant relationship between research & development activities and employees' training with labor productivity, the fourth and fifth hypotheses are rejected. Adjusted coefficient of determination of .664 indicates more significant changes in labor productivity compared to changes in capital expenditure. The present findings are in disagreement with findings indicating the existence of a meaningful relationship between research & development and employees' training with labor productivity in high-tech industrial companies and the relationship is stronger than that of capital expenditure and labor productivity.

Results of Testing Hypotheses in Medium -tech Industries

Table 2
Estimating linear regression model in medium-tech industries

Variable	*Coefficient*	*t-Statistic*	*probability*
C	5.445	1.44	.16
Ln(K/E)	.453	1.822	.078
Ln(TR/E)	.491	1.463	.15
Ln(C/E)	.892	5.782	.000
Ln(E)	-.518	-.983	.333
Regression Analysis	R-squared		.621
	Adjusted R-squared		.569
	Durbin-Watson stat		2.266
	F-Statistic		11.898
	Prob(F-Statistic)		.000
Residual Normality test	Jarque-Bera stat		.804
	probability		.668

According to Table 2, distribution of error sentence shows that jarkbra's statistic equals with .804 and p-value is .668. Therefore, the distribution is normal at .95. Durbin – Watson Statistic of 2.266 is located between 1.5 to 2.5 and the hypothesis indicating the self-correlation among equation errors is accepted. F statistic of 11.898 and p-value of .000 indicate the validity of estimated linear regression model. P-value of natural logarithm coefficient of research & development cost for number of employees is .078 which is greater than level of error. Therefore, the first hypothesis is rejected at the .95 level of significance. P-value of natural logarithm coefficient of education cost for number of employees is .15 which is greater than level of error, therefore, the second hypothesis is also rejected at the .95 level of significance. However, p-value of natural logarithm coefficient of capital expenditure for number of employees is .000 which is less than level of error. Therefore, the third hypothesis is supported at the .95 level of significance. According to the lack of any significant relationship between research & development activities and employees' training with labor productivity the fourth and fifth hypotheses are rejected. Adjusted Coefficient of Determination of .569 indicate the stronger changes in labor productivity compared to changes in capital expenditure. The present findings are in disagreement with those of other studies

suggesting the existence of a meaningful relationship between capital expenditure and labor productivity in medium-tech industrial companies.

Results of Testing Hypotheses in Low-tech Industries

Table 3
Estimating linear regression model in low-tech industries

Variable	*Coefficient*	*t-Statistic*	*Probability*
C	3.01	1.855	.069
Ln(K/E)	-.009	-.049	.96
Ln(C/E)	.766	8.081	.000
Ln(E)	-.098	-.439	.662
Regression Analysis	R-squared		.615
	Adjusted R-squared		.594
	Durbin-Watson stat		1.643
	F-Statistic		28.326
	Prob(F-Statistic)		.000
Residual Normality test	Jarque-Bera stat		1.155
	probability		.561

Eviews software does not represent a multiple linear regression model in low-tech industrial companies, therefore, observations of company-year, independent variable of natural logarithm of education cost per number of employees including 23 observations are deleted and linear regression model is estimated again.

Based on Table 3, jarkbra's statistic equals with 1.155 and p-value is .561 indicating the normality of distribution of error sentence at the .95 level of significance. Durbin – Watson Statistic is located between 1.5 to 2.5 and the hypothesis indicating the lack of any self-correlation among equation errors is supported at the .95 level of significance. F statistic of 28.326 and p-value of .000 indicate the validity of linear regression model. P-value of natural logarithm coefficient of research & development cost for number of employees is .96 which is greater than level of error, therefore, the first hypothesis is rejected at the .95 level of significance. However, p-value of natural logarithm coefficient of capital expenditure for number of employees is .000 which is less than level of error, therefore, the third hypothesis is supported at the .95 level of significance. Based on the lack of any significant relationship between research& development activities

and employees' training with labor productivity, the fourth and fifth hypotheses which compare these relations are rejected. Adjusted Coefficient of Determination of .594 indicates the stronger changes in labor force productivity compared to changes in capital expenditure. The present findings are in disagreement with those obtained by previous researchers which indicate a significant relationship between research& development activities and employees' training with labor productivity and this relationship is weaker than that between capital expenditure and labor productivity.

Summary and Conclusion

Labor force is a valuable source for all companies; therefore, labor productivity has increasingly attracted researchers' attention. On the other hand, due to the rapid growth of knowledge, research& development activities and education have put significant effects on labor productivity, although the severity of such effectiveness is influenced by a variety of factors. Different level of technology in industries is one of these factors. The findings of previous studies show indicate that the relationship between research& development activities and labor productivity becomes weaker with a decrease in level of technology; however, the relationship between capital expenditure and labor productivity becomes stronger with a decrease in level of technology. The present findings indicate the lack of any significant relationship between research& development activities and employees' training with labor productivity in Tehran Stock Exchange companies and level of technology has not significantly influenced the results.

Suggestions for Future Research

Further research is needed to investigate the effectiveness of research& development activities and employees' training and to present some solutions in order to increase their level of quality. Such activities may have necessary effectiveness, however, labor force does not intend to improve its performance and attempts must be made to satisfy the employees. The suggestions are as follows:

1. Investigating the relationship between investment in research & development activities and employees' training with labor productivity in companies
2. Investigating the relationship between employees' rights and advantages and their labor productivity
3. Investigating the relationship between employees' satisfaction with managers' performance and their labor productivity
4. Investigating the relationship between economic, cultural and social problems with companies' labor productivity

Research Limitations

The limitations are as follows:

1. Lack of transparent definition for high, medium and low-tech industries and lack of categorization of the industries based on the level of technology was the primary limitation. Finally, the categorization was done according to Kumbhakar et al. survey.
2. Lack of any appropriate separation of research& development costs and employees' training in some companies was the next limitation. In such companies research & development costs along with laboratory and controlling costs, and even other costs have been revealed in financial statements and some required data were not extracted due to the lack of a specific base for determining desired amounts which were not revealed along with financial statements.

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