

Productivity and firm performance: Evidence of Iranian unprofitable firms

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Abstract: This study investigates the impact of firm productivity indices namely, human capital efficiency and employed capital efficiency on loss of unprofitable firms listed on the Tehran Stock Exchange. Data were obtained from a sample of 45 unprofitable firms from 2002 to 2008. The regression results indicate that both human capital efficiency and capital employed efficiency negatively related with firm loss. Other findings reveal that firm size as well as sale growth has negative impact on firm loss. However, we find no relationship between state ownership and firm loss.

Key words: Productivity, firm performance, unprofitable firms, Iran

INTRODUCTION

Solow (1957) finds that around 90 per cent of improvement in real per capita output, in the US economy, is due to the efficiency growth. Easterly and Levine (2001) document that long-term growth of countries is largely driven by productivity growth. In firm level, Crew *et al.* (1971) argue that in the competitive environment, firm's long-run survival seems impossible without increasing productivity. Hence, productivity has attracted the attention of sizable researches at both country level (e.g., Solow, 1957; Miller and Upadhyay, 2000; Easterly and Levine, 2001) and firm level (e.g., Maudos *et al.*, 1999; Fernandes, 2008; Boothby *et al.*, 2010; Tovar *et al.*, 2011). Productivity is addressed as the ratio of inputs (e.g., labor, material and money) to outputs (services and goods). A firm can increase its growth and competitiveness through improvement in their productivity, and this situation also leads development of country.

This stream of thinking is accepted that profitability is a comprehensive criterion in order to assess the performance of a firm because the ultimate objective of the firm is profit. Whereas, this matter must be considered that firm's environmental elements can have influence on profitability, and sometimes there is no strong relation between firm's performance and its profitability. Hence, only relying on profitability indicator to evaluate firm's performance may not seem sufficient. Prior research (e.g., Fernandes, 2008; Kamath, 2008; Ting and Lean, 2009; Banimahd *et al.*, 2012) has applied a set of well-known proxies of a firm's performance, namely, Tobin's Q, return on asset (ROA), return on equity (ROE), earnings per share (EPS) and market valuation (MB). However, beside these measures, the measuring of productivity and applying of it can be useful for analyzing and evaluating of firm's performance. Consistent with this argument, the findings of prior research (e.g., Riahi-Belkaoui, 1999; Liberman and Kang, 2008) reveal that productivity benchmarks are useful to explain and predict of performance and also to predict future cash flows.

Numerous studies have considered the firm's productivity and its effect on profitability in both developed and developing countries (e.g., Halkos and Tzeremes, 2007; Fernandes, 2008; Mastromarco and Ghosh, 2009; Boothby *et al.*, 2010; Tovar *et al.*, 2011; Ceccobelli *et al.*, 2012). However, our survey reveals the lack of proper empirical evidence related firm's productivity in Iran. On the other hand, it is important to note that oil-based economy of Iran leads an anti-productivity culture in the society because the oil income covers the inefficiencies of Iran's economic cycle (Emami, 2011). Moreover, the survey of Nahavandi and Nikzad (2012) shows that 19 per cent of state owned enterprises (SOEs) is unprofitable in 2009. Thus, not only the absence of proper research about the effective factors on firm's productivity in Iran motivates us to study the productivity of Iranian unprofitable firms, but also the considerable per cent of unprofitable SOEs in Iran. Hence, this study attempts to consider the impact of productivity of the loss of unprofitable firms listed on Tehran Stock Exchange (TSE).

The significance of this study is that it can be an introduction for additional research concerning productivity in Iran by other researchers in the future, and can empirically highlight the fundamental role of productivity on decreasing the losses of unprofitable firms. In fact, the findings of this study can be useful for managers, investors, creditors, analysts and other users of financial reports. In addition, it is expected that this study contributes to the productivity literature in several ways. The findings of this study can enrich productivity literature, particularly concerning developing countries. Moreover, at the best of our knowledge, this study for the first time considers the impact of productivity on loss of unprofitable firms.

2. Background and Hypotheses development:

2.1 Productivity in Iran:

Oil and gas are still the most of Iran’s exports and compose the large portion of the state revenues. The main negative effect of oil revenues in Iran is that the state covers economic weaknesses and inefficiencies by the oil revenues. Other disadvantage of oil-based economy of Iran is the funding of bulk and inefficient state bureaucracy. Parallel working, weakness in the motivation system of employees, dysfunctional patterns of promotion in SOEs, the lack of transparency, bureaucracies and among others are some signs of governmental system’s weaknesses. In fact, most of the aforementioned weaknesses in the governmental system of Iran go back to the massive oil revenues that show the defective system as healthy and vibrant. Briefly, the oil revenues not only have covered the inefficiencies of economic cycle of Iran, but they also have increased the size of bureaucratic system as well as led various types of corruptions and weaknesses in the system.

In addition, the oil revenue has spread the anti-productivity culture in the most bodies and organizations (in society), and has placed this wrong culture with the traditional and religious culture of productivity and contentment. Such that most of developing countries have more balanced patterns of consumption than Iran. These major and deep disadvantages, in social and economic cultures of Iran, are due to forthright injection of oil revenues to the national economy. Unfortunately, this system leads decreasing of some moral values such as punctuality, enthusiastic, discipline and conscientious. In the lack of these fundamental values, any development is very close to impossible (Emami, 2011).

Following Islamic Revolution in Iran, in 1979, due to the nationalization plan all insurance firms, banks and industries were nationalized, and their ownerships were moved to the state (Roudaki, 2008). In order to promote the role of private sector in Iran’s economy Ministers Board ratified the Privatization Law in 1991. After 20 years of the ratification and implementation of the privatization low, the state is the main ownership in Iran. Thus, the lack of productivity in SOEs leads that considerable per cent of these firms encounter with loss. For instance, in 2009, 19 percent of SOEs are unprofitable (Nahavandi and Nikzad, 2012). In addition, a part of SOEs were listed on TSE.

2.2 Theoretical background:

Profitability is defined as the main objective of each firm to obtain more success and generally as relation between income and cost. In addition, financial information users apply it as a criterion to evaluate firm’s performance. According to the microeconomic theory, firm employs a set of inputs, such as capital and labor, to produce output. Thus, simply, the definition of productivity is the ratio of outputs to inputs. Baily and Schultze (1990) document that the rate of profit decreases when the rate of productivity growth decreases. Efficient utilization of resources can led high productivity and performance. In other words, if a firms’ productivity increases, given firm can decrease its costs of outputs, goods or services, that it leads increasing profit margin. Miller (1984) points out that, to control and monitor of production improvement in long-term, productivity is more appropriate than profitability. Because profitability can be changed by various elements such as inflation, raise and down in price of inputs or outputs while these elements don’t have influence on productivity. In this line, Hit and Brynjolfsson (1996) argue that productivity does not mean of profitability at all times and vice-versa. However, the direct relation between productivity and profitability is argued and documented by prior research (e.g., Kaplan, 1983; Miller, 1984; Sink and Tuttle, 1989; Tangen, 2002; Bottazzi *et al.*, 2008). Consistent with this argument, Bottazzi *et al.* (2008, p. 711) argue that “Efficiency in carrying out production-whether originating from technical capabilities, superior managerial routines, improved organizational characteristics, innovative (or imitative) ability, or firm broadly defined embedded competences-represents the fundamental source of firms’ differential competitiveness, and sets the stage for potentially different profitability levels”. In chart 1, the relation between profitability with productivity and price recovery is presented.

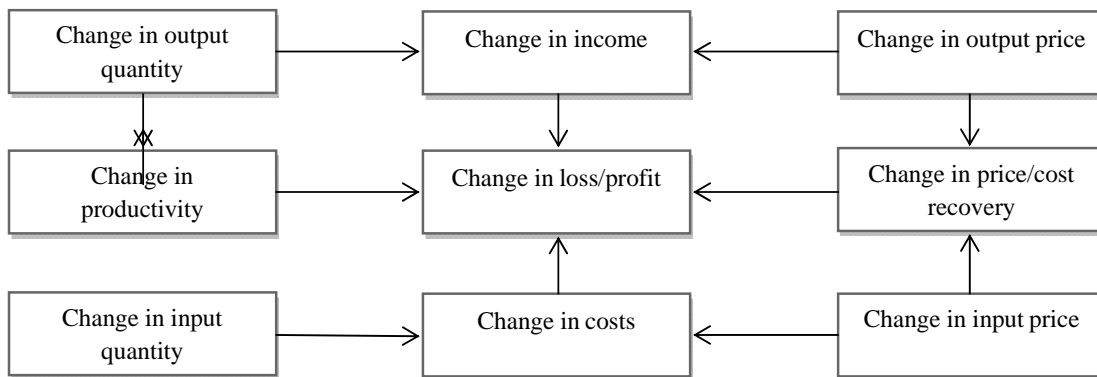


Chart 1: The relation between profitability with productivity and price recovery- Miller (1984)

Management accounting literature claims that firm's value can be increased by improving in its productivity (Kaplan, 1983), and total firm's productivity has positively associated with firm stock price (Palia and Lichtenberg, 1999). This shows that there is direct relation between firm productivity and firm market performance. In this line, Sink and Tuttle (1989), and Tangen (2002) suggest that productivity has direct association with firm's performance and profitability.

2.3 Literature Review:

Banker *et al.* (1996) consider the impact of productivity and price recovery on profitability in the US telecommunications industry. The findings indicate that, if competition in market increases, price recovery ability of firms will decrease. However, the firms, to prevent decrease in profitability due to the decrease in price recovery ability, raise their operational efficiencies through promoting productivity. Riahi-Belkaoui (1997), using productivity indicator based on value added as firm's economic performance indicator, performs a research before and after amendment of firms' financial structure. The findings reveal that efficiency of firms which merged vertically decrease, and the efficiency of horizontal subordinate firms which do various activities increase. In another study, Riahi-Belkaoui (1999) represents that productivity indicator which computed through the ratio of value added to total assets is useful indicator beside accounting traditional ratios. The findings of the research indicate that, to analyze firm's profitability, productivity indicators based on value added can be useful. In fact, this indicator can provide useful information for users to better understand firm's performance. Low productivity reveals that a firm cannot efficiently apply its limited and worth resources to make product and services. Chandy (1980) documents that the lack of strategic plans, in appropriate management information system, traditional procedures and poor human capital planning have negative effect on productivity in India. Sun *et al.* (2002) find out that the profitability of privatized firms declared in China. The authors conclude that state ownership has positive relation with profitability of state-owned entities. Klein and Marquardt (2006) consider effective factors on firms' losses in US in 50 years period, from 1951 through 2001. They find that low productivity is one of the effective factors on firm's unprofitability. In addition, firm size, accounting conservatism, cash flow from operation and operation cycle are identified as other effective factors. Liberman and Kang (2008) study the relation between productivity and profitability in steel industry in South Korea. The findings show that the indicator of productivity based on value added is better indicator about performance than profitability. In addition, Bottazzi *et al.* (2008) study productivity, profitability and financial performance in Italy during 1988-2003. The authors find a positive association of the indicator of human resource efficiency and profitability with firm growth. The results indicate a positive relation between profitability and productivity. In addition, other findings reveal that firms with high productivity have high profitability, and they grow faster than other firms accordingly.

2.4 Hypotheses Development:

Human Capital Efficiency:

Human capital contains the ability, knowledge, experience, skill and talents of firm's personnel (Huselid *et al.*, 1997). Human capital is one of the fundamental factors that affect firm's performance and value. Boothby *et al.* (2010) argue that higher quality (greater skilled) human resources generate greater labor input than lower quality human resources. The findings of this research reveal that more skilled labor positively related with productivity. In country level, Miller and Upadhyay (2000) find that human capital has positive impact on productivity. Also Bartel (1994) finds a positive relation between productivity and training programs. Prior research (e.g., Gerhart and Milkovich, 1992) provides evidence related to positive relationship between productivity and incentive compensation system. Maudos *et al.* (1999) argue that consideration of human capital as an effective factor on productivity by Japan improves substantially of productivity and efficiency in the country. Fernandes (2008) documents that managerial quality has positive impact on productivity. Teixeira and Fortuna (2010) find that the impact of human capital productivity is stronger than internal research and development efforts in Portugal. In addition, the authors conclude that poor productivity of foreign direct investment and licenses is due to the lack of proper investment and motivations of human capital. Thus, the findings of prior research reveal that and higher skilled human capital and efficient using of the capital can improve productivity and finally performance. Thus the first hypothesis is arranged as below:

Hypothesis 1 (H₁):

Human capital efficiency has positive relation with profitability.

Capital Employed Efficiency:

Physical and financial resources are two types of firm's resources (see, Hoskisson and Hitt, 1990; Chatterjee and Wernerfelt, 1991). We consider the efficiency of these two resources as the employed capital. Lee (2005) document that, from 1970 to 2000, the ratio of physical to worker increased dramatically from 14% to 57% that it increased relative productivity in Korea. Consistent with this, he provides evidence that, during

past three decades, the gap of output per worker has dramatically reduced between US and Korea. In addition, Lee (2005) finds that although, recently, the productivity increases in manufacturing industries of Korea, the productivity of services industry is still poor. The author suggests that Korea should stimulate its investment in both technology and human capital. The findings of Coe and Helpman (1995) and Coe *et al.* (1997) indicate that technology (such as property, plant, equipment, etc.) import improves total factor productivity. Mendi (2007) and Kim *et al.* (2009) argue that technology is expected to have positive influence on productivity. In this line, Teixeira and Fortuna (2010) find that advanced machinery and equipment are effective factors on long-term productivity. The findings of prior research show that the efficient employing of physical and financial resources and advanced machinery and equipment can increase firm's productivity and profitability. Thus, the second hypothesis is developed as follows:

Hypothesis 2 (H₂):

Capital employed efficiency is positively related with profitability.

Research method:

3.1 Sample selection:

The research sample is obtained from firms listed on the Tehran Stock Exchange (TSE) for the years 2002 through 2008. Due to the heterogeneity among the firms listed on TSE, we consider some special factors when choosing the research sample. First, firms must be listed in TSE since the year 2002 and must not be financial firms. The second, the ends of firms' fiscal years must be 20 March. Third, firms report loss after listed in TSE. Fourth, firm must not have missing data. With regard to the aforementioned conditions, 45 firms and 315 observations during 2002 through 2008 are considered as the research's sample.

3.2 Data analysis:

According to the resource-based view the better performance of a firm in an industry than other firms in the same industry is explained based on internal and firms-specific elements (e.g., Amit and Schoemaker, 1993; Collis, 1994). Bartelsman and Doms (2000) mention some effective factors on firm productivity as human capital quality, technology, ownership, legal system and international exposure. With regard to the theoretical discussion concerning the relation between productivity and profitability, the findings of prior research and the aim of this study, we consider the impact of two variables, namely, human capital efficiency (HCE) and capital employed efficiency (CEE) as indices of productivity.

We control for firm size (SIZE), Sale growth (SALGTH) and state ownership (STOWN). There is no clear standpoint concerning the impact of firm size on productivity and profitability. One stream argues that the productivity of large firm is higher because they can use more specialized resources, better coordinate them, etc. (Halkos and Tzeremes, 2007). Based on this stream, Tovar *et al.* (2011) find that firm size has positive impact on firm's productivity in electricity distribution industry in Brazil. The opposite stream posits that small firms can be more efficient due to non-hierarchical structures, more flexibility and lower agency problems (Halkos and Tzeremes, 2007). Fernandes (2008) finds that the productivity of small firms is larger than big size firms. Seth (1990) points out that an increase in product can decrease the average total cost due to the sharing fixed costs on large amount of products. In fact, an increase in product can decrease the unused capacity of a firm, and finally can increase its productivity and profitability. The state ownership theory argues that the inefficiency is the main implication of state ownership (see, Lin *et al.*, 2009). Claessens and Fan (2002) argue that, in SOEs, due to the political economy and corruption, the motivation of the state may be different than the citizens' interest which is wealth maximization. However, Sun *et al.* (2002) document that state ownership has positive relation with firm performance in China.

We apply multiple regression analysis (MRA) to examine the relation between independent variables and firm performance (Hair *et al.*, 1992; Weir, 1997). To consider the possible multicollinearity problem between independent variables not only Pearson Correlation Matrix is applied, but also Tolerance Index and Variance Inflation Factor (VIF). The following is the regression model (Eq.1) applied for examining Hypotheses:

$$LOSS_{it} = \alpha + \beta_1 HCE_{it} + \beta_2 CEE_{it} + \beta_3 STOWN_{it} + \beta_4 SIZE_{it} + \beta_5 SALGTH_{it} + \varepsilon_{it} \quad (1)$$

Where

$LOSS_{it}$ = net loss for firm i in year t.

HCE_{it} = the ratio of value added to total salaries and wages for firm i in year t. This ratio shows the role of human capital in creating firm's value added.

CEE_{it} = the ratio of value added to total assets for firm i in year t. This ratio indicates the role of physical and financial assets in creating firm's value added.

$STOWN_{it}$ = the percent of shares which belong to state for firm i in year t.

$SIZE_{it}$ = the natural log of total assets for firm i in year t .
 $SALGTH_{it}$ = the change in sale for firm i from $t-1$ to t .

The indicator of productivity is measured based on Riahi-Belkaoui (1999) and Liberman and Kang (2008) researches. The authors measure productivity indicator based on accounting value added. It is important to note that, to homogenize data in firm's level, variables are scaled by total assets.

Value added is measured by following equation:

$$VA = W + I + DP + DIV + T + R \tag{2}$$

Where: VA: value added, W: salaries and wages, I: interest expenses, DP: depreciation expenses, DIV: dividends, T: corporate taxes and R: profits retained for the year.

4. Empirical Results:

4.1 Descriptive Statistics:

Table 1 shows descriptive statistics of research variables. The absolute average number of unprofitable firms' loss is 526 million Rials. The mean of human capital efficiency (HCE) is 28.8 per cent. In fact, the ratio indicates very low human capital efficiency. Low value added and personnel inefficiency in unprofitable firms can be the main reasons of low human capital efficiency. In other words, in profitable firms the ratio of human capital efficiency is more than 1. In addition, the table presents 4.9 per cent as the mean of capital employed efficiency (CEE). This reveals that value added is equal only 5 per cent of the firms' assets. It is important to note that in profitable firms the CEE ratio should be higher than unprofitable firms because they have greater value added.

Table 1: Descriptive statistics

Variables	N	Mean	Median	SD	Min	Max
LOSS	315	526.034*	595.000*	295.450*	2.000*	989.000*
HCE	315	0.288	0.969	7.651	34.24.000	89.450
CEE	315	0.049	0.032	0.011	0.003	0.072
STOWN	315	58.240	53.000	22.000	11.000	99.000
SIZE	315	70123.000**	58381.000**	21002.000**	2761.000**	138678.000**
SALGTH	315	0.151	0.040	0.940	-1.000	9.760

* indicates the absolute value based on the million Rials of Iran. ** reveals the numbers are based on the million Rials of Iran. LOSS is the net loss of a firm. HCE is human capital efficiency as measured by the ratio of value added to total salaries and wages of a firm. CEE is capital employed efficiency a measured by the ratio of value added to total assets of a firm. STOWN is state ownership as measured by the percent of a firm's shares which belong to state. SIZE is firm size as measured a firm's total assets. SALGTH is sale growth as measured by the change in sale of a firm from $t-1$ to t .

The mean of STOWN is 58.24 per cent. This shows that the majority of unprofitable firms listed in TSE are SOEs. This descriptive statistics is consistent with the findings of Nohavandi and Nikzad (2012) who report that 19 per cent of SOEs are unprofitable in Iran. Moreover, table 1 reveals 70'123 million Rials as firm size (SIZE). Finally, mean of sale growth (SALGTH) is 15.1 per cent. It is noteworthy that although the mean of sale growth seems proper for unprofitable firms, with regard to the considerable inflation rate of Iran, the sale growth may not sufficient to convert unprofitable firms to profitable firms.

Table 2 presents Pearson's correlation for all variables applied in this research. The table shows that human capital efficiency (HCE) is positively associated with firm performance. In fact, firms with higher HCE have lower loss compared to firms with lower HCE. Capital employed efficiency (CEE) has positive correlation with firms' performance. In other words, efficient applying of firms' physical and financial resources can decrease the loss of unprofitable firms. The correlation between state ownership and firm performance is weak but positive. Total assets are positively associated with firms' performance. Indeed, the likelihood of loss for large firms is lower than small firms. As for the correlation between sale growth (SALGTH) and firm performance, it can be concluded that sale growth can decrease the loss of unprofitable firms, but due to weak correlation its effect may be minor in loss decreasing.

Table 2: Pearson correlation matrix

Variables	Pearson correlated coefficient					
	SALGTH	HCE	CEE	LOSS	STOWN	SIZE
SALGTH	1	0.044	0.056	0.087	0.007	-0.010
HCE		1	0.58	0.29	0.004	0.153

CEE		1	0.586	-0.089	0.232
LOSS			1	0.066	0.329
	STOWN			1	-0.022
SIZE					1

LOSS is the net loss of a firm. HCE is human capital efficiency as measured by the ratio of value added to total salaries and wages of a firm. CEE is capital employed efficiency a measured by the ratio of value added to total assets of a firm. STOWN is state ownership as measured by the percent of a firm’s shares which belong to state. SIZE is firm size as measured by a firm’s total assets. SALGTH is sale growth as measured by the change in sale of a firm from t-1 to t.

Table 2 shows that independent variables pairs don’t have intense multicollinearity. The highest multicollinearity is between the human capital efficiency (HCE) and capital employed efficiency (CEE) that equals 46 percent. In addition, the results of statistical tests of Tolerance Index and Variance Inflation Factor (VIF) which are presented in table 3 show the lack of multicollinearity between independent variables. Based on statistics, when the results of these tests are close to one, independent variables don’t have intense multicollinearity.

4.2 Regression results:

Table 3 reports ordinary least squares (OLS) regression results for Eq.1. The adjusted R-squared of Eq. 1 is 0.49 which indicates that independent variables of this study explain 49 per cent of cross sectional variation in LOSS. The estimated coefficient for HCE equals 0.063 in 1% significant level. Our finding is consistent with first hypothesis (H₁) that hypothesized a positive relation between human capital efficiency and profitability. This indicates that unprofitable firms with higher human capital efficiency have lower net loss. This finding is consistent with the findings of prior research (Maudos *et al.*, 1999; Mastromarco and Ghosh, 2009; Teixeira and Fortuna, 2010). Table 3 presents 0.026 as estimated coefficient in 5% significant level for CEE. The result is accordance with the second hypothesis (H₂). This result reveals that using physical and financial resources as efficiently decrease net loss of unprofitable firms. This finding is similar to that of Teixeira and Fortuna (2010).

Table 3: Regression results

Variables	Predicted sign	Coefficient	Significant level	Tolerance Index	Variance Inflation Factor
HCE	+	0.063	0.000	0.568	1.520
CEE	+	0.026	0.002	0.662	1.511
STOWN	-	-0.072	0.304	0.975	1.028
SIZE	+	0.087	0.000	0.965	1.037
SALGTH	+	0.054	0.005	0.996	1.004
R ²		0.49			
Durbin-Watson Stat			1.625		
F-Statistics		60.469	0.000		

LOSS is the net loss of a firm. HCE is human capital efficiency as measured by the ratio of value added to total salaries and wages of a firm. CEE is capital employed efficiency a measured by the ratio of value added to total assets of a firm. STOWN is state ownership as measured by the percent of a firm’s shares which belong to state. SIZE is firm size as measured by the natural log of total assets of a firm. SALGTH is sale growth as measured by the change in sale of a firm from t-1 to t.

The estimated coefficient for STOWN is -0.072, and it is insignificant. In fact, this finding indicates that appearance of state ownership is not effective on the loss of unprofitable firms. This finding is inconsistent with the argument and findings of Claessens and Fan (2002), and Lin *et al.*, (2009). Table 3 reports 0.087 as the estimated coefficient of SIZE in 1% significant level. Indeed, this finding reveals that the possibility of loss is lower in large firms than small size firms. In addition, it is accordance with findings of prior research (e.g., Tovar *et al.*, 2011). However, this finding is contrary to that of Fernandes (2008) who documents that the productivity of small firms is greater than large firms. The estimated coefficient for SALGTH is equal with 0.054 in the 5% significant level. This finding indicates that sale growth decreases the net loss of unprofitable firms. The result is consistent with aforementioned theories (see, Miler, 1984; Seth, 1990).

Conclusion:

This study considers the role of some productivity indices on firm's performance in the emerging market of Iran. We apply human capital efficiency and employed capital efficiency as the productivity indices and loss of unprofitable firms. To examine hypotheses, we collect data from annual reports of listed firms on TSE from 2002 to 2008.

The results of this study reveal that productivity has positive impact on performance of unprofitable firms. Generally, when productivity increases, the loss of the firms decreases. In particular, we find that both human capital efficiency as well as employed capital efficiency has negative impact on firm loss. Other findings reveal that firm size and sale growth are negatively related with firm loss. On the issue of state ownership, we document that its appearance in Iranian firms does not have a significant positive influence on firm loss. The findings of this research indicate that improvement in firms' performances depends on improvement in productivity.

This study can provide some important suggestion for either managers or researchers. The findings of this study suggest that firms' managers by improving the human capital efficiency and capital employed efficiency can improve their firm's profitability. In fact, firm's managers through training the personnel, applying incentive compensation plans, using new technology and decreasing firm's unused capacity can improve productivity and profitability. In addition, due to the lack of proper productivity in Iran, both Iranian managers and researchers should focus on productivity. Our survey reveals the lack of sufficient empirical evidence related productivity in the context of Iran. Hence, other researchers can compare the productivity of unprofitable and profitable firms. In addition, with regard to the presence of state ownership in Iran, researchers can compare productivity between SOEs and private sector audit firms. Moreover, researchers can consider the impact of other factors on productivity, such as export, foreign investors, etc.

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