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International Diffusion of Organizational Practices: Integrating the Rational Choice and Institutional Models

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Abstract
The present study extends the international diffusion literature beyond the dominant institutional paradigm, and argues for an integrated consideration including economic motivations for the adoption of organizational practices. We propose that in an aggregate cross-national analysis of the diffusion of organizational practices, considering industry characteristics allows consideration of economic motivations for adoption. We use data from 2001-2004 ISO9000 certifications in the manufacturing industries of seven OECD countries. The results show that lagged industry characteristics along with institutional factors explain cross-industry and cross-country differences in ISO9000 certification.
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INTRODUCTION

In diffusion research, uneven levels and patterns of adoption across both industries and countries continue to remain the subject of much inquiry. Although the decision to adopt an innovation or practice involves a complex cost-benefit analysis of economic and social factors, recent research has pointed to the limitations of both the institutional (Colyvas & Jonsson, 2011) and the rational choice models (Nelson, Peterhansl, & Sampat, 2004) in being able to accurately specify adoption across industries and countries. This is a non-trivial issue, since this may be indicative of a serious limitation in traditional approaches to researching diffusion. Explaining differences in the level and patterns of adoption becomes even more imperative as recent evidence suggested that cross-country differences in industry performance are often associated with differences in their levels of use certain practices (Bloom & van Reenen, 2012; Ichniowski & Shaw, 1999; Ichniowski, Shaw, & Prennushi, 1997).

The first approach emphasizes the sociology of adoption, and studies the influence of institutional processes on the legitimization of a technology or practice in a given context (DiMaggio & Powell, 1983; Guler, Guillén, & MacPherson, 2002). Institutions are found to incentivize certain behavioral patterns and expectations, and influence practices likely to be adopted in a cross-national setting (Chesbrough, 1999; Nelson & Sampat, 2001). The second approach emphasizes the economics of adoption, and focuses on characteristics of both the adopter and the technology or practice under consideration (Karshenas & Stoneman, 1993; Katz & Shapiro, 1987; Keller, 2001). Adopter heterogeneity impacts expectations of costs of adoption and associated payoffs, and therefore has an effect on motivation to adopt (Davies, 1979; Geroski, 2000; Karshenas & Stoneman, 1993). Previous work on international diffusion of organizational practices focuses on cross-national diffusion at country level and emphasize on institutional and geographic factors explaining different adoption levels (Guler, Guillen & MacPherson 2002; Albuquerque, Bronnenberg, & Corbett, 2007). Some efforts have been made to address these shortcomings, but there is an important gap represented by its agnostic stance concerning the heterogeneity in the economic motivations.
Using an integrative lens, this study proposes that industry characteristics that reveal economic motivations behind adoption may work along with institutional factors at the national level to influence the adoption of an organizational practice in an industry. We show that in addition to national institutional factors, lagged industry characteristics explain cross-industry and cross-country differences in adoption levels.

This study considers that certain characteristics of national industries allow us to proxy economic motivations to adopt. Existing evidence supports our approach. First, a few industry-level analyses of single economies show that industry characteristics can proxy heterogeneity in firm resources which in turn influence cost and benefits of adoption (Schilling & Steensma, 2001; Sahaym et al., 2007; Sahaym, Steensma, & Barden, 2010). Second, reflecting the structure-strategy paradigm (Porter 1980), industry-level characteristics seem to capture information that can predict firm behavior, especially in relation to R&D investment, productivity (Cohen, Levin, & Mowery, 1987; Mauri & Michaels, 1998; Waring, 1996), and use of specific organizational forms (Choi & Contractor, 2016; Hagerdoon & Narula, 1996). We test our theoretical arguments by investigating the international diffusion of the International Organization for Standardization (ISO) ISO9000 quality management standard. Adoption of ISO9000 has been used in the literature to proxy for the use of similar organizational forms (see for instance Guler et al., 2002) when adoption involves the development of specific routines and practices (Attwell, 1992; Bénézech, Lambert, Lanoux, Lerch, & Loos-Baroin, 2001). We use data on the number of ISO9000 certificates in the manufacturing industries of seven OECD countries in 2001-2004. Results support the argument that industry characteristics along with institutional factors both explain cross-industry and cross-country differences in ISO9000 certification.

Our study makes three key contributions to research on international adoption and diffusion of organizational practices. First, it proposes and finds support for the idea that economic motivations alongside institutional mechanisms, explain differences in the levels of organizational practice adoption. This confirms that the economic benefits from the adoption of organizational practices depend also on adopters’ capabilities and strategies (David, 1975; Davies, 1979; Geroski, 2000). We contribute by showing that while institutional mechanisms may influence adopters
operating in specific institutional and technological contexts by creating incentives for isomorphic behavior (Guler et al., 20002), potential adopters have different innovation strategies and business models, develop different capabilities and characteristics, and consequently expect different types of returns from, and different levels of costs of adoption of specific organizational practices. Since ISO9000 is a set of guidelines aimed at improving the reliability of quality management systems and providing a market signal, its diffusion is more likely to be driven by social and institutional mechanisms (Albuquerque et al., 2007; Guler et al., 2002; Nelson et al., 2004), we would expect the importance of economic motivations (reflected in adopters’ characteristics) to hold and be particularly strong for explaining the adoption of other organizational practices.

Second, it adds to the traditional adoption literature which mostly neglects managerial and organizational practices, as well as the simultaneous role of economic and institutional factors on adoption. Our study reinforces their thesis that economic motivations play a role in adoption (Schilling, & Steensma 2001; Silverberg et al., 1988), and extends it by proposing and showing evidence that economic motivations, along with institutional factors, play also a role in explaining the adoption of organizational practices.

Third, our study contributes to the literatures on national comparative advantage and industrial organization by showing that industries differ significantly across countries, and that these national peculiarities of national industries and national institutional explain the adoption of organizational practices. While these literatures have mostly assumed the behavior and performance of national industries as the result of complex interactions between many different country and industry-level factors (Nelson, 1993; Porter 1985; 1990), our study in line with Choi & Contractor (2016) show that some country and industry effects can be identified.

THEORY AND HYPOTHESES DEVELOPMENT

Diffusion research has developed broadly along two intellectual traditions. A body of literature rooted in institutional theory views adoption as isomorphic behavior engendered by the need to adhere to social justifications and obligations. Social influences shape rules, norms and beliefs which in turn define and enforce acceptable behavior by individuals, firms and industries
Based on the premise that success is contingent on conformity, institutional factors induce homogeneity in firms’ internal structures, processes and activities. Findings from cross-country studies of adoption of management practices indicate, for example, that both public discourse and international trade flows (Albuquerque et al., 2007; Guler et al., 2002) along with national embeddedness (Gooderham, Nordhaug, & Ringdal, 1999; Terlaak and King, 2006) drive adoption decisions.

A parallel body of work rooted in economic theory argues that a firm’s choice to adopt a particular technology or process is motivated by considerations of strategic and economic benefits (Nelson, 1991). Variance in adoption is not only due to heterogeneity among adopters, but also a result of firms actively strategizing to differentiate themselves in the competitive landscape. Adopters with different resources and capabilities may have varying expectations of economic value (Darnall & Edwards, 2006; Geroski, 2000; Romeo, 1975), they also face different hurdles to adoption (Griliches, 1957, 1960; Levin, Levin, & Meisel, 1992). Their assessment of the value of adopting an innovation also depends on how well the innovation fits with, and advances their competitive strategies (David, 1975; Davies, 1979). Findings indicate that cross-country adoption of management practices is associated with number of direct competitors, capital ownership (Bloom & van Reenen, 2007, 2012), degree of internationalization, R&D activities (Whittington et al., 1999), and with firms’ competitive position within country and industry (Massini, Lewin, & Greve, 2005).

Each of these approaches has limitations. The institutional approach has been criticized for viewing “organizations as captives of the institutional environment in which they exist” (Tolbert & Zucker, 1983: 22) and more specifically in the context of diffusion research, for conflating institutionalization and diffusion in spite of evidence to the contrary (Colyvas & Jonsson, 2011). The rational choice models have been criticized for being agnostic of institutional differences in spite of research findings which emphasize the need to incorporate contextual variables into economic models (Nelson et al., 2004). Research finding Japanese firms, contrary to their European counterparts, did not report a radical transformation of their routines in the 1990s (Massini, Lewin, Numagami & Pettigrew, 2002) point to the need to do so. These two streams of literature have proceeded in parallel, with each applying its own specific lens to study the phenomena (Nelson et al.,
2004). Some few studies appear to have bridged these approaches. Evidence from single industry-country studies suggests that even though underlying rationality and cognition may differ, both economic and institutional factors influence adoption (Tolbert & Zucker 1983; Westphal, Gulati, & Shortell 1997; Kennedy & Fiss 2009). Evidence from international adoption analysis also points in that direction (Choi and Contractor, 2016). Joint consideration of economic and institutional factors is particularly relevant in cross-country settings where lack of informational clarity may obfuscate ‘evidence of efficacy’ (Nelson et al., 2004).

In other words, research on cross-country and cross-industry diffusion of organizational practices need to integrate these approaches since both institutional and economic aspects are at play in the adoption decision. While adopters from a specific institutional context may perceive different levels of economic value emanating from an organizational practice or an innovation (Chesbrough, 1999; Furman et al., 2002; Nelson, 1991; Pavitt, 1998), the factors that influence their economic motivations are likely to persist over the institutional context in which they operate. Intuitively, therefore, it appears that in order to unpack adoption patterns across both countries and industries, one needs to account for both sets of factors: institutional factors that operate at the country level, and factors that reflect the heterogeneous resource positions of industries operating within the country.

**The diffusion of ISO 9000 quality management certification**

The increasing importance of quality management systems prompted the ISO to set up Technical Committee 176 in 1979 in order to harmonize multiple national and private quality management and assurance standards. Building on the British Standards (BS5750) and NATO quality procedures, the committee developed an international quality assurance standard, and ISO9000 was introduced in 1987 to replace various quality standards that were in vogue. By harmonizing quality terms, systems, and standards, the ISO9000:1987 standard was expected to facilitate global trade by assuring customers that their orders would be produced and delivered according to explicit and agreed specifications. ISO9000 was updated in 1994 and 2000. From 1994, third-party certification of firm’s conformance to standards was required; the 2000 update mandated
the issue of only single-firm certification (previously, firms could have more than one certification relating to different sites and products).

ISO9000 is a process management standard; instead of focusing on product characteristics, it emphasizes the firm’s business processes, and provides guidelines for the adoption of continuous improvement practices. ISO9000 assumes that firms can better control the quality of their products if processes are codified, which requires firms to document their processes in quality manuals (Bénézech et al., 2001; Withers & Ebrahimpour, 2000). Certification is awarded following an external audit and agreement among the certification body that the firm’s organizational processes conform to its standard and to the written quality manual. Certification is for a three-year period after which a new audit is conducted and certification either extended or withdrawn (Benner & Tushman, 2002; Bénézech et al., 2001; Guler et al., 2002). From the decision to adopt, certification takes an average of 18 months to review existing processes and develop, document, and implement management control systems respecting the standard guidelines and the firm’s routines (Corbett, Montes-Sancho, & Kirsch, 2005).

ISO9000 certification does not ensure a specific quality of a finished product, or a customer-based TQM culture. Instead, it indicates that the firm has implemented and is compliant with a set of written guidelines governing product quality management (Bénézech et al., 2001; Prajogo & Sohal, 2003). Thus, ISO9000 is often understood as a signal of quality management (Withers & Ebrahimpour, 2000). While there is conflicting evidence regarding the effect of ISO9000 on adopters’ financial performance (Corbett et al., 2005; Prajogo & Sohal, 2003; Seddon, 2000; Yeung, Lo, & Cheng, 2011), there is agreement about its positive impact on process improvements (Levine & Toffel, 2010; Terlaak & King, 2006; Withers & Ebrahimpour, 2000). The returns observed from certification seem closely associated with the expected net benefits (Bénézech et al., 2001; Larsen & Häversjö, 2001), which in turn depend on the capabilities and characteristics of adopters (Darnall & Edwards, 2006; Tari & Sabater, 2006).

In the late 1990s, ISO9000 certification became diffused worldwide with requests from multinationals, governments, large customers and contractors, and suppliers. ISO9000 was virtually a prerequisite for entry to global markets, and for newly de-regulated sectors and outsourced public
services in domestic markets (Corbett & Kirsch, 2001; Pan, 2003; Withers & Ebrahimpour, 2000). However, there are cross-country and cross-industry differences in diffusion of ISO9000 certification (Corbett et al., 2005; ISO, 2005, 2010). These differences suggest that ISO9000 adoption may depend also on the industry characteristics in different countries. Since the characteristics of industries vary across countries, we would expect the diffusion of ISO9000 to reflect such variance.

Predictors to Adoption of Organizational Practices

Industry level

Studies in industrial organization economics and strategic management provide evidence that due to an industry’s structural characteristics – namely entry barriers, demand structure, competition, suppliers, and regulatory conditions – constituent firms tend to converge on similar patterns of behaviors. Broadly, this occurs for a variety of reasons. First, the agglomeration and cluster literatures point to a link between national industry-level factors to distinctive innovation capabilities among firms (Furman et al., 2002; Porter 1985; 1990). Second, industries go through systemic changes as they evolve, which shifts the basis of competitive advantage. Changes in knowledge and technological bases within an industry, for example requires firms to engage in innovation strategies that are aligned with the shifting basis of competitive advantage in the industry (Nelson & Winter, 1982; Pavitt, 1984; Malerba, 2004). Third, as firms compete, they tend to imitate each other’s best practices (Coleman, 1993; Winter, 1987) due to which isomorphic patterns can be detected in their competitive behaviors (Balasubramanian & Lieberman, 2010; Sahaym et al., 2007).

In sum, there are compelling reasons why industry-level factors that relate to its competitiveness and capacity may influence adoption of certain types of practices and technologies by firms that constitute the industry in one country.

In the context of diffusion research, Schilling & Steensma’s (2001) effort to develop a ‘comprehensive industry-level theory’ that predicts firms’ adoption of modular organizational forms is particularly illuminating. Their study suggests that while adoption of a particular type of organizational form may occur at the firm-level, patterns and levels of such adoption can be predicted by industry factors. Specifically, they find that in industries characterized by heterogeneity
in inputs and demand, firms place greater value on the flexibility provided by modular organizational forms, and therefore variance in modular forms being predicted by industry-level heterogeneity in production systems. In other words, industries are legitimate units of analysis to study adoption practices.

Within an industry, one is likely to witness systematic variance in diffusion rates across national borders. Porter’s (1990) work suggests that co-located firms, suppliers, related industries, and institutions develop a set of competencies which make them distinctive and globally competitive. Due to shared factor endowments such as skilled labor pools and localized technological infrastructure (Justman & Teubal, 1995), relationships with specific national and international suppliers and customers (Chesbrough, 1999), specific forms and levels of competition and dynamics among with local counterparts (Raco, 1999; Agrawal & Cockburn, 2003), in different countries, an industry tend to accrue different degrees of capability, and therefore global equity for their products and services. This in turn creates specific incentives for certain kinds of firm behavior regarding adoption of technologies and practices in an industry in a specific country.

In their study of steel production lines, Ichniowski & Shaw (1999) show that the technological and production systems used by Japanese firms led them to adopt a system of human resource practices that were far more comprehensive and holistic than those adopted by their US counterparts. Even though the bio-tech industry shares some fundamental similarities across borders, entrepreneurial activity in the French, US and Japanese biotech industry differ greatly due to differences in market structure of the pharmaceutical industry, the boundary-spanning activities of scientists (Gittelman, 2006), and buyer-supplier ties (Chesbrough, 1999). In a study of the nuclear power industry, Lester & McCabe (1993) explain how a low degree of reactor standardization and fragmented ownership explain why the US lags behind France where nuclear reactors are highly standardized, and single ownership of multiple sites is prevalent. Focusing on international R&D alliances, Choi & Contractor (2016) show that the characteristics of national industries, in particular their technological capacity and technological specialization, affect the competitive advantage of each partner and consequently the alliance organizational mode chosen.

Hence, firms operating within similar industries but in different countries are likely to
develop specific capabilities and routines which influence their expectations and assessment of value around a new organizational practice or technology, and its adoption costs, which in turn creates variance in their motivation to adopt (Chesbrough, 1999; Lester & McCabe, 1993). In addition, the capacity to adopt may be systematically different across industries with very different levels of skills and technological specialization (Datta, Guthrie, & Wright, 2005; Darnall & Edwards, 2006) since it involves overcoming significant organizational and technological hurdles (Weigelt & Sarkar, 2009). Thus, cross-country differences in industry characteristics are likely to influence both the expected value and costs of adoption (Nelson, 1993; 2002; Schilling & Steensma, 2001; Teece, 1996).

Therefore, in a study of cross-national diffusion of an organizational practice, it is important to model asymmetric motivations for adoption at industry-country levels since these reflect underlying economic motivation for adoption which is crucial to explaining differences in adoption levels. In the present study, we examine the effect of two well-studied industry characteristics, namely the capacity for technical change and productivity, on the adoption of ISO9000.

**Technological Capacity.** In industry level studies, technological capacity is understood as the ability to create scientific knowledge, and innovation that can capitalize on market opportunities (Furman et al., 2002). Investment in R&D activities builds a capacity to effect and deal with technical change (Machin & van Reenen, 1998), and design new, improved products (Hall, Griliches, & Hausman, 1984). Investment in R&D enables firms to also develop absorptive capacity to identify potential benefits, to develop and adopt new technologies and practices (Silverberg, Dosi & Orsenigo, 1988; Cohen & Levinthal, 1989; Massini et al., 2005). Thus, industry formal engagement in R&D activities characterizes the innovative orientation of industries (Malerba & Orsenigo, 1987; Pavitt, 1984).

The diffusion literature has well documented that technologically-competent adopters face lower costs of accessing, transforming, and using information, and therefore can anticipate higher net benefits from adoption. Several studies show that they are also more likely to be proactive and early adopters (Darnall & Edwards, 2006; Kennedy & Fiss, 2009; Pennings & Harianto, 1992). In addition, better technology performance tends to accompany industries that have created the
resources to support the development of new technologies and practices and the adoption of best practice to leverage product value (Bodas Freitas & Iizuka, 2012; Teubal & Andersen, 2000).

The ISO9000 literature shows that firms that invest heavily in R&D anticipate lower costs and time for ISO9000 adoption, and are more likely to focus on identification, design, and implementation of practices, procedures, and technologies to meet the standard, while also improving learning practices and activities (Bénézech et al., 2001; Larsen & Häversjö, 2001). Less competent adopters, however, are likely to regard ISO9000 certification as a costly burden. Such firms will introduce changes in response to external auditors’ demands, rather than seeing it as an opportunity to implement an innovation in their processes (Black & Lynch, 2001; Larsen & Häversjö, 2001; Prajogo & Sohal, 2003; Seddon, 2000). Despite their lower adopting capacity, however, firms with low levels of technological capabilities may be motivated to adopt. ISO9000 certification signals quality management, reducing information asymmetries and agency costs, which facilitate access to international markets and improve internal process efficiency (King, Lenox, & Terlaak, 2005; Terlaak & King, 2006). This may be less important for firms that invest heavily in developing new knowledge, competences, and innovative opportunities since they are likely to design technologically-differentiated products able to compete in international markets (Pavitt, 1998; Winter, 2003). Therefore, the overall benefits through ISO9000 adoption may be uneven across levels of technological capabilities, and might even weaken in the upper tail of the distribution. Also Benner & Tushman (2002) show, ISO9000 is associated with exploitative rather than exploratory technology innovation strategies that require high levels of competences to pursue new knowledge paths. Thus, while we expect ISO9000 adoption levels in an industry to increase with technological capacity, we would expect the relationship to weaken at very high levels.

Based on the above discussion, in an international context, one would then expect that an industry will observe relatively higher level of adoption of ISO9000 in countries where this specific industry has built moderately-high technological capacity.

**H1a: There exists an inverted-U relationship between the level of technological capacity of an industry in one country and the level of ISO9000 diffusion in that national industry.**
*Industrial Productivity*. In industry level studies, the notion of productivity characterizes firms’ relative performance in production and management activities (Abramovitz, 1986; Bernard & Jones, 1996; Färe, Grosskopf, Norris, & Zhang, 1994). Given a specific production technology, often understood as labor-capital ratio, high labor productivity is often associated with efficient organization and production management, and value addition; on the other hand, low returns per unit of value paid to employees tend to be related to obsolete equipment and work organization, less-qualified employees, and low levels of product reliability and competitiveness (Abramovitz, 1986; OECD, 2009). Since an industry may be considered a location where labor, and technical and market information circulate, and equipment can be shared and sold among firms, companies operating in an industry in a specific country are likely to be clustered around similar productivity levels (Malerba & Nelson, 2011; OECD, 2009; Porter, 1990).

Given the nature of ISO9000, the incremental benefits from ISO9000 adoption are likely to decrease with the industrial level of labor productivity for two reasons. First, the opportunities for improving productivity through ISO9000 adoption are fewer the higher the productivity levels observed. ISO9000 includes general knowledge on process management and organization. Its adoption represents an opportunity to play catch-up in organizational and process efficiency, despite costs that are associated with certifiers’ fees and with orchestrating the changes required to achieve such certification. While organizations with poor productivity stand to make immediate gains from adoption by relying on readily available codified and standardized knowledge (Abramovitz, 1986), those that are higher up on the productive curve are unlikely to experience easy performance gains. With ISO9000 involving the implementation of mechanistic practices that on one hand facilitate knowledge crystallization (Prajogo & Sohal, 2003; Seddon, 2000) but on the other introduce certain rigidities (Barker, 1993; Boiral, 2003), organizations that are already efficient and process-driven may expect to see fewer benefits. Innovative organic practices have been shown associated with higher performance and productivity, especially when they are bundled rather than applied individually (Ichniowski, Shaw, & Prennushi, 1997; Ichniowski & Shaw, 1999). The adoption of ISO9000, at least in the short-term, might reduce the possibility for employees to contribute and use
their skills and knowledge to increase their work performance (Huselid, 1995). Secondly, ISO9000 as a signal of quality is particularly important for lagging firms (Spence, 2002; Stiglitz, 2002). For less productive organizations, ISO9000 certification can signal the ability to produce according to specifications, and enable entry to international markets and global supply chains (Bodas Freitas & Iizuka, 2012; Withers & Ebrahimpour, 2000).

However at one point the relationship between the level of ISO9000 certification adoption and the industrial level of labor productivity may reverse. Although highly productive industries may be less motivated to adopt, their capacity to comply with the standard will be higher. Highly productive industries have higher financial capacity to adopt technologies and practices, and their firms are more able to implement ISO9000 in a way that is less disruptive to internal knowledge flows and learning, and more able to design and implement practices that counterbalance the organizational rigidities arising from ISO9000 (Darnall & Edwards, 2006; Huselid, 1995; Prajogo & Sohal, 2003; Tari & Sabater, 2006). Thus, the negative relationship between level of adoption and labor productivity is expected to be flat in the upper tail of the distribution since highly productive adopters have the resources and capabilities to design less disruptive implementation (Bénézech et al., 2001).

Based on the above discussion, in an international context, one would then expect that an industry will observe relatively higher level of adoption of ISO9000 in countries where this specific industry has built moderately-low productivity levels.

\[ H1b: \text{There exists a U-shaped relationship between the degree of productivity of an industry in one country and the level ISO9000 diffusion in that national industry.} \]

Country level

It is well established that administrative, political systems, and regulation differ across national economies (Lavie & Miller, 2008), and that these institutions can influence the adoption of new business practices by firms operating in the country (Nelson & Sampat, 2001; Oliver, 1997). We draw on prior literature on cross-country studies (Choi & Contractor, 2016; Guler et al., 2002; Lavie
and identify national governance and economic openness as two critical national institutional factors that need to be considered in our model. Next, we discuss how these two country-level factors may influence directly the level of ISO9000 adoption.

**National Governance.** National regulation and policies can influence adoption of certain practices by creating appropriate incentives (Tolbert & Zucker, 1983; Damanpour & Schenider, 2009; Guillén, 1994). Countries with effective governance are likely to create institutional environments conducive to adoption of policies that encourage industry modernization and competitiveness.

In countries with strong legal enforcement and with high quality of policy formulation and implementation, transaction costs associated with search, forecast, monitoring and enforcing contracts are relatively lower than in countries with low effective governance (Choi & Contractor, 2016; Galang, 2012). The risks associated with appropriation of benefits from innovation and new practices adoption are also lower in countries with effective governance (Choi & Contractor, 2016; Galang, 2012). In addition, regulatory efforts to promote private sector development, and improve public services create incentives to standardize optimal forms of organizing, and developing new capabilities to meet desired outcomes (Lavie & Miller, 2008; Tolbert & Zucker, 1983; Withers & Ebrahimpour, 2000). For example, a study of the chemical industry in 113 countries by Delmas & Montiel (2008) shows that voluntary industry standards and targeted government policies, supporting the development of a technological infrastructure that enhances standardization and quality control, created incentives for certification.

Accordingly, one would expect that effective national governance systems to influence positively the diffusion of ISO9000, a process standard that aims to improve quality control, and facilitate participation in global markets.

**H2a: There exists a positive relationship between the degree of effective national governance and ISO9000 diffusion in industries in that country.**

**Economic Openness.** The extent to which a national economy is exposed to global capital and markets can influence the adoption of certain technologies and practices (Guler
et al., 2002). Selling to foreign buyers often requires compliance with specific standards in their trade zone, as well as with the standards and procedures of the supply chain (Gereffi & Korzeniewicz, 1994). While certification with international standards and procedures is almost compulsory for firms that want to produce for global markets, the process by which a national industry creates conditions to make its production compliant with international standards is complex and involves a mix of firm and industry level efforts (Bodas Freitas & Iizuka, 2012).

In global capital and production markets, multinationals are particularly powerful in driving isomorphism (Guler et al., 2002). Because multinationals are active in many countries, and interact with many local firms, they are often a source of diffusion and institutionalization of a behavior - in an industry or in a country (Blomström & Kokko, 1998; Guler et al., 2002). Although the influence of multinationals may be asymmetric across regions (Padilla-Perez, 2008), their activity is often seen as enhancing inter-country diffusion of similar practices and technologies (Boyacigiller & Adler, 1991). Multinationals have specific product specifications and operate using particular technologies, product designs, and organizational procedures which often also are imposed on their local suppliers (Gereffi & Korzeniewicz, 1994). Hence, besides international standards, multinationals develop their own set of standards and procedures that permit to define specific processes and product characteristics relevant to its own markets and brands but also to support their crucial suppliers to build their competences to become compliant with international standards (Gereffi, Garcia-Johnson, & Sasser, 2001). Thus the more open a national economy is to players in the global production and capital markets, the more likely that certain behaviors and organizational practices that are common-place in global markets will be accepted as legitimate (Drori et al. 2006). Accordingly, one would expect that degree of economic openness of a national economy to influence positively the diffusion of ISO9000.

\[ H2b: \text{There exists a positive relationship between the degree of economic openness and ISO9000 diffusion in industries in that country.} \]

**DATA AND METHODS**

**Data and Sample**
We use data on the number of ISO9000 certificates across manufacturing industries in seven OECD countries (Czech Republic, Finland, Italy, Japan, South Korea, Portugal, Spain) from 2001 to 2004, collected from various ISO surveys. The timeframe, in particular the left-censoring in 2000, and the country composition of the sample is data driven. The global certification survey (conducted annually since the mid-1990s) has published information on ISO9000 certification by industry only since 2000 (ISO, 2001). Before 2000 and ISO9000:2000, firms could have more than one certification - relating to multi-site or multi-activities. Since 2000, single-firm certificates have been issued. The 2000 revision of ISO9000 introduced some significant changes by mandating continuous improvement from design to customer service compulsory within the company as a whole, eased compatibility with other standards, and simplified adoption by service firms. We focus on the three years immediately after publication of ISO9000:2000 because it has some peculiarities. In this period, even in case firms were already certified, renewal of ISO9000 certification required the investment on a complete update of the quality system installed rather than just a new audit that permitted to extend certification. By focusing on this three years period immediately after the publication of ISO9000:2000, we expect to focus adoption decisions that involve some relevant investment and thus being motivated by somehow strong economic and institutional motivations, and in this way to capture more clearly the economic, social, and institutional effects and the characteristics of adopters on adoption.

The choice of countries in our sample is driven by availability considerations. We use data for those countries for which information on the number of certificates by industry was available for at least 80% of national certificates (for some countries e.g. the UK, these data are available for less than 20% of the total number of certificates). Czech Republic, Finland, Italy, Japan, South Korea, Portugal, Spain are diverse in terms of size, income levels, and belonging (or not) to the European Union (EU). We focus on manufacturing due to the non-availability of information on the independent variables for services in our sample countries\(^i\).

Information on the independent and control variables are from the OECD STAN and ANBERD datasets. Following Guler et al. (2002), we ruled out the possibility of reverse causality, and account for the time lag between decision and award of certification. More specifically, in our
model, the independent and control variables are lagged two years. Since ISO9000 implementation takes 18 months on average, the two year lag provides information on the independent variables at the time of the decision to adopt, and the construction of an effective control group as in Corbett et al. (2005).

**Dependent Variable.**

The dependent variable is the number of ISO9000 certificates. For each year, and for each country, we have one observation per manufacturing activity.

**Independent variables.**

*Industry Technological capacity.* R&D intensity is the most common measure of industry capacity for technical change, design of new or improved products and technologies, and creation of innovative market opportunities (Furman et al., 2002; Machin & van Reenen, 1998). Technological capacity is then measured as total R&D expenditure as a percentage of industry value added. We include linear and squared terms of this variable.

*Industry productivity.* Given a specific production technology (we control for labor intensity of production technologies), labor productivity differentials are associated with different levels of efficiency (Abramovitz, 1986; Färe et al., 1994). Thus, productivity is measured by output per unit of value in labor, i.e. ratio of industry valued added to total labor compensation (Hsieh & Klenow, 2009). Traditional measures of labor productivity were ruled out because of lack of information on full-time equivalent employment for three of our countries. In addition, information on employment tends not to be internationally comparable given different national rules on daily and yearly working hours, and differences in non-declared employment (Delgado, Ketels, Porter, & Stern, 2012; Dollar & Wolff, 1988). We use a labor productivity measure that reports output per unit of value in labor, i.e. in line with capital productivity (Hsieh & Klenow, 2009). Linear and squared terms of this variable are included.

*National governance.* Following Lavie & Miller (2008) we use the World Bank indicators of country governance (governance effectiveness, regulatory quality, rule of law, and control of corruption) to characterize the regulatory and institutional differences of countries in our sample. As these variables are highly correlated with each other (more than 0.9), we include in the regression the
variable National governance which is the extracted principal component, capturing information on all four dimensions of the national institutional set up (Galang, 2012).

Economic openness. Examining the cross-country diffusion of ISO9000, Guler et al. (2002) use share of inward foreign direct investment in GDP as a measure of the effect exerted by coercive global organizations such as multinational and global supply chains on domestic firms. We use the same measure, share of inward FDI, as a proxy for a nation’s economic openness.

Control variables. We control for several industry and national competing explanations.

We control for positive network externalities from adoption, in the same industry, i.e. for the increased the benefits of early adoption to future adopters. We follow the literature and include the lag of the number of ISO9000 certificates in the national industry. We also control for industry labor intensity since process efficiency may depend on the labor intensity of the production technology and the wage rate (Arrow, Chenery, Minhas, & Solow, 1961; Huselid, 1995; OECD, 2009). Datta et al. (2005) show that labor intensity moderates the effect of human resources management practices on labor productivity. Labor intensity is measured as the ratio of total labor compensation to capital compensation, equivalent to the elasticity of returns with respect to the wage rate (ratio of labor share to capital share in value added) (Arrow et al., 1961, p. 229).

ISO9000 is argued to have diffused globally through trade flows with the UK, the country that lead on the development and diffusion of ISO9000 from its publication until 2001 (Pan, 2003). Thus, trade cohesion with the UK may be conducive to ISO9000 adoption, and might highlight both social and economic incentives for adoption. To control for these effects, we include the variable Trade-UK, measured as the industry share of bilateral trade with the UK.

Request from international customers is the most frequent motivation for ISO9000 certification (Corbett & Kirsch, 2001; Pan, 2003). This has led to the idea of ISO9000 being a “passport” to continue exporting and to entry to global markets (Business Week, 1993; SwissCert, 2014; Withers & Ebrahimpour, 2000). ISO9000 certifiers advertising their services also stress that: “For many companies, registration to ISO 9001 is a key to securing and maintaining global business” (SwissCert, 2014). Thus, the degree of industry export activity might highlight both economic motivations to reduce information asymmetry and agency costs (King et al., 2005), as well
as coercive requests from international buyers (Corbett & Kirsch, 2001; Withers & Ebrahimpour, 2000). To control for these effects, we use *Export intensity* as the ratio of industry exports in total industry production, to account for the degree of exposure of the national industry to the demands of international buyers in relation to ISO9000 adoption. This is in line with Albuquerque et al. (2007) which considers the average effect of n largest national export markets.

Finally at industry level, we control for relative industry size in the national economy. Data on number of firms per industry are not available for most countries in our sample; therefore, we use share of industry value added in national GDP to proxy for industry size.

To account for national differences in the capacity to access technical aspects of quality standards, we follow Guler et al. (2002) and include a proxy for the national knowledge base which is measured as the ratio of R&D expenditure to GDP.

The EU has specific regulations for domestic markets. The EU also includes ISO9000 in global assessment procedures related to some products from non-EU countries (Business week, 1993; Clougherty & Grajek, 2008; Pan, 2003; Withers & Ebrahimpour, 2000). We include the dichotomous variable *EU* to identify those EU member countries where pressure to ISO9000 certification is less strong. Finally time, country, and industry fixed effects are included to control for other sources of unobserved heterogeneity.

Table 1 presents the correlation coefficients and descriptive statistics for the dependent, explanatory, and control variables.

[Insert Table 1 about here]

**Analysis**

Given the count type dependent variable - number of ISO9000 certificates in an industry - we use a negative binomial model which allows us to relax the Poisson assumption of equal mean and variance because the dependent variables are over dispersed (Long & Freese, 2003). We run this model with fixed effects and to adjust for potential heterogeneity, we estimate robust standard errors.

**RESULTS**

Table 2 presents the results of the negative binomial regression of the number of ISO9000
certificates with fixed effects. Model 1 includes all the control variables; Model 2 adds the country-level independent variables; Model 3 includes all the controls and the linear term of the industry independent variables; Model 4 includes all the controls variables and the linear and the squares of the variables for industry characteristics. Finally Model 5 is the full model.

[Insert Table 2 about here]

The results are consistent across all the model specifications, and support our predictions about the effect of industry characteristics and of institutions on industry characteristics, on the level of uptake of ISO9000. The results without the lag of ISO9000 certificates do not change.

The control variables behave as follows. In all the models, the lagged number of ISO certificates, trade with UK, and industry size are positive and significant. For example in model 5, lagged number of certificates ($\alpha= 0.000, p<0.001$), industry size ($\alpha= 5.756, p<0.01$) and Trade with the UK ($\alpha= 4.955, p<0.0001$), show a strong positive relationship with the number of ISO9000 certificates in an industry. In models 3, 4 and 5, export intensity in the industry ($\alpha= 0.849, p<0.05$) is significantly associated with the number of ISO9000 certificates in an industry.

The country-level controls are significant in models 1, 2, 4 and 5. In model 5, national knowledge base ($\alpha=-2.969, p<0.05$), and EU membership ($\alpha=-5.131, p<0.01$) influence ISO9000 adoption negatively and significantly. Time, industry, and national fixed effects are significant.

After having discussed the behavior of the control variables, we discuss now how results support our hypotheses.

Results in models, 3, 4 and 5 (full model) support H1a and H1b and confirm that industry characteristics matter for explaining the level of adoption of organizational practices. In model 5, the coefficient of the linear term of industry technological capacity ($\alpha= 0.120, p<0.001$) is positive and significant, and the squared term is negative and significant (model 5: $\alpha=-0.002, p<0.001$). This result supports H1a. H1b proposes a U-shaped relationship between productivity (output per unit of value in labor) and ISO9000 adoption. In model 5, results support this prediction: the linear coefficient of industry productivity ($\alpha= -0.475, p<0.001$), is negative and significant, and the squared term ($\alpha= 0.017, p<0.01$) is positive and significant.

Results in models 2 and 5 confirm that national institutional factors directly influence the
level of adoption of organizational practices. In model 5, the coefficient of national governance (model 5: $\alpha = -0.512, \rho < 0.05$) is significant and positive. This result supports predictions in H2a. Similarly, as predicted (H2b), in model 5, the coefficient of economic openness ($\alpha = -0.073, \rho < 0.05$) (H2b) is significant and positive.

Robustness checks

In addition to the negative binomial model, we also estimate the level of adoption of ISO9000 using the mixed multi-level effects model, which permits to account for the multi-level nature of our data, i.e., for the fact that industries are nested in countries. This model includes both fixed and random effects at both industry and country levels. We estimate the model using Stata, following the procedure suggested by Rabe-Hesketh & Skrondal (2012).

The results of the multi-level mixed-effects regression, reported in Table 3, mostly confirm the results of the negative binomial with fixed effects. Results support H1a, H2a and H2b, but not H1b. In Models 3, 4 and 5 the linear and quadratic terms of industry technological capacity are significant, supporting predictions in H2a. In models 2 and 5, the coefficients of national governance and economic openness are significant and negative, supporting predictions in H2a and H2b.

[Insert Table 3 about here]

The hierarchical model also provides information on the residual variance decomposition across the levels of analysis used. In the last model, industry random effects explain 35.9% of total residual variance but in the context of industries nested in countries, they explain 84.6%. This result confirms that national industries have very specific characteristics that explain levels of adoption.

DISCUSSION

Noting that patterns of diffusion are yet unexplained across countries and industries and the subject of much ongoing research, we argued for a need to integrate the two dominant intellectual paradigms within which diffusion research has been conducted, namely the institutional and rational choice models. Combining the latter’s focus on adopter characteristics that influence the economics of adoption, with the former’s focus on national institutions that constrain or facilitate isomorphic
behavior of its constituent members, we believe will pave the way for a more holistic framework, and a better explanation of cross-industry and cross-country differences in adoption of organizational practices. We thus set out to understand the role that economic motivations, revealed in industry characteristics such as technological capacity and productivity, play in explaining cross-country and cross-industry differences in the level of adoption of organizational practices along with certain institutional factors – national governance and economic openness. Our central thesis is that while industrial characteristics shape economic motivations to adopt organizational practices, national institutions define the context in which firms take decisions. Specifically, we argue that in studying cross-national diffusion of organizational practices, including industry characteristics allows us to account for the economic motivations of adoption, and to explain cross-country and cross-industry differences in the adoption of organizational practices (Hypotheses H1a and H1b). We also argue that institutional factors will influence the adoption of organizational practices (Hypotheses H2a, H2b).

We illustrate our arguments empirically by analyzing whether industry characteristics explain cross-national differences in ISO9000 adoption along national institutional factors. Using data from manufacturing industries in seven OECD countries, we showed that in any country, an industry’s technological capacity and productivity - which reveals underlying economic motivations - impacts the adoption of ISO9000 in a non-linear manner. Our results suggest that firms in a national industry assess the value of ISO9000 certification against their capabilities, and that this value appears to be higher for firms that invest moderately in the development of technological capabilities and have non-average levels of productivity. Our findings also show that the effectiveness of national governance and openness to international markets and global players positively and significantly affects ISO9000 certification, reflecting the roles of institutions in shaping the incentive to adopt. Greater the country’s openness to the activities of global players, stronger the incentives for local industries to signal their quality given that the competitive environment is more demanding. The more effective the national governance, the greater the availability of relevant input and specialized services supporting industrial competitiveness through technological and organizational best-practices adoption.
Finally, our results suggest that the same industry can have different characteristics across countries, which in turn can explain differences in levels of adoption. Specifically, the multi-level mixed effects model shows that if industries are not considered as nested in countries, 36% of total residual variance is explained. However if considered as nested, they explain 85%. Hence, the effect of early adoption which are significant in the fixed effect models, become less significant to explain diffusion if industries are seen as nested in countries with specific institutional set-ups. Overall, we find that despite the significance of institutions, industry characteristics reflecting the economic motivations for adoption are significant for explaining ISO9000 certification. Thus, a focus on only the institutional or on the economic drivers of organizational practice adoption and diffusion provides a partial view of firms’ adoption decisions.

Our main conclusion is that heterogeneity in the adoption of organizational practices results from several industry characteristics and country institutional factors. This suggests that the traditional economic and institutional approaches provide different but complementary perspectives on the process of international diffusion of organizational practices. Thus, this study reinforces the need for the integration of economic motivations, captured by the industry characteristics, along with national institutional factors in order to overcome the limitations of these two approaches when used in a discrete manner.

Our study is not without limitations, some of which suggest potentially fruitful avenues for future research. First, the analysis in this paper is conducted at the 2-digit industry level which although providing a certain level of detail is a rather aggregate level of analysis. It would be interesting to replicate the study at lower levels of industry aggregation. This would require an alternative data source, since ISO surveys do not provide more disaggregated data for numbers of certificates. Second, industries across countries are likely to specialize in different parts of the value chain and different product categories. Further research could examine whether our findings can be replicated if the unit of analysis is product category rather than industry. A focus on product categories would allow control for differences in national specializations within industries. This would involve qualitative research based on interviews and case studies to obtain insights into meso-level processes. Third, our research design did not permit us to examine whether and how the
relationship between the incentives generated by economic and institutional factors change the organizational structure, evolve over time, or how they influence the content of organizational practice. Further research using qualitative longitudinal data based on case studies might identify the sources and patterns of adaptation of organizational practices to firms’ organizational, technological, and market contexts, and how some of these firms actively influence the dominant institutions and the rationale for adoption of certain organizational structures. Finally, the analysis is based on seven different sized OECD countries with different institutional involvement in common trade areas.

While our sample is constitute by a varied sample of countries, and our analysis included many industry and national level controls, we cannot fully guarantee that our results will be generalizable to other country samples with specific different national and industry regulations, and innovation policies, and especially, alternative national quality certification. This study is however an early attempt to explore how economic and institutional factors explain adoption of organizational practices across countries, and we hope that future research will be able to integrate these bodies of work together into a more coherent theory of cross-national industry-level diffusion of innovations.

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1 In 1994-2001, the UK had the highest number of ISO9000 certificates; in December 2001 the next ranked were China, Italy, Germany, and the US. The ranking changed after publication of ISO9000:2000: in December 2005, China and Italy were the leaders, followed by Japan, Spain, the UK, the US, and Germany. The ten largest industries (manufacturing and services) awarded ISO9000 certification in 2005, were construction, basic and fabricated metals, electrical and optical equipment, machinery, wholesalers, business services, rubber and plastics, food and beverages, chemicals and transport, storage and communication, which were the largest adopters of certification since the late 1990s (ISO, 2001, 2005). The laggards are water utilities, gas supply, publishing, shipbuilding, aerospace, wood products, and nuclear fuels.

2 Specifically, we have information on the following industries: Food products, beverage and tobacco; Textiles and textile products; Leather and leather products; Manufacture of wood and wood products; Pulp, paper, paper products, printing and publishing; Manufacture of coke & refined petroleum products; Chemicals and pharmaceuticals; Rubber and plastic products; Non-metallic mineral products; Basic metal and fabricated metal products; Machinery and equipment; Electrical and optical equipment; Transport equipment; other manufacturing.

3 For the countries and industries where information on employment is available, we computed the correlation coefficients of the traditional measure for labor productivity, i.e. number of employees, and our measure based on total compensation. The correlation coefficient is high and significant.

4 Compared to other manufacturing activities (the reference category), food, rubber, non-metallic metals, metals, machinery show significantly higher levels of ISO9000 certification. Pharmaceuticals and transport equipment have significant negative coefficients. Compared to Spain (the reference category), Czech Republic, and Portugal have significantly lower levels, and Japan and Italy higher levels of ISO9000 certification.
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Us and Joseph Schumpeter Doesn't.” Industrial and Corporate Change, 7 (3): 433-452.
Winter, S., 1987 "Knowledge and Competence as Strategic Assets," in David Teece (Ed.), The Competitive Challenge-Strategies for Industrial Innovation and Renewal, Cambridge, MA: Ballinger
Table 1. Descriptive statistics and correlation coefficients of the explanatory variables

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<th>Variable</th>
<th>Mean</th>
<th>Std. Dev.</th>
<th>Min</th>
<th>Max</th>
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<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
<th>(5)</th>
<th>(6)</th>
<th>(7)</th>
<th>(8)</th>
<th>(9)</th>
<th>(10)</th>
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<td>(1) Technological C.</td>
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<td>7.08</td>
<td>0</td>
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<td>1.00</td>
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<td>1.00</td>
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<td>0.00</td>
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<td>(4) Governance</td>
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<td>(5) Export Intensity</td>
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<td>0.00</td>
<td>0.00</td>
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<td>(6) Trade with UK</td>
<td>0.11</td>
<td>0.06</td>
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<td>0.106</td>
<td>-0.178</td>
<td>0.227</td>
<td>0.354</td>
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<td>0.00</td>
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<td>(7) Lag ISO9000</td>
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<td>11570</td>
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<td>0.02</td>
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<td>(11) EU member</td>
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<td>0.527</td>
<td>0.189</td>
<td>0.653</td>
<td>-0.071</td>
<td>-0.210</td>
<td>-0.002</td>
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Table 2. Negative binomial with fixed effects estimation of ISO9000 diffusion

<table>
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<td>0.017**</td>
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<td>Labor Intensity</td>
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<td>-0.011</td>
<td>-0.022*</td>
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<td>[0.016]</td>
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<td>5.536***</td>
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<td>0.849*</td>
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<td>[0.374]</td>
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<td>[1.892]</td>
<td>[2.047]</td>
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Robust standard errors in parentheses *** p<0.001, ** p<0.01, * p<0.05, + p<0.1
### Table 3. Multi-level mixed effects estimation of ISO9000 diffusion

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Robust standard errors in parentheses*** p<0.001, ** p<0.01, * p<0.05, + p<0.1