MANAGERIAL SECRECY AND INTELLECTUAL ASSET PROTECTION:

THE INFLUENCE OF NATIONAL CULTURE

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Abstract. Although secrecy is argued to play an important role in intellectual assets protection, the evidence suggests that firms do not equally use secrecy as a protection mechanism. Small, independent biotechnology enterprises in twenty six countries were surveyed to assess whether differences in secrecy practices as an intellectual asset protection mechanism are due in part to national culture. Results indicate that national culture traits directly influence secrecy use.

This paper analyzes the effects of national culture on the use of secrecy. In the biotechnology sector, secrecy is almost as important as patenting as an intellectual property (IP) protection mechanism (Thumm, 2001). The capacity of an innovative firm to get returns on its R&D investments is closely linked to its capacity to protect its intellectual property. Protection is defined as the process by which firms sustain the uniqueness and value of their technological competencies (McEvily, Eisenhardt, & Prescott, 2004). The benefits of intellectual property protection are numerous. Intellectual Property (IP) protection plays an important role in economic growth throughout the world (Gould & Gruben, 1996), and is positively related to innovation rates (Dosi, Marengo & Pasquali, 2006). The means of IP protection are grouped into two categories: (1) formal protection, such as patents and other legal mechanisms, and (2) strategic protection, such as lead time, secrecy, complementary sales and service, and complementary manufacturing facilities and know-how (Levin, Klevorick, Nelson, & Winter, 1987; Cohen, Nelson, & Walsh, 2000).

Data from the third European Community Innovation Survey (CIS3) show that, in most countries, strategic protection is more frequently used than formal protection, and of the strategic protections, secrecy is the most commonly used. Secrecy is defined as "any information that can be used in the operation of a business or other enterprise and that is sufficiently valuable and secret to afford an actual or potential economic advantage over others." (Restatement of the Law Third *Unfair Competition*) (Brown & Prescott, 2000). Increases in the commercial value of scientific and technical information, major reductions in the delay between basic research and its applications, and the high cost of patenting promote secrecy.

Nevertheless, the use of secrecy varies significantly across countries (Thumm, 2001; Ronkainen & Guerrero-Cusumano, 2001). For instance, secrecy is proportionally more important than patents in the United Kingdom than in France (Jaumotte & Pain, 2005). Secrecy rates are 15% for the United Kingdom and 22% for Italy (Thumm, 2001). A comparative study in new European countries showed that 44% of small Slovenian firms use secrecy versus 6% in Romania (Crowley, 2004). According to Cohen, Goto, Nagata, Nelson, & Walsh, (2002), Japanese respondents report secrecy as a minor appropriability mechanism, in contrast to U.S. respondents, who report it as a major mechanism.

Although differences across countries have been reported, there is little discussion on the underlying reasons for these differences. Why do some firms use secrecy intensively while others do not? Of course, the appropriability mechanism choice critically depends on several exogenous factors, such as the prevailing institutional and legal environment. Nevertheless, secrecy is not limited to formal trade secret protection. Keeping a secret may depend on attitudes toward personnel, the organizational culture, and the firm's management style (Liebeskind, 1997; Hannah, 2005). Consequently, we suggest that social factors have some influence.

The objective of this paper is to investigate the role of national culture values in managerial use of secrecy. It is paramount to consider national culture. Managers who are socialized in their respective national cultures are likely to have distinct frames of reference (Westwood & Posner, 1997), different interpretations, and different behaviors (Cowan, 1986). Moreover, differences in social and economic institutions reflect differences in intellectual property rights. For instance, by analyzing software piracy, Marron and Steel (2000) and Husted (2000) showed that protection depends on cultural factors. To prevent culture from being a purely residual black box, Redding (1994) considers it necessary to identify a country's cultural characteristics in advance to explain organizational differences. Thus, we developed a set of hypotheses regarding the effect of Hofstede's values approach (1980) on secrecy. We tested these hypotheses using data from a questionnaire administered to the managers of small and medium biotechnology companies located in thirty countries.

The remainder of this article is organized as follows. The next section presents a literature review, providing an overview on secrecy as an intellectual assets protection mechanism. Four research hypotheses concerning national cultural values are then formulated. The research method is outlined, and the statistical estimations and empirical results are presented and analyzed. A discussion and conclusion follow.

SECRECY AND NATIONAL CULTURE

Secrecy in organizations

In knowledge-based industries, knowledge is costly because it takes time and manpower to develop. Knowledge is embodied in employees (Liebeskind, 1997). Knowledge may be non-patentable, and "the legal protection available for knowledge tends to be narrow in scope, so that a considerable body

of knowledge that is valuable to the firm cannot be protected through these avenues" (Liebeskind, 1997: 629). Consequently, firms may protect knowledge through alternative mechanisms, such as secrecy. Secrecy is a highly attractive mechanism, because the possessor of the secret can appropriate its returns indefinitely, and companies can exploit the competitive advantage offered by these secrets for long periods (Hannah, 2005). Secrecy is favored by internal sources of information in R&D processes (Arundel, 2001). It is effective in protecting processes that can be hidden within the firm (Cuello de Oro & Lopez-Cozar, 2007; Levin et al. 1987, Cohen et al. 2000), and in protecting rapidly changing technology, because new processes are more difficult to patent and their patents are more difficult to enforce (Argyres & Silvernan, 2004).

In a study on the relative effectiveness of patents and secrecy using the CIS I survey for six European Union countries, Arundel (2001) concludes that secrecy provides an effective alternative for IP protection. Moreover, he found that the firm's secrecy rate is even more effective than patents, independently of firm size.

"[Secrecy] is an option only for innovations that can in fact be kept secret: the holder of a trade secret cannot exclude anyone who independently discovers it or who legally acquires the secret by such means as accidental disclosure or reverse engineering" (von Hippel, 1998: 54). Secrets can be protected by a trade secret. Nevertheless, a critical distinction between trade secrets and legal protection mechanisms such as patents is that, "rather than protection through a one-time application/registration process, a trade secret can only be protected by keeping it secret by continually performing administrative and security measures required by state trade secret laws" (Maurer & Zugelder, 2000: 158). In principle, in some countries, trade secret laws require an employee entrusted with a trade secret to keep it and not reveal it to another firm. In practice, trade secret protection is incomplete (Fosturi & Rønde, 2004). First, a firm alleging a misappropriation of a trade secret has to demonstrate that the trade secret exists. This often proves to be difficult, as the information constituting the trade secret is unknown to the public and may not be easily defined (Hannah, 2005). The alleging firm's position is particularly weak in cases where employees defect to competitors. Courts are concerned about the freedom of employees to seek new job opportunities. They are therefore reluctant to prevent an employee from working for a competitor by granting injunctive relief

or enforcing a very restrictive non-compete covenant. The concept of secrecy is not limited to formal trade secret protection. Anand and Galetovic (2004: 256) contend that "secrecy might be of limited practical use because it may be difficult, even impossible, to keep secrets from employees because these secrets typically reside with the individuals and are not 'in the firm'". Hence, it has been suggested that administrative protections are more effective when they are supported by specific organizational actions. Employers can establish some rules that employees are required to follow when they are dealing with trade secrets. According to Hannah (2005), there are two types of trade secret procedures: access restriction and handling. The former restrict employees' right of entry to certain areas of an organization's physical facilities, their right to use sensitive documents and their means of copying them, and their right to use computers and the means of communication (Hannah, 2005). Restrictive rules can also address social interactions by preventing specified employees from interacting with specified others (Liebeskind, 1997). "Trade secret handling procedures establish rules for what employees can and cannot do with trade secrets once they gain access to them" (Hannah, 2005: 73). According to Hannah's results, employees' familiarity with handling procedures is positively related to their felt obligations to protect trade secrets, whereas their familiarity with access restrictions is negatively linked to their felt obligation to protect trade secrets. In other words, when employees feel they have been placed in a position of trust, they are more likely to feel more obligated to protect trade secrets. Keeping a secret hence depends on attitudes toward personnel, organizational culture, and the firm's management style, and may also depend on national cultural values.

Individualism/collectivism and secrecy

The biggest threats to a company's trade secrets and other secrets are not spying competitors but current and former employees (Hannah, 2006). According to Hannah (2007), an employee's capacity to retain secret information is closely linked to a feeling of obligation and self-categorization. Hannah (2007) showed that employees who self-categorize as a part of an organization are more likely to try to act in their employer's interests, and hence are more likely to keep secrets. Social research on secrecy stresses that secrecy has the power to inhibit individual communication and cooperation (Chalk, 1985). Secrecy manifests itself as a tendency to restrict the disclosure of information available to outsiders (Doupnik & Riccio, 2006). Secrecy does not allow a sense of belonging to the group to

develop because it separates individuals (Fine & Holyfield, 1996). In fact, keeping secrets requires an active process of social inclusion and exclusion (Keane, 2008). This process is often strengthened through a process of identification, either with a privileged few, a department or division, or the organization itself. Secrecy becomes a vector for categorization; there are those who share the secret (the in-group) and the others (the out-group). According to social identity theory, individuals tend to classify themselves and others into various social categories, such as organizational membership, religious affiliation, gender, or age cohort (Tajfel & Turner, 1985). This phenomenon, known as depersonalization of self-representation, occurs in a comparative context between in-groups and out-groups (Yuki, 2003).

Individualism/collectivism is the degree to which individuals are integrated into groups and look after each other (Hofstede, 1980). Individualism/collectivism is "positively related to variables such as personal time, freedom, and challenge, and negatively related to the use of skills, physical conditions, and training" (Ronen & Shenkar, 1985: 446). Theorists largely agree that the principal distinction between individualist and collectivist values lies in the degree of in-group loyalty and identity (Triandis, Bontempo, Villareal, Asai, & Lucca, 1988). Individualists show less group loyalty and prioritize personal over collective goals. It has been suggested that collectivism is an intragroup rather than an intergroup phenomenon (Yuki, 2003). Yuki's (2003) framework proposes that East Asian collectivism is largely based on the promotion of cooperative behaviors and the maintenance of relational harmony within in-groups. The evidence also suggests that discrimination against out-groups is more pronounced in individualistic cultures (Gudykunst, 1988). Individualistic societies are more intergroup comparison-oriented than collectivist societies (Takemura, Yuki, Kashima & Halloran, 2007). Bond and Hewstone's (1988) study showed that social differentiation weaker in Chinese than British subjects. Moreover, rather than thinking about groups as categories of depersonalized members, collectivist societies are mainly concerned about maintaining a complex relational structure within the in-group (Yuki, 2003). Collectivist societies tend to be driven more by the importance of relationship networks. For instance, analyzing trust, Yuki (2003) suggested that trust is highest toward individuals who are presumed to share a direct or indirect network of relationships. Consequently, in collectivist societies, a cross-group relationship may blur the psychological boundary

between in-group and out-group. Yuki (2003) added that, in individualist societies, the level of trust for strangers should be based on shared category membership. Secrecy and secrets primarily suggest an intergroup focus. This focus occurs when people perceive group and intergroup differences, i.e., those who share the secret versus the others. This suggests that firms in individualistic societies would place more importance on secrecy as an intellectual property mechanism.

A second consequence of the individualism/collectivism dimension is related to secrecy. Secrecy helps the powerful maintain control over valuable information resources (Bellman, 1981). Liebeskind (1997) noted that, in order to protect their secrets, firms may deploy "rules that restrict social interaction by specified employees with specified others." Cultural individualism/collectivism has a direct effect on communication, because it affects the norms and rules that guide behavior (Gudykunst & Ting-Toomey, 1988) and the motivation to seek and disclose individuating information (Gudykunst, 1997). Individualism/collectivism affects the capacity of individuals to control the flow of information. In a cross-study analysis, Gudykunst, Matsumoto, Nishida, Kim & Heyman (1996) found that "silence" is used more in individualist societies (the countries analyzed are Australia and the U.S.), more specifically when there is a good reason for silence.

Taken together, the above arguments suggest the following hypothesis:

> Hypothesis 1. Firms in high individualism countries will show higher secrecy than low individualism countries.

Masculinity/femininity and secrecy

Competitive behavior may encourage firms to erect barriers around their distinctive competencies (Lado, Boyd, Hanlon, 1997). Once information is disseminated, this competitive advantage diminishes. According to Nabel (1975), secrecy is a major power resource of organizations in maintaining a competitive advantage over rivals. Secrecy is rooted in the competitive nature of the economy. It has been suggested that competitive societies protect their secrets better (Nabel, 1975). Competition is linked to Hofstede's masculinity/femininity dimension. Hofstede describes masculinity in terms of very traditional roles for the two sexes. At the same time, he contrasts the "masculine" concepts of aggression, autonomy, competition, dominance, and the acquisition of tangible things with the "feminine" concepts of nurturance, passiveness, cooperation, affiliation, helpfulness, and an

emphasis on feelings rather than goods. Firms in masculine cultures are more likely to implement strategies aimed at weakening the competition, and are more aggressive in their pursuit of environmental opportunities than firms in feminine societies (Kreiser, Marino & Weaver, 2002).

Secrecy impedes knowledge sharing. Several studies have evaluated the role of culture in knowledge sharing by analyzing the individualist/collectivism dimension (e.g. Chow et al., 2000). However, few have analyzed the impact of the masculinity dimension. Nevertheless, it has been suggested that competition reduces knowledge sharing and usually creates an atmosphere of secrecy between organizations (Hansen, 1999). Ford and Chan (2003) explained that highly masculine cultures may have more difficulty sharing knowledge when the competitiveness is between both individuals and organizations.

Another possible explanation for the link between secrecy and the masculinity dimension stems from the impact of masculinity on cooperative relationships. It has been suggested that firms use patents to signal their technological prowess to the stock market, or to demonstrate the firm's quality in order to attract partners (Rothaermel & Boeker, 2008). For instance, Coombs and Deeds's study (2000) showed that patents have a highly significant impact on the ability of biotechnology firms to attract capital through strategic alliances. Rothaermel (2002) found that patenting is positively and significantly linked with the number of the firm's alliance relationships. Furthermore, Arundel (2001) concluded that participation in cooperative R&D reduces the probability that a firm will prioritize secrecy over patents. Firms that prioritize secrecy usually focus on in-house information. Regarding alliance formation, Steensma et al. (2000) showed that firms in high masculine cultures are less inclined to cooperate and more likely to go it alone in their technological innovation than firms in high feminine cultures.

Taken together, the above arguments suggest the following hypothesis:

> Hypothesis 2. Firms in high masculinity countries will show higher secrecy than firms in low masculinity countries.

Power distance and secrecy

Hofstede's third national culture dimension is power distance. Power distance refers to the extent to which the members of a society expect power to be distributed equally in organizations and

institutions (Hofstede, 1980). In general, members of low power-distance cultures believe in power sharing between subordinates and supervisors (Ronen & Shenkar, 1985). High power distance is usually associated with a preference for control through rules, high hierarchical differentiation, and high centralization (Lachman, Nedd & Hinings, 1994). Shane (1993) observed that high power distance impedes innovation. Employees holding high power distance values are likely to rely on authorities for direction rather than seek ongoing performance feedback and autonomy in decision-making (Bailey, Chen & Dou, 1997). It has been suggested that, given the limits of legal rules, formal control—such as rules that restrict the transfer of specified knowledge, social interaction, or physical access by specified employees—may enhance secrets protection (Liebeskind, 1997). Nevertheless, formal rules to protect knowledge are costly (Liebeskind, 1997) and can be counterproductive (Hannah, 2005). In less opportunistic and more trusting cultures, formal rules are not necessary (Ouchi, 1980). Hannah (2005) stressed that employees who feel they are trusted are more likely to feel obligated to protect their organization's trade secrets. Hofstede (1980) found that the dimension of power distance also reflects societal trust. He argues that power distant societies exhibit low interpersonal trust and a great need to control individual behavior. "A smaller power distance leads to the feasibility of control systems based on trust in subordinates; in larger power distance countries, such trust is missing" (Hofstede, 1980: 384). It has been suggested that secrecy as a protection mechanism is used in organizations where organizational trust is high (Hannah, 2005).

Moreover, secrecy is effective in protecting processes that can be hidden inside the firm (Cuello de Oro & Lopez-Cozar, 2007), and is often used in the early stage invention process (Hussinger, 2006). During the early stages of the product development process, firms explore new opportunities. Exploration is described as an "experimentation with new alternatives" having returns that "are uncertain, distant, and often negative" (March, 1991). Although different protection mechanisms may be employed at the same time for a given innovation, the protective value of secrecy is higher in the early stage invention process rather than the exploration stage. Nakata and Sivakumar (1996) suggested that low power distance may facilitate new product development during the initiation phase. Because low power distance is based on a more egalitarian view, it may encourage idea proliferation

by acknowledging the value of contributions regardless of a person's identity or position in the organization.

Taken together, the above discussion suggests our third hypothesis:

Hypothesis 3. Firms in low power distance countries will show higher secrecy than firms in high power distance countries.

Uncertainty avoidance and secrecy

As a protection mechanism, secrecy is a dimension of innovation management. According to Cohen et al.'s study (2000), the most important reasons for the choice not to patent are the demonstration of novelty (32%), information disclosure (24%), and the ease of inventing around patents (25%). Secrecy is therefore closely linked to innovative efforts. Innovative efforts vary among nations (Shane, 1993). Some researchers have shown that cultural values make some societies more likely to be innovative and inventive (Shane, 1993). More specifically, the general belief is that high uncertainty avoidance hinders the organizational capability to innovate (Nakata & Sivakumar, 1996; Shane, 1993; 1995). Shane (1995) showed that uncertainty-accepting societies are more innovative because championing roles, which overcome organizational inertia to innovation, are more likely to be accepted in these societies.

Risk is also linked to the uncertainty avoidance dimension and its impact on the use of secrecy as an IP protection mechanism. High uncertainty avoidance societies are generally intolerant of ambiguity and rely on rules to deal with unknown situations (Hofstede, 1980). There is a strong theoretical link between uncertainty acceptance and risk taking. Hofstede (1980) noted that "a low uncertainty avoidance index (UAI) means by definition a greater willingness to take risks" (Hofstede, 1980: 127). Kreiser et al. (2002) showed that organizational risk taking is negatively associated with a culture's uncertainty avoidance. Although secrecy and patenting are not exclusive (Arundel, 2001; Cohen et al. 2000), several studies have analyzed why firms engage in costly patenting by considering the alternative between secrecy and patenting (Arundel, 2001; Denicolò & Franzoni, 2004; Kultti, Takalo & Toikka, 2007). According to risk theory, executives explicitly consider the risk and reward probabilities associated with choices in order to maximize their expected utility (Kanheman & Lovallo, 1993). They weigh the limits of patent protection against the risks associated with secrecy

(Denicolò & Franzoni, 2004). Another point of view is that when innovators contemplate patenting, the typical choice is not between patenting and keeping the innovation secret, but rather between patenting and letting the competitors patent (Kultti et al., 2007). If a firm engages in R&D that results in innovation, it is confronted with asymmetric information concerns regarding 1) the potential research behavior of its competitor (another firm may compete on the same innovation) and 2) the potential success of a competitor's innovation. In this game, each firm must decide whether to keep the innovation secret or to patent it without knowing what the other firm will do. Kultti et al. (2007) demonstrated that "in the equilibrium, it is always better to patent than to keep the innovation secret; each innovator fears that other innovators have made the same innovation, and then opting for secrecy would be profitable only if an innovator knew that she were the sole innovator" (2007: 33). In the effort to avoid uncertainty, the difficulties in estimating that risk may lead firms to prefer patent inventions to secrecy.

Taken together, the above discussion leads to our fourth hypothesis:

> Hypothesis 4: Firms in low uncertainty avoidance countries will show higher secrecy than firms in high uncertainty avoidance countries.

DATA AND METHODOLOGY

Data collection: Context and sample

We tested our hypotheses on a sample of small and medium independent biotechnology enterprises (less than 500 employees) included in the Bioscan database. The Bioscan database contains information on 1,386 independent SMEs. Our motivation for selecting only small- and medium-sized enterprises was to neutralize the often heterogeneous organizational traits of large enterprises that may affect secrecy use. Organizational behavior in smaller firms tends to be determined by key decision makers (Lumpkin & Dess, 1996). The survey was therefore emailed to the owners or general managers of each firm in the sample. We conducted pretest interviews with a small group of academic experts before sending out the final version of the questionnaire. In a cross-cultural study, it is usually advisable to translate the questionnaire into the respondent's native language. Nevertheless, in biotechnology, most CEOs are English-speaking. Although all questionnaires were therefore sent in English, translations into the predominant language of each non-English-speaking country were

offered. In the end, none of the questionnaires was translated. Of the 1,386 managers who received the questionnaire, 356 took part in the study. This 24% response rate compares favorably with the 15–24 % response rate in similar studies (e.g., Knight & Cavusgil, 2004). Non-responses can generate selection bias. York (1998) defined selection bias as "any characteristic of a sample that is believed to make it different from the study population in some important way" (1998, p. 239). Selection bias potentially threatens both internal and external validity. Non-response biases were difficult to determine due to a lack of basic data. Some questionnaires were returned by mail and were anonymous. Hence, the non-response bias was assessed by comparing respondents and non-respondents according to the average national cultural indexes. A series of nonparametric Kruskal–Wallis tests was performed on the data to test these differences. No statistically significant differences were observed (UAI, $\chi^2 = 1.194$; PDI, $\chi^2 = .160$; ICI, $\chi^2 = 2.238$; MFI, $\chi^2 = 2.245$). Table 1 presents the distribution of respondents by country.

TABLE 1
Distribution of Respondents by Country

Country	Number of questionnaires sent	No. of responses	% of responses	Response rate (%)
Argentina	1	1	100	100
Australia	29	10	33	33
Austria	4	0	0	0
Belgium	11	2	17	17
Brazil	1	0	0	0
Canada	119	30	25	25
China	6	2	33	33
Denmark	19	4	20	20
Finland	6	2	33	33
France	40	10	25	25
Germany	55	11	20	20
Hungary	3	1	33	33
Iceland	4	2	50	50
India	3	1	33	33
Ireland	4	0	0	0
Israel	17	4	22	22
Italy	4	2	50	50
Japan	29	8	27	27
Netherlands	17	10	59	59
New Zealand	4	4	100	100
Norway	4	2	50	50
Portugal	1	0	0	0
Romania	1	1	100	100
Russia	3	2	67	67
Singapore	7	3	43	43

Sweden	16	4	25	25
Switzerland	19	5	26	26
Taiwan	2	1	50	50
U.K.	90	25	28	28
U.S.	867	210	24	24
Total	1,386	356	100	26

Measurements

Independent variables

National culture values. The four cross-cultural indices developed and validated by Hofstede (1980) – individualism⁄collectivism (IND), masculinity/femininity (MAS), power distance (PDI), and uncertainty avoidance (UAI) – were used to measure the cultural values of the countries in this study. Indices range from 0 to 120. In our sample, IND scores range from 17 in Taiwan to 91 in the U.S., MAS scores range from 5 in Sweden to 95 in Japan, PDI scores range from 13 in Israel to 93 in Russia, and UAI scores range from 8 in Singapore to 95 in Russia. Hofstede's taxonomy and measurement system were employed rather than a subjective measurement, because cultural values are society-level phenomena that are most accurately captured at the society level (Geletkanycz, 1997). Nevertheless, it is important to note that other cultural taxonomies should also prove useful in the study of organizational phenomenon.

Control variables. When testing our hypotheses, it was important to rule out alternative explanations for findings and other causal factors of secrecy. In order to control this aspect, we included several control variables, presented in Table 2.

First, given the prior research establishing the impact of organizational trust, employee control, innovativeness, and firm size on secrecy (Liebeskind, 1997; Hannah, 2005; Arundel, 2001), we controlled for these effects at the firm level.

Organizational trust was measured using a scale constructed with four items developed by Huff and Kelley (2003). Principal component analysis reveals that all items overwhelmingly loaded on a single factor. The four items were aggregated to compute an overall measure of organizational trust, which obtained a reliability of 0.91. Employee control was measured with the two-item scale derived from

Hannah's study (2005). Innovativeness was measured by the number of patents obtained by the firm.

Firm size was measured by the log of the number of employees.

Table 2
Description of Control Variables

Variable	Item[a]	Cronbach's α	Source
Employee control	1. We always control employee access to products and technologies or processes. 2. It is important to continuously control employees' behaviour.	0.70	From Hannah (2005)
Organizational trust	1. There is a very high level of trust in this organization. 2. In this organization, subordinates trust the managers a great deal. 3. If someone in this organization makes a promise, others in the organization will almost always trust that the person will do his or her best to keep that promise. 4. Managers in this company trust their subordinates to make good decisions.	0.91	Huff and Kelley, (2003)
Innovativeness	The number of patents obtained by the firm		
Firm size	Logarithm of the number of employees		

[a]5-point Likert scale with options ranging from 1 = "Strongly disagree" to 7 = "Strongly agree."

Second, at the country level, we controlled for the effect of the institutional property rights system. We

therefore used the International Property Rights Index (IPRI), which ranks 115 countries in terms of

physical and intellectual property protection (IPRI, 2008). The original IPRI comprises three core

categories: the Legal and Political Environment (LP), Physical Property Rights (PPR), and Intellectual

Property Rights (IPR). For this study, we retained only two dimensions: LP and IPR. The Legal and

political Environment (LP) category addresses 1) confidence in the courts, or how confident business

managers are that the legal system will uphold their property rights; 2) the degree of political stability,

and 3) the degree of corruption in the public sector. The Intellectual Property Rights (IPR) component

addresses four aspects of intellectual property. "More generally it evaluates the protection of

intellectual property, and additionally it reviews a country's policies and their effectiveness in

enforcing patents, trademarks, and copyrights." (IPRI, 2008: 18). We used the mean of these two

indices to create our Intellectual Property Rights Index (IPRI) (see Table 3).

Table 3
Intellectual Property Protection Index by Country

Country	Legal and political environment	Intellectual property rights	Intellectual property right index (IPRI)
Argentina	8.1	7.9	8.00
Australia	8.1	7.9	8.00
Belgium	7.1	7.9	7.50
Brazil	4.5	5.1	4.80
Canada	7.8	7.8	7.80
China	5.1	4.4	4.75
Denmark	8.4	8.1	8.25
Finland	8.9	8.5	8.70
France	6.8	8.1	7.45
Germany	8.3	8.4	8.35
Hungary	5.7	6.2	5.95
Iceland	8.8	6.7	7.75
India	5.9	5.2	5.55
Israel	6.0	6.3	6.15
Italy	5.1	6.5	5.80
Japan	7.5	8.2	7.85
Netherlands	8.2	8.0	8.10
New Zealand	8.7	7.9	8.30
Norway	8.5	7.8	8.15
Romania	4.6	5.0	4.80
Russia	3.2	3.9	3.55
Singapore	8.0	7.5	7.75
Sweden	8.3	7.6	7.95
Switzerland	8.6	8.0	8.30
Taiwan	5.7	6.4	6.05
U.K.	7.7	8.2	7.95
U.S.	6.6	7.9	7.25

(IPPR, 2008)

Dependent variable and Analysis

Secrecy, our dependent variable is an ordinal response variable. It is measured by a single item: *"We maintain secrecy regarding product and process technology"*. In our case, the dependent variable has three discrete outcomes (1 = low, 2= medium, 3 = high). According to Wanous and Hudy (2001: 368), single-item measures may be used when the construct of interest is (a) unidimensional rather than multidimensional, (b) clear to the respondents, and (c) sufficiently narrow.

The ordered regression model was deemed appropriate for the variables. However, the crucial precondition for an ordered regression model, known as the proportional odds assumption, was rejected. Consequently, a stereotype regression model was used. The stereotype ordered regression (SOM) proposed by Anderson (1984) is a response to the restriction assumption of parallel regressions in the ordered regression model. It is defined as

$$Pr(y = m \mid x) = \frac{\exp(\phi_m \beta' x)}{\sum_{j=1}^{3} \exp(\phi_j \beta' x)} \quad \text{for } m = 1,3.$$

where, x is the vector of covariates with coefficient β to be estimated. In order to make the model identifiable, Anderson (1984) recommended $_1= 1$ and $_3 = 0$, but other constraints are possible. We used the SOREG command in Stata to implement our model. As shown in Table 4, multicollinearity was a concern, given the high inter-correlations among the explanatory national cultural variables. Consequently, we first ran a set of univariate models to see whether any single national cultural value was associated with the dependant variable. Second, we ran successive multivariate models including the control variables and national cultural values to obtain the net effect of national cultural values on the secrecy rate. Model 1 is a base model including only the control variables.

We observed 252 cases of high secrecy, 69 cases of low secrecy, and 36 cases of medium secrecy.

RESULTS

Descriptive statistics for all variables and their zero-order correlations are presented in Table 4. Consistent with our expectations, correlation analyses reveal that cultural values are related to secrecy. The hypotheses posit relationships between national cultural values and secrecy. Table 5 presents the results of the different models: estimations of β_s and Φ_i. In a stereotype regression, Φ_i parameters measure the distinguishability of the various categories with respect to the predictors: if the Φ_i parameters of two categories are similar, the categories are likely to be indistinguishable. For each model, we tested whether the categories could be combined by adding the constraint $\Phi_1 = \Phi_2$, which implies that a low rate of secrecy and a medium rate of secrecy can be combined. In three models (models 1, 3, and 7), the likelihood rate tests showed that the "low rate" and "medium rate" categories can be combined.

The first hypothesis proposes firms in high individualism countries will show higher secrecy than firms in low individualism countries. As Table 5 shows, individualism/collectivism values are significantly and positively related to secrecy ($\beta = 0.07$, p 0.001 in Model 2 and Model 6). Results therefore support Hypothesis 1.

Table 4
Descriptive Statistics and Zero-order Correlations

	Mean	S.d	1	2	3	4	5	6	7	8	9
1. Secrecy	2.70	.60	1,000								
2. Firm size	1.32	0.39	0.11								
3. Monitoring	6.82	1.84	0.31**	-0.02							
4. Innovativeness	5.31	10.58	.20*	0.23**	-0.04						
5. Organizational trust	16.33	2.71	0.25**	0.22**	0.12	0.13					
6. Intellectual property rights index	7.44	.59	0.21*	-0.01	-0.11	-.20*	-0.07				
7. Uncertainty avoidance index	49.58	13.99	-0.32**	-0.12	0.27**	-0.01	-0.21*	-0.14*			
8. Power distance index	41.10	10.53	-0.41**	0.05	0.23**	.08	-0.04	-0.42**	0.45**		
9. Individualism/collectivism index	83.38	14.25	0.22**	0.24**	-0.18*	-0.01	0.14	0.10*	-0.54**	-0.32**	
10. Masculinity/femininity index	58.13	13.77	0.25**	0.08	-0.03	-0.07	0.31**	-0.14*	0.18**	0.12*	0.12**

Note: N = 356, *p .05, **p .01.

Table 5
Stereotype Ordered Regression Results Dependent Variable: *Secrecy*[a]

	Model 1		Model 2		Model 3		Model 4		Model 5		Model 6		Model 7		Model 8		Model 9	
Φ_1[a]	1		1		1		1		1		1	.	1		1		1	
Φ_2	1		0.56***	(0.12)	-0.49	(0.53)	1		0.30***	(0.21)	0.57***	(0.12)	1		0.72	(0.14)	0.58***	(0.15)
Φ_3[b]	0		0		0		0		0		0		0		0		0	
Control variables																		
Firm size	-0.41	(0.29)									-0.69	(0.39)	-0.39	(0.30)	-0.36	(0.40)	-0.50	(0.39)
Innovativeness	0.13**	(0.04)									0.12*	(0.05)	0.12***	(0.03)	0.15**	(0.05)	0.15**	(0.10)
Organizational trust	0.21**	(0.07)									0.18†	(0.09)	0.22***	(0.07)	0.18*	(0.08)	0.16*	(0.09)
Employee control	0.17*	(0.07)									0.076	(0.10)	0.16*	(0.07)	0.19*	(0.09)	0.25	(0.10)
IPR index	0.42†	(0.21)									0.78**	(0.27)	0.42*	(0.213)	1.13***	(0.31)	0.69*	(0.28)
Cultural values																		
Individualism/Collectivism			0.07***	(0.01)							0.07***	(0.01)						
Masculinity-/Femininity					-0.02	(-0.02)							-0.00	(0.01)				
Power distance							-0.04***	(0.01)							-0.08***	(0.01)		
Uncertainty avoidance									-0.04***	(0.01)							-0.03**	(0.01)
χ^2	31.50***		38.45***		2,81		12.69***		14.75***		53.98***		32.50***		40.10***		35.99***	
dl			1		1		1		1		6		6		6		6	

[a] The Φ_i parameters measure the distinguishability of the various categories with respect to the predictors: if the Φ_i parameters of two categories are similar, the categories are likely to be indistinguishable.

[b] Φ_1 = Low secrecy used; Φ_2 = Medium secrecy used; Φ_3 = High secrecy used

N = 357; † $p < 0.10$; $p < 0.05$; $p < 0.01$; $p < 0.001$.

[a] Coefficients are unstandardized, Standard errors are in parentheses.

Hypothesis 2 posits that firms in masculine cultures will place more importance on secrecy. The univariate model (Model 3), which includes this cultural dimension, is not significant. The coefficient in Model 7, which includes the control variables, is also non-significant. Masculinity therefore has no influence on the importance placed on secrecy, and Hypothesis 2 is not supported.

Hypothesis 3 predicts that firms in lower power distance countries will show higher secrecy rates than firms in high power distance countries. Table 5 indicates that power distance has a negative and significant effect on the importance placed on secrecy ($\beta = -.04$, p 0.001 in model 4; $\beta = -0.08$, p 0.001 in model 8), supporting Hypothesis 3.

Hypothesis 4 posits that the lower the uncertainty avoidance in the firm's national culture, the more firms will tend to use secrecy to protect innovation and intellectual assets. The coefficient for uncertainty avoidance is negative and significant in the two models ($\beta = -0.04$, p 0.001 in Model 5; $\beta = -0.03$, p 0.001 in Model 9). Thus hypothesis 4 is supported.

As shown in previous research, secrecy and patenting are not always non-exclusive (Arundel, 2001). Innovativeness, measured by the number of patents obtained, is positively linked to secrecy. Moreover, organizational trust and employee control are positively linked to secrecy, IPRI is positively related to secrecy, and secrecy is used more in countries where intellectual property enjoys better legal protection. As suggested by Teng (2007), in weak IP protection regime trade secret tend to be less recognized.

DISCUSSION AND CONCLUSION

A growing body of research has highlighted the prominent role of cultural values in managerial practices (Kirkman et al. 2006). The objective of our study was to determine the effect of national cultural values on managerial attitudes toward secrecy and the use of secrecy as an IP protection mechanism. Overall, three of the four hypotheses are supported. Our results indicate that firms in individualistic societies use secrecy more.

These results confirm previous research on both the impact of national culture on knowledge sharing within organizations and comparisons of intellectual property rights protection across countries. By investigating how knowledge sharing openness is affected by specific aspects of national culture, using Chinese and American subjects to represent cultures that differ on collectivism, Chow, Deng and Ho (2000) showed that Chinese people express a greater willingness to share knowledge than their U.S. counterparts. Hui and Triandis (1986) noted that collectivism is characterized by sharing material and immaterial resources. They explained that, in "collectivism societies, resources are always pooled." Marron and Steels (2000) quoted *The Bangkok Post* (1995) as follows: "The problem of intellectual property rights is very individual. Ours is collective culture where ideas belong to everyone." By analyzing piracy rates across countries, Marron and Steel (2000) showed that high individualistic countries tend to have low piracy rates, and that collectivist traditions encourage property sharing. Consequently, secrets are easier to keep in individualistic societies, particularly when these secrets provide a competitive advantage. Nevertheless, the United States (a country with a high individualism score) presents regional particularities. Saxenian (1994) reports differences between Silicon Valley and Route 128 in Massachusetts. She argues that the relative proximity between companies in Silicon Valley makes it very difficult to preserve an atmosphere of secrecy, so that restricting the transfer of confidential know-how information becomes much harder. In such settings, trade secrets are more difficult to enforce, given the poor reputations of companies that sue departing employees (Hyde 2006). This does not mean that secrecy is not used. On the contrary, Hyde (2006) notes that all firms in Silicon Valley require new employees to sign a form stating that everything they are working on

belongs to the company, everything they work on after leaving the company for a year or two belongs to the company, and no confidential or proprietary information is to be disclosed outside the company.

Not surprisingly, masculinity does not influence the use of secrecy as an intellectual property protection mechanism. In fact, most of the research shows that masculinity is generally not associated with strategic directions or decisional processes (e.g. Geletkanycz 1997). Husted (2000) found no link between cultural masculinity and software piracy rates. Shane et al. (1995) concluded that the masculinity dimension is not associated with innovation.

Our results show that, in low power distance and low uncertainty avoidance cultures, firms tend to protect their innovation and intellectual assets using secrecy. These results have also been confirmed by empirical studies on intellectual property protection across cultures. According to Ronkainen and Guerrero-Cusumano (2001), low power distance and low uncertainty avoidance countries have low piracy rates and are also more innovative.

Furthermore, our results show that, at the firm level, employee control and organizational trust enhance secrecy use. At the country level, the intellectual property right index (IPRI) is positively linked to secrecy. Nevertheless, potentially important factors such as first-to file rules and first-to invent principles were not considered in this study. As pointed out by Scotchmer and Green (1990), first-to-file rules may induce innovators to patent rather than choose secrecy. The other rule of priority dispute resolution, which is used only in the United States, is based on the first-to-invent principle, which tends to make secrecy more attractive.

To our knowledge, few studies have analyzed secrecy use in a cross-national perspective. One major empirical work by Salter and Niswander (1995) tested Gray's (1988) theory, which links accounting values and systems to Hofstede's cultural constructs, and found that culture indeed has an effect on secrecy and financial reporting practices. Comparing their results with ours raises some interesting issues. Referring to Gray's definition of secrecy as "a preference for confidentiality and restriction of disclosure of information about the business only to those who are closely involved with its management and financing as opposed to a more transparent approach, open and publicly accountable approach" (Gray 1988: 8), Salter and Niswander (1995) used the less informative annual report as a measure of secrecy. They found that secrecy has a significant positive relationship with uncertainty avoidance and a negative relationship with individualism, the relationship between secrecy and power distance or masculinity having failed to materialize. In other words, except for masculinity, their results contradict ours. This leads us to conclude that the influence of national culture on secrecy depends on both the nature and type of information that must be kept secret, as well as the firm's objective. Therefore, an organization may have a number of secrecy concerns: secrecy about remuneration, secrecy and ethical behavior, and secrecy as an intellectual property mechanism. These different dimensions of secrecy should be analyzed separately.

From a managerial point of view, our results show that it is easier to use secrecy as an IP protection mechanism in certain cultures. Consequently, this study may help managers choose their IP protection mechanisms for internationalized and decentralized R&D units.

Future research could explore the impact of cultural values other than those identified by Hofstede (e.g., Schwartz and Bilsky 1990). It would also be useful to analyze organizational secrecy practices and employee behavior in keeping organizational secrets, for instance in subsidiaries located in different areas, by considering individuals rather than the organization as the analysis unit.

REFERENCES

Anand, B. N., & Galetovic, A. (2004). Strategies That Work When Property Rights Don't. In G. D. Libecap (ed.), *Advances in the Study of Entrepreneurship, Innovation, and Economic Growth: Intellectual Property and Entrepreneurship:* 261-304. Stamford, CT: JAI Press.

Anderson, J. A. (1984). Regression and ordered categorical variables. *Journal of the Royal Statistical Society,* 46(1):1–30.

Arundel, A. (2001). The relative effectiveness of patents and secrecy for appropriation. *Research Policy,* 30: 611–624.

Argyres, N. S., & Silverman, B. S. (2004). R&D, organization structure, and the development of corporate technological knowledge. *Strategic Management Journal,* 25: 929-958.

Bailey, J. R., Chen, C. C., & Dou, S. G. (1997). Conceptions of self and performance-related feedback in the U.S., Japan and China. *Journal of International Business Studies,* 28: 605–625.

Bellman, B. L. (1981). The paradoxe of secrecy. *Human Studies*, 4: 1-24.

Bond, M. H., & Hewstone, M. (1988). Social Identity Theory and the Perception of Intergroup Relations in Hong Kong. *International Journal of Intercultural Relations*, 12: 153-170.

Brown, J. D., & Prescott, J. E. (2000). Products of the Mind: Assessment and Protection of Intellectual Property. *Competitive Intelligence Review,* 11: 60–76.

Chalk, R. (1985). Overview: AAAS Project on Secrecy and Openness in Science and Technology Science, *Technology, & Human Values*, 10 (2): 28-35.

Chow, C. W., Deng, F. J., & Ho, J. L. (2000). The Openness of Knowledge Sharing within Organizations: A Comparative Study of the United States and the People's Republic of China. *Journal of Management Accounting Research*, 20: 65-95.

Cohen, W. M., Nelson, R. R., & Walsh, J. P. (2000). Protecting their intellectual assets: appropriability conditions and why U.S. manufacturing firms patent (or not), *Working paper 7552.*

Cohen, W.L., Goto, A., Nagata, A., Nelson, R., & Walsh, J.P. (2002). R&D spillovers, patents and the incentives to innovate in Japan and the United States. *Research Policy*, 31: 1349–1367.

Coombs, J. E., & Deeds, D. L, (2000). International alliances as sources of capital: evidence from the biotechnology industry. *The Journal of High Technology Management Research,* 11(2): 235–253.

Cowan, D. A. (1986). Developing a process model of problem recognition, *Academy of Management Review,* 11(4): 763–776.

Crowley. P. (2004). Innovation in the new Member States and Candidate Countries-Output, barriers and protection, Eurostat, KS-NS-04-013.

Cuello de Oro, D. J., & López-Cózar, C. (2007). Las patentas como mecanismo de apropiación de rentas económicas. Un estudio empírico en el sector farmacéutico español. *Revista Europea de Dirección y Economía de la Empresa,* 16 : 11–28.

Denicolò V., & Franzoni, L. A. (2004). Patents, secrets, and the first-inventor defense. *Journal of Economics & Management Strategy,* 13(3): 517-538.

Dosi, G., Marengo, L., & Pasquali, C. (2006). How much should society fuel the greed of innovators? On the relations between appropriability, opportunities and rates of innovation. *Research Policy*, 35: 1110–1121.

Doupnik, T. S., & E. L. Riccio (2006). The influence of conservatism and secrecy on the interpretation of verbal probability expressions in the Anglo and Latin cultural areas. *The International Journal of Accounting,* 41(3): 237–261.

Fine, G. A., & Holyfield, L. (1996). Secrecy, trust, and dangerous leisure: generating group cohesion in voluntary organizations. *Social Psychology Quarterly,* 59(1): 22–38.

Fosturi, A., & Rønde, T. (2004). High-tech clusters, technology spillovers, and trade secret laws. *International Journal of Industrial Organization*, 22: 45–65.

Ford, D. F., & Chan, E. Y. (2003). Knowledge sharing in a multi-cultural setting: a case study. *Knowledge Management Research & Practice,* 1: 11–27.

Geletkanycz, M. A. (1997). The salience of 'culture's consequences': The effects of cultural values on top executive commitment to the status quo. *Strategic Management Journal,* 18(8): 615–634.

Gould, D. M., & Gruben,W. C., (1996). The role of intellectual property rights in economic growth. *Journal of Development Economics,* 48: 323–350.

Gray, S. J. (1988). Towards a theory of cultural influence on the development of accounting systems internationally. *Abacus,* 3: 1–15.

Gudykunst, W. B. (1988). Culture and Intergroup Processes. In H. B. Michael (ed.), *The cross-cultural challenge to social psychology*: 165-181. Thousand Oaks, CA: Sage.

Gudykunst, **W.** B., & Ting-Toomey, S. (1988**).** *Culture and interpersonal communication.* Newbury Park, CA Sage.

Gudykunst, W.B., Matsumoto, W., Nishida, T., Kim, K., & Heyman, S. (1996). The influence of cultural individualism-collectivism, self construals, and individual values on communication styles across cultures, *Human Communication Research*, 22(4): 510–413

Gudykunst, W. B. (1997). Cultural Variability in Communication: An Introduction, *Communication Research,* 24: 327–348.

Hannah, D. R. (2005). Should I keep a secret? The effects of trade secret protection procedures on employees' obligations to protect trade secrets. *Organization Science,* 16: 71–84.

Hannah, D. R. (2006). Keeping trade secret secrets. *MIT Sloan Management Review*, 47(3): 17–20.

Hannah, D. R. (2007). An examination of the factors that influence whether newcomers protect or share secrets of their former employers. *Journal of Management Studies*, 44(4): 465–487.

Hansen, M. T. (1999). The Search-Transfer Problem: The Role of Weak Ties in Sharing Knowledge across Organization. *Administrative Science Quarterly*, 44(1): 82–111.

Hofstede, G. (1980). *Culture's consequences: International differences in work-related values*. Newbury Park, CA: Sage.

The International Property Rights Index. IPRI 2008 Statistics http://www.internationalpropertyrightsindex.org/ Accessed 19 December 2008.

Huff, L., & Kelley, L. (2003). Levels of organizational trust in individualist versus collectivist societies: A Seven-Nation study. *Organization Sciences,* 14(1): 81–90.

Hui, C. H., & Triandis, H. C. (1986). Individualism-collectivism: a study of cross-cultural researchers. *Journal of Cross-Cultural Psychology*, 17: 225–248.

Hussinger, K. (2006). Is Silence Golden? Patents versus Secrecy at the Firm Level. *Economics of Innovation and New Technology,* 15: 735-752.

Husted, B. W. (2000). The impact of national culture on software piracy. *Journal of Business Ethics,* 26: 197–211.

Jaumotte, F., & Pain, N. (2005). From innovation development to Implementation: Evidence from the community Innovation Survey. *OECD Economics department Working Papers 458*, OECD Economics Department.

Kanheman D., & Lovallo, D. (1993). Timid choices and bold forecasts: a cognitive perspective on risk taking. *Management Science,* 39(1): 17–31.

Keane, C. (2008). Don't Ask, Don't Tell, Secrets—Their use and Abuse in Organizations. *Journal of Management Inquiry,* 17(2): 107–110.

Kirkman, B. L., Lowe, K. B., & Gibson, C. B. (2006). A quarter century of Culture's Consequences: a review of empirical research incorporating Hofstede's cultural values framework. *Journal of International Business Studies*, 37: 285–320.

Knight, G., & Cavusgil, S. (2004). Innovation, organizational capabilities and the born-global firm. *Journal of International Business Studies*, 35(2): 124-141.

Kreiser, P., Marino, L., & Weaver, K. (2002). Correlates of entrepreneurship: The impact of national culture on risk-taking and proactiveness in SMEs. Reno, NV, USA: US Association for Small Business & Entrepreneurship.

Kultti. K., Takalo, T., & Toikka, J. (2007). Secrecy versus patenting. *The RAND Journal of Economics,* 38(1): 22-42.

Lachman, R., Nedd, A., & Hinings, B. (1994). Analyzing Cross-National Management and Organizations: A Theoretical Framework. *Management Science*, 40(1): 40–55.

Lado, A., Boyd, N. G., & Hanlon, S. C. (1997). Competition, cooperation, and the search for economic rents: A syncretic model. *The Academy of Management Review,* 22(1): 110–141.

Levin, R.C., Klevorick, A.K., Nelson, R.R., & Winter, S.G. (1987). Appropriating the returns from industrial research and development. *Brookings Papers on Economic Activity*, 3, 783–820.

Liebeskind, J. P. (1997). Keeping organizational secrets: Protective institutional mechanisms and their costs. *Industrial and Corporate Change,* 6: 623–663.

Lumpkin, G. T., & Dess, G. G. (1996). Clarifying the entrepreneurial orientation construct and linking it to performance. *Academy of Management Review,* 21: 135–172.

March, J. G. (1991). Exploration and exploitation in organizational learning. *Organization Science,* 2: 71–87.

Marron, D. B., & Steel, D. G. (2000). Which countries protect intellectual property? The case of software piracy. *Economic Inquiry,* 38(2): 159–174.

Maurer, S. D., & Zugelder, M. T. (2000). Trade secret management in high technology: a legal review and research agenda. *The Journal of High Technology Management Research*, 11(2): 155–174.

McCullagh, P. (1980). Regression models for ordinal data. *Journal of the Royal Statistical Society*, 42: 109–142.

Mcevily, S. K., Eisenhardt, K., & Prescott, J. E. (2004). The Global Acquisition, Leverage, and Protection of Technological Competencies. *Strategic Management Journal*, 25: 713–722.

Nabel, M. V. (1975). Corporate secrecy and political accountability. *Public Administration Review*, 35(1): 14–23.

Nakata, C., & Sivakumar, K. (1996). National Culture and New Product Development: An Integrative Review. *Journal of Marketing,* 60(1): 61-72.

Ouchi, W. G. (1980). Markets, bureaucracies, and clans. *Administrative Science Quarterly,* 25: 129-14 I.

Redding, S. G. (1994). Comparative management theory: jungle, zoo, or fossil bed?. *Organization Studies*, 15(3): 323–359.

Ronen, S., & Shenkar, O. (1985). Clustering Countries on Attitudinal Dimensions: A Review and Synthesis. *The Academy of Management Review,* 10(3): 435–454.

Ronkainen, I. A., & Guerrero-Cusumano, J. (2001). Correlates of intellectual property violation. *Multinational Business Review,* 9(1): 59–65.

Rothaermel F. T. (2002). Technological discontinuities and interfirm cooperation: what determines a startup's attractiveness as alliance partner?. *IEEE Transactions On Engineering Management,* 29(4): 388–397.

Rothaermel F. T., & Boeker, W. (2008). Old technology meets new technology: complementarities, similarities, and alliance formation, *Strategic Management Journal*, 29: 47–77.

Salter, S. B., & Niswander, F. (1995). Cultural influence on the development of accounting systems internationally: A test of Gray's [1988] theory. *Journal of International Business Studies*, 26(2): 379–397.

Shane, S. (1993). Cultural influences on national rates of innovation. Journal of Business Venturing, 8(1): 59–73.

Shane, S. (1995). Uncertainty Avoidance and the Preference for Innovation Championing Roles. *Journal of International Business Studies,* 26(1): 47–68.

Shane, S., Venkataraman, S., & MacMillan, I. (1995). Cultural differences in innovation championing strategies, *Journal of Management,* 21, 931–952.

Schwartz, S., & Bilsky, W. (1990). Toward a theory of the universal content and structure of values: extensions and cross-cultural replications. *Journal of Personality and Social Psychology*, 58: 878–891.

Scotchmer, S., & Green, J. (1990). Novelty and Disclosure in Patent Law. *The RAND Journal of Economics,* 21(1): 131–146.

Steensma, K., Marino, L., & Weaver, K. (2000). Attitudes toward cooperative strategies: A cross-cultural analysis of entrepreneurs. *Journal of International Business Studies*, 31(4): 573–591.

Tajfel, H., & Turner, J. C. (1985). The social identity theory of intergroup behavior. In S. Worchel & W. G. Austin (Eds.), *Psychology of intergroup relations*: 7-24. Chicago: Nelson-Hall.

Takemura, K**,** Yuki, M., Kashima, E. S., & Halloran, M. (2007). A cross-cultural comparison of behaviors and independent/interdependent self-views. In A.B.I. Bernardo, M.C. Gastardo-Conaco, & M.E.C.D. Liwag (Eds.), *The self, relationships, and subjective well-being in Asia: Psychological, social, and cultural perspectives*: 105-121. Seoul, Korea: Kyoyook-Kwahak-Sa.

Teng, B-S. (2007). Managing intellectual property in R&D alliances. *International Journal of Technology Management*, 38 (1/2): 160-177.

Triandis, H. C., Bontempo, R., Villareal, M. J., Asai, M., & Lucca, N. (1988). Individualism and collectivism: cross-cultural perspectives on self- ingroup relationships. *Journal of Personality and Social Psychology,* 54(2): 323–338.

Thumm, N. (2001). Management of Intellectual Property Rights in European Biotechnology Firms. *Technological Forecasting and Social Change*, 67: 259–272.

Von Hippel, E. (1998). Economics of product development by users: the impact of 'sticky' local information. *Management Science,* 44(5): 629–644.

Yuki, M. (1983). Intergroup Comparison versus Intragroup Relationships: A Cross-Cultural Examination of Social Identity Theory in North American and East Asian Cultural Contexts. *Social Psychology Quarterly*, 66(2): 166–183.

York, R. O. (1998). *Conducting social work research*. Boston: Allyn & Bacon.

Westwood, R. I., & Posner, B. Z. (1997). Managerial values across cultures: Australia, Hong-Kong and the United States. Asia Pacific. *Journal of Management,* 14: 31–66.