TQM AND PERFORMANCE: IS THE RELATIONSHIP SO OBVIOUS?

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Abstract

The aim of this study is to explore more fully the relationship between total quality management (TQM) and firm performance, taking TQM as an internally consistent system of practices. The paper tests the link between the two variables using the universal approach, analyzes whether the most competitive firms are those adopting TQM, and tests for an isomorphic effect on other firms. The study uses a sample of Spanish firms that have received TQM prizes at the national or regional level between 1997 and 2003 and a control sample for comparison. The findings indicate that in the absence of any evidence to confirm the universal hypothesis, TQM pioneers experience performance gains, because of the early implementation of the system; however, late adopters do not experience similar results. Firms using a TQM system are not necessarily better than their counterparts are, before putting the system into action. One important aspect of the contribution of this study is of a methodological nature, since it uses panel data, which takes into account the unobservable heterogeneity between individuals and the dynamics of firms' financial variables.

Keywords: Total quality management, performance, institutional theory, systemic approach

1. Introduction

Though many researchers consider Total quality management (TQM) to be an important organizational innovation, often authors include TQM among management fads (David and Strang, 2006; Miller, Hartwick and Le Breton-Miller, 2004; Rich, 2008). A great deal of empirical research investigates the relationship between TQM and performance. Some authors find positive results (Anderson, Rungtusanatham and Schroeder, 1995; Choi and Eboch, 1998; Hendricks and Singhal, 1996, 1997, 2001a, b; Shenaway, Baker and Lemak, 2007), others fail to find any significant link (Powell, 1995; Westphal, Gulati and Shortell, 1996) and some even identify an inverse relationship (Davis, 1997). In the light of these findings, numerous authors highlight the need for a deeper investigation of the relationship between TQM and performance and the creation of further bridges between Organizational Theory and TQM (Dean and Bowen, 1994; Hackman and Wageman, 1995; Sila, 2007; Sitkin, Sutcliffe and Schroeder, 1994; Sousa and Voss, 2002; Spencer, 1994; Waldman, 1994).

This study explores the link between TQM and performance from different perspectives. On the one hand, it contrasts the universal approach to the direct relationship between TQM and performance. TQM is almost prescriptive in orientation (Dean and Bowen, 1994) and advocates a universal application to organizations and organizational activities (Sitkin et al, 1994). On the other hand, the study analyzes the cause and effect relationships between TQM and performance, both within and between firms. It tests whether the relationship between TQM and performance is associated with firms, which were already performing better before the implementation of TQM, or whether the relationship is more important for the first firms to put this system into practice.

The most important contribution of this study is of a methodological nature, since it uses panel data, which takes into account the unobservable heterogeneity between individuals and the dynamics of firms' financial variables. Nowadays, any business research must take into account not only cross-section effects but also time effects. This issue is not present in the existing research on TQM, at least as far as the authors are aware. Therefore, the results reported in previous literature are less robust than those achieved in the present study are. The main conclusion emerging from this study is that only early TQM adopters experience performance gains because of TQM implementation. The evidence also suggests that the greatest impact on performance takes place a year after receiving external recognition for implementing the system.

The remainder of the paper follows the next structure: the second section presents the theoretical basis for the study and the hypotheses; the third describes the database; the fourth discusses the methodology and results; and the fifth summarizes the main conclusions.

2. Theoretical framework

2.1. TQM and Performance – the universal approach

One of the basic principles when applying a total quality system is to bear in mind that TQM practices function as an interdependent system that can be combined with other organizational assets to generate competitive advantage (Hackman and Wageman, 1995). Milgrom and Roberts (1990) defended the systemic concept and develop a formal optimizing model of the way in which manufacturing methods that encompass TQM assist firms to maximize their expected profits. Other areas of Management Theory, such as Human Resources, apply the concept of fit or internal consistency (Arthur, 1994; Huselid, 1995; McDuffie, 1995). In the TQM context, the main contributions employing this perspective are those that view TQM as a holistic

construct (Chenhall, 1997; Choi and Eboch, 1998; Douglas and Judge, 2001; Easton and Jarrel, 1998; Hendricks and Singhal, 1996, 1997, 2001a, b; Lai and Cheng, 2005; York and Miree, 2004).

The use of the systemic concept in TQM complicates implementation because the expected outcome depends on the need for a thorough transformation of the firm's management system. Several TQM experts suggest that successful implementation of TQM requires metamorphosis, total change or radical change (Reger, Gustafson, Demarie and Mullane, 1994) and the complete reformation of organizational culture (Olian and Rynes, 1991). The most widely used models at both the theoretical and practical levels are the Malcolm Baldrige, the Deming and the European Foundation Quality Management (EFQM) models, which incorporate the set of TQM constructs most frequently used in the literature (Sousa and Voss, 2002). Given the complexity and pervasiveness of implementing TQM in an organization, it is important to assess the degree of implementation of TQM practices when evaluating the TQM relationship with competitive advantage (Douglas and Judge, 2001). These models also have an accreditation system in which a team of experts assesses the internal consistency or fit between the various factors.

The theoretical arguments, which suggest a link between the implementation of these systems and firm performance, are diverse. York and Miree (2004) note that the arguments gather under two main headings: customer satisfaction (Ahire and Dreyfus 2000; Choi and Eboch, 1998; Hendricks and Singhal, 1996; Omachonu and Ross, 1994; Rust, Zahorik and Keiningham, 1994; Shetty, 1998) and efficiency improvement (Anderson et al, 1995; George and Weimerskirch, 1998; Handfield, Ghosh and Fawcet, 1998; Reed, Lemak and Montgomery 1996). If the firms improve the quality of their products and services then their reputation, customer satisfaction and customer loyalty

will increase too. As a consequence, firms will be able to increase their market share and product prices, and therefore their profits. Firms also achieve efficiency improvement by means of productivity increase, improvement of product design and processes. The development of these activities will make it possible for the company to achieve a reduction in the costs of production and an increase in sales.

Besides, if the usefulness of TQM from the business perspective lies in its potential to achieve and maintain competitive advantage (Powell, 1995) and TQM programs increase the degree to which customers consider their requirements met and organizations improve efficiency, then global and economic measures of organizational effectiveness will improve over the long term (Hackman and Wageman, 1995).

Hypothesis 1: The implementation of a contrasted TQM system leads to an increase in global firm performance.

2.2. Cause-effect in TQM and Performance

When investigating the TQM-firm performance relationship, it is necessary to bear in mind the causal linkages. Most research that finds a positive relationship between TQM and performance establishes causality relationships through cross-section data. Some papers (Hendricks and Signal 1997, 1999, 2001a; Easton and Jarrel, 1998) attempt to analyze the effect of TQM on performance in the long term. However, few studies investigate the causal linkages, that is, whether the increase in performance is a direct consequence of TQM or whether there could be a different reason for explaining the observed relationship. This study explores the cause-effect links from two different points of view to answer two different questions. First, do the best firms adopt a TQM system and therefore do performance differentials pre-exist before TQM implementation? In other words, are the differentials because some of the firms were already better? Second, do early implementers of a contrasted TQM system achieve

more performance gains than late-implementer firms do? In other words, does being the first have consequences for performance?

Causation or covariation

The main argument justifying the first question is that if firms' performance is not analyzed before TQM implementation, it leads to the conclusion that firms have improved their performance as a consequence of this innovation, when actually they could have been performing better than their counterparts before the implementation. In line with this argument York and Miree (2004) consider that if the firms were already better performers, it is possible to establish a covariation relationship between TQM and performance, but not a causal relationship. One theoretical reason that can justify the fact that TQM firms are better is the consideration of TQM as a system. Bearing in mind that TQM practices function as an interdependent system, which requires a radical and complete change of principles and practices, and that a partial change in practices is not effective - as has been defined in the first hypothesis - firms should possess enough economic and human resources to be able to effect the transformation. Very few papers have analyzed this question. York and Miree (2004) find that firms receiving an award already showed a better financial performance than their competitors did before adopting TQM methods. Hansson and Eriksson (2002), in their study of Swedish quality award recipients, find weak differences in the performance of the firms between the implementation period and the post-implementation period. They argue that quality award recipients might have been high-performing companies even before implementation of TQM. **Hypothesis 2: Firms that adopt a TQM system perform better, even before implementation, than those that do not adopt a TQM system.**

Early implementers or late implementers

Institutional Theory (Di Maggio and Powell, 1983; Meyer and Rowen 1977) tries to account for homogeneity between organizations and it can help to answer our second hypothesis. Indeed, a number of authors have used Institutional Theory in the analysis of TQM (Mueller and Carter, 2005; Sila, 2007; Staw and Epstein, 2000; Westphal and Shortell, 1997; Zeitz, Mittal, and McAulay, 1999). Competitive isomorphism describes the tendency of organizations to try to become like those they perceive to be more successful, while "mimetic behavior" refers to a widespread propensity for managers to adopt practices that are already in place in other organizations. A desire to improve performance drives early adopters of organizational innovations, but as innovation spreads, it reaches a threshold beyond which adoptions provide legitimacy rather than improving performance (Meyer and Rowen, 1977). However, strategies that are rational for individual organizations may not be rational if large numbers adopt them (Di Maggio and Powell, 1983).

Under this perspective, Westphal and Shortell (1997), Taylor and Wright (2003) and Benner and Veloso (2008) analyze the relationship between early adopters and performance, arguing that pioneering companies in applying a TQM model can benefit from being the first ones in the market in which they adopt an innovation. Such companies can be the first ones to achieve major levels of customer satisfaction or efficiency improvements, and therefore take advantage of this better situation. In this sense pioneering companies in applying TQM can obtain extraordinary profitability if the competition reacts slowly (Lederer, 1995). Otherwise, competitive isomorphism and mimetic behaviour can explain why late firms adopt this system although they are not the first ones.

Hypothesis 3a: Firms that are early implementers of a contrasted TQM system achieve higher performance gains. Hypothesis 3b: Late implementers do

not see the same performance gains as pioneer firms do from adopting a contrasted TQM system.

3. Database

3.1. TQM implementation

The choice of the variable to measure the level of TQM adoption is a key issue. The literature provides two main options. The first verifies the level of implementation by means of surveys or interviews to gather information about the situation within the firm. Haynek (2003) cites several measures for the level of TQM implementation used in the literature based mainly on surveys. The main drawback associated with this approach is the subjectivity of the respondent who tends to be someone involved in the organization, and whose replies may therefore lack the rigor required to obtain an accurate measure of the variable in question. The other alternative, which the present study adopts, is to use the conferral of a quality award as an indicator of a firm's high level of TQM implementation. There are several reasons to consider the award as a proxy for effective TQM implementation. Two worth mentioning are, first, the criteria for conferring the awards measure the level of implementation of this kind of system, and, second, the quality awarding involves enquiries at several firm levels, to ensure that the winner has effectively succeeded in implementing TQM. For a more detailed explanation of the rationale for the use of this proxy, see York and Miree (2004). One implication of the use of this proxy is that it avoids the bias of asking the company itself to judge the efficiency of its TQM system. Besides, the licensors of prizes exclude financial performance in the selection of the winning companies and they ensure that in their analysis financial information is independent from TQM practices (Hendricks and Singhal, 1997). Nevertheless, the utilization of this proxy has some limitations. For example, the number of prizes and criteria can change throughout the years and

countries, which makes it impossible to compare strictly results of studies. In addition, the use of this variable restricts the results to those winning companies, obviating companies that could have implemented suitable TQM but have not competed for a quality prize.

From an empirical viewpoint, some authors have considered the fact of having gained a quality prize as a variable proxy to measure the suitable implementation of a TQM system and analyze the relationship between implementation and company performance. Hendricks and Singhal (1996, 2001b) find that the market price of the companies increases on having gained a prize and Adams, McQueen and Seawright (1999) obtain similar results only for winners of Malcolm Baldrige awards. More related to our study, Hendricks and Singhal (1997, 2001a) and Easton and Jarrell (1998) explore the impact of TQM's effective implementation on the operative performance of the companies and state that companies that gained quality awards improve their performance. York and Miree (2004) question the assertion that winning companies improve their performance with the implementation of these systems and argue that such companies experience better performance before and after gaining the prize.

In Europe, the benchmark for firms with a high level of TQM implementation is being the recipient of EFQM awards. This study uses a sample of Spanish firms that have received TQM prizes awarded at the national or regional level related to EFQM. Detailed information about the prizes is available at www.centrosdeexcelencia.com. Applicants' quality reports are evaluated by committees of experts from the awarding bodies. The experts have recognized prestige and wide experience in the evaluation of TQM. The awarding bodies grant the prizes to companies that have obtained the number of points previously set out in the criteria for the evaluation of TQM. The criteria are related to leadership, customer focus, process management and employee

involvement. This process guarantees that the company receiving the award has a suitable level of TQM implementation.

For the purposes of this research, the firms selected are those that obtained one of these distinctions between 1997 and 2003. The analysis focuses on the period 1994 to 2006, thus enabling us to observe these firms for a number of years before and after receiving an award.

In order to prevent problems relating to sampling selection and achieve consistent results, the study assembles a sample of control firms with a view to drawing comparisons between these and the award-winning firms. The control sample pairs each award-winning firm with a group of firms of the same size and sector, and with sufficient available financial data. Although some authors use only one control firm, from a statistical perspective using all of the firms in the industry reduces the potential variability that could arise from choosing single firm. The grouping by sectors uses the four-digit SIC code. The analysis employs the book value of assets as the variable to control for size. When a control group of firms of the same size does not exist, the study uses 2-digit SIC code. Under these constraints, for some winners, only there exist nine control firms and so, this is the number selected for each winner to maintain the same criteria. Therefore, the sample contains 80 award-winning firms and 720 control firms. Information on both sets of firms was drawn from the Spanish financial database *Sistema de Análisis de Balances Ibéricos* (SABI).

3.2. Performance

The analysis requires a firm performance measure. Some studies analyze the effect of TQM in global measures of performance such as share market value and firm profit (Narver and Slater, 1990; Nicolau and Sellers, 2009; Sterman, Repenning and Kofman, 1997; Rust et al, 1994). Many other papers use financial as well as non-

financial performance (Powell, 1995; Curkovic, Vickery and Dröge, 2000). Chakravarthy (1986), Zhu (2000) or Martínez-Costa, Choi, Martínez and Martínez-Lorente (2009) among others, indicate that company performance is a complex phenomenon requiring more than a single criterion to characterize it. In fact, the literature recognizes that performance is a construct that covers diverse intentions and levels inside the organization. Following Chakravarthy (1986), this study considers several measures of performance that are useful to capture the excellence of a company. Specifically, the four routes of performance analyzed are profitability, productivity, the ability to raise long-term capital resources and the firm's investment in its future. Profitability is a common indicator of performance. The return on assets (ROA), the cash flow by investment ratio (CFOI) and the return on sales (ROS) measure this dimension. These variables include indicators such as sales or the cost of sales. Garvin (1984) and Sousa and Voss (2002) argue that they cover the two main routes for the effect of quality on business performance: the manufacturing route and the market route. Productivity is another important way to weigh up the capacity of the company and relates to company efficiency. Labor productivity is measured by the added value per employee (AVOE) and capital productivity by sales revenue per total assets (SOA). Firms' ability to raise long-term capital resources is measured by the debt to equity ratio (DOE). Bourgeois (1981) also proposes the market-to-book ratio, but the database does not include this information. Finally, the firm's investment in its future is measured by the working capital to sales ratio (WOS) as Bourgeois (1981) suggests. Alternative variables, such as the percentage of its sales revenues allocated to R&D expenses and the increases in the capital expenditure to sales ratio, are not available.

4. Method and Results

4.1. TQM and Performance

As already indicated in the theoretical framework, the universal hypothesis states that contrasted TQM system implementation leads to an increase in firm performance. In order to weigh up this issue, that is, the potential changes in the performance of firms with total quality systems, we estimate the following general model:

$$Performance_{i,t} = \beta_0 + \beta_1 Performance_{t-1} + \beta_2 (Size)_{it} + \beta_3 D_{it} + \varepsilon_{it} \quad (1)$$

where $Performance_{i,t}$ captures the performance measures considered in the study of firm i in year t (ROA, CFOI, ROS, AVOE, SOA, DOE and WOS). In order to include dynamic performance indicators, the model introduces one-period lagged performance, where parameter β_1 measures the level of performance persistence. The value of assets (log) is used as a proxy for firm size. To prevent problems in the estimation, this variable is included as an additional explanatory variable only when it is not included in the performance measure (ROS, AVOE, DOE and WOS). Finally, the model includes a dummy variable that takes different values according to the model used. Given the uncertainty as to the exact moment at which the implementation of the quality system makes its impact on firm performance, we estimate three different models. Thus, model 1 includes $CYD_{it,}$ a dummy variable that takes a value of 1 for award-winning firms the year they receive the TQM award and zero otherwise. Model 2 includes $PYD_{it,}$ a dummy variable that takes a value of 1 for award-winning firms the year prior to winning the TQM award and zero otherwise. Finally, model 3 includes $FYD_{it,}$ a dummy variable that takes a value of 1 for award-winning firms the year after they receive the TQM award and zero otherwise.

The choice of appropriate methodology to achieve our objectives is vital to the robustness of the results. This study employs the panel data methodology, for several reasons. Firstly, it is able to incorporate the dynamic features of the variable under

analysis. In addition, it controls for individual heterogeneity by introducing the unobserved individual effect, η_i, while also incorporating heterogeneity through time, μ_t, in order to control for macroeconomic effects on firm profitability. Therefore, $\varepsilon_{i,t}$, which is the error term for the firm i observed over t periods has three components: the individual effect, η_i, the time effect, μ_t, and random disturbance, v_t.

The estimation of the dynamic model is carried out using a two-step generalized method of moments (GMM, Hansen, 1982) that provides a consistent and efficient estimator (Arellano and Bond, 1991) to address potential endogeneity in the model. The instruments are the lags of the dependent variable from t-2 and the lags of the independent variables from t-1. Sargan's statistic tests instrument validity. Sargan's over-identification test follows a chi-square distribution with degrees of freedom equal to the number of over-identifying restrictions.

In order to eliminate individual effects, and given that η_i may be correlated with the remaining variables, we apply first differences of the variables and the model obtained is estimated using the error correction procedure proposed by Windmeijer (2005) for small samples. The tests m(1) and m(2) - serial correlation tests for order 1 and 2, respectively - have been calculated using residuals in first differences. The tests are asymptotically distributed as N(0,1) under the null hypothesis of no serial correlation and the m(2) statistic is calculated following Arellano and Bond (1991). In addition, two Wald's statistics - z_1, for the joint significance of the model coefficients, and z_2, for joint significance of the time dummies - have been estimated. Both statistics are asymptotically distributed as a chi-square under the null hypothesis of no joint significance. All estimations were performed using STATA/SE 10.

Table 1 here

Table 1 presents the estimates of all three models used to test *hypothesis 1* on the full sample and on all performance measures. The table only includes the coefficients for the dummy variables representing the moment of the award (the study variable), the year of winning the award, the previous year and the later year, m(2) and the Sargan test. For the sake of clarity, the table omits the coefficients of the other variables and the other tests.

A general observation shows that the results can be generalized for all the considered measures of performance. It is worth noting that all three models yield the same conclusions with respect to the study variables. Whether the results focus on the year of the award, the year before, or the year after, the performance of award-winning firms does not visibly change. The results suggest that the implementation of a TQM system has no significant effect on firm performance. They do not therefore support hypothesis one. This finding stands in contrast to the results of Hendricks and Singhal (1997, 2001a) and York and Miree (2004), the studies which best lend themselves to comparison with the present study, since they use the conferral of a TQM award as a proxy for the effective implementation of a quality system. One possible explanation for the divergence of the findings is the methodology used in this study, since the use of panel data analysis enables us to take into account certain effects that other methods do not consider, although that might affect the results.

4.2. Cause-effect analysis

Hypothesis 2 tests whether firms with high levels of TQM adoption (proxied by a quality award) are already performing better than the rest, even before implementing the system. Table 2 shows performance averages for both the award-winning and the control firms.

Table 2 here

These data span the period from three years prior to winning the award to three years afterwards. We found significant differences between the winning firms and the control from year one for the ROA, CFOI, ROS and VAOE variables. Additionally, the variable ROA shows significant differences at the 10% level for one year and two years before receiving the award. Provided that only one of the performance variables shows superior values before and after the implementation, it is not possible to state that there are significant differences in performance between the winning firms and the control; so hypothesis 2 is partially confirmed.

Hendricks and Singhal (1997) argue that a TQM program takes an average of 2.5 years to implement and to yield its first benefits. Thus, firms will probably have already been developing their TQM system in the years prior to winning a TQM award. During that time, the company has to assume some costs to carry out the implementation and, consequently, face reduced profits. Furthermore, the return on this kind of investment in organizational innovation and human capital will tend to be of a long-term nature. These arguments can explain increases in performance differentials after the first year.

Hypotheses 3a and b determine whether the early implementers and late implementers increase their performance by adopting a contrasted TQM system. Early-implementer firms are those that adopt the model before its wide diffusion, while late-implementer firms are those that take up the model later. These firms, as advanced in the theoretical framework, may have different motives for adopting such a system. The question is therefore whether pioneer TQM adopters experience significant performance

gains and whether late adopters observe this effect too. Equation (1) tests for variation in firm performance levels following TQM implementation for the early-adopter firms and their late-adopter counterparts. The pioneer sample groups firms that won the award in 1997, 1998, 1999 and 2000, together with their corresponding control sample, and the late-implementer sample groups those that won it in 2001, 2002 and 2003, also with their control sample.

Table 3 here

Table 3 shows the results for the firms classed as TQM pioneers, based on the year they won the award. The coefficients of the dummy variables associated with the hypothesis to test vary across the different models and across the different performance measures. A common result was obtained for all the measures of performance: whether the dummy variable is the year of the award or the year before, the difference in performance among the award-winning firms is not significantly different from other years. However, if the dummy variable is the year after the award (model 3), the results change. Pioneer TQM award winners, that is, the leaders in adopting such systems, present significant performance gains, which emerge the year after receiving external recognition for their effort. Therefore, the positive impact, rather than being immediate, becomes apparent only in the long term. ROA, CFOI, ROS, VAOE and DOE improve significantly the year after the award and SOA and WOS do not change. These results show that TQM implementation improves the firm's performance, though not in all the components that can characterize the firm's excellence. The most visible results centre on the measures of profitability, labor productivity and the ability of the firm to raise long-term capital resources. These variables are related to the two routes that TQM

models use to improve firm performance: customer satisfaction and efficiency. There are not significant differences in the dimensions of the firm's investment in its future and capital productivity. The results could be explained because these variables are more related to the firm's innovation ability and the relationship between TQM and innovation is not so evident (Perdomo-Ortiz; González Benito and Galende, 2009).

Table 4 here

Table 4 shows the results of the second segment, that is, those firms that won a quality award in the second part of the sample period. The coefficients on all the dummy variables associated with the period when the firm wins the award are not significant in all models and performance measures. In some of these models, the Wald test rejects the hypothesis of joint significance of the time dummies. The results still hold after re-estimating the model without the time dummies (the results are available from the authors upon request). Nevertheless, the estimates of the model with the time dummies are given here, in order to maintain consistency with those presented previously.

Therefore, our findings confirm that those firms that lead the field in the adoption of this management-changing decision actually gain in performance. The performance levels of late-implementer firms, by contrast, show no such improvement. This result is similar to that obtained by Westphal and Shortell (1997), Taylor and Wright (2003) and Benner and Veloso (2008).

Finally, turning the focus to the group of pioneer firms, where clear performance improvements take place following the implementation of their total quality systems, this study analyzes whether such performance gains are due to the superior ability of

award-winning firms versus non-award winners and, if so, whether their superior ability exists before winning the award. In a complementary direction, the study also considers what happens with late-adopter firms. In this way, *Hypotheses 2* and *3* are combined.

Table 5 here

Table 5 shows the differences in means between the pioneer award-winning firms and the control firms. The results indicate that the differences become significant from year 1 onwards for some of the variables used to measure performance, ROA, CFOI, ROS, AVOE and DOE. In other words, pioneer award-winning firms perform better than the rest after obtaining the prize; therefore TQM improves the performance of the former and distances them from the latter.

Table 6 here

The results relating to the performance of the late-implementer firms are given in Table 6 and they show that late TQM adopters do not present better performance levels than the control firms and therefore TQM adoption does not necessarily lead to performance improvement, in either absolute or relative terms. These results imply that later adopters are not necessarily in a better position than their competitors are either before winning the prize or afterwards. The tendency of some firms to imitate successful companies and to act without evaluating the suitability of the conditions or the timing can explain this result. In addition, as suggest Hendricks and Singhal (2001b), winning quality awards can also be viewed as a credible a low-cost mechanism to signal to the market and customer that the firms have implemented an effective TQM

program. This questions, up to a point, the usefulness of the indiscriminate use of these improvement systems.

5. Conclusions

Following TQM as a global business management system, firms apply a set of principles and practices in order to obtain a competitive advantage. Much research has been carried out on the impact of the various TQM practices on firm performance. The present study, however, uses a systemic approach. For the system to function effectively, the firm's organizational culture must undergo a global change, involving the introduction of a set of principles and practices. This study analyzes the TQM-performance relationship from the universal approach and examines the cause-effect relationship between TQM and performance within and between firms. It addresses the question of whether TQM-adopting firms are already more efficient before deciding to introduce this organizational innovation into their management framework. It also explores two further issues. The first is whether pioneer firms adopt this organizational innovation as a means to gain competitive advantage. The second is whether there is an isomorphic effect among other firms. This effect could be due to the success and relevance of TQM in the business world, or to the wide publicity and advertising given to cases where the introduction of the system has resulted in competitive advantage for the firm in question.

Our most important contribution is the use of panel data. This approach allows for unobservable individual heterogeneity and controls for possible macroeconomic effects on firm performance, which increases the robustness of the results.

The main conclusions emerging from this study cast doubt on previous research findings that claim that the implementation of this type of management system invariably leads to performance gains. Our results are consistent with studies that

question the universal view of TQM and signal the need to include more factors in the analysis. Only pioneer TQM adopters experience performance gains because of implementation and present a higher average performance level than the control firms. This finding confirms that a desire to improve performance often drives early adopters of organizational innovations. The evidence also suggests that the greatest impact on performance takes place a year after receiving external recognition for implementing the system. This implies a long-term effect, taking into account that the firms fully develop the system after an interval of at least two years before receiving the award.

The firms defined as late implementers, however, experience no performance gains and their average performance level is no higher than that of their control sample. Therefore, as the adoption of these systems becomes more widespread, TQM adopters fail to adapt the system to their own idiosyncrasy and organizational inertia motivates its adoption. In such cases, it appears that TQM adoption simply helps them to maintain their attained level of performance but not to improve their results.

Our findings indicate that, prior to full implementation of the system, TQM adopters overall show a higher performance level than the control sample on only one of the variables that measure performance, that is, ROA. Therefore, in general, the results do not support the assertion that companies were better before TQM adoption.

These findings may help firms to decide to what extent this kind of firm management improvement is worth adopting and to calculate the associated costs, in the awareness that the results are neither immediate nor equal across early and late adopters. The latter should rethink before carrying out investments that incur an extra cost if they do not achieve an increase in financial performance. The aura created around these systems does not seem to have real effects in the late-winning companies. Nevertheless, many companies develop these systems in the expectation of some other benefits, such

as supporting the image of the company and improvement in employee satisfaction (Yang, 2006).

Finally, this study provides public and private institutions with some useful guidelines for the planning of future actions to promote the adoption of these management systems. As far as possible, public institutions should control the utilization of public funds, promoting only activities that are innovative, and analyzing whether some implementations are only fads of the moment, without real repercussions. In addition, managers should consider whether it is worth involving the company in the whole process of competing for a quality prize with the aim of increasing its performance and devise alternative methods to implement improvements through quality or other innovations.

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Table 1. GMM estimation results. Whole sample.

	ROA	CFOI $*10^{-2}$	ROS $*10^{-2}$	AVOE $*10^{-3}$	SOA $*10^{-2}$	DOE	WOS $*10^{-3}$
Model 1							
β_{CYD}	-0.01	-0.50	-0.63	-0.22	-0.58	0.54	-0.21
(p-value)	(0.99)	(0.32)	(0.29)	(0.31)	(0.11)	(0.51)	(0.61)
m_2	-0.43	1.49	1.31	1.34	1.60	-1.18	-1.31
(p-value)	(0.66)	(0.13)	(0.19)	(0.18)	(0.12)	(0.23)	(0.19)
Sargan(df)	23.38 (26)	29.43 (24)	32.28 (25)	46.72 (37)	23.41 (26)	33.56 (37)	18.87 (27)
(p-value)	(0.62)	(0.20)	(0.15)	(0.13)	(0.61)	(0.63)	(0.87)
Model 2							
β_{PYD}	0.38	0.57	0.44	0.16	0.29	-0.74	0.04
(p-value)	(0.30)	(0.33)	(0.38)	(0.47)	(0.36)	(0.59)	(0.87)
m_2	-0.43	1.48	1.31	1.34	1.59	-1.18	-1.31
(p-value)	(0.66)	(0.14)	(0.19)	(0.18)	(0.12)	(0.23)	(0.19)
Sargan(df)	24.44 (26)	29.38 (24)	32.21 (25)	47.18 (37)	23.57 (26)	34.07 (37)	18.71 (27)
(p-value)	(0.55)	(0.21)	(0.15)	(0.12)	(0.60)	(0.60)	(0.88)
Model 3							
β_{FYD}	-0.02	0.29	0.32	0.02	0.28	-0.63	0.41
(p-value)	(0.96)	(0.57)	(0.48)	(0.91)	(0.29)	(0.41)	(0.52)
m_2	-0.43	1.48	1.32	1.34	1.60	-1.18	-1.31
(p-value)	(0.66)	(0.14)	(0.19)	(0.18)	(0.12)	(0.23)	(0.19)
Sargan(df)	23.67 (26)	29.51 (24)	32.32 (25)	47.00 (37)	24.02 (26)	33.40 (37)	18.73 (27)
(p-value)	(0.59)	(0.20)	(0.15)	(0.13)	(0.57)	(0.63)	(0.88)

Table 2. **Mean percent in performance. Whole sample.** Differences between the performance of the winners and their respective controls.

* significant at 10%

** significant at 5%

*** significant at 1%

		Years						
Mean		**-3**	**-2**	**-1**	**0**	**1**	**2**	**3**
ROA	Winners	4.65	6.00	6.52	5.86	5.87	5.33	4.94
	Controls	4.53	4.34	5.15	5.12	3.95	3.33	3.35
	t-value	0.14	1.88*	1.8*	1.19	2.82***	2.46**	1.83*
CFOI	Winners	0.10	0.08	0.09	0.08	0.10	0.10	0.11
	Controls	0.09	0.07	0.08	0.08	0.09	0.09	0.09
	t-value	0.15	0.70	0.52	0.29	2.01**	1.97**	2.01**
ROS	Winners	0.12	0.08	0.06	0.04	0.16	0.09	0.07
	Controls	0.05	0.05	0.05	0.04	0.04	0.04	0.05
	t-value	0.75	1.30	0.63	0.06	1.97*	1.56	1.35
AVOE	Winners	65349	68030	60667	53559	60683	62779	61751
	Controls	50200	58147	56455	44786	47979	46583	45963
	t-value	1.60	1.10	0.53	-0.37	1.95**	1.98**	1.89**
SOA	Winners	1.51	1.32	1.22	1.34	1.35	1.33	1.20
	Controls	1.49	1.18	1.21	1.32	1.40	1.41	1.19
	t-value	0.14	1.03	0.14	0.30	-0.43	-0.82	0.09
DOE	Winners	64.41	61.99	60.75	59.75	58.32	57.72	55.21
	Controls	64.70	63.58	62.94	61.98	61.90	60.99	60.50
	t-value	-0.13	-0.68	-0.94	-1.01	-1.52	-1.27	-1.57
WOS*10^2	Winners	0.20	0.04	0.91	0.05	0.58	0.08	0.03
	Controls	0.05	0.15	1,03	0.06	0.20	0.03	0.03
	t-value	1.03	-0.81	-0.16	-0.73	0.72	1.12	0.29

Table 3. GMM estimation results. Early adopter firms

	ROA	CFOI $*10^{-1}$	ROS $*10^{-2}$	AVOE $*10^{-3}$	SOA $*10^{-2}$	DOE	WOS $*10^{-3}$
Model 1							
β_{CYD}	0.26	-0.04	-0.09	-0.12	-0.17	-0.91	0.01
(p-value)	(0.65)	(0.51)	(0.20)	(0.47)	(0.58)	(0.70)	(0.21)
m_2	1.20	1.06	1.24	0.04	0.99	-0.96	-0.25
(p-value)	(0.22)	(0.28)	(0.21)	(0.96)	(0.32)	(0.34)	(0.80)
Sargan(df)	27.05 (20)	22.78 (18)	27.06 (20)	20.70 (19)	21.58 (20)	11.60 (19)	12.14 (14)
(p-value)	(0.13)	(0.20)	(0.13)	(0.35)	(0.36)	(0.90)	(0.58)
Model 2							
β_{PYD}	0.94	-1.24	-0.02	0.18	-0.19	-2.11	-0.01
(p-value)	(0.20)	(0.32)	(0.75)	(0.17)	(0.64)	(0.50)	(0.48)
m_2	1.20	1.00	1.24	0.03	1.00	-0.96	-1.06
(p-value)	(0.23)	(0.37)	(0.21)	(0.97)	(0.32)	(0.34)	(0.28)
Sargan(df)	27.43 (20)	21.52 (17)	27.44 (20)	20.91 (19)	22.12 (20)	11.73 (19)	21.64 (19)
(p-value)	(0.12)	(0.20)	(0.12)	(0.34)	(0.33)	(0.90)	(0.30)
Model 3							
β_{FYD}	0.97	0.12	0.10	0.20	0.27	-1.79	-0.02
(p-value)	(0.06)	(0.03)	(0.09)	(0.09)	(0.41)	(0.08)	(0.18)
m_2	1.29	1.11	1.24	0.04	0.99	-0.93	-0.24
(p-value)	(0.20)	(0.26)	(0.21)	(0.96)	(0.32)	(0.35)	(0.81)
Sargan(df)	27.10 (20)	23.05 (18)	27.25 (20)	21.23 (19)	21.77 (20)	24.81 (20)	21.76 (20)
(p-value)	(0.13)	(0.19)	(0.13)	(0.32)	(0.35)	(0.21)	(0.35)

Table 4. GMM estimation results. Late adopter firms.

	ROA	CFOI $*10^{-2}$	ROS $*10^{-2}$	AVOE $*10^{-3}$	SOA $*10^{-2}$	DOE	WOS $*10^{-3}$
Model 1							
β_{CYD}	0.36	0.01	0.02	-0.12	-0.76	-0.20	-0.57
(p-value)	(0.73)	(0.96)	(0.63)	(0.47)	(0.15)	(0.83)	(0.49)
m_2	-1.31	-1.34	0.71	0.04	1.23	-1.23	-1.08
(p-value)	(0.19)	(0.18)	(0.48)	(0.96)	(0.22)	(0.22)	(0.28)
Sargan(df)	19.59 (14)	12.52 (14)	12.13 (14)	20.70 (19)	8.63 (14)	19.76 (14)	20.13 (21)
(p-value)	(0.15)	(0.56)	(0.59)	(0.35)	(0.85)	(0.14)	(0.51)
Model 2							
β_{PYD}	0.65	0.09	-0.02	0.18	0.35	0.04	0.63
(p-value)	(0.36)	(0.19)	(0.63)	(0.17)	(0.51)	(0.95)	(0.42)
m_2	-1.30	-1.34	0.71	0.03	1.21	-1.23	-1.08
(p-value)	(0.19)	(0.18)	(0.48)	(0.97)	(0.22)	(0.22)	(0.28)
Sargan(df)	19.35 (14)	12.95 (14)	12.16 (14)	20.91 (19)	8.62 (14)	19.79 (14)	20.67 (21)
(p-value)	(0.16)	(0.55)	(0.59)	(0.34)	(0.85)	(0.14)	(0.48)
Model 3							
β_{FYD}	-0.84	-0.09	0.01	0.20	0.01	0.13	0.00
(p-value)	(0.39)	(0.36)	(0.95)	(0.11)	(0.99)	(0.87)	(0.98)
m_2	-1.31	-1.34	0.71	0.04	1.22	-1.22	-1.08
(p-value)	(0.19)	(0.18)	(0.47)	(0.96)	(0.22)	(0.22)	(0.28)
Sargan(df)	19.46 (14)	12.55 (14)	12.93 (14)	21.23 (19)	8.51 (14)	19.65 (14)	20.64 (21)
(p-value)	(0.15)	(0.56)	(0.60)	(0.32)	(0.86)	(0.14)	(0.48)

Table 5. Mean percent in performance. Differences between the performance of the early winners and their respective controls.

* significant at 10%

** significant at 5%

*** significant at 1%

		Years						
Mean		-3	-2	-1	0	1	2	3
ROA	Winners	4.14	5.92	6.67	6.32	6.66	5.83	5.15
	Controls	4.51	4.68	5.40	5.74	4.38	4.02	2.85
	t-value	-0.32	1.14	1.31	0.80	2.77***	2.15**	2.32**
CFOI	Winners	0.11	0.08	0.09	0.08	0.11	0.10	0.12
	Controls	0.10	0.08	0.09	0.08	0.09	0.09	0.09
	t-value	1.11	0.15	0.29	0.00	1.97**	1.85*	2.16**
ROS	Winners	0.03	0.08	0.06	0.05	0.08	0.07	0.07
	Controls	0.04	0.05	0.05	0.04	0.05	0.04	0.05
	t-value	-0.21	1.04	0.91	0.58	2.01**	2.23**	2.34**
AVOE	Winners	57978	83025	67522	47093	69028	66485	68586
	Controls	51206	65263	58774	46947	45626	43254	41650
	t-value	0.90	1.31	0.80	0.03	1.97**	1.82*	1.93*
SOA	Winners	1.37	1.33	1.21	1.25	1.31	1.29	1.11
	Controls	1.40	1.20	1.20	1.24	1.33	1.35	1.12
	t-value	-0.15	0.72	0.07	0.05	-0.16	-0.49	-0.04
DOE	Winners	62.97	59.57	58.18	57.95	56.06	56.15	55.87
	Controls	65.25	62.48	61.40	60.86	61.66	61.37	60.46
	t-value	-0.75	-0.93	-1.11	-1.10	-2.02**	-1.89*	-1.82*
WOS*10^2	Winners	0.04	0.05	0.70	0.05	0.93	0.10	0.03
	Controls	0.03	0.05	0.68	0.08	0.31	0.02	0.03
	t-value	0.73	-0.12	0.03	-0.77	0.72	1.17	-0.02

Table 6. Mean percent in performance. Differences between the performance of the late winners and their respective controls.

* significant at 10%

** significant at 5%

*** significant at 1%

		Years						
Mean		-3	-2	-1	0	1	2	3
ROA	Winners	5.63	6.15	6.24	4.95	4.37	4.32	4.26
	Controls	4.55	3.69	4.65	3.90	3.09	1.97	4.82
	t-value	0.78	1.61	1.27	0.92	1.08	1.35	-0.31
CFOI	Winners	0.08	0.05	0.07	0.08	0.10	0.08	0.09
	Controls	0.09	0.07	0.09	0.09	0.08	0.10	0.09
	t-value	-0.32	-1.47	-1.04	-0.54	1.24	-1.11	0.29
ROS	Winners	0.24	0.07	0.04	0.03	0.31	0.01	0.07
	Controls	0.05	0.04	0.04	0.04	0.04	0.05	0.05
	t-value	0.85	0.75	-0.05	-1.69	1.19	-1.45	1.01
AVOE	Winners	76071	44289	49527	38005	63359	52871	51010
	Controls	48636	46583	52846	41425	51378	51820	52671
	t-value	1.32	-0.39	-0.32	-0.73	1.03	0.11	-0.19
SOA	Winners	1.71	1.30	1.24	1.49	1.42	1.39	1.34
	Controls	1.63	1.16	1.22	1.44	1.52	1.51	1.31
	t-value	0.21	0.76	0.14	0.39	-0.43	-0.69	0.16
DOE	Winners	66.50	65.55	64.61	62.63	61.78	61.41	52.66
	Controls	63.84	65.28	65.34	63.71	62.26	60.31	64.27
	t-value	0.76	0.08	-0.19	-0.29	-0.12	0.20	-1.78
WOS*10^2	Winners	0.46	0.03	1.23	0.04	0.04	0.04	0.05
	Controls	0.08	0.31	1.56	0.04	0.04	0.04	0.04
	t-value	0.99	-0.79	-0.28	0.27	-0.60	-0.40	0.53