The impact of international standards certification on firm performance in less developed countries

Micheline Goedhuys*

Leo Sleuwaegen*

Abstract

This paper examines the effects of international standards certification (ISC) on both operational efficiency and sales performance for firms from a wide set of countries exhibiting different degrees of institutional development. Against a large dataset of manufacturing firms operating in 59 countries we find that ISC raises efficiency and sales performance of firms through efficiency gains and quality signaling, with the effects being larger in countries where market supporting institutions are weak. The largest gain in performance comes from direct productivity improvements helping firms to climb the technological ladder and closing the productivity gap with firms based in developed countries.

Keywords: certification, productivity, firm growth, institutional development, transaction costs

*KU Leuven and Vlerick Business School

1. INTRODUCTION

Over recent decades, the development, spread and implementation of internationally accepted quality standards have gained increasing significance. In collaboration with various stakeholders, standards have been developed that define the technical specificities of products in all industries. In addition, generic process standards have been developed to describe best-practice management systems. These standards do not specify performance targets or the technical quality specifications of products and services but focus on the management system by which a product or service is produced (Marimon, et al., 2006). The management system of a firm is crucial in identifying internal problems and bottlenecks, and for building capacities for innovation and change. Businesses that implement and respect international standards can apply for a quality certificate. The firm's quality management system is then verified by a specialized third party, who issues a certificate of conformity when the requirements are met.

The most widely diffused and adopted set of standards are those developed by the International Organization for Standardization (ISO), whose main objective is to harmonize standards worldwide in order to stimulate international trade and global welfare (Marimon et al., 2006). Yet, internationally, adoption of certificates is still very unevenly distributed. In African and Latin American countries for instance, adoption has been weak, but it has recently taken off and is growing rapidly. Asia and Eastern Europe are experiencing rapid increases. In the rest of the world, and especially in Western Europe where the standards were originally introduced, the growth rate in new certification and the share of global certification are decliningⁱ (ISO, 2008).

These countries would appear to have reached ‘market saturation levels’ (Sampaio et al., 2009, p.44; Saraiva and Duarte, 2003; Franceschini et al., 2004).

Our paper goes beyond this observation and provides the rationale that explains why interest in international standards certification has been growing in developing countries. Firms will make a strategic choice to obtain a quality certificate if the perceived benefits from this investment exceed their cost. We argue that the net benefits are greater in less-developed, institutionally weak countries where ill-developed institutions are unable to support efficient market transactions. The benefits derive from direct efficiency and productivity gains lowering the cost of producing and selling the product, and from indirect effects from improving the firm’s competitive position and lowering transaction costs in wider and complex markets (Sampaio et al., 2009).

Whether the impact of certification is more important in developing and institutionally weak countries has never been systematically tested at the level of the firm, where the decision to engage in the certification process is takenⁱⁱ. Our paper pools firm-level data from nearly 60 countries at different levels of institutional development and provides several novel contributions to the literature. First, we develop arguments why firms in institutionally less developed countries can obtain greater benefits from certification than firms in more developed countries. Second, building on the literature concerning the impact of standards on the performance of firms, this study empirically tests the effects of certificate adoption on the productivity and growth of individual firms, using a wide set of countries, differing in the degree of their

economic, social and institutional development. Third, we test the extent to which international standards certification substitutes for the disciplining force of efficient-functioning markets, and we provide evidence that the certification effect on productivity and growth is more important for firms operating in countries characterized by weak institutions. Fourth, we investigate the role of particular institutional features deemed crucial for the efficient-functioning of markets – property rights and investor protection, trade institutions, the judiciary, and freedom from corruption – in relation to the performance-enhancing effects of international standards certification that we found in this study.

The paper is structured as follows: section two presents previous findings from the literature and develops the conceptual framework. Building on this framework, section three explains the hypotheses for testing. Section four explains the empirical approach, including data, the estimating model, and variable construction. Section five discusses the estimation approach. Section six presents the results. Section seven provides an elucidation of our findings and conclusions.

2. THE NET BENEFITS OF INTERNATIONAL STANDARDS CERTIFICATION (ISC)

International management standards currently address a variety of issues including quality management, environmental management, social accountability and working conditions. All the

major management system standards in use today are highly comparable in the manner in which they operate and in how they are intended to be implemented. The ISO 9000 family of standards, first introduced in 1987, are generic quality management standards applicable to any organization, irrespective of size, industry, or managerial culture. Quality management reflects what the organization does to enhance customer satisfaction by meeting buyer requirements and expectations (ISO 2002). In 1996, addressing the need for a global system of environmental self-regulation, the environmental management system standard, ISO 14000, was introduced (Delmas, 2002). ISO 9001 and ISO 14001, which furnish the requirements for quality management and environmental management systems, are among the ISO system's most well-known and widely implemented standards (Marimon et al., 2006), spreading to over 176 and 155 countries respectively (ISO 2008). Similarly, the ISO management system approach was implemented in other areas, such as social issues and working conditions. Social Accountability International (SAI), a human rights organization, introduced its Social Accountability 8000 standard (SA 8000) in 1998 and, by July 2005, 710 certifications had been awarded. SA 8000 specifies a social management system modeled on ISO standards and sets standards for key labor rights. A feature common to all of these standards is that they are management system standards that stipulate the internal organizational processes and management practices that firms need to implement in order to obtain certification.

Faced with the emergence of new standards in these various areas, a rich empirical literature emerged, studying the motivations of firms applying for certification and the benefits derived from it (see Sampaio et al., 2009 for an overview of these studies). Essentially, it reveals two types of advantage or economic benefit to the firm. First, evidence shows that some firms realize

important operational benefits internally through the process of applying for and sustaining certification. This process requires firms to analyze, evaluate, adjust and codify their production and distribution processes for goods and services, resulting in cost reductions and efficiency gains (e.g. Romano, 2000; Sun, 2000, Casadesús and Giménez, 2000, Bayati and Taghavi, 2007, among others).

Second, standard certificates have an important signaling role: firms use the certificate strategically to ‘signal’ to external parties that the firm is a reliable supplier and partner. This view is strongly embedded in the New Institutional Economics perspective, which builds on the influential work of Coase (1937), who identified transaction costs as a factor explaining why some transactions take place within firms and not between firms – and Williamson (1975, 1985) who identified bounded rationality and individual opportunism as factors potentially raising those transaction costs. To reduce uncertainty in transactions, institutions represent the important ‘rules of the game’ that shape economic interactions (North, 1991); they can be either formal institutions – including laws, regulations, property rights – or informal rules, such as norms and values, habits and practices, social conventions, reputation and trust. The literature identifies various kinds of mechanisms that serve to reduce the transaction costs of different governance modes such as markets, hierarchies and hybrids. For example, trust has been found to reduce transaction costs in strategic alliances (Gulati, 1998; Ring and van de Ven, 1992). With respect to market transactions, the literature has focused on mechanisms such as credible commitments (Williamson 1985) and signaling through certification, professional licensing, guarantees, and brands (Akerlof, 1970).

Previous papers developed the argument that quality standard certificates can act as globally decentralized institutions and can have their biggest impact on developing countries where institutional voids exist and where quality challenges are more pronounced (Clougherty and Grajek, 2008; Potoski and Prakash, 2009). Within this approach, quality certification has been identified as a low-cost instrument capable of signaling a firm's unobserved quality performance (Anderson et al., 1999; King et al., 2005; Terlaak and King, 2006, Clougherty and Grajek, 2008; Potoski and Prakash, 2009, Delmas and Montiel, 2009). Signaling becomes important when information asymmetries exist between sellers and buyers in vertical relationships. This occurs when important characteristics of the firm or the product are not directly observable. Firms generally possess more information about their characteristics and conduct than potential customers and other stakeholders. These information asymmetries increase transaction costs, including a) customers' costs of searching for, screening, and identifying suppliers that possess desirable characteristics, b) costs associated with drafting agreements to assure that suppliers possess the unobservable characteristics that they claim, and c) costs of verifying whether the contractual terms have been met (Milgrom and Roberts, 1992). In these circumstances, suppliers have an incentive to reveal information about their characteristics through an informative signal from certification.

This signaling role of certificates has also become central in the literature on Corporate Social Responsibility (CSR) and the adoption of certificates related to sustainable development. The self-interest of firms obtaining such certificates consists in finding support for their activities

from stakeholders while, at the same time, avoiding excessive CSR regulations imposed by governments (see e.g. Kitzmuller and Shimshack, 2012).

Clearly, the signaling of unobservable quality characteristics has to be credible and must be able to differentiate firms that possess the characteristics from others that do not (Spence, 1973). Moreover, to achieve this, firms are obliged to incur significant costs. The *costs* associated with certification comprise implementation costs such as the expense of creating and updating required procedures and documents, and the cost of restructuring organizational processes and training, as well as certification costs such as fees for third-party certification audits conducted by private auditing firms (Potoski and Prakash, 2009). The cost of the certification audit alone – over and above the cost of implementing and sustaining the management system – is significant, depending on firm size and preparation (Anderson et al., 1999). Firms will only incur those costs if they perceive the benefits to be greater. The costs of quality certification are substantially higher in less-developed and institutionally weak countries (Maskus et al., 2005). In some of these countries, access to certification bodies is difficult, procedures expensive, and managerial infrastructure insufficiently developed to implement the right procedures. The problems may be aggravated by a lack of transparency of the certification bodies (UNIDO, 2012)

Yet, in spite of these extra costs, we expect the *internal* and *external* net benefits of ISC to be disproportionately greater for firms in developing countries where markets are inefficient primarily because of weak supportive institutions. An efficient competitive market is considered the most powerful force for economic efficiency (Shleifer and Vishny, 1997). The poor

functioning of markets makes it difficult for firms to receive proper feedback and to benchmark their efficiency against competitors. International standards certification can, in such cases, act as a substitute by providing firms with an international benchmark standard. In addition, developing country firms face greater difficulties in credibly signaling quality, as buyers tend to infer the quality of the seller partly from the generally poor reputation of the country where the seller is located (Tybout, 2000, Hudson and Jones, 2003, Potoski and Prakash, 2009, Montiel et al., 2012). Firms operating in institutionally weak countries are, therefore, disproportionately hampered by information asymmetries and negative reputation effects. These latter elements reinforce the signaling role of ISC. In the next section, we develop several hypotheses based on the further development of these arguments, and we subject them to empirical testing in section five of the paper.

3. HYPOTHESES

An significant number of studies have investigated the impact of certification on firm performance. Most of these studies find a positive effect on operational or organizational performance (Terziovski and Samson, 1999; Romano, 2000; Sun, 2000, Withers and Ebrahimpour, 2000, Casadesús and Giménez, 2000, Singels et al., 2001; Summers Raines, 2002, Tari' and Molina, 2002; Quazi and Jacobs, 2004; Bayati and Taghavi, 2007, among others) which translates into superior productivity or efficiency levelsⁱⁱⁱ, as a result of the implementation of best-practice management standards. However, other studies find no support

for this relationship (Terziovski et al. 1997; Rahman, 2001; Barla, 2007). The absence of unequivocal results appears to be associated with variance in the data samples used and heterogeneity of the business contexts in which various companies operate. The central theme of our paper is that the relationship between the use of an ISC and productivity gains is strongly moderated by the institutional context.

In most developed economies, markets play a key role in fostering efficiency and growth. Market forces ensure that the goods consumers desire are produced in the quantities they want, using the most efficient production, marketing and distribution methods. A competitive market based on solid institutions of well-protected property rights, anti-trust regulations and other supporting institutions creates incentives for participating firms to improve efficiency and achieve growth. Differences in institutions have been shown empirically to be among the most important determinants of cross-country differences in economic growth (Barro, 1991, Dawson, 1998, Gwartney et al., 2006). The maintenance of property rights and the rule of law are central to the efficient organization of economic activity (Barro, 1996, 1997, 2000). Several scholars have shown that countries with deficient institutions and, in particular, weak property rights protection, trade and investment restrictions, corruption, and distortionary policies create fewer enterprises and generate less investment in physical and human capital, reaching lower levels of economic performance (Knack and Keefer, 1995, Mauro, 1995, Besley, 1995, Barro, 1997, 2000, Hall and Jones, 1999, Rodrik, 1999, La Porta et al., 2008).

In a highly competitive market environment, firms are under pressure to conform to high quality standards set by the market and to realize important productivity gains, irrespective of whether they apply for a quality certificate (Nickell, 1996, Bloom and Van Reenen, 2007). A certificate can still act as a management tool to help achieve these standards. However, it is the process of competition and selection in the market that forces firms to respect minimum standards. In developing and least developed countries, however, market selection is weak, and the majority of firms are small businesses operating much further away from the technological and managerial frontier, and they operate within the bounds of non-constant quality over time (Goedhuys, 1999). For these firms, implementation of the standards required for certification may well entail significant adjustments and improvements resulting from the codification of quality management routines.

If the institutions that govern seller-buyer transactions are missing, or not respected by the citizens or the state, corruption will prevail (Hellman et al., 2002, Hill, 2003). Markets cannot efficiently allocate resources and exercise their disciplinary role with regard to adopting best practice and improving performance. Markets do not generate the necessary feedback for firms to improve performance and to benchmark efficiency against competitors. In this context, international standards certificates can act as a substitute institutional device in providing firms with proven global benchmark models to help them improve efficiency in line with international standards. These arguments imply that, in countries where institutions fail to provide a competitive market environment, the benefits of ISC may be substantially greater in helping firms to improve productivity. We therefore hypothesize:

Hypothesis 1A: Firms with quality certification achieve higher levels of productivity.

Hypothesis 1B: This effect is moderated by the institutional quality of the country, with a stronger positive effect in weaker institutional quality countries.

Firms with improved efficiency as a result of using an ISC will normally translate this into a better offering (lower price, better quality product or service) and will achieve greater sales. Beyond this direct effect, the signaling function of the certificate may create additional sales. The signaling impact of certification on firm growth is stronger when the information asymmetry problem looms large. This is the case in industries where buyers have greater difficulty in acquiring information about suppliers as in the case of R&D and advertising-intensive industries or when complex technologies are involved (Terlaak and King, 2006, Blind and Hipp, 2003). Terlaak and King (2006) argue that ISC can signal a firm's superior but unobserved attributes, and they find that ISO certification increases facility growth when the attributes of suppliers are intangible and buyers face multiple suppliers. Transaction costs are also greater when contracting parties are physically, socially, culturally or institutionally more distant from each other, which is the case in international trade. Firms who intend to sell products to wider markets face more serious information problems since spatial, cultural and linguistic barriers complicate the buyer's capacity to assess product quality (King, Lenox and Terlaak, 2005, Johnstone and Labonne, 2009, Potoski and Prakash, 2009).

In this context, Clougherty and Grajek (2008) underscore three properties of certification: first, certified firms can credibly claim that they have a documented quality system, ensuring that products are made to exacting specifications. Second, it helps communicate internal systems to customers and provides a common procedural language to be used across organizations. Third, it may help reduce and settle organizational disputes. They argue that these “quality-signal, common-language, and conflict-settling properties lower the transaction costs and information asymmetries involved with business-to-business relations across borders, thus making arm’s length trading relations less costly”. Hence, to investigate empirically the potential signaling role of certification, we hypothesize:

Hypothesis 2A: Firms with ISC achieve higher levels of sales growth

Hypothesis 2B: The sales effect is larger than the gains coming from improved efficiency

Firms in less-developed market environments tend to operate substantially below the technological production frontier (Sleuwaegen and Goedhuys, 2003, Goedhuys and Sleuwaegen, 2010). Hence, the transmission of improved efficiency into better sales conditions resulting from the implementation of world quality standards may also be more substantial than in more advanced countries. We also expect, in such environments, (less wealthy) buyers to be more sensitive to efficiency improvements that are translated into a firm’s lower prices for goods and services.

Moreover, in countries where corruption prevails and institutions such as trade policies, contract-enforcing mechanisms and property rights protection are weak in support of swift transactions, firms will be severely affected by the negative reputation of the country. They will have even greater difficulty convincing new buyers to engage with them in transactions that are perceived as risky. For them, the reward of demonstrating transparency and capability to supply conforming products will be even higher, in order to compensate for these institutional deficiencies. Firms will use ISC certificates as a signaling device to reduce uncertainty and transaction costs for their less-informed buyers. In particular, it will help them counter the negative reputation effects of their economic environment. It will demonstrate a firm's readiness to settle conflicts in countries where courts are not an effective alternative. We therefore argue that the sales growth impact from certification will be substantially greater in those countries where weak institutions and deficient informational systems create extra transaction costs.

Hypothesis 3: The effect of ISC on sales growth will be greater in countries with weak institutional quality.

4. EMPIRICAL APPROACH

(a) Data

We empirically test the hypotheses in section 3 against a large dataset of manufacturing firms operating in 59 developing and transition countries. The data are derived from the World Bank Investment Climate Survey (ICS), conducted in a harmonized manner in 2006 in various African and Latin American countries and in 2008 in Eastern European and Central Asian countries. The ICS is the most important source of firm-level data covering a variety of factors that influence the performance of firms in developing countries. The data are cross-section data and contain information on value added, the firm's capital stock, employment, and sales for the last accounting year before the interview was conducted. African and Latin American surveys refer to the accounting year 2005. Eastern European and Central Asian surveys refer to 2007. In addition, the dataset provides some historical information on sales and employment for three years prior, which makes it possible to calculate growth over a three-year period, 2002-2005 for African and Latin American firms and 2004-2007 for European and Central Asian firms.

Firms were asked whether or not "they have an internationally recognized quality certificate (in particular ISO 9000, 9002, 14000)". We use this variable to investigate the benefits of implementing major management system standards, even though we are unable to focus the analysis on the effect of any certificate in particular or on differences between them. Nevertheless, there appears to be considerable overlap in the drivers behind the various certificates and their diffusion patterns. Many scholars have indeed indicated that various certificates are sought by firms for comparable reasons and with similar benefits for their corporate image (Pan, 2003; Poksinska et al., 2003, Corbett and Kirsch, 2001; Vastag 2004,) and that the number of ISO 9000 certificates in a country significantly affects the number of ISO 14000 certificates (Vastag, 2004, Franceschini et al., 2004, Marimon et al. 2006, Prakash and

Potoski 2006, 2007). Clougherty and Grajek (2009) have used the strong correlation between ISO 9000 and ISO 14000 diffusion to instrument for ISO 9000 with ISO 14000. The strong similarities in terms of motives, benefits and international diffusion patterns of the various types of quality certification provides support for aggregating them into the single measure of international standards certification that we use in this study.

The samples of firms in the ICS are drawn from the business register following a stratified random sampling based on location, size and industry (for more details on the methodology of the survey, see World Bank, 2003). After pooling the various country datasets, we retained only firms active in manufacturing. We dropped firms in services and retail because the questionnaire used for these firms was more limited, and crucial information on a number of variables was not available. Unfortunately, some firms dropped out because information was missing on variables crucial to our analysis, such as employment, capital or sales. This resulted in a firm-level dataset of 7320 firms. The firms in our sample are active in the following broad industry sectors: food processing and beverages (25%), textiles (8%), garments (14%), chemicals (11%), non-metallic mineral products (5%), machinery and equipment (6%), electronics (1%), basic metals and metal products (8%), other manufacturing (22%). The sample is presented in Table 1. Table 1 presents the countries included in the sample and the number of observations in each country.

INSERT TABLE 1 HERE

Measures for the institutional quality of the countries are derived from two sources: First, we use the World Bank Ease of Doing Business (EDB) rankings 2008. This database contains country rankings for the quality of regulations directly affecting businesses and is calculated as the average of the country's score on 10 sub-themes including starting a business, dealing with construction permits, employing workers, registering property, obtaining credit, protecting investors, paying taxes, international trading, contract enforcement, and closing a business (for more details, see World Bank, 2005). A total of 178 countries in 2008 were ranked accordingly. To ensure that we were tracking the role of quality certification as a substitute institution for (the lack of) efficient markets, we looked separately at the role of specific institutions considered essential for the functioning of efficient markets. We, therefore, investigated three sub-indicators from the Ease of Doing Business source – 'Trading across borders' reflecting trade institutions; 'Contract enforcement' providing evidence on the efficiency of the judiciary system; and 'Protecting investors' to assess property rights protection. As an alternative source of institutional quality indicators, we used information retrieved from the '2008 Index of Economic Freedom' (The Heritage Foundation, 2008, see also Johnson et al., 1999). This is an index scoring nations on ten broad factors of 'economic freedom', its respective sub-indices^{iv}. In our analysis, we used two sub-indices, 'property rights' and 'freedom from corruption', as additional checks on the robustness of the results.

On average, 22 percent of the sampled firms have a quality certificate. There are, however, large differences across countries, ranging from as high as 74 percent in the Czech Republic, 63 percent in Hungary and 54 percent in Slovenia to a low ranging from four percent to seven percent in countries such as Cape Verde, Guinea Bissau, Angola, Burundi, Guinea, Burkina

Faso, and Paraguay. At the more aggregate level, the average proportion of certified firms is higher in high institutional-quality countries (countries in the upper half of the ranking), being respectively 28 percent, versus 17 percent in lower institutional-quality countries (the lower half in the country ranking) (not in the Table).

(b) Empirical model

(i) Productivity

In explaining productivity, we follow an important strand in the empirical literature which found that product (and process) innovation affects productivity, based on the model developed by Crépon et al. (1998). This literature is embedded in the neo-classical view that technological progress and innovation are drivers of growth through productivity gains. Two variables are included as control variables in our productivity equation to capture the technological characteristics of the firm: one dummy variable for product innovation (D-product inno.) and one for firms using ICT generic technologies for interacting with their clients and suppliers through the development of company websites. We also control for a set of firm-specific characteristics, such as firm age and foreign ownership, and specific sector and country characteristics using country and sector dummies.

Our major interest lies in measuring the impact of the ISC variable (Hypothesis 1A). This effect is captured by the coefficient of the dummy variable ISC for firms that have an internationally recognized quality certificate. To test whether its impact is larger in institutionally weak countries (Hypothesis 1B), we include the overall World Bank Ease of Doing Business ranking 2008 as a measure of institutional weakness (INSTWEAK) and also interact the variable with ISC. The variable has been transformed to range between zero and one, with higher values of the rank score referring to weaker institutional quality. The impact of ISC on TFP and the moderating impact of institutional quality are tested by the following model:

$$\begin{aligned}
 TFP = & a_0 + \sum a_1 (\text{Firm age and ownership}) + \sum a_2 (\text{Technological characteristics}) + \\
 & a_3 (\text{Institutional weakness}) + a_4 (\text{ISC}) + a_5 (\text{ISC} * \text{Institutional weakness}) + \\
 & \sum a_6 (\text{Industry Dummies}) + \sum a_7 (\text{Country dummies}) + e \quad (1)
 \end{aligned}$$

where e is an i.d.d. error term.

(ii) Sales growth

A comparable analysis is carried out for sales growth. Since the seminal work of Jovanovic (1982), growth has been increasingly modeled as a learning process that explains why small and young firms grow faster^v. In line with established work on firm growth, we therefore model sales growth as a function of firm size and age, and technological characteristics as control variables in the equation (Evans 1987, Dunne and Hughes, 1994, Sleuwaegen and Goedhuys, 2002, 2010).

The impact of quality certification on sales growth (Hypotheses 2A and 2B) is measured by including ISC in the equation. By interacting ISC with variables of institutional weakness of the country where the firm is active, we can directly test Hypothesis 3.

In addition, country specific factors such as those related to macro-economic conditions or country-specific demand conditions are controlled for by including country dummies. Industry dummies capture industry-wide influences that may affect firms active in the same industry, across nations.

The final model corresponds to the following equation:

$$\begin{aligned} \text{Sales growth} = & b_0 + b_1 \ln(\text{Sales}_{t-3}) + b_2 [\ln(\text{Sales}_{t-3})]^2 + b_3 \ln(\text{Firm age}_t) + b_4 [\ln(\text{Firm age}_t)]^2 \\ & + b_5 \ln(\text{Sales}_{t-3}) * \ln(\text{Firm age}_t) + \end{aligned}$$

$$\begin{aligned}
& b_6(\text{Institutional weakness}) + b_7(\text{ISC}) + b_8(\text{ISC} * \text{Institutional weakness}) + \\
& \Sigma b_9(\text{Technological characteristics}) + \\
& \Sigma b_{10}(\text{Industry Dummies}) + \Sigma b_{11}(\text{Country dummies}) + e
\end{aligned} \tag{2}$$

where e is an i.d.d. error term.

Table 2 presents the definition and measurement of the variables.

INSERT TABLE 2 HERE

5. ESTIMATION APPROACH

In the estimation procedure, we had to consider possible endogeneity of ISC in the productivity and growth performance equations. More efficient firms and those growing larger are more likely to have an ISC but they nevertheless expect performance gains from certification. We formally tested and found ISC to be endogenous in the productivity and growth equation. To account for this endogeneity, we estimated the model with an instrumental variable IV technique following a 2SLS procedure (Wooldridge, 2002). ISC is estimated using all the variables of the productivity and growth equation, plus two extra instrumental variables: D-license and Tax controls. The first instrument measures whether the firm uses licenses from other (foreign)

firms, while the second instrument measures the number of times per year the firm is inspected by tax authorities. The rationale for including these instruments is that firms that use licenses are often forced by the licensors to implement ISC, while firms that are subject to greater controls from tax authorities have a self-interest in being transparent and in following codified procedures about the way they organize their activities and transactions. An ISC serves this purpose well and, hence, we expect firms subject to control from external private partners or public authorities to adopt ISC.

Table 3 shows the results of a probit estimation explaining the probability that a firm has an ISC. All the exogenous variables used in the 2SLS models for productivity and sales growth are included in the probit in the first column. The second column shows the results for the instrumenting equation, which is extended by the two instruments, D-license and Tax controls.

An F-test shows the significance of adding the two extra instruments. DIT IS NIET GEBEURD, WEGLATEN?

The results of the instrumenting equation are in line with expectations. Firms that obtain an international quality certificate are larger, older and technologically more advanced. A doubling of the size leads to a five percent increase in the likelihood that a firm has an ISC. Firms that interact with clients and suppliers through a company website and firms introducing new products are also more likely to have an ISC, raising the probability by ten percent and four percent respectively. The certified firms also have a more skilled workforce.

INSERT TABLE 3 HERE

Equally, foreign ownership has a positive influence on ISC adoption. Foreign firms transferring proven practices from their home country tend to encounter lower costs in implementing international quality standards than indigenous firms. But also, firms of foreign origin have to obtain 'legitimation' for their way of doing business in the particular environment of the host country. They incur additional costs of doing business in a host country, arising from the unfamiliarity of the environment and from cultural, political, and economic differences. This generates competitive disadvantages compared to domestic firms, a phenomenon described in the literature as the 'liability of foreignness' (Zaheer, 1995, Elango, 2009, Yildiz and Fey, 20121 among others).

Interestingly, the equation shows no evidence that firms in less institutionally developed countries demonstrate higher certificate adoption, despite the greater benefits that we expect from certification in these countries. This result should not surprising, however, as not only the benefits but also the costs of obtaining an ISC are more important in countries where institutions are weakly developed. Developing countries typically have neither the public resources required to provide national laboratories for testing and certification nor the capability for collective action to raise their standards. As a result, a significant portion of meeting the costs of standards may be borne by individual firms (Maskus, et al. 2005; Czubala, Shepherd and Wilson 2007, Moenius, 2006). They include the implementation costs of revising and installing new procedures of work, based on western routine approaches, and establishing an organization that

complies with the multiple certification and testing procedures. For firms in the least developed nations – where a skilled workforce and frontier production technologies are more troublesome to acquire – these extra costs act as a counterweight to the potential signaling benefits of enhanced corporate reputation.

In Appendix 1, we show the full 2SLS results with extra tests for the validity and strength of the instrumental variables. The results show a chi-square Sargan score of 1.26 and 0.22 in the respective productivity and sales growth equations, confirming the validity of our instruments. Respective F-tests for the first stage regression were 90 and 54, indicating that our instruments are significant and relatively strong.

6. PRODUCTIVITY AND SALES RESULTS

(a) ISC and productivity

The results of the productivity equations are presented in Table 4. The first column shows the OLS estimation, as a reference equation. Given the endogeneity of ISC, we discuss the results of the IV estimation (Column (2)). To test Hypotheses 1B, we enter both the ISC variable and its interaction with the institutional variables in the equation in Column (3).

Focusing on the relationship between institutional quality, ISC and productivity, we observe a very marked upward shift in productivity levels for certified firms, in support of Hypothesis 1A. The IV estimation shows a larger estimated coefficient of the ISC variable than in the OLS estimation of Column (1), indicating that there is a downward bias in the original OLS estimation. In support of Hypothesis 1B, the coefficient of the interaction variable of ISC with INSTWEAK, the institutional weakness variable in Column (3), suggests that the effects from certification are stronger for firms located in low institutional quality countries. The larger effect from ISC in the lower institutional quality countries thus reflects the closing of a larger pre-certification gap in productivity from world standards, consistent with the arguments presented in section 2.

The results for the additional control variables in Column (3) show that higher productivity levels are robustly found among firms with foreign ownership, firms using a well-developed ICT infrastructure, and firms introducing new products.

INSERT TABLE 4 HERE

(b) ISC and sales growth

The results of the growth estimation are presented in Table 5. The IV estimation results, presented in Column (2), provide evidence that sales growth is related to firm size and age, in line with stylized facts that smaller and younger firms grow faster. The results support the negative size-growth and age-growth relationships resulting from a learning process that takes place in the earliest years of operation, during which firms discover their true efficiency and grow until they reach a minimum efficient scale (Cabral, 1995; Coad, 2009). The use of ICT, product innovation and foreign ownership are equally found to positively shift growth levels.

Zooming in on the certification-institutional quality-growth relationship, we observe a positive and significant influence from ISC raising growth rates, in support of Hypothesis 2A. In support of Hypothesis 3, the coefficient of the interaction term of ISC and INSTWEAK in Column (3) shows that the ISC effect is more important in institutionally weak countries. The extra effect may come from two different sources: a) the transmission of improved efficiency into better sales conditions and b) the signaling of quality to buyers where the effect may be larger in institutionally weak environments suffering from more severe information problems and asymmetries.

INSERT TABLE 5 HERE

To disentangle the signaling effect from operational performance improvements, we have added productivity improvements over the same growth period as an additional explanatory variable in the sales growth equation. If after including this variable, ISC still plays a role in the equation, we interpret this as evidence that signaling benefits are present. The results in Column (4) of Table 5 indicate that productivity gains have an important impact on sales growth. Productivity gains induced by ISC or other innovative activity can trigger extra sales growth, as predicted by models of active learning (Ericson and Pakes, 1995). More importantly, however, the ISC effect remains positive and significant, providing evidence for the role of ISC as a signaling device, in line with Hypothesis 2B.

The results in Column (4) also show a substantially different coefficient for the interaction variable combining ISC with the institutional quality of the country. The coefficient remains positive but fails to reach statistical significance at conventional significance levels. In other words, signaling effects are strong, as witnessed by the coefficient of ISC applying to all countries, but no different in institutionally weak countries. This result suggests that the extra sales growth coming from certification in institutionally weak environments happens primarily through the conduit of improved efficiency and not through a larger effect coming from signaling. To strengthen this interpretation, we ran an extra regression presented in Appendix 2, relating the productivity gains of each firm to ISC and the institutional weakness variable. The results clearly indicate that productivity gains are smaller in less developed countries but, more importantly, that ISC has a distinct and greater impact on productivity gains in institutionally weak countries, as witnessed by the positive and significant coefficient for the interaction variable $ISC*INSTWEAK$. These results provide support for the position that the significant

extra effect we found for the interaction variable $ISC*INSTWEAK$ in the basic reduced equation model (3) comes from the closing of larger productivity gaps in institutionally less developed countries.

(c) The dimensions of institutional quality

In testing the basic model, we used $INSTWEAK$, the rank of the Ease of Doing Business index, as a measure of institutional weakness. This variable is a composite indicator summarizing various underlying institutional pillars deemed essential for efficient market functioning. To verify the robustness of our results and the interpretation of our findings, we decomposed the $INSTWEAK$ variable and ran separate regressions for sub-indicators that are considered essential for efficient market functioning. We tested the model for ‘trading across borders’, ‘contract enforcement’ and ‘protecting investors’ (Columns (1)-(3)) and extended the analysis by including two components of the Index of Economic Freedom ‘property rights’ and ‘corruption’ (Columns (4)-(5)). All institutional variables are normalized to range between zero and one, to facilitate comparison. Whereas EDB variables indicate rankings, the IEF variables are indices, transformed to take higher values for weaker institutional quality countries, comparable to the EDB variables. The IV estimation technique is uniformly applied^{vi}.

Except for ‘Investor protection’, all of the selected institutional quality pillar variables produce a significant effect in the expected direction: better institutions resulting in higher levels of sales growth by firms based in the country. The coefficient of the ISC variable is positive and significant in all equations, and of approximately the same estimated magnitude. Most importantly for our robustness test, however, the results for the different institutional quality variables manifest a reinforced ISC effect on the growth in sales of firms established in lower institutional countries. The effects are of comparable magnitude across the equations. Only for ‘Property Rights protection’ and ‘Corruption’ does the effect tend to be somewhat larger. This result is not surprising and in line with many other studies that have singled out these factors as the most important institutional pillars for stimulating entrepreneurship and innovation (Hill, 2003). ‘Trading across borders’ has a large direct effect on sales growth and underscores the importance of efficient trade policies and institutions, and the associated learning effects resulting from the international exposure of firms. ‘Contract enforcement’ points to the key role of efficient contract enforcing mechanisms for sales growth and the strong substitute role that self-regulatory mechanisms such as certificates can play in countries where judiciaries are complex and inefficient. Indeed, as indicated by Clougherty and Grajek (2008), “the conflict-settling properties of ISO certification help reduce trade barriers between businesses from different nations by setting reasonable working procedures that smooth inter-firm relations and reduce instances of conflictual hold-up”. Our firm-level evidence indicates that this effect is particularly strong for firms located in countries where conflicts are difficult to settle through the courts.

INSERT TABLE 6 HERE

7. DISCUSSION AND CONCLUSIONS

This study presents original firm-level evidence of the effects of international standards certification on the operational and sales performance of the firm for a wide set of countries differing in the degree of their institutional (market) development. We find evidence that ISC raises efficiency more and leads to a better sales performance by firms in countries where market-supporting institutions are weak.

In a related paper, Feng, et al. (2008) examined manufacturing and service companies in Australia and New Zealand. They found that ISO 9000 certification had a positive and significant effect on operational performance but a weaker effect on overall business performance. Our results are in line with their findings, but they show that the operational efficiency improvements are more substantial in countries where markets are less developed and, as a result, large productivity differences exist across firms, with most firms working substantially below the technological possibility frontier. In such environments, ISC can have an important impact on moving firms up the technological ladder and improving their productivity. A global standards certificate, such as the widely used ISO 9000, can be seen as an institution that can partly substitute for the disciplining role that efficient markets exert on the behavior and performance of firms. Deficient markets typically occur where supporting institutions such as

property-right protection and level-playing field regulations fail. In most of these countries, firms are only beginning to implement efficient management systems. Whereas competitive forces in well-developed markets force firms to adopt best-practice technologies, in institutionally weak countries market forces cannot exert a similar disciplining role. In such environments, ISC will act as a substitute institution, helping firms to improve efficiency in pursuit of basic standards that are accepted world-wide.

Recent empirical studies have also argued that firms located in developing countries face extra difficulties in reaching consumers in global markets. With information asymmetry, global buyers often associate the product with the generally poor reputation of its country of origin (Potoski and Prakash, 2009). Producers face greater difficulty in signaling their product quality, and they use international standards as a mechanism to mitigate information asymmetries and stimulate international trade. There is macro evidence supporting this argument. Clougherty and Grajek (2008) find that ISO diffusion has no effect in developed nations, but it enhances exports in developing nations, underscoring its major importance in institutionally weaker countries. At the micro level of the firm, no such evidence existed. However, there are related studies on the growth of African firms which showed that, in weakly developed markets, formally registered firms exhibit higher growth rates. They enjoy a better institutional standing in their industry and benefit from positive reputation effects – elements that help to explain their superior growth performance (Goedhuys and Sleuwaegen, 1999; Sleuwaegen and Goedhuys, 2002). Like formal registration and reputation, ISC is likely to have a comparable effect, signaling the compliance of the firm with basic management standards and reducing the transaction costs deemed higher in institutionally weak countries. Our study finds clear evidence for this signaling role.

However, we do not find that this effect rises systematically with the degree of institutional weakness shown by the country. The signaling effect appears to be equally strong in all investigated countries. We should, however, point out that the most advanced countries are not included in our sample. Hence, it is still possible that inclusion of highly advanced countries would reveal differential and stronger signaling effects for less developed countries. We find that the extra ISC effect on sales growth of firms in the least developed countries of our sample comes primarily from efficiency improvements. It seems, therefore, reasonable to assume that the macro evidence found for ISC in relation to extra international trade may be largely accounted for by productivity improvements, in addition to the earlier identified signaling benefits from certification.

In seeking to verify our results for the different institutional pillars deemed important in an efficient market environment, we found that the evidence holds for different pillars considered by the World Bank in their 'Ease of Doing Business' Indicator. The effects tend to be somewhat stronger for 'Corruption' and 'Property Rights', two indicators that are considered essential for entrepreneurship and innovation.

Our findings have some important implications for public policy. In profiling the certificate holder, we found that firm size and age of firms emerge as important factors explaining the probability that the firm uses an ISC. The size and age effects primarily reflect the fact that the costs of acquiring and using an ISC are prohibitively high for small and young firms in less

developed countries. The costs include the difficulty of finding qualified personnel to document and implement change and relatively more extensive audits (UNIDO, 2012). These costs are important constraining factors explaining why few small firms apply for an ISC in spite of the potential benefits. Hence, improving access conditions and providing firms with infrastructure and support to meet the requirements of an ISC emerge as effective instruments in a well-designed private enterprise support program.

In sum, the results we present in this paper provide new and original micro evidence of ISC effects on performance that were difficult to test at the macro level or that, as a consequence of aggregation, resulted in mixed evidence. However, our study also has some limitations. First, while covering a wide set of countries, the data only allowed us to perform a cross-section analysis. Panel data covering a longer period would have enabled us to embark on a more extensive analysis, examining the performance of the firm before and after certification. Second, our data are restricted to manufacturing firms; it would be interesting to broaden this area of study and include the strategies and benefits of ISC for firms in the services sector. Finally, our study should be complemented with qualitative case studies to better understand how and when firms take the decisions to apply for ISC, unveiling specific motivations and behaviors of firms in institutionally weak countries.

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ⁱFor instance, the share of Europe in worldwide ISO 9001 certification declined from 49% to 45% over the period 2003-2007, a decline mainly due to Western European countries. It increased for Latin America and Africa from 1.87% to 4.14% and 4.04% to 8.29% respectively over the same period. In absolute numbers, the increase is still high in all regions of the world (having nearly doubled in Europe and quadrupled in Africa and Latin America).

ⁱⁱ We found one micro-evidence based study demonstrating different effects of certification, comparing the effect of certification for businesses in the US and Thailand (Ussawahanitchakit, 2002).

ⁱⁱⁱ The findings are mostly supportive of a positive relationship between certification and financial performance (e.g. Simmons and White, 1999, Häversjö, 2000, Chow-Chua et al., 2003; Dimara et al., 2004; Naser et al., 2004, Sharma, 2005, Corbett et al., 2005) but not always (Lima et al., 2000; Dimara et al., 2004; Han et al., 2007). Dunu and Ayokanmbi (2008) have indications that revenue and income improve after ISO 9000 certification, but the effect vanishes when other indicators are used.

^{iv}These are: Business freedom, trade freedom, monetary freedom, government size/spending, fiscal freedom, property rights, investment freedom, financial freedom, labor freedom, freedom from corruption.

^v Firms enter the industry with different relative (fixed) efficiency levels. Once established in the industry, firms learn about their efficiency, especially in their first years, with least efficient firms being forced to exit, while more efficient businesses expand. This explains why young firms grow faster once they discover, having come face-to-face with the challenge of the marketplace, that they can withstand competition. The higher and erratic growth rates of smaller firms are related to the size at which young firms enter the industry vis-à-vis the Minimum Efficient Scale (MES), dictated by the technological conditions of the industry (Coad, 2009).

^{vi} The estimated models compare to the equation in Table 5, Column 3.

Table 1: Composition of the sample and incidence of certification by country, ordered by Ease of Doing Business (EDB) ranking

	<i>Rank</i>	# obs.	% ISC		<i>rank</i>	# obs.	% ISC
Estonia	17	67	0.48	Swaziland	95	50	0.28
Georgia	18	54	0.19	Azerbaijan	96	68	0.26
Latvia	22	52	0.40	Croatia	97	44	0.45
Lithuania	26	50	0.20	Uruguay	98	140	0.17
Slovak Rep.	32	39	0.41	Paraguay	103	105	0.08
Chile	33	343	0.22	Bosnia-Herz.	105	63	0.44
Armenia	39	53	0.40	Russia	106	247	0.21
Namibia	43	69	0.36	Argentina	109	319	0.27
Mexico	44	681	0.24	Belarus	110	40	0.15
Hungary	45	72	0.64	Guatemala	114	250	0.10
Bulgaria	46	57	0.26	Uganda	118	240	0.15
Romania	48	57	0.42	Honduras	121	174	0.17
Botswana	51	78	0.13	Ecuador	128	187	0.20
Mongolia	52	119	0.20	Tanzania	130	212	0.21
Slovenia	55	59	0.58	The Gambia	131	22	0.18
Czec Rep.	56	47	0.70	Cape Verde	132	46	0.04
Turkey	57	339	0.52	Albania	136	10	0.30
Peru	58	216	0.19	Uzbekistan	138	97	0.20

Panama	65	83	0.06	Ukraine	139	164	0.20
Colombia	66	447	0.12	Bolivia	140	170	0.16
El Salvador	69	263	0.14	Rwanda	150	38	0.16
Kazakhstan	71	95	0.33	Tajikistan	153	50	0.16
Poland	74	66	0.29	Cameroon	154	105	0.21
Macedonia	75	67	0.40	Mauritania	157	71	0.09
Montenegro	81	15	0.13	Burkina Faso	161	41	0.07
Serbia	86	107	0.46	Guinea	166	81	0.06
Moldova	92	93	0.18	Angola	167	112	0.07
Nicaragua	93	201	0.16	Burundi	174	76	0.05
Kyrgyz Rep.	94	61	0.26	Guinea Bissau	176	29	0.07
				Congo D.R.	178	119	0.08

Table 2: Definition of variables

Definition		Mean (STD)
<i>Dependent variables</i>		
ISC	=1 if firm has an internationally recognized quality certification	0.22
TFP	Estimated Total Factor Productivity in period t	8.86 (1.64)
SALES GROWTH	Growth of sales over a three year period, measured by [ln (sales _t) – ln (sales _{t-3})]/3	0.14 (0.34)
<i>Explanatory variables</i>		

Log(sales t-3)	Sales in period t-3, in log.	12.95 (2.21)
Log (firm age)	Age of the firm in t, in logarithmic terms	2.73 (0.75)
D-foreign	=1 if the firm is foreign owned	0.13
INSTWEAK	Institutional weakness measured by the Ease of Doing Business 2008 overall ranking of the country where the firm is active; normalised variable; higher values imply lower institutional quality	0.45 (0.26)
Trading across borders	Institutional weakness measured by the EBD 2008 ranking on the subcomponent 'Trading across borders', of the country where the firm is active; normalised variable, higher values imply lower institutional quality	0.54 (0.24)
Investors' protection	Institutional weakness measured by the EBD 2008 ranking on the subcomponent 'Protecting investors', of the country where the firm is active; normalised variable, higher values imply lower institutional quality	0.40 (0.27)
Contract Enforcement	Institutional weakness measured by the EBD 2008 ranking on the subcomponent 'Contract enforcement', of the country where the firm is active; normalised variable, higher values imply lower institutional quality	0.44 (0.25)
Property rights	Institutional weakness measured by the Index of economic freedom 2008 score on subcomponent 'Property rights' of the country where the firm is active; normalised variable, rescaled so that higher values imply weaker property rights	0.38 (0.22)
Corruption	Institutional weakness measured by the Index of economic freedom 2008 score on subcomponent 'Freedom from corruption' of the country where the firm is active; normalised variable, rescaled so that higher values imply more corruption	0.38 (0.20)
Skill Level	Proportion of skilled production workers in total production workers	0.66 (0.33)
D-ICT	=1 if the firm uses a website to interact with clients and suppliers	0.43
D-product inno	=1 if the firm has introduced into the market any new or significantly improved products in the past three year period	0.68
D-license	=1 if the firm uses a license from a foreign-owned company	0.15

Tax controls	Number of controls by tax authorities over the last 12 months	
Productivity gain	Productivity gains, measured by the log of sales per employee in t3 minus the log of sales per employee in t0	0.26 (1.02)

Table 3: Results of the probit equation, explaining the probability that the firm has an ISC

	(1)	(2)
	ISC	ISC
	(dy/dx)	(dy/dx)
Log (sales t-3)	0.057*** (0.003)	0.054*** (0.003)
Log (firm age)	0.019*** (0.007)	0.021*** (0.007)
D-foreign	0.095*** (0.017)	0.077*** (0.016)
Skill level	0.026* (0.015)	0.025 (0.015)
D-ICT	0.104*** (0.012)	0.096*** (0.012)
D-product inno	0.043*** (0.011)	0.033*** (0.011)
INSTWEAK	-0.091 (0.171)	-0.083 (0.172)
D-license		0.126*** (0.016)
Tax controls		0.001* (0.000)
Observations	7,320	7,320

Pseudo R ²	0.248	0.259
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Notes: Marginal effects are reported; Country and sector dummies included in the estimation;

Robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1

Table 4: Estimation results for productivity (TFP)

	(1)	(2)	(3)
	OLS	IV	IV
Log (firm age)	0.098*** (0.021)	-0.002 (0.027)	0.033 (0.024)
D-foreign	0.646*** (0.044)	0.282*** (0.070)	0.401*** (0.063)
Skill level	-0.033 (0.045)	-0.041 (0.051)	-0.042 (0.048)
D-ICT	0.537*** (0.033)	0.214*** (0.059)	0.325*** (0.047)
D-product inno	0.164*** (0.033)	0.063 (0.039)	0.103*** (0.037)
INSTWEAK	-0.235 (0.238)	0.377 (0.590)	-0.342 (0.254)
ISC	0.448*** (0.037)	2.348*** (0.267)	1.354*** (0.236)
ISC*INSTWEAK			0.801** (0.409)

Constant	6.903*** (0.172)	8.644*** (0.234)	7.120*** (0.183)
Observations	7,320	7,320	7,320
R-squared	0.521	0.333	0.516

Notes: Country and sector dummies included in the estimation;

Robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1;

Table 5: IV Estimation results for sales growth

	(1)	(2)	(3)	(4)
	OLS	IV	IV	IV
Log (sales t-3)	-0.313*** (0.013)	-0.255*** (0.019)	-0.270*** (0.019)	-0.040*** (0.012)
Log(sales t-3)^2	0.010*** (0.001)	0.007*** (0.001)	0.007*** (0.001)	0.001 (0.001)
Log (firm age)	-0.086*** (0.033)	-0.056 (0.038)	-0.055 (0.038)	-0.131*** (0.021)
[Log(firm age)]^2	0.035*** (0.005)	0.027*** (0.006)	0.027*** (0.006)	0.016*** (0.003)

Log(sales t-3)*Log(age)	-0.009*** (0.002)	-0.008*** (0.003)	-0.008*** (0.002)	-0.000 (0.001)
D-foreign	0.088*** (0.011)	0.045*** (0.015)	0.040*** (0.015)	-0.008 (0.007)
D-ICT	0.117*** (0.008)	0.071*** (0.013)	0.071*** (0.013)	0.020*** (0.006)
D-product inno.	0.046*** (0.008)	0.029*** (0.010)	0.030*** (0.010)	0.026*** (0.005)
INSTWEAK	-0.033 (0.067)	0.007 (0.144)	-0.088 (0.079)	0.014 (0.046)
ISC	0.074*** (0.009)	0.536*** (0.087)	0.360*** (0.096)	0.171*** (0.050)
ISC*INSTWEAK			0.431*** (0.090)	0.012 (0.042)
Productivity gain				0.279*** (0.004)
Constant	2.504*** (0.105)	2.449*** (0.135)	2.338*** (0.137)	0.600*** (0.088)
Observations	7,320	7,320	7,320	7,320
R-squared	0.297	0.054	0.299	0.814
Sargan chi-sq.		0.22		
First stage F-statistic		54855		

Notes: Country and sector dummies included in the estimation;

Robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1;

Table 6: IV Estimation results for sales growth; different measures for institutional quality

<i>Institutional weakness :</i>	(1)	(2)	(3)	(4)	(5)
	EDB	EDB	EDB	IEF	IEF
	Trading across borders	Contract enforcement	Investors' protection	Property rights	Corruption
Log (sales t-3)	-0.265*** (0.019)	-0.256*** (0.019)	-0.265*** (0.019)	-0.269*** (0.019)	-0.269*** (0.019)
[Log (sales t-3)]^2	0.007*** (0.001)	0.007*** (0.001)	0.007*** (0.001)	0.007*** (0.001)	0.007*** (0.001)
Log (firm age)	-0.060 (0.038)	-0.0519 (0.039)	-0.060 (0.038)	-0.056 (0.038)	-0.061 (0.038)
[Log (firm age)]^2	0.027*** (0.006)	0.028*** (0.006)	0.028*** (0.006)	0.027*** (0.006)	0.028*** (0.006)
Log(sales t-3)	-0.008*** (0.003)	-0.009*** (0.003)	-0.008*** (0.003)	-0.008*** (0.003)	-0.008*** (0.003)
*Log(age)					
D-foreign	0.043*** (0.015)	0.042*** (0.015)	0.042*** (0.015)	0.043*** (0.015)	0.045*** (0.015)
D-ICT	0.070*** (0.013)	0.069*** (0.013)	0.072*** (0.013)	0.071*** (0.013)	0.071*** (0.013)
D-product inno.	0.030*** (0.010)	0.028*** (0.010)	0.030*** (0.010)	0.030*** (0.010)	0.029*** (0.010)

<i>Institutional Weakness</i>	-0.427*** (0.085)	-0.418*** (0.104)	-0.053 (0.130)	-0.317*** (0.093)	-0.287*** (0.088)
ISC ^a	0.371*** (0.100)	0.423*** (0.095)	0.407*** (0.094)	0.291*** (0.108)	0.293*** (0.110)
<i>ISC*Instit. weakness</i>	0.329*** (0.095)	0.315*** (0.096)	0.325*** (0.086)	0.402*** (0.102)	0.388*** (0.105)
Constant	2.599*** (0.147)	2.494*** (0.141)	2.495*** (0.142)	2.528*** (0.147)	2.541*** (0.149)
Observations	7,320	7,320	7,320	7,320	7,320
R-squared	0.297	0.297	0.298	0.298	0.298

Notes: ^a ISC is instrumented. Country and sector dummies included in all estimations; Robust standard errors in parentheses;

*** p<0.01, ** p<0.05, * p<0.1;

EDB : Ease of Doing Business, World Bank, 2008;

IEF : Index of Economic Freedom, 2008, Heritage Foundation and the Wall Street Journal, 2008.

Appendix 1: Full results of the 2SLS estimation

First stage		First stage	
ISC	TFP	ISC	SALES GROWTH

ISC		2.348***		0.536***
		(0.267)		(0.087)
INSTWEAK	-0.223	0.377	-0.067	0.007
	(0.163)	(0.590)	(0.158)	(0.144)
Log (sales t-3)			-0.120***	-0.255***
			(0.017)	(0.019)
[Log (sales t-3)]^2			0.007***	0.007***
			(0.001)	(0.001)
Log (firm age)	0.052***	-0.002	-0.061	-0.056
	(0.006)	(0.027)	(0.041)	(0.038)
[Log (firm age)]^2			0.015**	0.027***
			(0.006)	(0.006)
Log(sales t-3) *Log(age)			-0.0004	-0.008***
			(0.002)	(0.003)
D-foreign	0.160***	0.282***	0.075***	0.045***
	(0.013)	(0.070)	(0.014)	(0.015)
D-ICT	0.152***	0.214***	0.090***	0.071***
	(0.010)	(0.059)	(0.010)	(0.013)
D-product inno.	0.040***	0.063	0.028***	0.029***
	(0.010)	(0.039)	(0.010)	(0.010)
Skill level	0.005	-0.041		
	(0.014)	(0.051)		

D-license	0.171***		0.131***	
	(0.012)		(0.013)	
Tax controls	0.0003*		0.0002	
	(0.0001)		(0.0002)	
Constant	-0.082	8.644***	0.552***	2.449***
	0.065	(0.234)	(0.138)	(0.135)
Observations	7320	7,320	7320	7,320
R-squared	0.213	0.333	0.265	0.054
F((2,7246)	90.629***		54.855***	
Sargan chi-sq.	1.261		0.219	

Appendix 2: Results explaining productivity gain

VARIABLES	Productivity gain	Productivity gain
Institutional weakness	-0.417***	-0.472***
	(0.046)	(0.051)
ISC	0.089***	-0.026
	(0.029)	(0.054)
Institutional weakness*ISC		0.286**
		(0.115)
Constant	0.424***	0.451***
	(0.025)	(0.027)

Observations	7,320	7,320
F(2,7317)	51.49***	
F(3,7316)		36.41***

Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1