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Dick, Gavin P.M. and Casadesus, Marti and Heras Saizarbitoria, Iñaki (2002) ISO 9000 Registration's Impact on Sales and Profitability: A Longitudinal Analysis of Performance Before and After Accreditation. *International Journal of Quality & Reliability Management*, 19 (6). pp. 774-791. ISSN 0265-671X.

DOI

<https://doi.org/10.1108/02656710210429618>

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IJQRM
19,6

ISO 9000 registration's impact on sales and profitability

A longitudinal analysis of performance before and after accreditation

774

Received July 2001
Revised January 2002

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Keywords ISO 9000, Certification, Sales, Profit

Abstract Although there is a plethora of research articles that study ISO 9000 quality management systems and their association with business success, there is little empirical research that can attribute causality to certification. Contributes to the question of causality, through a comparison against a control group of the actual sales and profitability of 400 certified companies pre and post registration. Using a longitudinal methodology finds that, although the performance of certified companies is superior to that of 400 non-certified firms, there is no evidence of improved performance after registration in the 400 certified firms studied. Concludes, from these findings, that the superior performance of certified firms is due to firms with superior performance having a greater propensity to pursue ISO 9000 registration. Illustrates the potential dangers in inferring that ISO 9000 certification leads to superior business performance. Additionally the findings should give pause for thought for decision-makers. Certification is a major investment yet the findings show that inflated expectations of performance improvement after ISO 9000 accreditation may be unfounded.

Introduction

Registrations to the ISO 9000 quality management system standard have grown rapidly in recent years with over 408,000 registrations in 158 countries at the end of 2000, a growth of 50 per cent in two years (ISO, 2001). This suggests that there is a wide spread belief in the business community of the benefits of ISO 9000 registration. Although there is a plethora of research articles that study ISO 9000 quality management systems and their association with business success, there is little of this research that can attribute causality. The inference often drawn is that ISO accreditation leads to higher levels of performance, what tends to be forgotten is that the opposite direction of causality could be true, i.e. that successful firms may well have a propensity to pursue certification.

In this article, we aim to examine this question of causality, by comparing the actual sales and profitability of 400 accredited firms and comparing their performance with their achievements prior to registration. Using a methodology that provides evidence of causation we find that, although the



performance of certified companies was superior to that of 400 non-certified firms, there was no evidence of improved performance after registration in the 400 certified firms studied. These findings lead us to conclude that the superior performance of certified firms is due to firms with superior performance having a greater propensity to pursue ISO 9000 registration.

Literature review

Quality and business performance

Our examination of the literature finds that the vast majority of the articles that do address the business value of certification are, unfortunately, either anecdotal, case study based, or report only descriptive statistics. Case studies are an ideal way of illustrating success stories and the realities of implementation. However, they do not provide proof that quality certification is associated with improved performance, only that it is possible. Due to these concerns, we focus here on empirical research that uses statistical data analysis. We start by examining the research that looks at quality improvement and business performance before reviewing the literature on ISO 9000 certification and performance.

Derived from our study of the literature we discern two themes that relate to business performance: first, better product or service quality differential against competitors (Schoefler *et al.*, 1974; Buzzel and Wiersema, 1981; Craig and Douglas, 1982; Phillips *et al.*, 1983; Jacobson and Aaker, 1987; Capon *et al.*, 1990; Rust *et al.*, 1994) and second, those studies that identify quality management system characteristics (the most dominant being improved conformance quality) that reduce internal costs or are associated with business performance improvement (Maani *et al.*, 1994; Flynn *et al.*, 1995; 1997; Forker *et al.*, 1996; Caruana and Pitt, 1997; Adam *et al.*, 1997).

Although most studies report performance improvements, some find that performance benefits are limited. For instance, Redman *et al.*'s (1995) survey of 880 firms in the UK showed fewer than half the firms claiming even a minor improvement in sales or profitability as a result of quality management initiatives. In addition, we note that although there is agreement in these studies on the association between quality and performance, there is little commonality in how performance is measured or how quality is defined.

To aid our understanding of the quality factors that have been found to have an influence on business performance, we select some of the research mentioned above for more detailed examination. Jacobson and Aaker (1987) found product quality had a positive influence on return on investment, market share and price. An investigation of 65 firms in the furniture industry (Forker *et al.*, 1996) discovered that quality – defined as conformance to specification – was significantly related to sales growth and the return achieved on the sales growth. These findings indicate the powerful impact that better conformance can have on reducing costs and through better product quality attracting, and retaining, customers. Flynn *et al.*'s (1995) study of the transportation, electronics and machinery industries found that good internal quality (made

right first time) was associated with greater employee involvement and better process control. Greater employee involvement could be associated with the total quality ideal, while better process control should come from the quality control that underpins good quality management systems. This indicates that better process control should lead to lower rework and diminishing costs of quality. Findings from the World-class Manufacturing Project (Flynn *et al.*, 1997) indicate that achieving conformance to specification with low levels of rework has a direct effect on competitive advantage, while management perception of the plant's product quality and customer service, relative to its competitors (quality differential), had an even greater impact. "Right first time" was strongly associated with better process flow management while quality differential was shown to be linked with better process management and quality control.

The research reviewed found that better product quality relative to competitors was associated with sales growth and better sales margins. It was also found that good quality control and improved conformance quality was related to competitive advantage. An effective quality management system will have process control as an essential activity. Better process control will, the research suggests, be consistently associated with less rework and hence lower costs in achieving conformance quality. These lower costs will lead to better comparative business performance. This is in line with Deming (1986), who reasons that as quality improves, waste is eliminated, costs are reduced, and financial performance improves.

Inferred in the pursuit of quality certification is the assumption that it is associated with good quality systems, leading to better quality, improved business performance and hence better profitability. The expected links are shown in Table I. The model shows the approved quality management system bringing an increased emphasis on quality, which leads to less waste or duplication of effort, and improved quality. These improvements lower costs while the improved product quality means fewer customer defections leading to increased sales volume. In turn these benefits lower the cost of sales, and improve sales volume while lowering the average cost of acquiring new business. Indeed, even if all the quality benefits do not materialise we would

ISO certification	Quality management system	Quality improvement	Business performance	Profitability
Certified to ISO 9000 standard	The approved quality management system brings an increased emphasis on quality and how it may be achieved consistently	<i>Internal</i> Less waste and duplication of effort <i>External</i> Quality received by customers improves	Reduced costs improve competitiveness Fewer customer defections so sales increase Badge of quality opens more sale opportunities	Cost of sales reduces leading to increased profits Profitability benefits from scale economies, and lower sales acquisition costs

Table I.
The expected links between quality certification and business performance

expect the possession of the “quality badge” to lead to increased sales opportunities and hence improved profitability from increased volume. Hence, we should expect that firms that are accredited to ISO 9000 would enjoy superior levels of profitability.

However, the research we now examine on the links between quality certification and improved performance reveals that the performance gains expected are not consistently found.

ISO 9000 certification and business performance

Although there are many studies reporting expectations of increased market share and improved product quality from ISO 9000 implementation (for example, Ebrahimpour *et al.*, 1997), there are much fewer empirical studies on the business performance benefits actually achieved. The UK research of Mann and Kehoe (1994) noted that quality certification was associated with improved business performance at the operational level. While, Buttle’s (1997) survey of 1,220 certified UK companies found that improving operations as well as marketing gains were claimed by most of the firms following quality certification. Similar findings were found by Casadesús *et al.*’s (2000) study of 500 firms. Further afield in Singapore Quazi and Padibjo (1998) found in addition to marketing gains, improvements in product quality. However, the large-scale descriptive studies of Lloyd’s Register of Quality Assurance (1993), the Institute of Quality Assurance (1993), and Breka (1994), report that the greatest gain from quality certification is widening market opportunities rather than improvements in quality itself.

In contrast, a rigorous empirical study (Terziovski *et al.*, 1997) of 1,000 firms in Australia and New Zealand found that quality certification had no significant, positive relationship with business performance. They noted that the principal motivation for pursuing quality certification was the ability of the certificate to open customers’ doors that were previously closed, or would close, if quality certification were not achieved.

It appears that few studies report the full range of benefits suggested by the model presented in Table I. Could this be due to organisations reacting to external pressure to be certified? Some studies (for instance, Gore (1994)) have suggested when firms are reacting to external pressure for certification they may see ISO 9000 registration as the prime objective and adopt a minimalist approach to achieve it. These firms may possess quality certification but they do not value the quality management system that quality certification requires, so will achieve limited benefits. Support for this proposition is found in the Science and Engineering Policy Studies Unit’s (SEPSU, 1994) study, which reviewed 28 surveys relating to ISO 9000. It concluded that there appears to be a relationship between managers’ motives for adopting certification and gains achieved in business performance. Companies that cited customer pressure as their reason for pursuing certification were less likely to report improvements than those which gave other reasons for adopting quality certification.

These studies infer that the motive for seeking certification is an important predictor of performance. Insights into this motivation variable are provided by an empirical study of 272 Australian firms by Jones *et al.* (1997). It found evidence that firms that sought quality certification because of externally imposed perceptions of the necessity to “obtain a certificate” were found to experience fewer beneficial outcomes of certification than firms which had a “developmental” view of quality improvement. These developmental firms’ motives included a desire to use quality certification to improve the company’s internal processes, and/or help lower quality costs and increase customer focus. Support for this view is found in a survey of 192 Dutch firms where financial benefits were contingent on firms having internal reasons for pursuing accreditation (Singles *et al.*, 2001). Further insights into the motivation theme are provided by the research of Abraham *et al.* (2000), who found that certification provided little guarantee of high performance outcomes unless accompanied by substantial changes in leadership, structure and communications.

However, in contrast to Jones *et al.*’s (1997) findings indicating that a developmental or strategic orientation is a moderating variable, Terziovski *et al.* (1997) found that their variable “TQM environment” (indicative of a developmental view of quality) had no significant influence on the relationship between quality certification and business performance.

ISO 9000 certification and performance measured by financial accounts

The studies we have discussed so far rely on self-reporting by respondents of the benefits or otherwise of quality certification. We next review the few empirical studies that avoid the potential bias of self-reporting through the use of objective indicators of profitability obtained from annual accounting returns and reports.

Lloyds Register of Quality Assurance’s (1996) survey found certified companies’ sales growth, profit margins, and return on capital employed were much better than the industry average. Support for this can be found in a Spanish longitudinal study that compared the return on assets employed of 400 accredited and 400 non-accredited firms between 1994 and 1998 (Heras *et al.* 2002). The authors found that the returns on assets employed were consistently better in certified firms than in non-certified ones. Also reporting higher returns on assets employed (but only marginally higher) is Wayhan *et al.*’s (2001) study of the financial results of 96 USA firms between 1990 and 1998. They note that sales revenue did not increase, suggesting that the increased profitability was due to a reduction in internal costs. However, these studies cannot prove causality since it is also possible those firms seeking certification to ISO 9000 tend to have better financial performance before and after registration. In contrast to these studies that report improved profitability, is a Danish longitudinal study (Häversjö, 2000) that is not compromised by this causality question. Häversjö’s analysis of the returns on capital employed of 800 companies between 1989 and 1995 found no significant improvement post certification. The findings show that in the three years after certification the

returns averaged 23.6 per cent compared with an average of 24.3 per cent prior to registration (both relative to non-certified firms). However, after certification the registered firms enjoyed four years of better sales growth compared to the non-certified firms.

A summary of the research on ISO 9000 certification and business performance is presented in Table II. This table reveals contradictory results in the columns, “lower costs or waste” and “better quality”. In the presence of intermediate variables (most of which relate to motives for accreditation) it shows that the majority of the surveys report lower costs or waste (six out of eight), and better quality (three out of five). However, when the intervening variable is absent/weak only a minority of surveys show lower costs or waste (three out of eight) and better quality (one out of five). This suggests that for many firms quality improvement as a result of quality certification will be conditional on motivation that goes beyond getting the “quality badge”.

When we look at the self-reported higher sales and market share column, the summary shows it to be the most common and consistent benefit reported in the surveys. This stronger showing of sales related benefit compared to “lower costs” or “better quality” could be due to the marketing benefits of registration, combining with the sales gains made from fewer customer defections due to improved product quality.

We can see some support for these self-reported higher sales or market share in the studies using accounting data to measure sales growth, since two out of

First named author	If variable present	Self-reported		Accounts		
		Lower costs or waste	Better quality	Higher sales or share	Higher sales growth	Higher profitability
Institute of Quality Assurance (1993)				Yes		
Lloyd's Register of Quality Assurance (1993)				Yes		
Breka (1994)				Yes		
Mann and Kehoe (1994)		Yes				
Lloyd's Register of Quality Assurance (1996)					Yes	Yes
Buttle (1997)		Yes		Yes		
Terziovski <i>et al.</i> (1997)		No	No	No		
Quazi and Pradibjo (1998)			Yes	Yes		
Casadesús <i>et al.</i> (2000)		Yes		Yes		
Häversjö (2000)					Yes	No
Wayhan <i>et al.</i> (2001)					No	Yes
Heras <i>et al.</i> (2002)						Yes
SEPSU (1994)	Customer driven			- Yes + No		
Jones <i>et al.</i> (1997)	Developmental view	+ Yes - No	+ Yes - No	+ Yes - No		
Terziovski <i>et al.</i> (1997)	TQM environment	+ No - No	+ No - No	+ No - No		
Abraham <i>et al.</i> (2000)	Leadership etc.	+ Yes - No	+ Yes - No			
Singles <i>et al.</i> (2001)	Internal motivation	+ Yes - No		+ Yes - No		

Notes: + = benefits if variable is present/strong; - = benefits if variables is absent/weak

Table II.
Summary of research on ISO 9000 certification and business performance

the three studies report higher sales. In the studies that have used accounting measures only one study reports both higher sales growth and higher profitability, but overall it would seem that firms with quality certification do show either higher sales growth or higher profitability.

Overall, there is evidence, albeit not consistent enough to be compelling, to support the broad range of benefits suggested in Table I, which showed quality certification is associated with lower costs through reduced wastage and quality improvement, or increased market sales through perceived higher quality and improved market opportunities.

However, caution is needed in implying that certification is the cause of these benefits, since the cross-sectional methodology that is used in 16 out of the 17 studies we have summarised, cannot infer that certification is the cause. It may be equally true that these firms with superior performance have a greater propensity to pursue certification than their less successful rivals. The evidence for causation would be much more persuasive if the results were associated in time, and followed the accreditation date. To this end, we use a longitudinal approach that should produce stronger associations between variables and allow us to study differences between pre and post certification performance.

Methodology

The research analysed in this paper studies the comparative financial performance of ISO 9000 certified firms before and after certification, and compares them with a control group of firms without certification over a five-year period.

The research was undertaken in the Basque Autonomous Community, which is with Madrid and Cataluña considered to be one of the regions in Spain where ISO 9000 registrations are concentrated, and relatively, the region where ISO 9000 has had the greatest impact since it has close to 20 per cent of the Spanish registrations yet its contribution is only 6 per cent to Spain's gross domestic product (Heras, 2000). The data for this study was gathered from the Ardán database, an Entrepreneurial Information Service of the Consortium of the Exempt Zone of Vigo[1]. The Ardán database is one of the most complete at domestic level in Spain, for both economic and financial information, since it includes data for more than 100,000 companies, and more than 500 items of annual data for each company and year. This data is recorded from, among other sources, the outcome and balance sheets that the companies submit to the Mercantile Register. For this investigation, we used two samples from the Ardán database; one random sample of 400 ISO 9000 certified companies (from an average total population of 520), and another random sample of 400 non-certified companies. Data was available for the years 1994, 1995, 1996, 1997, and 1998, and included the sales revenue for each accounting year, as well as the profitability ratio (ROA, the ratio of net profit before interest and tax on total assets). In addition, for the certified companies, the data set included information on their last quality certification registration date. This

information on registration dates was checked with the registration bodies and where necessary with the companies to ensure that the date we recorded was the true date of the firm's initial registration to ISO 9000.

Possible sources of bias in the two samples were checked. First, we noted that the two samples were not homogenous. Certified firms had on average larger sales turnovers than non-certified firms did, which is also true for the total population of certified companies in the Basque Autonomous Community (Heras, 2000). Since the two samples were not homogeneous, it could be argued that any difference in profitability of the certified companies is a direct result of their larger average size. To test for this distortion we used, the statistical z -test of proportions, with a level of significance set at $\alpha = 0.05$, as well as a t -test for differences in means, since information on sales revenue was available. Both these calculations corroborate that the proportions are not significantly different. Additionally, we calculated the relationship between the firm's sales revenue and the ROA. We found the correlation coefficient was extremely weak and no other relationship was visible on a graphical plot of these against the five years of data.

Likewise the distribution by industrial sector of both the certified and non-certified companies was analysed and we found that the average profitability for certified firms was higher for each sector (manufacturing, construction, trade and services) compared to the non-certified firms. Although, the sample distributions by sector were not homogenous, because the sample of certified companies was biased towards certain industrial sectors and types of goods, the samples profile was similar to that previously reported for the total population of certified companies (Heras, 2000). In order to evaluate if there were statistically significant differences in the profitability ratio among industrial sectors, the average profitability ratio for all the sectors and years was calculated to verify if sectoral differences were creating a bias in the results. Using t -tests for differences in means no statistically significant differences were identified (level of significance set at $\alpha = 0.05$). Therefore, we feel confident that any differences between ISO certified and non-certified companies that we may find are not be related to the non-homogenous size or sectoral distribution of the two samples.

In summary, the research design consists of three samples of firms: certified, "will be certified" and non-certified for each of the five years. And two variables, sales growth, and return on total assets employed (ROA).

Findings

Using the sales turnover, the average growth in sales on the previous year was calculated for the certified and the non-certified firms for each of the years 1995, 1996, 1997, and 1998. The results are presented in Table III. In each of the four years, it can be observed that the average sales growth of the certified firms is superior. Over the period 1994 to 1998, the certified firms enjoyed compound sales growth of 65 per cent compared to the non-certified firms' 46 per cent. To check the statistical validity of the difference in growth we used t -tests for

differences in means with a significance level set at 0.05. The tests found the differences were statistically significant for the first two of the four years (1994-1995 and 1995-1996).

It would be tempting to believe that the cause of the superior sales performance is due to the systematic quality management system and possession of the “badge of quality” following accreditation to the ISO 9000 standard. However, there is the important issue of the cause and effect relationship. Even if, as shown in Table III, it can be statistically proven that the certified companies have a greater average level of sales growth in two out of the four years than the non-certified companies, it cannot be concluded that the ISO 9000 certification leads to better sales performance. If causality is to be established the causal factor must precede the effect; otherwise, the opposite of the cause and effect relationship could be true, i.e. that higher performing companies are those that have a greater propensity to be certified to an ISO 9000 standard. To avoid this problem we now analyse a time series of performance that included the initial date of ISO 9000 accreditation.

To investigate the superior sales growth of certified firms; we analysed the mean sales growth, splitting the certified sample into two groups, those that were certified in that year and those that will be certified in a future year (labelled “not yet certified”). If we examine the sales growth in Table IV and compare the “certified” and “not yet certified” firms for each year, we can observe that the certified firms (compound growth 68 per cent) have performed similarly to the “not yet certified” firms (compound growth 74 per cent). In contrast, we find that non-certified firms have a lower compound sales growth (45 per cent) than the certified and the “not yet certified” firms. To check the statistical validity of the difference in growth we used *t*-tests for differences in means with a significance level set at 0.05. The tests found the differences were statistically significant for all the years between the “not yet certified” and the

Table III.
Sales growth in
ISO 9000 certified and
non-certified companies

	1994-1995	1995-1996	1996-1997	1997-1998	Compound
Certified (%)	21.86*	9.55*	12.43	10.16	65
Non-certified (%)	13.88*	5.30*	11.77	8.70	46

Notes: *t*-test of means is significant at level of significance set at $\alpha = 0.05$

Table IV.
Mean sales growth for
the certified, not yet
certified and
non-certified companies

	1994-1995	1995-1996	1996-1997	1997-1998	Compound
Non-certified (%)	13.88	5.30	11.77	8.70	45
Certified (%)	25.69*	10.40*	10.84	9.31	68
Not yet certified (%)	21.28*	9.11	15.52*	14.05*	74

Notes: *t*-test of means for certified or “not yet certified” firms’ data compared to non-certified firms’ data is significant at level of significance set at $\alpha = 0.05$. There are no significant differences between certified and “not yet certified” firms’ *t*-tests for all the years

non-certified, and for the first two of the four years (1994-1995 and 1995-1996) between certified and non-certified firms. We also found that there was no statistically significant differences between certified and “not yet certified” firms for any of the years.

These findings lead us to conclude that the superior sale growth of certified firms that we observed in Table III was because the firms with already higher sales growths are those that have a greater propensity to be certified according to ISO 9000 standards. In other words for these firms as a whole, sales growth after ISO 9000 registration is much the same as that achieved prior to accreditation.

In an earlier phase of our research (Heras *et al.*, 2002) that compared the return of assets employed (ROA) of ISO 9000 registered firms with a control group of non-registered firms, it was found that ISO registered firms had a ROA that was better than in non-certified companies, and that these higher returns were statistically significant in four out of the five years analysed (see Table V). In that article we expressed concerns about causality, but could not pursue any meaningful analysis of pre and post registration financial performance because the registration dates in the Ardán database were a mixture of initial and renewal dates. Now that we have the data on the initial registration date, we are able to address this question of causality.

To investigate the profitability of certified firms over time, we analysed the mean return on total assets employed (ROA), splitting the certified sample groups, as we did for sales growth into those that were certified in that year and those that will be certified in a future year. If we examine the ROA in Table VI, and compare the certified and “not yet certified” firms for each year, we can observe that the certified firms (period average 8.2 per cent) have similar levels of profitability to the “not yet certified” firms (period average 8.44 per cent). In contrast, we find that non-certified firms have a lower level of profitability (6.56 per cent) than the certified and the “not yet certified” firms. The *t*-tests found the differences were statistically significant between the non-certified and the “not yet certified” for all of the years, and were significant between non-certified and certified firms for three out of four years (1996-1998). We also found that there was no statistically significant differences between the ROA of certified and “not yet certified” firms in any of the periods.

These findings lead us to conclude that the superior profitability that we previously reported (Heras *et al.*, 2002) of certified firms was due to the more profitable firms being more likely to pursue ISO 9000 registration than firms

	1994	1995	1996	1997	1998	Period average
Certified (%)	6.57	8.98*	8.26*	8.40*	9.65*	8.36
Non-certified (%)	5.50	7.08*	5.70*	6.76*	7.78*	6.56

Notes: Figures are the per cent return on total assets employed; **t*-test of means is significant at level of significance set at $\alpha = 0.05$

Table V.
Profitability (ROA) for
the certified, and
non-certified companies

with lower levels of profitability. So it would seem that we cannot infer that ISO 9000 accreditation leads to higher levels of profitability since we have found that profitable firms are more likely to have certification, not that certified firms are more likely to be profitable.

However, could the lack of increase in profitability of the certified firms compared to the “not yet certified” be due to temporal limitations? A case can be made that the implementation of any system, or program related to quality, tends to pay off in the long, rather than the short run, so certification is most unlikely to cause a swift change in a company’s financial results. To check whether this is the case the profitability data was manipulated so that comparison of the companies pre and post initial certification date could be made using a methodology similar to that found in the empirical accounting research (Häversjö, 2000).

To allow us to make comparisons of firms’ pre and post registration profitability compared to non-certified firms, the mean figures of each group were compared (weighted difference in per cent of the certified firms’ ROA relative to that of the non-certified control group). The data was transformed to fictional years prior to and after certification (where “year 0” is the certification year). Table VII presents the results of this manipulation (for details of the methodology see [2]).

Examination of the “deviation %” row in Table VII first shows confirmation of our earlier findings, since the mean profitability for the certified firms is higher than non-certified firms in the years before, and after registration.

	1994	1995	1996	1997	1998	Period average
Non-certified (%)	5.50	7.08	5.70	6.76	7.78	6.56
Certified (%)		6.37	8.48*	8.29*	9.66*	8.20
Not yet certified (%)	6.57*	9.34*	8.14*	8.56*	9.61*	8.44

Table VI.

Mean profitability (ROA) for the certified, not yet certified, and non-certified companies

Notes: *t*-test of means for certified or “not yet certified” firms’ data compared to non-certified firms’ data is significant at level of significance set at $\alpha = 0.05$. There are no significant differences between certified and “not yet certified” firms’ *t*-tests for all the years

Certification year	- 5	- 4	- 3	- 2	- 1	0	1	2	3
1995					2	2	29	18	27
1996				24	41	45	32	37	
1997			20	30	15	3	23		
1998		48	66	67	23	55			
1999	14	11	28	13	22				
Deviation %	14	31	37	34	22	27	27	30	27
N certified firms	73	156	260	344	396	323	240	136	52

Table VII.

Deviation of the ISO sample’s profitability (ROA) to that of the non-certified firms per fictional year (year 0 is the certification date)

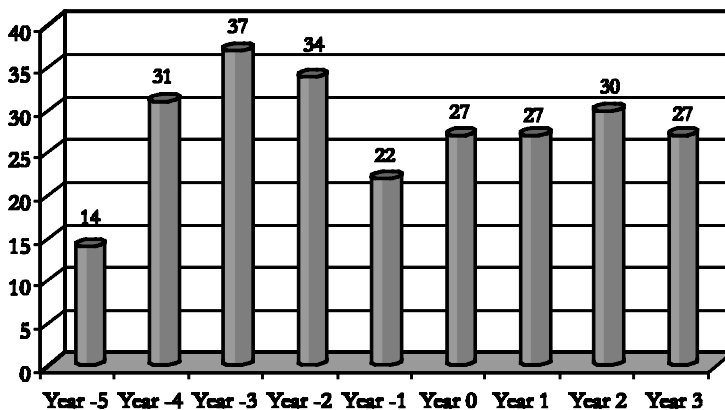
Notes: All figures are weighted per cent deviations in the per cent return on total assets employed. They are all positive relative to the non-certified companies

Second, we can see that the level of profitability does not improve after certification. If we look at the average deviation figure for the three years prior to certification $((37 + 34 + 22)/3 = 31.0$ per cent) compared to the three years after registration $((27 + 30 + 27)/3 = 28$ per cent) we can see no significant change compared to the certification year (27.0 per cent). The same applies if we average the deviation for all the years prior to registration (27.6 per cent) and those post year "0" (28.0 per cent). Third, if we look at the 1995 and 1996 rows, there is some indication that the earlier adopters of ISO 9000 did improve their profitability post certification. But, the smaller sample size for year 1995 certifications (73) and only two years of profitability history for the years prior to certification make this evidence weak. In contrast, the later adopters (1997 and 1998) have a worse performance after the registration year but for the same reasons, the evidence is weak. However, at the aggregate level the evidence can be viewed as much stronger. When we observe the trend in profitability shown in Figure 1, it is clear that there is no overall improvement in profitability after registration. The best that can be said is that the additional costs associated with accreditation have been recovered through gains made from it.

Overall, we must therefore conclude that we have found no evidence that certification has any influence on profitability or sales growth.

Discussion of findings

The literature that we reviewed earlier (Table II provides a summary) indicated that the most common benefits reported in the empirical research are increases in sales or market share. When we used the cross sectional analysis method that predominates these studies, we also found a significantly better sales growth in certified companies than in the control group of non-certified ones. However, on analysing the difference between pre and post registration sales growth for the certified firms we found no evidence to support any causal link between ISO 9000 registration and improvements in sales growth. Instead, we discovered that sales growth was consistently better than non-certified firms,



Note: year 0 is the certification date

Figure 1.
The ISO 9000 sample's average per cent deviation in profitability (ROA) before and after certification compared to that of the non-certified firms

both pre and post registration. This clearly illustrate how cross-sectional analysis can lead to erroneous conclusions of causality, a question we will return to in greater detail later.

Our findings concerning profitability (ROA) follow a similar pattern. Our earlier cross-sectional study (Heras *et al.*, 2002) indicated that there was an association between profitability and certification. However, on analysing the difference between pre and post registration profitability for the certified firms we found no evidence to support any causal link between ISO 9000 registration and improvements in profitability. Instead we discovered that profitability of the certified firms was consistently better than non-certified firms pre and post their registration. Our findings suggest that the many cross-sectional studies, such as Lloyds Register of Quality Assurance's (1996) survey that found certified companies' sales growth, profit margins, and return on capital employed were much better than the industry average, could well be implying an assumption of causality that is suspect. They may well be ignoring the propensity of more successful companies to pursue certification.

In our final analysis, we used a methodology that could provide stronger evidence of causation. We used a method similar to that used in empirical accounting research. We aligned cross-sectionally for the certification year so as to be able to compare levels of profitability in the years before and after registration. In this analysis, we found weak evidence that earlier adopters of the standard achieved higher levels of profitability after registration. However, if we accept that evidence, we also have to accept that the firms that registered later had profitability that declined after registration. On a stronger footing, we can say that our analysis strongly indicates that there is no improvement in profitability post registration. This analysis used a method identical to that of Häversjö's (2000) Danish study, in which he found little difference in the 800 companies' return on capital employed (ROC), pre (24.3 per cent) and post (23.6 per cent) registration. Clearly, our findings support Häversjö's, since we also have found no profitability improvement.

As briefly mentioned earlier there is a problem in most studies of ISO 9000 certification and performance improvement since the direction of causation cannot be plausibly established in cross-sectional research. Good financial performance may enable the pursuit of accreditation and may influence in self-reported studies the respondents' perceptions concerning how much credit it deserves for the current financial performance of the firm. In such studies, causation can virtually never be proved. However, the evidence for causation would be much more persuasive if the results were associated in time, and follow the accreditation date. We believe that the method we have used has avoided the problem associated with cross-sectional studies that are not closely associated with timing of the accreditation of the quality management system. The longitudinal approach we have used should produce stronger associations between variables since there is an argument that benefits from any system change take time to percolate through to bottom line improvements. Also in this study, we have used actual financial results, that should provide more

reliable evidence than self-reported results. Despite the strengths of this type of methodology, we have found no difference worthy of note between pre and post certification performance.

So, what are the possible reasons for this greater propensity of firms with superior financial performance to pursue accreditation to ISO 9000? A possible interpretation could be based on Adam's (1999) hypothesis. He suggested that as the systems required by ISO certification are costly to implement and maintain, highly profitable firms are more likely to be ISO certified. Thus, highly profitable firms are more likely to be ISO certified than less profitable firms. We noted earlier, that on average the certified firms in our study were larger. So could a possible alternative explanation be that the cost of accreditation is easier to bear for larger firms than smaller ones, since they are likely to have more internal quality expertise and therefore less reliance on expensive consultants. Another possible interpretation is that since growth in certification is a recent phenomenon in the Basque region, the firms that we have analysed are the pioneers of ISO 9000 registration. It could be, and our qualitative experience corroborates this, that these pioneer companies are characterised by having a greater exposure to international trade. Therefore, these firms are more exposed to international standards of competition, and to compete, they may already have in place many of the characteristics of "best practice" systems of quality management, prior to seeking accreditation. Thus, pre and post certification business performance will not differ much, since gaining the "badge of quality" is only giving recognition for what were already good quality management systems.

Conclusions

In this research we have analysed the differences in sales growth and profitability of 800 firms divided into three samples: certified, "not yet certified" and non-certified over a period of five years. As detailed in the methodology section we have tested for two possible sources of bias in our samples. First, certified firms had on average larger sales turnovers than non-certified firms did. Second, there was a difference in the distribution by industrial sector of the certified and non-certified companies. Our calculations allow us to feel confident that our results have not been confounded by these differences between ISO certified and non-certified companies. We concede that our evidence would be enhanced by considering a longer time series. However, our study has been limited to a five-year period because there were very few registrations in the Basque region prior to 1995 and data for the year 2000 was incomplete. When data is available for additional years, we will extend the analysis to examine a longer period after registration to see if there is any contra evidence to that presented here.

When we used a simple cross-sectional analysis method of comparing certified and non-certified firms we found a significantly better sales growth and profitability in certified companies than in the control group of non-certified ones. A finding similar to many reported in the literature that have

used this cross-sectional research design. However, on analysing the difference between pre and post registration sales growth and profitability for the certified firms we found no evidence to support any causal link between ISO 9000 registration and improvements. Instead we discovered that sales growth and profitability was consistently better than non-certified firms both pre and post registration. To check whether this lack of increase in performance of the certified firms compared to the “not yet certified” was due to temporal limitations, we aligned the firms cross-sectionally for the certification year so as to be able to compare levels of profitability in the years before and after registration. In this analysis, we found no improvement in profitability in the years following registration. These findings lead us to conclude that the superior performance of certified firms is due to firms with superior performance having a greater propensity to pursue ISO 9000 registration. Our evidence indicates that the direction of causality is that firms with superior performance are more likely to have certification, not that certified firms are more likely to have superior performance.

In the discussion, we put forward three possible reasons for this greater propensity of firms with superior financial performance to pursue accreditation to ISO 9000. First, that the systems required by ISO certification are costly to implement and maintain, so more profitable firms are more likely to be ISO certified. Second, that the cost of accreditation is easier to bear for larger firms than smaller ones, since they are more likely to have internal quality expertise and therefore less reliance on expensive consultants. Thirdly, that the certified companies are characterised by having a greater exposure to international trade, and to compete, they may have already emulated “best practice” systems of quality management, prior to seeking accreditation. Thus, no great difference is found in pre and post certification performance.

Although our study relates to only one region of Europe, we believe that our findings have broader implications for researchers and practitioners. For researchers, our findings illustrate the dangers in any inference of causality between ISO 9000 certification and superior business performance. Much of the research done to date relies on the cross-sectional study method. In these studies when an association between business performance improvement and certification is found, authors sometimes, and business readers more often we suspect, infer causality to certification. Clearly, our evidence suggests that this may be unsound. We suggest that research in this field is now mature enough to give much more emphasis to the question of causality, rather than association. To do this future research needs to focus on longitudinal studies that examine pre and post certification business performance, along with other moderating variables. The literature indicates that important moderating variables are motivations for pursuing accreditation (for a classification of motivations see, Jones *et al.*, 1997). Also, we suggest that it is important to measure the status of the firms’ quality management systems prior to starting accreditation, since certification may in many cases only be giving recognition for what are already good quality management systems.

For practitioners, our findings should give pause for thought. It is indeed tempting for managers to believe that ISO 9000 certification will lead to business benefits. After all firms that they would like to emulate in terms of performance often have it! This is then reinforced by the seemingly pervasive believe (oft quoted as supported by research) that a quality management system certified to ISO 9000 will reduce cost and increase sales. However, our findings indicate that it might be a wise decision to only pursue accreditation if there is a demand from customers for it, since we have found no sales or profitability improvements after certification. The *ISO 9000 Survey* (Irwin Professional and Duan and Bradstreet Information Services, 1996) in the USA found that the average costs associated with certification were US\$409,000 for large firms (sales above US\$11 million) and US\$71,000 for smaller firms. Clearly, these figures indicate that certification is a major investment, yet our findings show that the money spent on certification has not adversely affected the profitability of our firms. This does suggest that cost benefits arising from certification are on average sufficient to offset the investment. Therefore, we are not suggesting to practitioners that certification is a bad investment, rather that inflated expectations of performance improvement may be unfounded.

To summarise, in this study a methodology has been used that can provide evidence of causation. Although the performance of certified companies was superior to that of non-certified ones, we have found no evidence of improved performance after registration in the 400 firms studied. These findings lead us to conclude that the superior performance of the certified firms is due to firms with superior performance having a greater propensity to pursue ISO 9000 registration. We suggest that this evidence casts doubt on the inference drawn in some of the literature that suggests ISO 9000 accreditation leads to business performance improvement. Our evidence indicates that the direction of causality is that firms with superior performance are more likely to have certification, not that certified firms are more likely to have superior performance. Overall, we have found no evidence that certification has any significant influence on profitability or sales growth. The best that can be said is that the additional costs associated with accreditation have been recovered through gains made from it.

Notes

1. The authors would like to offer special thanks to the Ardán database and particularly Dr José Cabanelas Omil for his invaluable collaboration.
2. The methodology used to manipulate the data to allow the comparison shown in Table VII is best explained by way of examples. If we look at the 1995 row in Table VI, the difference in ROA compared to the non-certified firms is 2 per cent for the “year -1”: this means that for the companies certified in 1995, the profitability difference in per cent to the non ISO sample’s profitability is 2 per cent for the year 1994 (one year before certification, so, “year -1”). Looking at the row “deviation per cent”, it shows the weighted deviation in per cent of the ROA of the certified firms compared to that of the non-certified firms. For example, in the column “-4” (four years before certification), the score is 31 per cent which is calculated by the weighted deviation of the certified firms. This was calculated as 48 multiplied by the number of certified companies in 1998 for fiscal year 1994 (83), plus, 11 multiplied by

the number of certified companies in 1999 for fiscal year 1995 (73). The sum of the previous calculation in then divided by the number of certified companies in 1998 for fiscal year 1994 (83) plus those for 1999 for fiscal year 1995 (73) to give the result of 31.

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