

Contents lists available at [ScienceDirect](#)

Journal of High Technology Management Research



Quality standards and export activities: Do firm size and market destination matter?

Sanja Pekovic^{a,*}, Sylvie Rolland^b

^a University of Montenegro, Cetinjska 4, 81000, Podgorica, Montenegro

^b Dauphine Recherches en Management (DRM), Université Paris-Dauphine, PSL Research University, Paris, Place du Maréchal de Lattre de Tassigny, 75016 Paris, France

ARTICLE INFO

Available online xxxx

Keywords:

Quality standards
Export activities
Firm size

ABSTRACT

Using original data from French firms, this study explores the relationship between quality standards and four indicators of export activities: the logarithm of exports per employee, the logarithm of exports per employee destined for EU countries, the logarithm of exports per employee destined for non-EU countries, and the share of exports of total sales. The results indicate that the sign of the relationship between quality standards and export activities is positive and statistically significant for all four indicators, supporting the view that quality standards provide information on the general capability of a firm to meet the quality expectations of customers and thus make unobservable characteristics more public. Moreover, we examine whether the quality standards–export activities relationship is firm size dependent. The findings indicate that while quality standards improve the logarithm of exports per employee and the logarithm of exports per employee destined for non-EU countries for all categories of firm size, they do not influence logarithm of exports per employee destined for EU countries among large and small firms. Additionally, the effect is insignificant for the share of exports of total sales when we look at the medium size firms.

© 2016 Elsevier Inc. All rights reserved.

1. Introduction

The significant recognition of Quality Standards (QS) over the last several decades has emerged as a response to dramatic changes in the business environment following privatization, globalization and severe competition. Quality standards such as ISO 9000 certification imply changes in routines, processes and managers' and employees' roles that transform the complete organization (Mejia-Morelos, Grima, & Trepo, 2013). The premise of quality standards is based on improving an organization's efficiency through high-level coordination of its activities in a rationalized system of end-to-end processes, which includes every aspect of firm performance (Benner & Tushman, 2002). In this sense, changes imposed by quality standard implementation provide the necessary meta-framework to eliminate organizational failures and develop routines that stimulate various profitable improvements (Grolleau, Mzoughi, & Pekovic, 2012). The literature has paid particular attention to the relationships between quality standards and financial performance (e.g., Kaynak & Hartley, 2005), operational performance (e.g., Lo, Yeung, & Cheng, 2008), innovation performance (e.g., Pekovic & Galia, 2009) and customer satisfaction (e.g., Singh, 2008).

In spite of this burgeoning interest in quality standards, there has been very little research on the impact of quality standards on firm export activities, even though exports play a critical role in firm survival. We believe that adoption of quality standards could help firms to respond to new challenges and pressures imposed by market actors and regulation in the context of firm export activities. In this sense, the rationale for positive link could be based on the fact that if the quality level of firms is unobservable, quality standards can provide

* Corresponding author.

E-mail addresses: psanja@ac.me (S. Pekovic), sylvie.rolland@dauphine.fr (S. Rolland).

information on the general capability of a firm to meet the quality expectations of customers (especially those located abroad) and thus make unobservable characteristics more public (e.g., Grolleau et al., 2012; Pekovic, 2010). Moreover, the International Trade Center (2005) highlights the important role of quality standards for export competitiveness. As indicated by Yeung and Mok (2005), international standards (such as the ISO 9000 standard) help to prevent unnecessary barriers to international trade. In order to explore this important issue, we empirically examine if the quality standards are positively associated with higher exports. We use two databases named Organizational Changes and Computerization survey (COI, 2006) and the Annual Firm Survey (EAE, 2007). Employing these two databases allows us to work on a larger representative sample of French firms and so control for a very detailed set of firm characteristics and features in order to properly isolate the effects of the quality standards on different forms of firm export activities—such as the logarithm of exports per employee, the logarithm of exports per employee destined for EU countries, the logarithm of exports per employee destined for non-EU countries, and the share of exports of total sales—to address reverse-causality issues and to correct for the potential selection bias. Moreover, the few studies (e.g., Volpe Martincus, Castresana, & Castagnino, 2010; Potoski & Prakash, 2009) that have carried out the analysis are mainly focused on the impact of quality standards on exports regardless of firm size, or only focus on large firms, and so almost completely neglect the role of quality standards in small and medium firms. Nevertheless, the strategies employed by the small and medium enterprises (SMEs) to enter international markets may be quite different from those employed by the larger firms (Ogbuehi & Longfellow, 1994). Therefore, examining the impact of quality standards in SMEs contributes to the debate about whether new management practices (such as quality standards) tested in large firms can be beneficial to small and medium firms because SMEs should not be considered as a smaller model of large firms. Actually, adoption of quality standards in SMEs presents a deep transformational process that implies defining and specifying concrete objectives, functions, and work methods (Mejia-Morelos et al., 2013). However, since the financial and human resources constraints are usually a strong argument against implementation of management practices in small and medium firms, establishing a positive link between quality standards and export activities could have significant practical implications, especially if we consider that SMEs present more than 95% of enterprises in the OECD nations. Moreover, SMEs account for almost 60% of private sector employment, make a large contribution to innovation and support regional development and social cohesion (OECD, 2005).¹ For instance, SMEs represent 99.8% of the French firm population.² Furthermore, in the global environment, SMEs are aware that they cannot operate only in their local markets. In addition, working on French firms is appealing since the French trade balance showed a growing trade deficit in 2006 (Koenig, Mayneris, & Poncet, 2010). Therefore, the demand for policies that encourage exports underlines the need for further empirical analyses that explain the nature of the relationships between quality standards, export activities and firm size. In this sense, further understanding could provide policy-makers with consistent clues. Consequently, the objective in this study is to examine whether the impact of quality standards on different forms of firm export activities is related to firm size in the specific context of France.

In the next section, we introduce a conceptual model of the link between quality standards and firm export activities and introduce our hypotheses. The third section describes the data and model, the fourth section reports the results, and a final section offers some concluding remarks and suggestions for practice.

2. Research background and hypotheses

2.1. Quality standards and export activities

In the export market there are information imperfections about quality that cause consumers to practice discrimination against imports from certain countries or organizations (Kumar Das & Bandyopadhyay, 2003). This information asymmetry about quality attributes is generally more important when agents evolve in different institutional environments (distinguished on geographical, cultural and linguistic bases) (King, Lenox, & Terlaak, 2005) or when the quality level of firms stays unobservable for customers. The initial introduction of quality standards aims at harmonizing diverse regulatory environments by creating uniform standards and by sharing product safety regulations (Anderson, Daly, & Johnson, 1999). Furthermore, policy-makers have used the ISO 9000 standard to define minimum quality standards in situations where the probability of market failure has made regulatory intervention appropriate (Anderson et al., 1999). From a signaling perspective, quality standards can provide information on the general capability of a firm to meet the quality expectations of customers and thus make unobservable characteristics more public (Pekovic, 2010; Grolleau, Mzoughi, & Pekovic, 2007; Spence, 1973). Since buyers face high transaction costs in identifying quality exporters, quality standards could help to reduce information costs and thereby make it easier to conclude transactions or to establish inter-firm buyer–seller relationships (Volpe Martincus et al., 2010; Potoski & Prakash, 2009; Clougherty & Grajek, 2008; Terlaak & King, 2006). Therefore, internationally recognized certification such as the ISO 9000 standard may play a strong role in signaling unobservable characteristics and generating customer trust (Pekovic, 2010). In other words, as indicated by Withers and Ebrahimpour (2000) ISO 9000 certification has positive impacts on the dimensions of quality from which a firm improves its ‘public signals’. In addition, quality standards can alleviate problems of information asymmetries due to its common-language and conflict-setting properties (Spickernell, 1986; Clougherty & Grajek, 2008; Terlaak & King, 2006; Guler, Guillen, & Macpherson, 2002). Moreover, several papers confirm empirically the positive relationship between quality standards and firm export activities. For instance, using a unique firm-level dataset for Argentina over the period 1998–2006, Volpe Martincus et al. (2010) find that ISO 9000 certification is associated with increased exports along the extensive margin — primarily in terms of destination countries. Based on analyses of a panel of 140 countries from 1994 to 2004, Potoski and Prakash (2009)

¹ OECD SME and Entrepreneurship Outlook 2005 Edition.

² <http://www.insee.fr>

find that ISO 9000 certification levels are associated with increases in countries' bilateral exports, particularly developing countries' exports. Additionally, the literature argues that there may be significant efficiency gains in the form of reduced trade costs from operating within an established system of standards (e.g., Raballand & Aldaz-Carroll, 2007). We therefore expect that quality standards will have positive impact on French firm export activities.

Hypothesis 1. The adoption of quality standards is associated with higher export activities.

2.2. Effect of firm size

The ability of SMEs to operate in international markets is dependent on their resources and capabilities such as organizational, human, managerial, financial, marketing-related, or technological (Acs, Morck, Shaver, & Yeung, 1997). Given the known resource scarcity in SMEs, those firms generally consider exports as a high risk activity (Acs et al., 1997). Similarly, resource constraints can place a smaller firm at a quality disadvantage (Grolleau et al., 2007; Pekovic, 2010). Additionally, compared to small firms, managers of large firms will probably have a wide range of external contacts (e.g., management consultants) that would be able to act as catalysts for and facilitators of quality initiatives (Adams, 1999). Elango and Fried (1993) argue that flexible management practices can give large firms more flexibility, enabling them to compete more effectively on the market. Hence, smaller firms often struggle to achieve world-class quality standards. In contrast, larger firms are more likely to realize economies of scale and “learning-by-doing” by investing in certification. Moreover, Grolleau et al. (2007) argue that larger firms may influence the design of standards in order to raise costs for their smaller rivals. They conclude that such a strategy can be implemented by introducing a fixed cost of certification that can disadvantage smaller firms. Therefore, it is argued that quality practices are less beneficial to smaller firms (Struebing & Klaus, 1997). However, McGuire and Dilts (2008) propose several disadvantages related to the implementation of quality standards in large firms. For instance, the authors argue that large firms may be more resistant to change due to the presence of a significant management bureaucracy. Moreover, the market is often better informed about the quality commitment of large firms than of smaller ones (due to the greater public profile of larger firms), which may decrease the surprise effect during the certification announcement, nullifying in turn its effect on firm performance. Similarly, we may suppose that larger firms already have well established reputations for quality, making quality standards less likely to play a role of quality signal and therefore improve firm export activities. Additionally, Martín-Tapia, Aragón-Correa, and Rueda-Manzanares (2010) suggest that investment in innovative approaches is particularly useful for SMEs in order to compete in international markets against highly resourced large firms. In addition, the authors argue that the implementation of management strategy induces flexibility within the firm, which is found to help SMEs to obtain a competitive advantage in the international market. Several empirical studies have confirmed that quality standards have a bigger influence on SME performance than on the performance of larger firms (e.g., Hendricks & Singhal, 1996; McGuire & Dilts, 2008). Based on these arguments, we expect that firm size is an important moderator for the relationship between firm export activities and quality standards.

Hypothesis 2. Firm size moderates the relationship between quality standards and export activities.

3. Data and methods

The data is extracted from a French survey called *Organizational Changes and Computerization*, conducted by researchers and statisticians from the National Institute for Statistics and Economic Studies, the Ministry of Labor and the Center for Labor Studies. The questionnaire is self-administrated and describes work organizational practices in 2006 and changes occurring since 2003.³ The original dataset includes 14,369 observations. In order to obtain information on different forms of business export volumes and sales, the COI survey is merged with another database named the *Annual Enterprise Survey* (EAE, 2007)⁴ which is an annual, exhaustive and compulsory survey conducted by the French Ministry of Industry. As a result of these mergers, our sample includes 11,869 observations.

3.1. Dependent and independent variables

3.1.1. Exports

In order to uncover the real effect of quality standards on firm export activities, it is important to disaggregate total exports into individual markets. For instance, it is possible that quality standards would entail more improvements in exports to certain markets since customers in those countries would be more demanding with respect to quality. On the other hand, the effect of quality standards on socially, culturally and institutionally similar markets would be less efficient. Therefore we construct four variables that present different indicators of firm export activities. Firstly, we create variable *EXPORT*, which measures exports as the logarithm of the firm exports by the number of employees in 2007. Secondly, we construct variable *EXPORT_EU*, which presents the logarithm of exports per employee destined for EU countries in 2007. Thirdly, we create variable *EXPORT_non_EU*, which

³ More details about the design and scope of this survey are available on "<http://www.enquetecoi.net>" www.enquetecoi.net. Survey COI-TIC 2006-INSEE-CEE/Treatments CEE.

⁴ <http://www.insee.fr/fr/methodes/default.asp?page=definitions/enquete-annuelle-entreprises.htm>.

Table 1

Definition of variables and sample statistics (N = 11,869).

Variable	Definition	Mean	SD	Min	Max
EXPORT	Logarithm of export per employee (€) (Continuous variable)	1.63	2.39	−8.02	8.00
EXPORT_EU	Logarithm of export per employee destined for EU countries (€) (Continuous variable)	0.29	1.33	−6.58	7.39
EXPORT_non_EU	Logarithm of export per employee destined for non-EU countries (€) (Continuous variable)	1.40	2.31	−8.02	8.00
EXPORT_SALE	Share of exports of total sales (Continuous variable)	0.15	0.25	0.00	1.004
QS	Firm registration for ISO 9000, EAFQ, etc. Dummy variable (= 1 if registered in 2006)	0.60	0.50	0.00	1.00
SIZE	Number of employees (Continuous variable)	1566.227	7054.546	0.00	111,956
SIZE CATEGORY	Size of the firm				
	SMALL (0 TO 49 employees)	0.19	0.40	0.00	1.00
	MEDIUM (50 TO 249 employees)	0.24	0.43	0.00	1.00
	BIG (more than 250 employees)	0.57	0.50	0.00	1.00
HOLDING	Belonging to a group Dummy variable (= 1 if yes)	0.72	0.45	0.00	1.00
ES	Firm registration for ISO 14000, organic labeling or fair trade Dummy variable (= 1 if registered in 2003)	0.23	0.42	0.00	1.00
QUALITY STRATEGY	Firm's importance for quality strategy for product, service and performance. (1), representing very low strategic importance, to (4), representing very high strategic importance	3.57	0.57	1.00	4.00
COST LEADERSHIP STRATEGY	Strategic importance to competitive priced products and services. (1), representing very low strategic importance, to (4), representing very high strategic importance	3.25	0.68	1.00	4.00
CUSTOMER1	Customer's demands for product and service certificates (French NF label, QUALICERT, etc.) Dummy variable (= 1 if yes)	0.41	0.49	0.00	1.00
CUSTOMER2	Customer's demands for a contract to ensure delivery timeliness Dummy variable (= 1 if yes)	0.73	0.44	0.00	1.00
MARKET GROWTH	How the market of the main activity of the firm has evolved since 2003: DOWN (= 1 if yes) STEADY (= 2 if yes) GROWING (= 3 if yes)	2.03	0.71	1.00	3.00
MARKET COMPETITION	Since 2003, the firm been affected by new competitors on the market. (1), representing not very strongly affected, to (4), representing very strongly affected	2.39	0.83	1.00	4.00
MARKET UNCERTAINTY	Since 2003, the firm been affected by uncertainty on the market. (1), representing not very strongly affected, to (4), representing very strongly affected	2.76	0.80	1.00	4.00
SECTOR	Main activity of the firm. 11 dummy variables (= 1 if agrifoods, consumption goods, cars and equipment, intermediate goods, energy, construction, sales, transport, financial and real-estate activities, business services and services for individuals, respectively)	Because of the table's length we do not report sample statistics for sectoral variables			

presents the logarithm of exports per employee destined for non-EU countries in 2007. Finally, we use a variable denoted *EXPORT_SALE*, which represents the firm's volume of exports divided by the firm's sales in 2007.

3.1.2. Quality standards

To test the above-mentioned hypotheses, we use the binary variables denoted *QS*, which is equal to 1 if the firm was registered according to a quality standard such as the ISO 9001 standard and French quality EAQF standard in 2006. To address reverse-causality issues, given that good firm performance (in our case export activities) will allow a firm to implement quality standards, we model lagged effects by estimating the effect of having quality standards in 2006 on export activities in 2007.

3.1.3. Firm size categories

As defined by EU law⁵, we construct firm size categories as follows: *SMALL* equals 1 if the number of employees is 0–49, *MEDIUM* equals 1 if the number of employees is 50–249 and *BIG* equals 1 if the number of employees is >250.

⁵ <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2003:124:0036:0041:EN:PDF>.

3.2. Empirical strategy

Our attempt to verify empirically our hypotheses raises a problem because we would like to know the difference between a firm's exports with and without quality standards. Firms that adopt QS can be the object of a non-random selection process as it may depend on a firm's individual characteristics (e.g., size, sector, and firm strategy). This induces a selection bias. To avoid such a bias, we estimate evaluation models with matching estimators (Rubin, 1974). More precisely, we employ Propensity Score (PS) matching method.

Let us note T as a binary variable equal to 1 if the firm has received a treatment, i.e. registered with a quality standard. The efficiency of the treatment is measured through the result y_i . Thus each firm has two potential results: y_0 (if $T = 0$) and y_1 (if $T = 1$). y_0 and y_1 are never observed simultaneously, since a firm is either treated or untreated, but never both at the same time. In other words, only the real situation of the firm, noted Y , is observed: $Y = y_1T + y_0(1 - T)$.

Let us note y as the exports (which could take different forms). We consider the quality standards as the treatments and evaluate the effect of each treatment on y . Thus, three quantities are interesting: $C = E[y_1 - y_0]$ is the average treatment effect over the whole population; $C_1 = E[y_1 - y_0 | T = 1]$ is the average treatment effect over treated firms; and $C_0 = E[y_1 - y_0 | T = 0]$ is the average treatment effect over non-treated firms. If the property of independence is respected ($y_1, y_0 \perp T$), there would be no selection bias. In this paper, we use the kernel estimator proposed by Heckman, Ichimura, and Todd (1997, 1998). The standard error of the treatment effect is computed using bootstrap with 100 simulations.

In the first step of PS-matching, we estimate the probability of a firm adopting quality standards using background characteristics. Based on previous studies regarding quality standards, our analysis includes several important variables representing firm

Table 2
Determinants of quality standards.

Variables	QS (all sample)	QS (big firms sample)	QS (medium firms sample)	QS (small firms sample)
SIZE	0.00*** (0.00)	0.00 (0.00)	0.00 (0.00)	0.02*** (0.00)
HOLDING	0.85*** (0.05)	0.28*** (0.10)	0.85*** (0.0972)	0.58*** (0.11)
ES	1.94*** (0.09)	1.94*** (0.12)	1.56*** (0.19)	1.83*** (0.21)
QUALITY STRATEGY	0.25*** (0.04)	0.30*** (0.07)	0.0807 (0.08)	0.37*** (0.09)
COST LEADERSHIP STRATEGY	0.12*** (0.04)	-0.12** (0.06)	0.11 (0.07)	0.10 (0.08)
CUSTOMER1	1.58*** (0.05)	1.68*** (0.08)	1.38*** (0.10)	1.56*** (0.12)
CUSTOMER2	0.60*** (0.05)	0.61*** (0.08)	0.47*** (0.10)	0.70*** (0.11)
MARKET GROWTH	0.26*** (0.04)	0.40*** (0.05)	-0.01 (0.07)	0.11 (0.08)
MARKET COMPETITION	-0.02 (0.03)	-0.06 (0.04)	0.04 (0.06)	0.01 (0.07)
MARKET UNCERTAINTY	0.17*** (0.03)	0.20*** (0.05)	0.04 (0.06)	0.30*** (0.07)
AGRIFOODS	-0.27*** (0.11)	-0.53*** (0.17)	-0.48** (0.22)	-0.56* (0.29)
CONSUMPTION GOODS	-1.63*** (0.11)	-2.091*** (0.17)	-1.91*** (0.21)	-1.29*** (0.30)
CARS AND EQUIPMENT	0.17 (0.11)	0.49** (0.23)	-0.21 (0.20)	0.30 (0.22)
ENERGY	0.69* (0.40)	omitted	0.13 (0.80)	omitted
CONSTRUCTION	-0.19* (0.11)	0.42 (0.28)	-0.57*** (0.20)	0.34* (0.20)
SALES	-1.66*** (0.09)	-2.31*** (0.15)	-1.68*** (0.15)	-0.73*** (0.17)
TRANSPORT	-1.33*** (0.10)	-1.84*** (0.17)	-1.53*** (0.19)	-0.62*** (0.20)
FINANCIAL AND REAL ESTATE	-1.43*** (0.18)	-1.95*** (0.25)	-2.18*** (0.37)	-0.76* (0.41)
SERVICES FOR FIRMS	-1.03*** (0.09)	-1.36*** (0.14)	-1.73*** (0.16)	-0.52** (0.21)
SERVICES FOR INDIVIDUALS	-1.97*** (0.14)	-2.27*** (0.21)	-2.63*** (0.32)	-1.24*** (0.27)
Constant	-2.81*** (0.23)	-1.28*** (0.37)	-1.10*** (0.42)	-5.02*** (0.53)
R2	0.33	0.36	0.25	0.23
Observations	11,869	6630	2821	2269

(*), (**) and (***) indicate parameter significance at the 10, 5 and 1% levels, respectively.

characteristics such as size, holding, environmental standards, quality strategy, cost leadership strategy, customer's demands for product and service certificates, customer's demands for a contract to ensure delivery timeliness, market characteristics and sectors of activity (e.g., Mejia-Morelos et al., 2013; Pekovic, 2010; Singh, 2008; Guler et al., 2002).

The variables used in estimations, their definitions and sample statistics are presented in Table 1. No problem of multicollinearity has been detected.

4. Results

As already indicated, in the first step of PS-matching we estimate the probability of a firm adopting a quality standard. We work on the four different samples (all firm sizes; only large firms; only medium firms; only small firms). Logit estimation results are presented in Table 2 together with goodness-of-fit measures (Maximum-Likelihood estimation). The adjusted R-squares of the models for the determinants of quality standards in different sub-samples are 33% (p < 0.001), 36% (p < 0.001), 24% (p < 0.001) and 23% (p < 0.001), respectively, which can be considered acceptable values in terms of a statistical goodness-of-fit model.

As expected, the variables representing holding, environmental standards, quality and cost leadership strategy, market growth and uncertainty, and customer satisfaction practices are generally significant and positive, which confirms previous studies (e.g., Pekovic, 2010; Singh, 2008; Guler et al., 2002). Surprisingly, market competition is found to have no impact on a firm's probability of implementing quality standards. This result can be explained by the fact that, in a highly competitive market, quality standards could only partially address the issue of information asymmetry (Baltzer, 2012) due firms avoid implementing such practices in a competitive market. Interestingly, when looking at the results of the small firms' sample, we can notice that the size variable is positive and significant, which is not the case when looking at the results of the large and medium firms samples. The findings underline the importance of firm size relating to the implementation of quality standards especially among small firms. Finally, some sectors are less likely to implement quality standards—namely agrifoods, consumption goods, construction,

Table 3
PS-matching estimates.

	Global	SD	Treated	SD	Non-treated	SD
<i>EXPORT</i>						
QS (all sizes; N = 11,869)	0.57***	0.06	0.66***	0.06	0.45***	0.06
QS (big firms; N = 6630)	0.46***	0.11	0.44***	0.14	0.51***	0.08
QS (medium firms; N = 2821)	0.20***	0.09	0.26***	0.12	0.15*	0.09
QS (small firms; N = 2269)	0.31***	0.09	0.44***	0.10	0.24***	0.10
<i>EXPORT_EU</i>						
QS (all sizes; N = 11,869)	0.17***	0.04	0.14***	0.04	0.21***	0.04
QS (big firms; N = 6630)	0.08	0.07	-0.01	0.10	0.31***	0.05
QS (medium firms; N = 2821)	0.15***	0.06	0.14***	0.06	0.17***	0.07
QS (small firms; N = 2269)	0.04	0.06	0.06	0.06	0.04	0.07
<i>EXPORT_non_EU</i>						
QS (all sizes; N = 11,869)	0.50***	0.05	0.62***	0.07	0.34***	0.05
QS (big firms; N = 6630)	0.50***	0.12	0.55***	0.15	0.35***	0.08
QS (medium firms; N = 2821)	0.14*	0.09	0.23**	0.12	0.06	0.08
QS (small firms; N = 2269)	0.29***	0.09	0.40***	0.10	0.23***	0.10
<i>EXPORT_SALE</i>						
QS (all sizes; N = 11,869)	0.05***	0.01	0.07***	0.01	0.03***	0.01
QS (big firms; N = 6630)	0.05***	0.01	0.04***	0.01	0.05***	0.02
QS (medium firms; N = 2821)	0.01	0.01	0.00	0.01	0.02	0.01
QS (small firms; N = 2269)	0.01	0.01	0.03***	0.01	0.00	0.01

The standard error (SE) of the treatment effect is computed using bootstrap with 100 simulations. (*), (**) and (***) indicate parameter significance at the 10, 5 and 1% levels, respectively.

- QS (EXPORT) (all sizes; N = 11,869) min = 8680; max = 9602; mean = 9134.85; SD = 184.34.
- QS (EXPORT) (big firms; N = 6630) min = 4461; max = 5486; mean = 4944.61; SD = 214.89.
- QS (EXPORT) (medium firms; N = 2821) min = 2123; max = 2701; mean = 2419.96; SD = 117.91.
- QS (EXPORT) (small firms; N = 2269) min = 1816; max = 2131; mean = 2001.09; SD = 57.77.
- QS (EXPORT_EU) (all sizes; N = 11,869) min = 8670; max = 9616; mean = 9127; SD = 202.83.
- QS (EXPORT_EU) (big firms; N = 6630) min = 4470; max = 5410; mean = 4962.19; SD = 212.92.
- QS (EXPORT_EU) (medium firms; N = 2821) min = 2157; max = 2633; mean = 2417.07; SD = 109.11.
- QS (EXPORT_EU) (small firms; N = 2269) min = 1865; max = 2134; mean = 2007.98; SD = 56.
- QS (EXPORT_non_EU) (all sizes; N = 11,869) min = 8661; max = 9906; mean = 9126.95; SD = 205.46.
- QS (EXPORT_non_EU) (big firms; N = 6630) min = 4389; max = 5576; mean = 4995.39; SD = 265.99.
- QS (EXPORT_non_EU) (medium firms; N = 2821) min = 2163; max = 2685; mean = 2426.39; SD = 110.94.
- QS (EXPORT_non_EU) (small firms; N = 2269) min = 1843; max = 2133; mean = 1993.92; SD = 56.75.
- QS (EXPORT_SALE) (all sizes; N = 11,869) min = 8505; max = 9599; mean = 9137.59; SD = 210.04.
- QS (EXPORT_SALE) (big firms; N = 6630) min = 4586; max = 5542; mean = 4995.85; SD = 226.32.
- QS (EXPORT_SALE) (medium firms; N = 2821) min = 2173; max = 2626; mean = 2414.17; SD = 113.51.
- QS (EXPORT_SALE) (small firms; N = 2269) min = 1843; max = 2138; mean = 1996.54; SD = 59.75.

sales, transport, financial and real estate activities, business services, and services for individuals—compared to the intermediate goods sector.

PS-matching estimates are presented in Table 3.

The coefficient of quality standards on the logarithm of exports per employee, the logarithm of exports per employee destined for EU countries, the logarithm of exports per employee destined for non-EU countries, and the share of exports of total sales are positive and statistically significant ($p < .001$). Thus, our analyses demonstrate that quality standards impact exports positively, corroborating Hypothesis 1 and lending support to previous studies that demonstrate the relevance to firm exports of adopting quality standards (e.g., Volpe Martincus et al., 2010; Potoski & Prakash, 2009). Therefore, we may suggest that quality standards prove the ability of the firm to satisfy quality expectations of customers and make public unobservable attributes, especially in contexts when customers may be vulnerable to quality reputation (Pekovic, 2010). Additionally, the effect of quality standards is greater on the logarithm of exports per employee than on the other three indicators of firm exports. Moreover, it was especially greater than the effects on the logarithm of exports per employee destined for EU countries and the share of exports of total sales. This may suggest that the improvement in overall export activities is attributed largely to improvements in international activities.

Furthermore, we investigate whether the relationship between quality standards and export activities is also determined by firm size. Table 3 presents findings on sub-samples of larger, medium and smaller firms. The results show that there is a positive and significant relationship between quality standards and exports among large firms for three indicators of firm exports, namely the logarithm of exports per employee, the logarithm of exports per employee destined for non-EU countries, and the share of exports of total sales. Surprisingly, even though previous research argues that quality standards such as ISO 9000 present de facto standards for firms wishing to access the European market (Withers & Ebrahimpour, 2000), we find that among large firms quality standards do not impact export activities destined for EU countries. The results show that large EU (French) firms do not need an ISO passport to operate in the EU market. The plausible explanation is that large French firms are visible and accessible to their EU customers, which reduces information asymmetry. Additionally, King et al. (2005) find that firms are more motivated to adopt ISO certification when their potential buyers are more physically distant. Besides physical distance, French firms that operate in the EU market may not need quality standards as a proof for their quality commitment due to social, cultural, and institutional similarities with their customers (King et al., 2005). In other words, the European countries are traditional customers of French firms, so larger French firms do not need justification for their quality orientation. Furthermore, a positive relationship between quality standards and exports among medium firms is confirmed for three indicators of exports: the logarithm of exports per employee, the logarithm of exports per employee destined for EU countries, and the logarithm of exports per employee destined for non-EU countries. Hence, unlike larger firms that do not need to prove their quality commitment, medium firms have to demonstrate their quality strategy even to their non-distant buyer. This could be explained by the fact that large firms get more media coverage, so the EU buyer has a better idea of the quality practices of large French firms than of medium ones (McGuire & Dilts, 2008). Additionally, the results on medium firms are in line with those from Neumayer and Perkins (2005) indicating that firms that export to the EU are more influenced to adopt ISO 9000 as a model of best practice. Surprisingly, quality standards do not improve the share of exports of total sales among medium firms. Finally, the relationship between quality standards and exports is positive and significant for smaller firms when looking at the logarithm of exports per employee, the logarithm of exports per employee destined for non-EU countries, and the share of exports of total sales. However, the results indicate that quality standards do not improve the logarithm of exports per employee destined for EU countries among small firms. The results could be explained by the fact that small French firms export mainly to lower income EU countries that consume lower quality goods (Hallak & Schoot, 2008) so the positive effect of quality standards disappears. In this context, we confirm again that quality standards benefit more firms focused on exporting to distant markets. Therefore, even if small firms do not receive media coverage that decreases information asymmetry as do larger firms, small firms can rely on other factors such as social, cultural, and institutional similarities with their customers to reduce information asymmetry, and so do not need the certification when operating in the EU market. Therefore, we may suggest that a firm's exports destination presents an important factor to explain why firms may seek quality standards. So our findings indicate that the effect of quality standards depends on the degree of information asymmetries among export activities actors.

5. Conclusion

While quality standards have received a great deal of attention from researchers, an insight into their impact on firm exports is still lacking. Therefore, the aim of this paper is to provide empirical evidence on this issue using a sample of French firms. Moreover, this study aggregates empirical evidence to answer the question of whether the quality standards-exports relationship is dependent on firm size. Actually, we want to discover whether SMEs could also benefit from quality standards implementation.

Through our analysis, we find that quality standards are generally positively associated with firm exports. In other words, quality standards offer a 'low-cost' signal of a firm's commitment to quality (Clougherty & Grajek, 2008). Specifically, the PS-matching model shows that implementation of quality standards improves all four indicators of exports: the logarithm of exports per employee, the logarithm of exports per employee destined for EU countries, the logarithm of exports per employee destined for non-EU countries, and the share of exports of total sales. Moreover, while our findings are consistent with those of Volpe Martincus et al. (2010) and Potoski and Prakash (2009), our extension of the model leads us to support the notion that the effectiveness of quality standards is dependent upon firm size and indicators of the export activities considered. More precisely, our findings suggest that while quality standards in large and small firms enhance firm exports measured by the logarithm of exports per employee, the logarithm of exports per employee destined for non-EU countries and the share of exports of total sales, quality

standards do not contribute to better firm exports destined for EU countries. Furthermore, quality standards are positively associated with a better logarithm of exports per employee, the logarithm of exports per employee destined for EU countries, and the logarithm of exports per employee destined for non-EU countries among medium size firms. Thus, the prevailing argument that large firms are concerned more by the adoption of quality standards is questioned. These different results could help explain the two competing viewpoints concerning the effectiveness of quality standards among different categories of firm size. Moreover, based on the results obtained, we reveal significant variation in the quality standard effect across firm exports destinations. Therefore, we may suggest that customer geographical location is an important factor in explaining variations in the effect of quality standards on export activities. Accordingly, it is essential that once a firm has decided to operate in international markets, the first step is to decide which foreign market to choose (Brouthers & Nakos, 2005).

The key managerial implication of these results is that encouraging standards adoption is one of the possible means of improving firm export activities. Secondly, the results for size validate the importance of quality standards for SMEs. Thirdly, since quality standards do not improve firm exports destined for EU countries among small and large firms, we conclude that managers should not expect that quality standards could improve exports to all markets. However, managers are well-advised to pursue quality standards implementation since it improves other indicators of firm exports and also improves different indicators of firm financial performance (Grolleau et al., 2012).

This paper has some limitations that should be taken into account in further research. Firstly, future research is needed to explore equivalent questions in an international setting, especially if we consider that there are cultural differences concerning quality standards implementation. Secondly, there is some need to expand the measurement of exports. Including the precise location of a firm's customer will be helpful in understanding for what export destinations quality standards do or do not matter. Finally, future research should analyze whether or not the relationships that we have examined hold consistently over time.

Acknowledgments

The authors are grateful to Marc-Arthur Diaye, Gilles Grolleau, Naoufel Mzoughi and Huu Thanh Tam Nguyen for their useful comments. The authors also gratefully acknowledge the financial support for this work from the AFNOR "Performance des Organizations" endowment in collaboration with the Paris-Dauphine Foundation.

References

- Acs, Z. J., Morck, R., Shaver, M. J., & Yeung, B. (1997). The internationalization of small and medium-sized enterprises: a policy perspective. *Small Business Economics*, 9, 7–20.
- Adams, M. (1999). Determinants of ISO accreditation in the New Zealand manufacturing sector. *Omega*, 27, 285–292.
- Anderson, S. W., Daly, J. D., & Johnson, M. F. (1999). 'Why firms seek ISO 9000 certification: regulatory compliance or competitive advantage?' *Production and Operations Management*, 8(1), 28–43.
- Baltzer, B. (2012). Standards vs. labels with imperfect competition and asymmetric information. *Economics Letters*, 114, 61–63.
- Benner, M. J., & Tushman, M. (2002). Process management and technological innovation: a longitudinal study of the photography and paint industries. *Administrative Science Quarterly*, 47(4), 676–706.
- Brouthers, L. E., & Nakos, G. (2005). The role of systematic international market selection on small firms' export performance. *Journal of Small Business Management*, 43(4), 363–381.
- Clougherty, J. A., & Grajek, M. (2008). The impact of ISO 9000 diffusion on trade and FDI: a new institutional analysis. *Journal of International Business Studies*, 39(4), 613–633.
- Elango, B., & Fried, V. H. (1993). Flexible manufacturing technologies: implications for competition between small and large firms. *The Journal of High Technology Management Research*, 4, 241–254.
- Grolleau, G., Mzoughi, N., & Pekovic, S. (2007). Chemical firms' registration for the responsible care program and the ISO 14001 standard: a comparative approach. *Economic Bulletin*, 12(29), 1–13.
- Grolleau, G., Mzoughi, N., & Pekovic, S. (2012). 'Do quality and environmental-related standards improve French firms' performance?' *Environmental and Resource Economics*. <http://dx.doi.org/10.1007/s10640-012-9604-0>.
- Guler, I., Guillen, M. F., & Macpherson, J. M. (2002). Global competition, institutions, and the diffusion of organizational practices: the international spread of ISO 9000 quality certificates. *Administrative Science Quarterly*, 47(2), 207–232.
- Hallak, J. C., & Schoot, P. K. (2008). Estimating cross-country differences in product quality. *NBER WP*, 13807.
- Heckman, J., Ichimura, H., & Todd, P. (1997). Matching as an econometric evaluation estimator: evidence from evaluating a job training programme. *Review of Economics Studies*, 64(4), 605–654.
- Heckman, J., Ichimura, H., & Todd, P. (1998). Matching as an econometric evaluation estimator. *Review of Economics Studies*, 65(2), 261–294.
- Hendricks, K. B., & Singhal, V. R. (1996). Quality awards and the market value of a firm: an empirical investigation. *Management Science*, 42, 415–436.
- International Trade Center UNCTAD/WTO (2005). *Innovations in export strategy: a strategic approach to the quality assurance challenge*. Geneva: ITC.
- Kaynak, H., & Hartley, L. J. (2005). Exploring quality management practices and high tech firm performance. *Journal of High Technology Management Research*, 16, 255–272.
- King, A., Lenox, M., & Terlaak, A. (2005). The strategic use of decentralized institutions: Exploring certification with the ISO 14001 management standard. *Academy of Management Journal*, 48(6), 1091–1106.
- Koenig, P., Mayneris, F., & Poncet, S. (2010). Local export spillovers in France. *European Economic Review*, 54(4), 622–641.
- Kumar Das, S., & Bandyopadhyay, A. (2003). Quality signals and export performance: A micro level study, 1989–97. *Economic and Political Weekly*, 38(39), 4135–4143.
- Lo, C. K. Y., Yeung, A. C. L., & Cheng, T. C. E. (2008). ISO 9000 and supply chain efficiency: empirical evidence on inventory and account receivable days. *International Journal of Production Economics*. <http://dx.doi.org/10.1016/j.ijpe.2008.11.010>.
- Martín-Tapia, I., Aragón-Correa, J. A., & Rueda-Manzanares, A. (2010). Environmental strategy and exports in medium, small and micro-enterprises. *Journal of World Business*, 45(3), 266–275.
- McGuire, S. J., & Dilts, D. M. (2008). The financial impact of standard stringency: an event study of successive generations of the ISO 9000 standard. *International Journal of Production Economics*, 113(1), 3–22.
- Mejía-Morelos, J. H., Grima, F., & Trepo, G. (2013). Change and stability interaction processes in SMEs: a comparative case study. *Journal of Organizational Change Management*, 26(2), 370–422.
- Neumayer, E., & Perkins, R. (2005). Uneven geographies of organizational practice: explaining the cross-national transfer and diffusion of ISO 9000. *Economic Geography*, 81(3), 237–259.

- Ogbuehi, A. O., & Longfellow, T. A. (1994). Perceptions of US manufacturing SMEs concerning exporting: a comparison based on export experience. *Journal of Small Business Management*, 32, 37–47.
- Pekovic, S. (2010). What motivates firms to seek ISO 9000 certification: comparative approach of French manufacturing and services industries. *Journal of Economic Issues*. <http://dx.doi.org/10.2753/JEI0021-3624440403>.
- Pekovic, S., & Galia, F. (2009). From quality to innovation: evidence from two French employer surveys. *Technovation*, 29(12), 829–842.
- Potoski, M., & Prakash, A. (2009). Information asymmetries as trade barriers: ISO 9000 increases international commerce. *Journal of Policy Analysis and Management*, 28(2), 223–240.
- Raballand, G., & Aldaz-Carroll, E. (2007). How do differing standards increase trade costs: the case of pallets. *The World Economy*, 30(4), 685–702.
- Rubin, D. (1974). Estimating causal effects of treatments in randomized and non-randomized studies. *Journal of Educational Studies*, 66(5), 688–701.
- Singh, P. J. (2008). Empirical assessment of ISO 9000 related management practices and performance relationships. *International Journal of Production Economics*, 113(1), 40–59.
- Spence, M. (1973). Job market signaling. *Quarterly Journal of Economics*, 87(3), 355–374.
- Spickernell, D. (1986). The role of international standards in removing barriers to trade and assisting developing countries. *International Journal of Technology Management*, 1(1/2), 197–208.
- Struebing, L., & Klaus, L. N. (1997). Small businesses thinking big. *Quality Progress*, 2, 23–27.
- Terlaak, A., & King, A. A. (2006). The effect of certification with ISO 9000 quality management standard: A signaling approach. *Journal of Economic Behavior and Organization*, 60(4), 579–602.
- Volpe Martincus, C., Castresana, S., & Castagnino, T. (2010). ISO standards: a certificate to expand exports? Firm-level evidence from Argentina. *Review of International Economics*, 18(5), 896–912.
- Withers, B., & Ebrahimpour, M. (2000). 'Does ISO 9000 certification affect the dimensions of quality used for competitive advantage?' *European Management Journal*, 18, 431–443.
- Yeung, G., & Mok, V. (2005). 'What are the impacts of implementing ISOs on the competitiveness of manufacturing industry in China?' *Journal of World Business*, 40, 139–157.