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FINANCIAL IMPACT OF CERTIFICATIONS TO MANAGEMENT SYSTEM STANDARDS: EVIDENCE FROM TUNISIAN LISTED COMPANIES

Abstract:

Certifications to management system standards (ISO 9000, ISO 9001, ISO 14001, etc.) are a widespread benchmark for thousands of organizations around the world. A number of studies have been carried out in order to analyze the impact of these certifications over companies' performance. However, conclusions reached so far have been of a contradictory nature. The real benefits of these certifications continue to raise the debates and the different results show that the effect of certifications to management system standards on firms' performance remains to be explored specially in terms of financial improvement. The purpose of this research is to investigate the association between certifications to management system standards and Tunisian companies' financial performance covering the period 2010-2014. Such a study is likely to provide a useful insight to managers since the process of achieving and maintaining these certifications involves costs and time. The results find that there is no evidence that improvements in performance follow certifications and certified firms do not present higher performance than those that are not certified.

Keywords:

Financial Performance, Operating Performance, Certifications, ISO, Propensity Score Matching

JEL Classification: C19, G39, L25

I. Introduction

ISO management standards (such as ISO 9001 and ISO 14001) are the result of international expert agreement and offer the benefit of global management experience and good practice. Moreover, these standards can be applied to any organization regardless of the sector of activity. Therefore, they are the most widely used management tools in the world today. In fact, many organizations have achieved certifications to management system standards (1.609.294 certificates issued worldwide in 2014).

Since the process of obtaining certification involves time and money, the question remains whether this investment leads to better performance. A number of studies have been carried out in order to analyze the impact of these certifications over companies' performance. However, there is a lot of controversy surrounding the real benefits of this investment.

Some studies concluded that certifications to management system standards are associated with many internal benefits such as more efficient use of resources, increased quality of products and services, increased productivity, lower costs, better working conditions and external benefits such as customer satisfaction, competitive advantage, access to new markets, increased market share, increased sales, increased income (Sharma (2005), Terlaak and King (2006), Cheng et al (2007), Wu and Liu (2010), Ullah et al (2014), Chen (2012) and Ismyrlis et al (2015)). Others concluded that there is no evidence that improvements in performance follow these certifications (McGuire and Dilts (2008), Dick et al (2011), Ilkay and Aslan (2012) and Sampaio et al (2012)).

Moreover, most of the studies investigating the effect of certifications to management system standards over companies' performance have focused at the organizational and operational level. Very few studies have explored the impact of these certifications on financial performance.

In the other hand, despite the phenomenal growth in the number of Tunisian firms attaining ISO certifications, no studies have been carried out to examine whether these certifications are associated with higher performance for the Tunisian case.

In view of these facts, we propose to examine the impact of certifications to management system standards on Tunisian companies' financial performance covering the period 2010-2014. The present study poses the following research questions:

- Do certified firms get better financial performance compared to non certified ones?
- Do certified firms get higher financial performance after certification?

II. Literature review

Very few researches have measured the financial effects of certifications to management system standards. Existing literature is divided over whether such certifications improve companies' financial performance or don't lead to performance improvement.

1. Studies that support a positive relationship between certification to management system standards and financial performance

Some studies have used the event study methodology to detect the effects of certification to management system standards on the price of company shares.

Bernardi (1996) carried out an event study to analyze the French stock market's reaction to quality certification (ISO 9000). Using a sample of 28 companies traded between 1993 and 1996, he finds that the stock market reacts positively to such certification. Similarly, Docking and Downen (1999) report that small companies in the United States exhibited positive stock market reaction to the announcement of their first ISO 9000 certification.

The event study by Nicolau and Sellers (2002) also shows a positive stock price effect on the day of quality certification (ISO 9000) in Spain. Similarly Beirão et Sarsfield (2002) found a positive effect of ISO 9000 certification in the stock market of Portugal. This means that quality certification can be considered as a useful tool for reducing information asymmetries between sellers and buyers.

Lima et al (2000) report better sales to assets ratio for a sample of 129 ISO 9000 certified Brazilian companies. In addition, Heras et al (2002) find that the ISO 9000 certified firms in Spain achieved 24% to 45 % higher ROA than noncertified firms over a 4 year period. Using a sample of 70 firms listed on the Singapore stock exchange over a 6 year period, Sharma (2005) finds that ISO 9000 certification is associated with financial improvements. The financial performance was measured using three ratios: profit margin, growth in sales and earnings per share.

Corbett et al (2005) employed event study methods to test whether ISO 9000 certification leads to better financial performance in the United States. They report that certified firms do display a significant increase in return on assets ROA, return on sales ROS, Tobin's Q, sales growth and asset turnover relative to noncertified control group. Mohd and Muda (2012) observed a sample of 81 ISO 9000 certified companies listed on the Kuala Lumpur Stock Exchange and report higher return on assets ROA and return on sales versus a noncertified control group.

Pinar and Ozgur (2007) compared the monthly stock returns and variability of the returns of ISO 9000 certified versus non-ISO 9000 certified firms traded on the Istanbul Stock Exchange from January 1997 to September 2005. The paper concluded that certified firms generally had higher returns and lower variability of returns than non-ISO 9000 firms. Using a sample of 156 Egyptian firms, Wahba

(2008) finds that ISO 14001 exerts a positive and significant impact on the firm market value measured by Tobin's Q ratio.

2. Studies that support a negative or no significant relationship between certification to management system standards and financial performance

Singels et al. (2001) find worse ROA, productivity, cash flow, market share, sales growth and market growth of ISO 9000 certified companies compared with non-certified companies. Aarts and Vos (2001) report that the New Zealand stock market reacts negatively to the announcement of ISO 9000 certification. Martinez-Costa and Martinez-Lorente (2003) did not find significant effects of such certification in the Spanish stock market.

Canon and Garcés (2006) find that the Spanish stock market reacts negatively to the announcement of ISO 14001 certification. Similarly, Paulraj and De Jong (2011) concluded that stock market reacts negatively to the announcement of ISO 14001 certification in USA. McGuire and Dilts (2008) find that firms in United States have not experienced positive stock market reaction to the announcement of ISO 9000 certification by 204 firms over the period 1999 to 2002.

Martinez-Costa and Martinez-Lorente (2007) find that ISO 9000 certification has a negative effect on company results, mainly on earnings and ROA in Spain. The study confirms not only that certified companies have not enhanced their results, but also that their outcomes have deteriorated. Furthermore, they compared certified and non-certified companies. They found that certified companies are the group with the worse performance.

Heras et al (2011) used a five year longitudinal analysis to compare the financial performance of firms in Spain before and after ISO 14001 certification. They concluded that there is no evidence that enhancement in performance follow certification. Using a public database of Portuguese companies, Sampaio et al (2012) find that for the following measures: sales growth and ratio operational results over asset, the non certified companies do present on average higher performance than those that are ISO 9001 certified.

III. Hypotheses

According to signaling theory (Spence, 1973), an information asymmetry exists in markets in the sense that customers often do not have full knowledge of the characteristics of the product and its supplier. Certification to management system standards can be a useful tool to add credibility and reduce information asymmetry by indicating that products, services or systems are safe, reliable, good for the environment and meet specific requirements to satisfy customers and stakeholders. Moreover, according to stakeholder theory, organizations that manage their stakeholder relationships efficiently will survive longer and perform better than organizations that don't.

In the other hand, conformity to international standards helps businesses to reduce costs through improved systems and processes and increases customer satisfaction through improved safety and quality. It facilitates the access to new markets through ensuring the compatibility of products and services. As a result, it increases market share and sales. Therefore may lead to better financial performance (Manders 2014). Consequently, the present study advances the two following hypotheses:

Hypothesis 1: Certified firms outperform non certified ones

Hypothesis 2: Certified firms get higher results after certification

IV. Data and Sample Selection

Data needed for this research are of two types: information related to certification to management system standards and financial data for each firm. Information regarding certifications was collected from the prospectuses of the listed companies published by the Financial Market Council CMF and the websites of these companies. Financial data are obtained from Tunis Stock Exchange BVMT.

The present study focuses on 48 Tunisian companies listed on the Tunis Stock Exchange over a five-year period going from 2010 to 2014 (a group of 32 ISO certified companies and a group of 16 non-certified companies). We removed from the sample banks, insurance and financial companies.

V. Methodology

1. Measuring financial and operating Performance

We employed different financial and operating measures to evaluate the impact of the certification to management system standards on company performance. The variables analyzed are: return on equity ROE, return on assets ROA, and return on sales ROS as Cohen et al (1995), Hart and Ahuja (1996), Edwards (1998), Wagner et al (2002), Goh and Wan (2002), Corbett et al (2005), Ferreira (2008), Benner et al (2008), Iwata and Okada (2011), Heras-Saizarbitoria et al (2011), Chris lo et al, 2011, Mohd (2012).

For additional analysis, we used Sales growth rate, assets turnover ratio and operating margin as Sharma 2005, Corbett et al 2005, Martinez-Costa and Martinez-Lorente 2007.

2. Analysis

The objective of our study is to analyze the impact of certifications to management system standards on the financial performance of Tunisian listed companies. Two different analyses are employed in order to test our hypothesis:

The first analysis (*Analysis A*) tests whether certified companies outperform non certified ones. To do so, propensity score matching techniques and multiple linear regression are used. Multiple linear regression is a commonly used technique for estimating treatment effects in observational data, however, the statistical literature suggests that propensity score analysis has several advantages over multiple linear regression and is becoming more prevalent¹.

The second analysis (*Analysis B*) tests whether certified companies get higher results after certification. The student's t test and Wilcoxon test are used for this purpose.

2.1. *Analysis A*

The first analysis tests the first research question on the potential better performance of ISO companies over non ISO ones. For this reason, we used propensity score methodology PSM and multiple linear regression.

Propensity score analysis (Rosenbaum and Rubin, 1983) has become a popular approach to estimate causal treatment effects. Propensity-score matching (PSM) is a quasi-experimental option used to estimate the difference in outcomes (financial measures) between beneficiaries (ISO certified companies) and non-beneficiaries (non ISO certified) that is attributable to the treatment (certification to management system standards). PSM consists of three phases:

- Estimating the probability of being treated (certified) using a logit or probit regression conditional on a set of observable characteristics;
- Selecting a matching algorithm that is used to match each certified companies with non-certified one in order to construct a comparison group;
- Estimating the treatment effect and interpreting the results: the certification's impact may be estimated by averaging the differences in financial measures between each certified firm and non certified one from the constructed comparison group. The difference in averages can then be interpreted as the impact of the treatment (certification to management system standards).

To our knowledge, no study has used this method to study the effect of such certifications on firms' performance.

Regression analysis was conducted by many authors in order to identify the link between the ISO 9000 or ISO 14001 and financial performance (Hart and Ahuja 1996, Russo and Fouts, 1997, Wagner 2005, Sharma 2005, Benner et al (2008), Dick et al, 2011, Iwata and Okada 2011). For the regression analysis, we considered firm performance as the dependent variable that could be influenced among other factors.

Our model is as follow:

$$PF_{i,t} = \beta_0 + \beta_1 Cert_i + \beta_2 EQM_{i,t} + \beta_3 Size_{i,t} + \beta_4 Age_{i,t} + \beta_5 FL_{i,t} + \beta_6 IND_i + \epsilon_{i,t}$$

¹ Zanutto E. L, (2006), "A Comparison of Propensity Score and Linear Regression Analysis of Complex Survey Data", Journal of Data Science, 4, pp 467-91

$PF_{i,t}$: represents each of the financial performance measure (ROE, ROA ROS, Sales growth rate, turnover ratio assets and operating margin)

$Cert_i$: Dummy variable taking a value of 1 if the firm is certified and 0 otherwise

$EQM_{i,t}$: Equity Multiplier

$Size_{i,t}$: Company size (log of total assets)

$Age_{i,t}$: Age of the firm

$FL_{i,t}$: Financial leverage

IND_i : Dummy variable taking a value of 1 if the firm is a manufacturing one and 0 otherwise

2.2. Analysis B

Analysis B tests whether certified companies get better results after certification. The procedure is to compare, for each measure (ROE, ROA ROS, Sales growth rate, turnover ratio assets and operating margin), the two years average before certification and the two years after. The student's t test and Wilcoxon test are used for this purpose. These tests were employed by Cohen et al (1995), Watson et al (2004), Sharma (2005) and Corbett et al (2005).

VI. Results:

1. Analyze A

Results obtained with Propensity score analysis showed that the average effect of certification to management system standards is negative mainly on return on equity ROE and return on assets ROA. In fact, certified companies are the group with the worse performance. For example, the results obtained with the Radius matching method in Table 1(in Appendix) indicate that certified companies have a lower average ROE (6.2%) compared to the control group (17%).

Regression analysis confirmed also that certified companies have worse return on assets ROA compared to non certified ones (Table 7 in Appendix). Hence, our results did not support our first hypothesis. We conclude that certified companies don't outperform non certified ones in our sample.

2. Analyze B

The results of the student's t test and Wilcoxon test showed that certified companies have on average a better return on sales ROS and turnover ratio assets in the year of their certifications. However, for the rest of the measures the analysis did not reveal a significant improvement. To summarize, no long term abnormal performance was detected. Thus, our second hypothesis is not supported. We conclude that certified companies don't get higher results after certification.

VII. Conclusion

The purpose of this paper is to investigate the relationship between certifications to management system standards and Tunisian companies' financial performance. The first research question asks if certified companies get better performance compared to non certified ones. For this reason, we used propensity score methodology and multiple linear regression.

We found that such certification has a negative effect on company results, principally on ROE and ROA. In summary, results suggest that certified companies are the group with the worse performance.

The second research question asks if certified companies get higher performance during the period following certification. The results of the student's t test and Wilcoxon test showed that certified companies have on average a better return on sales ROS and a better asset turnover ratio only in the year of their certifications. However certified companies have not improved their results after being certified.

Our findings are consistent with those of Martinez-Costa and Martinez-Lorente (2007), Benner et al (2008), Ferreira et al (2008), Heras-Saizarbitoria et al (2011), Lo et al (2011), Sampaio et al (2011) and Ilkay and Aslan (2012).

An explanation for our results could be that certified firms incur costs for the certification process which are larger than the benefits that it produces. Another alternative explanation could be that some companies get the certificate only in response to external pressures (customer pressures) and don't use these standards as a model of good practices and as an opportunity for improvement. Consequently, they don't achieve better results.

Some studies found that there is a positive relationship between motivations for adopting ISO standards and business performance. They found that companies which achieved ISO certification based on internal motivations and not under pressures have experienced better results (Martinez-Costa and Martinez-Lorente (2007), Sampaio et al (2011)).

According to Corbett et al (2005), company's own efforts lead to better performance and not the standard or the certification themselves, but these efforts are boosted and guided by ISO standards.

Appendix

Table 1: Estimation of average treatment effects of ISO certification on ROE

| Period | Matching Method | Certified Group | Control Group | ATT ^(a) | T-Stat |
|-----------|------------------|-----------------|---------------|--------------------|--------|
| 2010 | Nearest Neighbor | 0.026 | 0.157 | -0.131 | -0.73 |
| | Kernel | 0.159 | 0.241 | -0.0829 | -0.79 |
| | Radius | 0.026 | 0.248 | -0.222*** | -1.65 |
| 2011 | Nearest Neighbor | 0.101 | 0.083 | 0.018 | 0.17 |
| | Kernel | 0.130 | 0.113 | 0.018 | 0.19 |
| | Radius | 0.101 | 0.164 | -0.063 | -1.48 |
| 2012 | Nearest Neighbor | 0.134 | 0.088 | 0.046 | 0.73 |
| | Kernel | 0.117 | 0.139 | -0.021 | -0.38 |
| | Radius | 0.134 | 0.186 | -0.052** | -2.20 |
| 2013 | Nearest Neighbor | -0.042 | 0.091 | -0.133 | -0.85 |
| | Kernel | -0.067 | 0.154 | -0.221 | -1.29 |
| | Radius | -0.042 | 0.143 | -0.184 | -1.31 |
| 2014 | Nearest Neighbor | 0.091 | 0.033 | 0.058 | 0.52 |
| | Kernel | 0.098 | 0.113 | -0.015 | -0.14 |
| | Radius | 0.091 | 0.114 | -0.023 | -0.33 |
| 2010_2014 | Nearest Neighbor | 0.062 | 0.089 | -0.027 | -0.35 |
| | Kernel | 0.086 | 0.15 | -0.065 | -1.02 |
| | Radius | 0.062 | 0.17 | -0.109* | -2.71 |

Source: Created by the author, (a) Average treatment effect on the treated, Significance levels: ***10%, **5%, *1%

Table 2: Estimation of average treatment effects of ISO certification on ROA

| Period | Matching Method | Certified Group | Control Group | ATT ^(a) | T-Stat |
|-----------|------------------|-----------------|---------------|--------------------|--------|
| 2010 | Nearest Neighbor | 0.051 | 0.049 | 0.002 | 0.05 |
| | Kernel | 0.071 | 0.070 | 0.0008 | 0.03 |
| | Radius | 0.051 | 0.093 | -0.042** | -2.12 |
| 2011 | Nearest Neighbor | 0.048 | 0.038 | 0.01 | 0.29 |
| | Kernel | 0.060 | 0.055 | 0.03 | 0.17 |
| | Radius | 0.048 | 0.088 | -0.04* | -2.74 |
| 2012 | Nearest Neighbor | 0.053 | 0.043 | 0.01 | 0.27 |
| | Kernel | 0.06 | 0.073 | -0.013 | -0.42 |
| | Radius | 0.053 | 0.101 | -0.048* | -2.94 |
| 2013 | Nearest Neighbor | 0.034 | 0.047 | -0.013 | -0.32 |
| | Kernel | 0.043 | 0.077 | -0.035 | -0.99 |
| | Radius | 0.034 | 0.081 | -0.046** | -2.32 |
| 2014 | Nearest Neighbor | 0.032 | 0.028 | 0.005 | 0.10 |
| | Kernel | 0.035 | 0.064 | -0.029 | -0.77 |
| | Radius | 0.032 | 0.066 | -0.034** | -1.99 |
| 2010_2014 | Nearest Neighbor | 0.044 | 0.041 | 0.003 | 0.09 |
| | Kernel | 0.053 | 0.067 | -0.014 | -0.51 |
| | Radius | 0.044 | 0.086 | -0.042* | -2.89 |

Source: Created by the author, (a) Average treatment effect on the treated, Significance levels: ***10%, **5%, *1%

Table 3: Estimation of average treatment effects of ISO certification on ROS

| Period | Matching Method | Certified Group | Control Group | ATT ^(a) | T-Stat |
|-----------|------------------|-----------------|---------------|--------------------|--------|
| 2010 | Nearest Neighbor | 0.068 | 0.030 | 0.038 | 1.08 |
| | Kernel | 0.095 | 0.047 | 0.048*** | 1.67 |
| | Radius | 0.068 | 0.083 | -0.014 | -0.56 |
| 2011 | Nearest Neighbor | 0.066 | 0.015 | 0.051 | 1.11 |
| | Kernel | 0.082 | 0.031 | 0.051 | 1.35 |
| | Radius | 0.066 | 0.081 | -0.015 | -0.77 |
| 2012 | Nearest Neighbor | 0.074 | 0.037 | 0.036 | 0.99 |
| | Kernel | 0.082 | 0.057 | 0.025 | 0.81 |
| | Radius | 0.074 | 0.094 | -0.020 | -0.96 |
| 2013 | Nearest Neighbor | 0.033 | 0.030 | 0.003 | 0.05 |
| | Kernel | 0.038 | 0.058 | -0.020 | -0.42 |
| | Radius | 0.033 | 0.085 | -0.053*** | -1.88 |
| 2014 | Nearest Neighbor | 0.044 | -0.068 | 0.112 | 1.39 |
| | Kernel | 0.047 | -0.008 | 0.055 | 0.85 |
| | Radius | 0.044 | 0.048 | -0.004 | -0.18 |
| 2010_2014 | Nearest Neighbor | 0.057 | 0.008 | 0.048 | 1.10 |
| | Kernel | 0.068 | 0.037 | 0.031 | 0.86 |
| | Radius | 0.057 | 0.078 | -0.022 | -1.06 |

Source: Created by the author, (a) Average treatment effect on the treated, Significance levels: ***10%, **5%, *1%

Table 4: Estimation of average treatment effects of ISO certification on Operating Margin

| Period | Matching Method | Certified Group | Control Group | ATT ^(a) | T-Stat |
|-----------|------------------|-----------------|---------------|--------------------|--------|
| 2010 | Nearest Neighbor | 0.089 | 0.087 | 0.002 | 0.06 |
| | Kernel | 0.114 | 0.094 | 0.019 | 0.61 |
| | Radius | 0.089 | 0.119 | -0.030 | -1.29 |
| 2011 | Nearest Neighbor | 0.089 | 0.046 | 0.043 | 0.79 |
| | Kernel | 0.106 | 0.063 | 0.042 | 0.95 |
| | Radius | 0.089 | 0.108 | -0.018 | -0.86 |
| 2012 | Nearest Neighbor | 0.094 | 0.069 | 0.024 | 0.63 |
| | Kernel | 0.098 | 0.083 | 0.014 | 0.43 |
| | Radius | 0.094 | 0.121 | -0.027 | -1.32 |
| 2013 | Nearest Neighbor | 0.069 | 0.082 | -0.012 | -0.20 |
| | Kernel | 0.072 | 0.098 | -0.026 | -0.51 |
| | Radius | 0.069 | 0.132 | -0.062** | -2.08 |
| 2014 | Nearest Neighbor | 0.078 | -0.040 | 0.119 | 1.64 |
| | Kernel | 0.076 | 0.011 | 0.065 | 1.09 |
| | Radius | 0.078 | 0.072 | 0.006 | 0.24 |
| 2010_2014 | Nearest Neighbor | 0.083 | 0.048 | 0.035 | 0.79 |
| | Kernel | 0.092 | 0.069 | 0.022 | 0.59 |
| | Radius | 0.083 | 0.110 | -0.027 | -1.30 |

Source: Created by the author, (a) Average treatment effect on the treated, Significance levels: ***10%, **5%, *1%

Table 5: Estimation of average treatment effects of ISO certification on Sales growth rate

| Period | Matching Method | Certified Group | Control Group | ATT ^(a) | T-Stat |
|-----------|------------------|-----------------|---------------|--------------------|---------|
| 2011 | Nearest Neighbor | 0.055 | 0.605 | -0.55 | -0.33 |
| | Kernel | 0.060 | 0.847 | -0.786 | -0.60 |
| | Radius | 0.055 | 1.112 | -1.056 | -3.58* |
| 2012 | Nearest Neighbor | 0.157 | -0.055 | 0.212 | 1.60 |
| | Kernel | 0.129 | -0.058 | 0.187 | 1.71*** |
| | Radius | 0.157 | 0.018 | 0.139 | 2.44** |
| 2013 | Nearest Neighbor | 0.109 | 0.022 | 0.087 | 1.15 |
| | Kernel | 0.136 | 0.046 | 0.089 | 1.12 |
| | Radius | 0.109 | -0.004 | 0.114 | 2.31** |
| 2014 | Nearest Neighbor | 0.028 | 0.034 | -0.006 | -0.10 |
| | Kernel | 0.031 | 0.074 | -0.043 | -0.71 |
| | Radius | 0.028 | 0.127 | -0.099 | -2.50** |
| 2011_2014 | Nearest Neighbor | 0.087 | 0.147 | -0.059 | -0.15 |
| | Kernel | 0.089 | 0.242 | -0.152 | -0.51 |
| | Radius | 0.087 | 0.286 | -0.198 | -2.82* |

Source: Created by the author, (a) Average treatment effect on the treated, Significance levels: ***10%, **5%, *1%

Table 6: Estimation of average treatment effects of ISO certification on Asset Turnover ratio

| Period | Matching Method | Certified Group | Control Group | ATT ^(a) | T-Stat |
|-----------|------------------|-----------------|---------------|--------------------|--------|
| 2010 | Nearest Neighbor | 1.007 | 0.901 | 0.107 | 0.33 |
| | Kernel | 1.031 | 1.096 | -0.065 | -0.22 |
| | Radius | 1.007 | 1.087 | -0.079 | -0.52 |
| 2011 | Nearest Neighbor | 2.722 | 1.664 | 1.058 | 0.39 |
| | Kernel | 3.019 | 2.290 | 0.729 | 0.29 |
| | Radius | 2.722 | 2.329 | 0.393 | 0.23 |
| 2012 | Nearest Neighbor | 2.061 | 0.956 | 1.105 | 1.00 |
| | Kernel | 2.234 | 1.148 | 1.086 | 0.87 |
| | Radius | 2.062 | 1.189 | 0.873 | 0.82 |
| 2013 | Nearest Neighbor | 1.002 | 0.920 | 0.082 | 0.26 |
| | Kernel | 1.034 | 1.056 | -0.022 | -0.08 |
| | Radius | 1.002 | 0.976 | 0.026 | 0.16 |
| 2014 | Nearest Neighbor | 0.965 | 0.971 | -0.006 | -0.02 |
| | Kernel | 0.998 | 1.127 | -0.128 | -0.44 |
| | Radius | 0.965 | 0.973 | -0.007 | -0.05 |
| 2010_2014 | Nearest Neighbor | 1.551 | 1.082 | 0.469 | 0.59 |
| | Kernel | 1.663 | 1.344 | 0.319 | 0.40 |
| | Radius | 1.552 | 1.301 | 0.251 | 0.43 |

Source: Created by the author, (a) Average treatment effect on the treated, Significance levels: ***10%, **5%, *1%

Table 7: Regression Results

| | ROE | ROA | ROS | Operating margin | Sales growth | Asset Turnover |
|----------------------|---------------------|---------------------|----------------------|---------------------|-------------------|----------------------|
| Cert | -0.057 (0.199) | -0.034* (0.002) | -0.0063 (0.698) | -0.005 (0.761) | -0.191 (0.411) | 0.149 (0.802) |
| EQM | -0.128** (0.050) | -0.005 (0.531) | -0.015*** (0.069) | -0.014** (0.039) | 0.028 (0.555) | -0.072 (0.722) |
| Size | -0.066** (0.029) | -0.005 (0.434) | -0.028* (0.004) | -0.030* (0.000) | -0.033 (0.210) | -0.066 (0.823) |
| Age | 0.016 (0.655) | -0.003 (0.613) | 0.030** (0.024) | 0.015 (0.155) | -0.031 (0.469) | -0.756*** (0.061) |
| FL | 0.335 (0.118) | -0.011 (0.629) | 0.0215 (0.423) | 0.038 (0.105) | -0.022 (0.912) | 0.502 (0.650) |
| IND | -0.014 (0.794) | -0.023** (0.045) | -0.0087 (0.547) | 0.003 (0.832) | -0.167 (0.318) | 0.043 (0.894) |
| Constant | 1.485* (0.005) | 0.214*** (0.092) | 0.512* (0.001) | 0.618* (0.000) | 0.964 (0.130) | 4.65 (0.447) |
| R² | 0.287 | 0.109 | 0.1204 | 0.094 | 0.017 | 0.072 |
| Prob > F | 0.023** | 0.000* | 0.028** | 0.012** | 0.698 | 0.002* |
| N | 233 | 233 | 233 | 233 | 186 | 233 |

Source: Created by the author, Significance levels: ***10%, **5%, *1%

Table 8: Mean differences between two-year pre-ISO certification period and two-year post-ISO certification period

| | Mean | T-Test (P-value) | Wilcoxon (P-value) |
|------------------------------|---------|------------------|--------------------|
| ROE | 0.038 | 0.635 | 0.705 |
| ROA | 0.001 | 0.901 | 0.905 |
| ROS | -1.709* | 0.027 | 0.002 |
| Operating margin | -0.010 | 0.552 | 0.510 |
| Assets turnover ratio | 0.050 | 0.378 | 0.347 |
| Sales growth rate | -0.159 | 0.677 | 0.648 |

Source: Created by the author, Significance levels: ***10%, **5%, *1%

Table 9: Mean differences between the year of ISO certification and two-year pre-ISO certification period

| | Mean | T-Test (P-value) | Wilcoxon (P-value) |
|-----------------------|----------|---------------------|-----------------------|
| ROE | 0.028 | 0.718 | 0.658 |
| ROA | 0.002 | 0.839 | 0.871 |
| ROS | 0.949 | 0.325 | 0.469 |
| operating margin | -0.013 | 0.434 | 0.496 |
| Assets turnover ratio | 0.096*** | 0.056 | 0.177 |
| Sales growth rate | -0.298 | 0.415 | 1.000 |

Source: Created by the author, Significance levels: ***10%, **5%, *1%

Table 10: Mean differences between two-year post-ISO certification period and the year of ISO certification

| | Mean | T-Test (P-value) | Wilcoxon (P-value) |
|-----------------------|---------|---------------------|-----------------------|
| ROE | 0.010 | 0.797 | 0.974 |
| ROA | -0.0003 | 0.973 | 0.957 |
| ROS | -2.658* | 0.004 | 0.000 |
| Operating margin | 0.002 | 0.879 | 0.510 |
| Assets turnover ratio | -0.045 | 0.147 | 0.222 |
| Sales growth rate | 0.089 | 0.185 | 0.482 |

Source: Created by the author, Significance levels: ***10%, **5%, *1%

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