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# INTELLECTUAL STRUCTURE OF THE OPEN INNOVATION FIELD: STATE OF THE ART AND A CRITICAL LITERATURE REVIEW

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**ABSTRACT:** *This paper presents an overview of open innovation. It positions the concept into a wider framework of scholarly research of innovation, discusses its historical development and its positioning within the wider area of innovation research. Using different types of bibliometric analysis, we estimate the impact of open innovation and continue with their contributions to the theory of innovation. While not a true paradigm shift as it used to claim, open innovation is a clearly defined innovation concept that brings important contributions to the theory of innovation, helps answering some of the key questions that were recognized by innovation scholars.*

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**Keywords:** *open innovation, innovation concepts, open innovation practices, open innovation policies, user innovation, bibliometric analysis*

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**JEL:** O31, I24

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## 1. INTRODUCTION

The nature of innovation has changed recently. Innovation activities have become globalized and open in a way that was unimaginable even 20 years ago (Wooldridge, 2010). Companies now innovate in an environment in which competition is global, knowledge is spread more widely, R&D investments are increasing and in which product life cycles are shortening (Koen De Backer, Cervantes, Van De Velde, & Martinez, 2008). Companies can no longer succeed by developing the next innovative product in their internal laboratories or by outsourcing manufacturing activities to low-cost countries (Herrigel, 2010). Countries implement competing innovation policies in order to become more attractive as potential innovation hubs.

These changes have brought new insight into innovation research. Several theoretical concepts have emerged, but the most interest has recently been devoted to a new innovation concept of open innovation, introduced by Henry Chesbrough's 2003 book (Chesbrough, 2003). The open innovation concept presumes that companies use external ideas besides

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those generated inside the boundaries of the company. They also seek internal and external ways to the market for them. Research and development represent an open system (H W Chesbrough & Crowther, 2006)<sup>3</sup>.

The underlying reason for the development of open innovation and other theoretical innovation concepts was the changing nature of innovation practices. During the first decades of the 20<sup>th</sup> century, industrial enterprises in the US cooperated and sourced R&D services from dedicated external R&D labs in a way that is very familiar to the current practitioners of open innovation (E. K. R. E. Huizingh, 2011), (Mowery, 1983). The best known example is Edison's The Invention Factory at Menlo Park. Cooperation between companies was common at the time and critical to the survival of an industrial structure dominated by small firms (Hollingsworth, Campbell, & Lindberg, 1991). Still, there was a large gap in theoretical understanding of innovation that was being observed in innovation practices.

Open innovation concept has been targeting this lack of understanding observed in existing innovation practices. Chesbrough claims that open innovation represents a paradigm shift. It emphasises cooperation and sharing of ideas between companies regardless of the boundaries between companies or states. Companies buy or license processes and innovations from other companies and at the same time push their innovations to the market through licensing, joint ventures or spin-offs (Chesbrough, 2003). This challenges the 'closed' innovation model that sees innovation as the result of work of the large internal laboratories that only large, usually multinational companies can afford.

While no one disputes that the open innovation concept has attracted a lot of attention both in practice and academia (E. K. R. E. Huizingh, 2011), there are authors that claim it is not a clear concept and that it comes in many forms, which makes the concept rich but hinders generalization. Others dispute the paradigm shift that open innovation claims to present. They predict that the term will fade away in a decade (E. Huizingh, Conn, & Torkkeli, 2011), merging into the 'standard' definition of innovation. Others have suggested that the term itself could be acting as a communication barrier - hindering growth in research and understanding, thus representing constraint to future research (Groen & Linton, 2010).

Based on these insights, our analysis on the literature review aims to contribute to filling the gaps in understanding innovation recognized by scholars (Fagerberger, 2005) and to answering three research questions in particular:

1. Is it really a new paradigm in understanding innovation (Chesbrough, 2003)?
2. Is open innovation a new innovation concept or just the continuation of the innovation research and not distinct from other existing innovation concepts (E. Huizingh et al., 2011)?

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3 In the paper, we continue to use Chesbrough's definition of open innovation which he defines as: "the use of purposive inflows and outflows of knowledge to accelerate internal innovation and to expand the markets for external use of innovation, respectively" (Henry William Chesbrough, Vanhaverbeke, & West, 2006, p. 1).



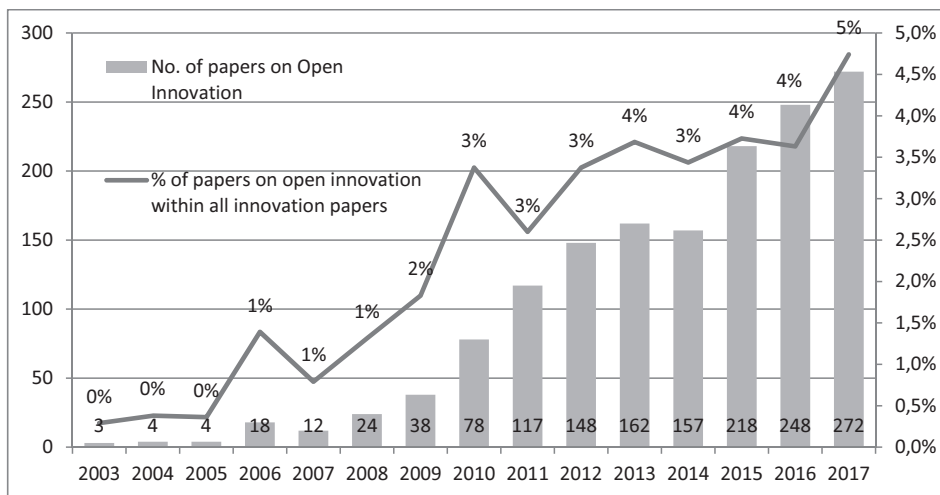
3. Is open innovation even important for theory and practice of innovation – or is the term a communication barrier hindering growth in innovation research and understanding of innovation (Groen & Linton, 2010)?

We will try to provide answers to these three research questions using the bibliometric methods and critical literature review.

## 2. DEVELOPMENT OF THE OPEN INNOVATION CONCEPT IN INNOVATION RESEARCH

The beginning of the open innovation concept is clear – , it was introduced in Henry Chesbrough's book in 2003 (Chesbrough, 2003). It received significant interest from scholars who soon followed with a growing number of publications.

Figure 1: Number of papers on open innovation and its share among innovation papers



Source: Thompson Reuters Web of knowledge 2018

The initial studies of open innovation focused on early adopters and good practice examples, which tend to be successful. They were usually case studies and descriptive in nature e.g. (Huston & Sakkab, 2006), (Chiaroni, Chiesa, & Frattini, 2009) or (Christensen, Olesen, & Kjar, 2005). Most case studies also focused on particular industries, most often high-tech (Chesbrough, 2003).

These initial studies were followed by expanding the scope to other industries (H W Chesbrough & Crowther, 2006). Some authors soon discovered that 'few corporations have institutionalised open innovation practices in ways that have enabled substantial growth or industry leadership' (Rufat-Latre, Muller, & Jones, 2010). More case studies

followed that attempted to compare different open innovation practices to determine their context dependency e.g.(Sarkar & Costa, 2008), (Vanhaverbeke, Ine, & De Zutter, 2012). They expanded the scope of activities connected to the concept (Grøtnes, 2009).

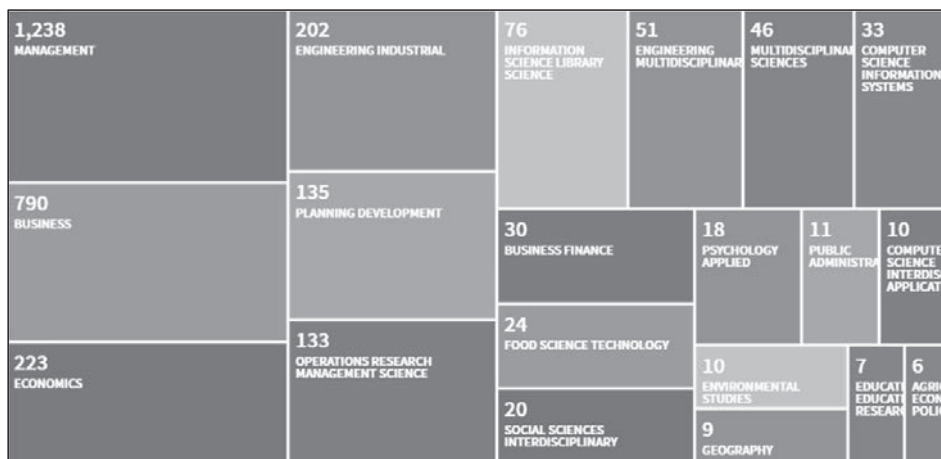
At the same time, the first empirical studies were implemented. They initially used existing data sources like the European CIS survey (Ebersberger, Herstad, Iversen, Kirner, & Som, 2011), (Mention, 2011) or global indicators that were not designed to measure open innovation (K. De Backer, López-Bassols, & Martinez, 2008). They later included specific quantitative studies, but often focused on certain industries (Harison & Koski, 2010), countries (Lazzarotti, Manzini, & Pellegrini, 2010) or institutions (Spithoven, Clarysse, & Knockaert, 2010).

Some quantitative studies focused on small and medium sized companies and discovered that open innovation is a logical step for them. Consequently, they are collaborating with external partners more frequently than large companies (van de Vrande, de Jong, Vanhaverbeke, & de Rochemont, 2009)

Others discovered that open innovation is not always the best option (Praest Knudsen & Bøtker Mortensen, 2011). A ‘closed’ innovation system can also be more suitable for some companies or even industries, as there are clear differences in open innovation among companies and industries. Some authors even believe that ‘closed’ innovation systems could return and see evidence of that emerging with the development of the Internet (Anderson & Wolff, 2010).

In recent years, open innovation research has seen systematic appraisals of the contributions of the open innovation in the form of several literature reviews and summaries, as well as identifications of areas for future research (West & Bogers, 2017). As the table X shows, the body of research on open innovation is still increasing and that means that it is spreading to new areas and targets new research questions. Interestingly, one of the opportunities identified by scholars is also a better connection to prior theoretical research, including topics such as absorptive capacity, user innovation, resources, dynamic capabilities, business models, and the definition of the firm (West & Bogers, 2017). They clearly recognized the opportunities of expanding the scope of open innovation beyond organisational-level research to multiple levels of analysis (Bogers et al., 2017).

There is some evidence that open innovation is limited to certain research areas – for example R&D management. Analysing the interest in open innovation, the search of Thomson Reuters Web of knowledge for “open+innovation” after 2003 (when the concept was established) and limiting the results to management, business and economics categories resulted in 1.554 documents in our document set. We have limited our research to the business, management and economics categories because they are by far the most numerous ones. Other categories are numerous but very limited, as the graph shows.

Figure 3: *Open innovation topic among the Web of knowledge categories*

Source: Thompson Reuters Web of knowledge 2018

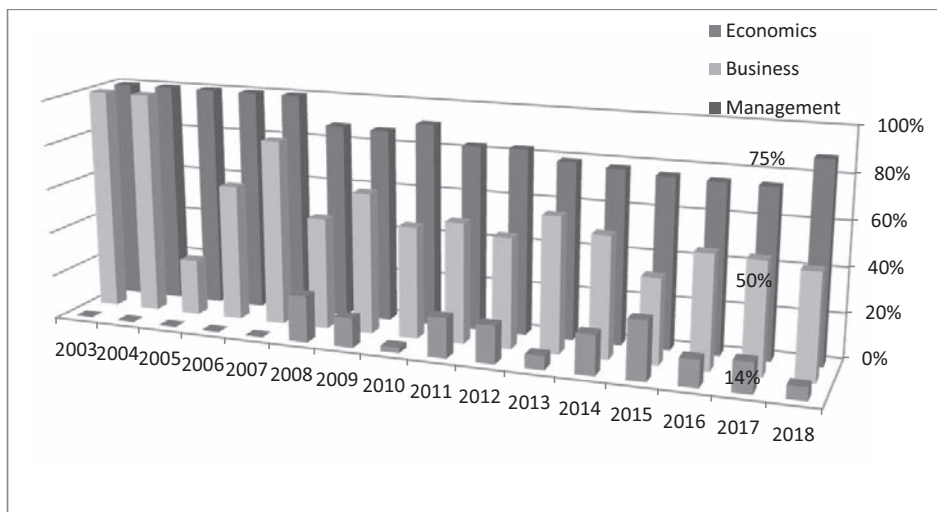
Our analysis also shows that open innovation remains most widely used in the management of R&D. This is clearly seen from the top journals publishing open innovation research with four out of five top journals that publish open innovation research focusing on R&D management.

Table 1: *Top journals that publish open innovation research*

Source Titles	Published articles
R D MANAGEMENT	67
RESEARCH TECHNOLOGY MANAGEMENT	59
TECHNOVATION	53
RESEARCH POLICY	51
INTERNATIONAL JOURNAL OF TECHNOLOGY MANAGEMENT	50
TECHNOLOGY ANALYSIS STRATEGIC MANAGEMENT	46
TECHNOLOGICAL FORECASTING AND SOCIAL CHANGE	42
JOURNAL OF PRODUCT INNOVATION MANAGEMENT	37
CREATIVITY AND INNOVATION MANAGEMENT	32
INTERNATIONAL JOURNAL OF INNOVATION MANAGEMENT	32

Source: Thompson Reuters Web of knowledge 2018

The focus on business and management aspects of open innovation is a constant and not changing much, emphasizing the focus on the business research topics. Even the category of economics is not well researched - and the interest of open innovation scholars in economics seems even to be waning in recent years.

Figure 4: *Categories chosen by the open innovation articles*

Source: Thompson Reuters Web of knowledge 2018

While our analysis focuses on the articles published after 2003, some articles also results from our search that originated before 2003. Interestingly, in the most cited literature review of open innovation (Dahlander & Gann, 2010), the authors also include papers on open innovation that were published even before the concept was introduced in 2003. They also present some additional findings. First, open innovation is not a completely new concept as the organisation of innovation activities that breached firm boundaries was already present before the introduction of the open innovation concept. This includes distributive innovation (Lakhani & Panetta, 2007) and network innovation (Steinle & Schiele, 2002) that remain closely connected to open innovation. The main difference between these concepts is the ratio between internal and external sources of innovation. Due to these similar concepts, the open innovation paradigm was much less sudden and more gradual. As confirmed also by our analysis, the open innovation concept that was introduced in 2003 was new, but open innovation activities were not.

This can be clearly seen in the table below, where open innovation references are presented. We have prepared a shared unit (bibliometric coupling) analysis on the dataset of 500 most cited open innovation papers in the categories of economics, management and business. Using the method most often used (Persson, Danell, & Schneider, 2009) and the BibExcel software (Persson, 2017), the analysis shows the most often used sources used in the open innovation core document set. A sizable percentage of open innovation research is clearly founded on previous innovation research.

Table 2: Top 20 most cited references by open innovation research core document set

Authors	Title	Year	Source Title
Chesbrough, HW Crowther, AK	Beyond high-tech: early adopters of open innovation in other industries	2006	R&D Management
Chesbrough, HW	Open innovation: the new imperative for creating and profiting from technology	2003	Harvard Business Press
Chesbrough, HW Vanhaverbeke, W West, J	Open Innovation: Researching the New Paradigm	2006	Oxford University Press
Chesbrough, HW	Open business models	2006	Harvard Business Press
Chesbrough, HW	The era of open innovation	2003	MIT Sloan Management Review
Cohen, W; Levinthal, D	Absorptive-capacity – a new perspective on learning and innovation	1990	Administrative Science Quarterly
Dahlander, L Gann, DM	How open is innovation ?	2010	Research Policy
Eisenhardt, K M	Building theories from case study research	1989	Academy of Management Review
Enkel, E Gassman, O Chesbrough, H	Open R&D and open innovation: exploring the phenomenon	2009	R&D Management
Grant, RM	Toward a knowledge-based theory of the firm	1996	Strategic Management Journal
Huizingh, E.K:R.R	Open innovation: state of the art and future perspectives	2008	Technovation
Laursen, K; Salter, A	Open for innovation: the role of openness in explaining innovation performance among uk manufacturing firms	2004	Strategic Management Journal
Laursen	The paradox of openness: appropriability, external search and collaboration	2014	Research Policy
Lee, S, Park, G Yoon, B, Et al.	Open innovation in SMEs – an intermediated network model	2010	Research Policy
March, JG	Exploring and exploiting in organizational learning	1991	Organization Science
Parida, V Westerberg, M Frishammar, J	Inbound open innovation activities in high-tech SME's: the impact on innovation performance	2012	Research Policy
Teece, D	Profiting from technological innovation – implications for integration, collaboration, llicensing and public-policy	1986	Research Policy
Van de Vrande, V De Jong, JPJ Vanhaverbeke, W, Et al.	Open innovation in SME's: trends, motives and management challenges	2009	Technovation
von Hippel, E	Democratizing innovation	2005	MIT Press

Source: Own shared unit (bibliometric coupling) analysis on the dataset of 500 most cited open innovation papers in the categories of economics, management and business.

*Papers marked with grey were published prior to the definition of the open innovation concept.*

Based on this analysis and the findings of other bibliometric studies of open innovation, is it safe to answer our first research question:

1. Is it really a new paradigm in understanding innovation (Chesbrough, 2003)?

While the concept is often presented as a revolutionary shift in understanding innovation activities, the change has been much less abrupt (Altmann & Li, 2011). In fact, open innovation is building on work developed by several innovation concepts introduced in the 1980's and 1990's. In order to represent a paradigm shift in the whole innovation research, open innovation would have to completely replace the old way of thinking, replacing the coherent tradition of investigation on innovation (Kuhn, 1962). However, our literature review as well as other reviews (E. K. R. E. Huizingh, 2011) clearly show that previous literature on innovation has also regarded network connections between actors (including connections across company boundaries) as being important. In particular, innovation systems concept has emphasised the collaborative aspect of innovation (B. Å. Lundvall, 1992; Richard R. Nelson, 1993).

Other authors have also recognized that the origins of open innovation were influenced by several areas of economics and management, developed over the last decades (e.g. dos Santos, Zambalde, Veroneze, Botelho, & de Souza Bermejo, 2015).

However, while open innovation is not a paradigm shift as it sometimes claims to be, does that mean that it has been redundant, yielding no contributions to scholarly research of innovation? Is it perhaps just limited to being a useful tool for companies that they can use to profit from innovation of others? Or has it made contributions to the theoretical understanding of innovation that other theoretical concepts haven't been able to? Does it represent a distinct innovation concept which brings valuable contributions to the body of knowledge on innovation?

### **3. RELATION OF OPEN INNOVATION CONCEPT WITH OTHER NEW CONCEPTS OF INNOVATION RESEARCH**

- Is open innovation a new innovation concept or just the continuation of the innovation research and not distinct from other existing innovation concepts (E. Huizingh et al., 2011)?

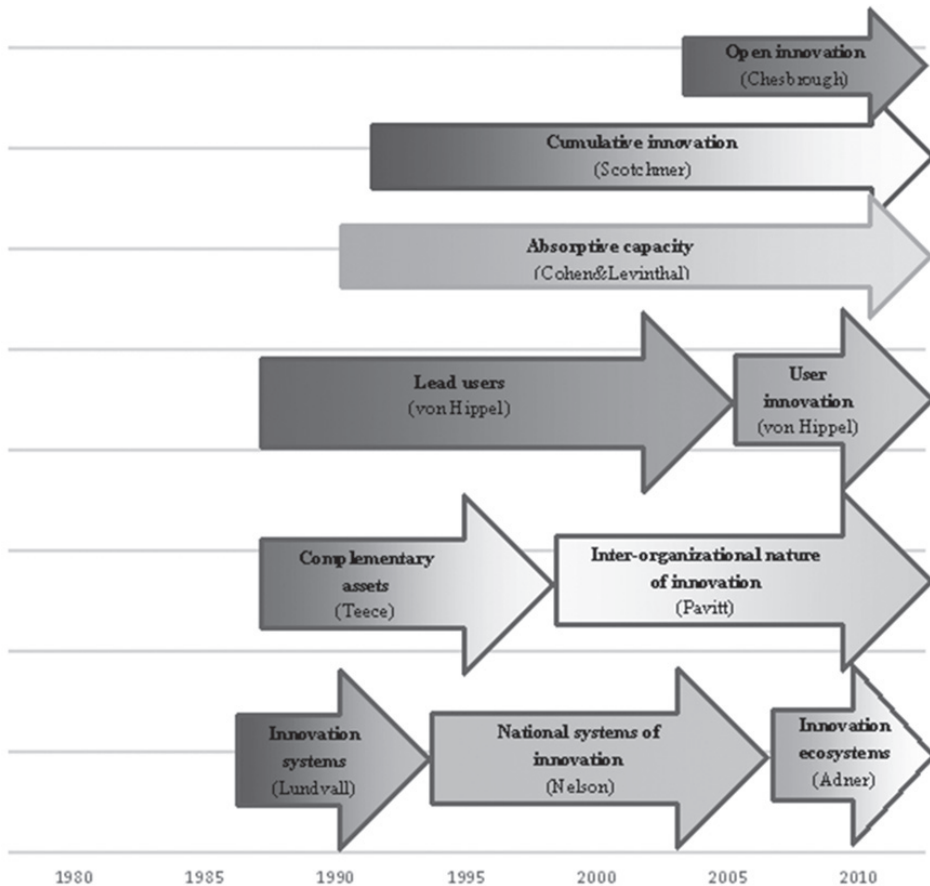
To answer this research question, it is important to recognize if open innovation has brought some theoretical contributions to the study of innovation that was lacking before. Essentially, our research question ask if open innovation, while not a paradigm shift in understanding on the innovation in general, is a new theoretical concept that is contributing knowledge and understanding to the innovation phenomena that was previously lacking. To answer this, we first need to establish the current state-of-the-art of scholarly understanding of innovation. A good overview of our current understanding of innovation was provided by the Oxford Handbook of Innovation ((Fagerberger, 2005).

Based on this overview, we have identified several concepts of innovation that have added to the understanding of innovation.

The concept of absorptive capacity supported the idea that companies should access and absorb external ideas, science and other kinds of knowledge inputs to innovation (Cohen & Levinthal, 1990). Complementary assets were discussed in regard to market failures in the innovation activities (Teece, 1986). The inter-organizational nature of innovation learning has been discussed by many authors (for example Pavitt, 1998). User-led innovation (von Hippel, 1986) introduced involvement of users in the innovation process. The concept of an 'innovation system' that includes customers, suppliers, competitors, universities, government organisations etc. was first used by Lundvall (B.-åke Lundvall, 1985). The analysis of innovation systems was upgraded with the work of Nelson (Richard R. Nelson, 1993) and others and is sometimes developed into innovation ecosystems (Adner, 2006). Exploration and exploitation of organisational learning were also discussed before (March, 1991).

Open innovation (as well as other authors before, for example Kline and Rosenberg (1986) also challenges the linear model of innovation (research → invention → innovation → diffusion) from the 1960's with the central role for research and development (Gibbons et al., 1994, Smith, 1994, (Clark & Guy, 1998). These models never corresponded to the complexities of the innovation processes (Chesbrough, 2003, 2006) as they could not explain innovation activities of small and medium enterprises or clusters. Open and networked innovation systems are much better able to explain the competitive advantage of these organizations. New models look at innovations as a non-linear technical and social process based on complex relations between companies and their environment (Asheim & Isaksen, 1997). These models explain the innovation process from the viewpoint of innovation flows in the organisations and between them (Saxenian, 1994) as the companies cooperate with suppliers, customers, research institutes or even competitors.

Figure 5: A historical overview of development of innovation concepts



Source: own conceptualization loosely based on Fagerberg (2005)

Dramatic developments of innovation activities and innovation research have not only influenced the emergence of the open innovation concept. Building on similar academic foundations, other innovation concepts have developed at the same time as open innovation.

Open innovation is often compared to open source innovation. Open-source innovation is a more specific concept, most often associated with software (Euchner, 2010). In open-source software, platforms like Linux represent platforms that enable users to develop and share the code that they need. There is no owned intellectual property since anyone can access, use and modify the code. That does not mean that there are no governance structures though and business models have developed based on the open-source. In fact, business model development based on open-source innovation has many similarities with open innovation and open business model generation. However, the concept of open –



source differs from open innovation in three main characteristics: intellectual property rights are open, open governance of R&D and open direction of development (Euchner, 2010).

The usage of open-source innovation is spreading from the IT industry to industries such as medical engineering and sports equipment. Some authors believe that there is a clear technological trend and that open-source community innovation will be the future of open innovation (Bughin, Chui, Johnson, & Internet, 2008). The new technological revolution of digital manufacturing could represent a great boost to open source (Pearce et al., 2010). Its recent applications include development of open-source communities for scientific publishing and design.

Nevertheless, there are signs that open-source innovation has reached its potential in software development (The Economist, 2012), an industry where it has become the most prevalent. Other open source usages have remained limited to a few cases and have failed to gain wider usage. As the open source concept is already well over a decade old, it has developed beyond expectations. However, it has not become the dominant or only innovation concept even in software development. Some argue that it will remain an interesting but niche practice of innovating (Economist, 2006).

Open source innovation is based on networks of individuals that form a community. This community both contributes to the development and uses the product or service. Sometimes, these networks have enabled users to radically redefine the role of the firms that supply them. Von Hippel sees this as a more general trend where users (both individuals and firms) are increasingly able to innovate for themselves (von Hippel, 2005). Similarly, the concept of user innovation builds on the insight of van Hippel that in many industries, users were the originators of the most novel innovation. The user's dominant role in originating innovations reflects the fact that knowledge is distributed and sticky, an insight originating from Hayek's work in 1945 (Hayek, 1945). The distributed nature of knowledge results in the acknowledgement that traditionally closed models of proprietary innovation will have difficulty completing knowledge intensive tasks when most of the needed knowledge resides outside of the organisation (Lakhani & Panetta, 2007). The user innovation concept represents several distributed innovation systems, including open source innovation. In practice, the limitations of such innovation are notable. They include a high failure rate for several projects, organisational issues in regards to delivering innovations on demand and difficulties in embracing distributed innovation into organisations. The last limitation is closely connected with the issues of trade secrecy and intellectual property protection (Lakhani & Panetta, 2007).

Even though open innovation and user innovation are closely connected concepts with a number of similarities and based on the same socio-economic and technological changes of the last decades, they are completely distinct and even competitive. Their main difference is in the business model. User innovation focuses on value creation through lead users and innovation communities. Open innovation does not only focus on value capture. This is the distinction that has made it very popular with companies when they finally

realize how they can profit from user innovation. Open innovation is primarily focused around the organization and the process of open innovation is within the firm and on ways of how to profit from them. Therefore, it clearly supports Intellectual Property Rights (IPR), while user innovation (especially open source innovation) does not support private ownership IPR. There are other differences between the user innovation concept and the open innovation concept, but it is clear that the main difference is the profit motive as the driver of innovation in the open innovation concept (West, 2012). Open and user innovation remain two separate, but similar theories of innovation.

In reality, both research streams are separate with only a handful of scholars active in both communities. Few authors have tried to combine and consolidate the two research streams. One example is Joel West (2010), who coined the overarching term of distributed innovation. However, the term has not yet been widely accepted.

There is a third body of scholarly research on innovation – cumulative innovation. This concept is most recently associated with the work of Scotchmer (1991). Her contribution from the 1990's and 2000's emphasises the cumulative nature of research since most new discoveries are the result of previous technological progress. They are based on the foundations provided by earlier researchers and innovators (Scotchmer, 1991). The cumulative nature of research poses challenges to the patent system. It does not provide proper incentives for research since it rewards only individual, often breakthrough innovations. By contrast, most improvements are incremental. The cumulative innovation literature considers the role of interdependencies of producers within the industry (West, 2009). Companies often share the leadership of technological progress, which does not depend on any one individual or firm. Companies also build upon a common, ever increasing pool of enabling science, even if their specific products are unique point products. The best example is the biopharmaceutical drug discovery (Scotchmer, 2004).

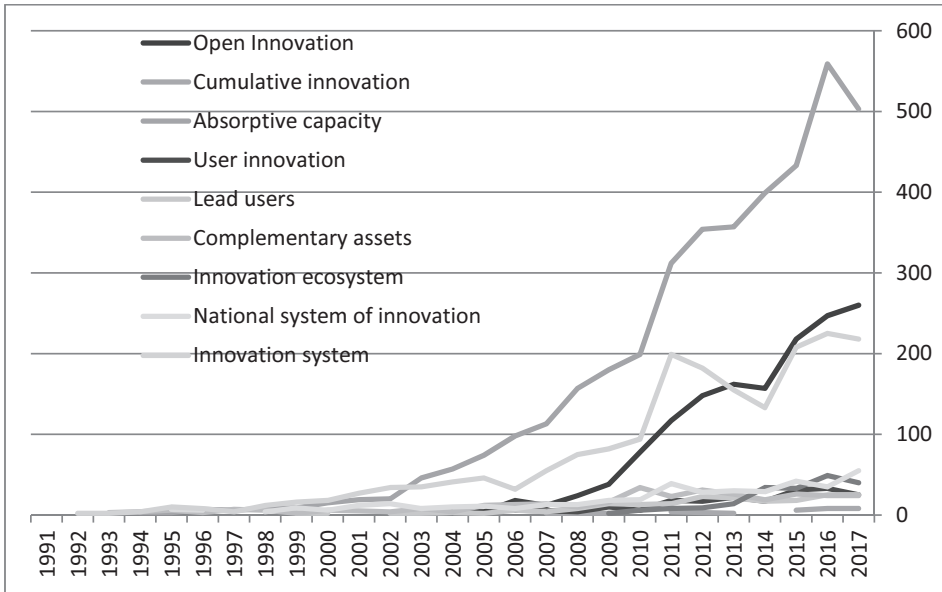
In some cases, cumulative innovation is fuelled by explicit cooperation between firms, while in other cases an industry's joint innovation is advanced through unintended spill-overs and information flows among the firms in the industry. In the latter case, cumulative innovation happens to the degree to which it is permitted by IP policies, as firms use whatever information is available to develop their innovations — and thus, IP monopolies tend to slow the rate of innovation and progress (Scotchmer, 1991). In contrast to the open innovation concept, cumulative innovation sees intellectual property protection as a possible hindrance to innovation.

There are other innovation concepts connected to similar innovation activities that form the foundation of the open innovation concept. Doing, using and interfacing mode of learning and innovation emphasises the role of informal processes of learning and experience-based know how (M. B. Jensen, Johnson, Lorenz, & Lundvall, 2007).

These concepts had different contributions to the understanding of innovation. Figure below shows that the highest number of articles have been discussing three main concepts of innovation: absorptive capacity, innovation systems and open innovation. Of these,

open innovation is the most recent concept but has seen the most rapid increase in the number of articles recently.

Figure 6: A historical overview of development of innovation concepts  
(Number of published articles for each innovation concept)

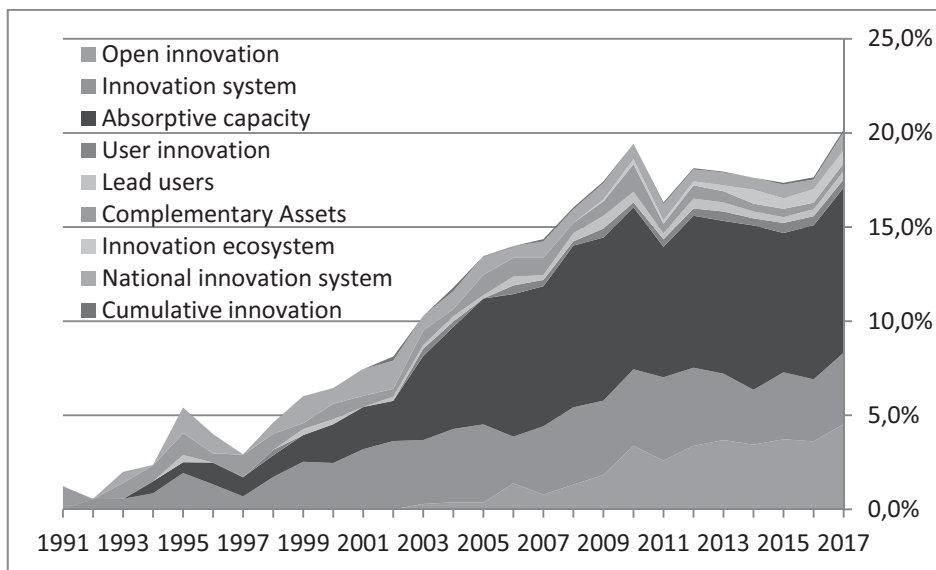


Source: Thompson Reuters Web of knowledge 2018

Each innovation concept was defined by keywords in the fields of economics, management and business in the research topic in the Web of knowledge

As a share of the total number of articles discussing innovation, open innovation has been representing some 4,5 % of the total research field in 2017. It trails only the concept of absorptive capacity that was discussed by almost 9 % of all innovation articles. Open innovation has contributed more papers than a much older concept of innovation systems while no other concept has yielded more than 1 % of all innovation articles.

Figure 7: A historical overview of development of innovation concepts (Share of published articles in the total publications on innovation)



Source: Thompson Reuters Web of knowledge 2018

Each innovation concept was defined by keywords in the fields of economics, management and business in the research topic in the Web of knowledge

This analysis shows that our understanding of innovation is comprised of several concepts and is discussed from different viewpoints, so it is unrealistic to expect one concept (such as open innovation) to become the only 'true' innovation concept. A body of knowledge on innovation is comprised of numerous theories (or research programs according to Lakatos (1976)) and each of them sheds new light on a subject – especially one as complex as innovation. Open innovation will never be the only innovation concept as other views on innovation already exist and will continue to exist in the future. However, open innovation does contribute new insights and is clearly different from other concepts, even very similar ones (like user innovation). It has a clear definition of the concept and fit the usual criteria for concept adequacy (Gerring, 1999).

It is actually one of the most prolific innovation concepts. Its impact on the understanding of innovation is also growing: it represents a growing proportion of additional published academic research articles. On the contrary, some other concepts (like cumulative innovation) have contributed almost no additional scientific articles in recent years and have thus all but stopped contributing to the body of knowledge about innovation. Based on this analysis and our findings, we can thus answer our second research question:

- Is open innovation a new innovation concept or just the continuation of the innovation research and not distinct from other existing innovation concepts (E. Huizingh et al., 2011)?

Clearly, the answer is positive. Open innovation is a new innovation concept, distinct from other innovation concepts. As other concepts, it is contributing new insights into our understanding of innovation.

#### **4. CONTRIBUTIONS OF OPEN INNOVATION**

Open innovation is thus not a paradigm but a new innovation concept that is growing and adding to our understanding of innovation. But what kind of contributions has it made to the theoretical understanding of innovation that other theoretical concepts haven't been able to?

Our analysis of literature shows that scholars have recognized at least three sets of contributions.

##### **4.1. Contributions of Open Innovation to the theory of the firm**

The result of the decline of the Fordist regime of innovation organisation and of the organisational expansion of innovation activities is that the locus of innovation is shifting away from the individual firm and national innovation system towards globally distributed knowledge networks. This development was not as new and surprising as it might seem. Alfred Marshall's concept of 'external economies' in 'industrial districts' were inspired by the modes of industrial organization found prior to the growth and consolidation of Fordism (Marshall, 1920). The major advantages of Marshallian industrial districts arise from the simple propinquity of firms, which allows easier recruitment of skilled labour and rapid exchanges of commercial and technical information through informal channels. They illustrate competitive capitalism at its most efficient, with transaction costs reduced to a practical minimum; but they are feasible only when economies of scale are limited.

However, the consequent theoretical work on the theory of the firm developed in another direction that implied that open innovation systems were opposing the existing economic theories of the firm. The debate on the nature of the firm followed Coase's insight that transaction costs in the market are not minimal but rather large. They represent a market failure that allows company's administrative control over transactions to be more efficient than market transactions (Coase, 1937). According to the transaction cost theory that evolved, companies exist since it is preferable not to leave some complex functions to the market as transaction costs would be too high (Williamson, O., 1975). Innovation services are an example of such a complex transaction, Therefore, according to this theory, open innovation systems would be less competitive than internal research.

Evolution theories (R.R. Nelson & Winter, 1982; Penrose, 1952, 1995, Veblen, 1898, 1899) describe development of companies from lower to higher levels of operations and success as a result of manager's actions, who transfer new routines to operational levels of the

company. They are connected to the general theory of evolution, which can be understood as any process whereby small variations can accumulate and predominate over time into large-scale changes. Companies improve their efficiency with relentless repetitions. By transferring complex routines and functions beyond the boundaries of the firm it would lose crucial benefits and control that it derives from its ownership. We find them especially useful as the underlying foundation for the research of business ecosystems. In connection to open innovation, they support government intervention as necessary due to the systemic failure argument. We will present this in more detail below.

Agent theories (Milgrom & Roberts, 1992) describe firms as a quest for control between principals and agents. Principals use contractual relations to allocate agents according to their needs. However, this is much more difficult for relations with outside partners as principals lose their hierarchical advantage.

Innovation economics (Schumpeter, 2013), (Freeman & Soete, 1974) enabled the development of large internal laboratories in corporations that enabled them to monopolize innovation by establishing large entry barriers.

All of these theories share the view that open innovation is not preferable to internal innovation. It was only Porter and his five forces model that recognized that the firm is at the centre of the network and other forces (the five forces he describes) are in the network as well (M. Porter, 1985). Concepts such as barriers to entry have less meaning, and the idea of rivalry, buyers, and suppliers is transformed by an environment of “co-competition”. The distinctions between companies and markets have been blurred. Some of the challenges of the networked world cannot even be considered from a firm-level perspective, any more than a complex ecosystem can be understood by studying one of its actors, or a chemical reaction can be understood by studying a single reagent. Nevertheless, they still looked at the positioning of the competitive advantage of the individual company inside a network of other players. At the core of Porter’s model, the boundaries of the firm remained intact.

The rise of networks has fundamental implications for business strategy and competencies. However, it also complicates and raises the issue of which activities the firms should perform internally and where to set the boundaries of the firm.

It seems that the most useful definition of the firm for researching open innovation is that firms are bundles of activities which simultaneously include different forms of interactions with external actor groups (Ebersberger et al., 2011). This implies that small firms can compete with larger firms through innovation if they collaborate with external partners. As such, open innovation activities can become a tool for small companies to successfully compete with the innovation activities of large companies. The lack of resources does not necessarily hinder their innovation activities as most theories of the firm would imply.

Empirical evidence confirms that. Some recent studies in the EU find that the SMEs engage in many open innovation practices and have increasingly adopted such practices

(van De Vrande, de Jong, Vanhaverbeke, & de Rochemont, 2009). Other studies show that SME's have, on average, a much higher intensity of open innovation practices than large companies (Vanhaverbeke et al., 2012). This finding is further developed (and contradicted) by the most comprehensive study of the effects of the firm size on different open innovation practices reported in the Open Innovation in Europe Report. It shows that firm size increases the implementation of open innovation practices (Ebersberger et al., 2011). This finding is also true for small firms. However, it clearly shows that SMEs are also actively implementing open innovation practices.

These global changes will be resolved through a combination of technology and social policies. Both will be organized differently than the standard theory suggests.

#### ***4.2. Contributions of Open Innovation to the innovation policy research***

Ever since the theory of open innovation was established, it has influenced innovation policies (e.g. (Chesbrough, 2003). This seems contradictory at first since the open innovation paradigm puts more emphasis on the market transactions in the innovation activities – ‘opening’ innovation activities that previously belonged to closed organisations. However, that does not mean that the markets for innovation function well.

Government intervention in corporate innovation activities was usually based on the market failure argument. In the world of perfect competition, the market's innate coordination mechanisms would allocate goods and services efficiently. They would reach the Pareto optimum (KJ Arrow & Debreu, 1954). However, since the perfect competition requirement is not fulfilled in the real world, the resulting allocation of resources is not optimal (Greenwald & Stiglitz, 1986). Knowledge has characteristics of a public good as it spills over from creator to other actors who are only limited by their own capabilities in utilizing it. This results in an appropriability problem for the creator of the knowledge. Innovating companies cannot fully appropriate the returns of their innovation and will hence under-invest in knowledge and knowledge creating processes (K Arrow, 1962). This reasoning is based on the classical view that goes back to Adam Smith (1845) and neoclassical economics. According to these views, the target for the government is to establish conditions for competition that will channel individual self-interest for the common good.

However, far from creating a perfect world, economic competition often encourages behaviours that not only cause enormous harm to the group but also provides no lasting advantages for individuals, since any gains tend to be relative and mutually offsetting (Frank, 2012). Other theories like evolutionary theory and institutional economic theories, for example the ‘varieties-of-capitalism approach’ (Hall & Soskice, 2001) and national business system (Whitley, 2000), though sometimes regarded as unorthodox, can better explain the reasoning for government intervention in open innovation systems. According to their view, various institutions are present in both contextual and transactional ecosystems (organization of markets). Actors in such ecosystems try to fulfil their interests by seek ways to position themselves in the institutional

environment and by actively trying to use it to their own advantage (Jaklič, 2009, p. 20). In an institutional environment, linkages among actors and institutions are crucial for successful innovation. Lack of linkages presents a systemic failure and can have crippling effects on innovation (Hwang & Horowitz, 2012). According to these views, the standard market failure rationale for government intervention is not sufficient to promote the development and diffusion of new technologies as innovation is based on a complex evolutionary process distributed in a system of multiple socio-economic agents whose behaviour and interactions are governed not only by market forces but to a greater extent by non-market institutions (Bleda & del Río, 2013). Linkages between actors serve as channels for knowledge diffusion and recombination. Lack of linkages and networking across organizational boundaries represents a system failure, as do lock-ins to specific collaboration partners, sources of ideas and information or excessive overall 'closure' of learning processes (S. J. Herstad et al., 2010). These failures need to be tackled in a similar way to market failures – with policy intervention (Klein Woolthuis, Lankhuizen, & Gilsing, 2005).

Based on the market and/or system failure argument supporting innovation policies, it seems clear that open innovation needs elaborate innovation policies. Far from becoming redundant, they remain an essential element of industrial policies. However, the new way of thinking about openness and innovation does influence the changes in innovation policies (S. Herstad & Bloch, 2008; S. J. Herstad et al., 2010). Different policy measures are needed to facilitate open innovation activities than were needed to support innovation in the past. But different in what way?

Open innovation theory does not contradict these insights and firmly supports the notion that government intervention in supporting innovation activities is justified. In fact, the open innovation theory suggests another line of reasoning to support government intervention<sup>4</sup>. It argues that linkages between actors serve as channels for knowledge diffusion and recombination. Lack of linkages and networking across organizational boundaries represents a system failure, as do lock-ins to specific collaboration partners, sources of ideas and information or excessive overall 'closure' of learning processes (S. J. Herstad et al., 2010). These failures need to be tackled in a similar way as market failures – with policy intervention (Klein Woolthuis et al., 2005).

There are some concrete examples of market and systemic failures that are inherent in the open innovation concept. It has emphasised the role of innovation and intellectual property agents (such as Innocentive and others), whose role is to promote novel solutions to mitigate market failures. However, these initiatives have not yet widely spread and remain no more than a niche segment of overall innovation activities. Their existence does not solve the market or system failures. Policy intervention is still needed. Researchers and policy makers have taken open innovation into account and tried to suggest policy changes that would support open innovation activities.

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<sup>4</sup> In fact, the systemic approach to innovation policy was developed into a line of research well before the introduction of the open innovation concept, but fits well with the concept.



An OECD study in 2006 specifically tried to provide recommendations on how to connect the new business strategies implementing open innovation with their policy implications (K. De Backer et al., 2008). More recently, several papers and studies have discussed the question of how national innovation policies can be reframed in a context of open innovation (e.g. (S. J. Herstad et al., 2010), (Ebersberger et al., 2011) and others). They suggest that national level tools are still the ones that represent the most immediate form of intervention into innovation behaviour (S. J. Herstad et al., 2010)

### **4.3. Contributions of Open Innovation to the cluster theory**

The answer to the idea that linkages between actors serve as channels for knowledge diffusion and recombination had been limited to a narrow geographic area. The idea became very popular and it is hard to find a country that is not trying to develop a network of complementary and competitive firms. A 2006 study identified 1400 cluster initiatives globally (Ketels, Lindqvist, & Sölvell, 2006). At their core, clusters are simply geographically proximate groups of interconnected companies and associated institutions in a particular field, linked by various commonalities and complementarities (external economies) (Michael Porter, 2008). But the definition of geographic proximity is changing due to the on-going developments of globalisation and information technologies. In 1998, Michael Porter wrote: “Now that companies can source capital, goods, information, and technology from around the world, often with the click of a mouse, much of the conventional wisdom about how companies and nations compete needs to be overhauled. In theory, more open global markets and faster transportation and communication should diminish the role of location in competition. After all, anything that can be efficiently sourced from a distance through global markets and corporate networks is available to any company and therefore is essentially nullified as a source of competitive advantage. But if location matters less, why, then, is it true that the odds of finding a world-class mutual-fund company in Boston are much higher than in most any other place? Why could the same be said of textile-related companies in North Carolina and South Carolina, of high-performance auto companies in southern Germany, or of fashion shoe companies in Northern Italy?” (ME Porter, 1998, p. 76).

For years, the competitive advantage of industrial districts and clusters has been based on product flexibility and production efficiency. The competitive advantage of firms is now less and less based only on simple products. Competition is more and more shifting to a “service” and to a “business model” level. Innovation now has a prominent importance to firms, and hence have innovation-centred strategies, foster the inter-clusters and the international collaboration of, enhance knowledge transfer and knowledge contamination between different entities (universities, research centres, firms, policy makers, consultants, technology parks, venture capitalists, knowledge brokers, etc.) (Bortoluzzi, 2014). Clusters are focusing on innovation collaboration and activities that can lead to competitive positioning as an innovative node in an innovation network (and consequently, value chain). Economic geographers have argued that interaction with distant partners may be at least as important for innovation as local collaboration (Cotic-Svetina, Jaklic, &

Prodan, 2008). Others have found that international linkages within the value chains are associated with superior innovation performance (S. Herstad & Bloch, 2008). It seems that success of (some) clusters was more based on (innovation) collaboration, not just locating firms in the same place (EIU, 2011). If such collaboration can be established over longer distances, it has at least the same potential to foster innovation as local clusters. Innovation collaboration (and other open innovation activities) is becoming the source of competitive advantage in clusters, just like in companies. Open innovation has contributed to understanding how companies can benefit from such innovation collaboration. It thus also offers the same insights for clusters.

While open innovation has contributed to other research questions about innovation, these contributions are sizeable and clearly aim at closing some gaps in our understanding of innovation as recognized by scholars (for example Fagerberg (2005)). The table below presents the main contributions that open innovation has brought to the research on innovation.

Table 3: *An overview of open innovation's contributions to innovation research*

Research questions	Main insights of innovation literature	Open innovation (OI) contribution
<b>What is innovation?</b>	<p>The function of innovation is to introduce novelty (variety) into the economic sphere. With no innovation, the economy will settle into a state with little or no growth. Innovation is crucial for long-term economic growth.</p> <p>Many different types of innovation exist with distinct features that have an influence on their research and implementation.</p>	<p>Open innovation emphasizes the innovation of new business models – business model innovation (H. W. Chesbrough, 2006). It also expands core concepts to Open Service Innovation (H W Chesbrough, 2011).</p> <p>Its focus on the organization of businesses to conduct and exploit innovation describes novel forms of organization (for example ‘innovation intermediaries’) and networks between companies and partners.</p> <p>It endorses the new ‘combinatorial innovation’ (Economist, 2014) describing the technological and start-up explosion as a system integration of newly emerging (digital) platforms.</p>
<b>How innovation occurs?</b> (with the insight on the systemic nature of innovation)	<p>A firm does not innovate in isolation but based on extensive interaction with its environment. Innovation journey is a collective achievement (Van de Ven, Polley, Garud, &amp; Venkatarman, 1999). System and network perspective are useful for the study of innovation.</p>	<p>The main insight of OI is that companies are no longer able to tackle the entire innovation process on their own. It is crucial to have access to external innovation. The number of sources of innovation is now greater, and its origins are increasingly heterogeneous</p> <p>Internal R&amp;D still plays a role. It is not obsolete. However, it takes on other (additional) tasks: it must pay attention to what is going on outside, identify gaps and holes - and remedy them - and facilitate integration; and it can become an additional source of income.</p> <p>Possibly the main contribution of OI is its focus on implementing OI in companies (innovation management).</p>
<b>Clustering characteristics of innovation</b> (in both time and space)	<p>Innovation tends to cluster in certain industries, which consequently grow more rapidly, implying structural changes in production and demand and, eventually organizational and institutional change.</p> <p>It also clusters in time, influencing business cycles.</p>	<p>OI does not focus on the clustering characteristics. It does support crowdsourcing and innovation communities in general, but both areas are more the focus of user innovation. It does contribute to the understanding that innovation communities can share the benefits of clusters even without geographical proximity.</p>
<b>Effects of innovation on economic performance</b>	<p>Innovation is a powerful explanatory factor of differences in performance between firms, regions and countries. Innovative countries have higher productivity and income than less innovative ones.</p>	<p>There are very few contributions of the effects that OI has on economic growth (although some studies focus on the effects on company growth).</p> <p>Generally lack of broad economic empirical studies on OI.</p>

Source: own conceptualization, loosely based on Fagerberg (2005)

With these insights it is possible to answer our third research question:

- Is open innovation actually hindering growth in research and understanding innovation and representing a constraint to future research (Groen & Linton, 2010)?

Open innovation is contributing towards answering some of the key questions about innovation that were recognized by innovation scholars. As the table above shows, it is adding some significant theoretical understanding to key research questions about innovation. It is clearly adding to our understanding of innovation and is among the most prolific innovation concepts. It is also particularly useful for practitioners as many companies have started intentionally developing their innovation activities in a more open way. Some authors believe that the majority of Fortune 100 companies already use open innovation systems (DeSouza, 2010).

The contributions of open innovation are clearly focused on the question of 'How does innovation occur?' Clearly, open innovation has contributed to the understanding how to implement it in companies. With regards to theoretical gaps in this area, intellectual property issues (especially trading), spatial and network aspects of organization of R&D teams, and management research on the operational and implementation aspects of open innovation in organizations are just some of the key areas where more research is needed to facilitate the consistency of open innovation theory, since there is no holistic model of open innovation which would identify all the determinants of the innovation process, test limits to opening up of organizations following the open innovation paradigm or help us understand the underlying cause-and-effect mechanisms of open innovation practices (Gassmann, Enkel, & Chesbrough, 2010).

## 5. CONCLUSIONS, LIMITATIONS AND FUTURE WORK OPPORTUNITIES

Research question	Sub-section	Source of the research question	Research method	Answer
Is open innovation (OI) really a new paradigm in understanding innovation?	1.2 Development of OI concept in innovation research	(Chesbrough, 2003)	Shared unit (bibliographic coupling) analysis	In order to represent a paradigm shift in the whole innovation research, open innovation would have to completely replace the old way of thinking, replacing the coherent tradition of investigation on innovation (Kuhn, 1962). However, our literature review as well as other reviews (citiram ?) clearly show that previous literature on innovation has also regarded network connections between actors (including connections across company boundaries) as being important.
Is it a new innovation concept or just the continuation of the innovation research and not distinct from other existing innovation concepts?	1.3 Relation of OI concept with other new concepts of innovation research	(E. Huizingh et al., 2011)	Historical overview of development of innovation concepts and a bibliometric analysis of key terms of the identified innovation concepts	A body of knowledge on innovation is comprised of numerous theories and each of them sheds new light on a subject – especially one as complex as innovation. Open innovation will never be the only innovation concept as other views on innovation already exist and will continue to exist in the future. However, open innovation does contribute new insights and is clearly different from other concepts, even very similar ones. It is actually one of the most prolific innovation concepts. Its impact on the understanding of innovation is still growing.
Is this even important for theory and practice of innovation? Is open innovation actually hindering growth in research and understanding innovation and representing a constraint to future research?	1.4 Contribution of OI	(Groen & Linton, 2010)	Analysis of the gaps in our understanding of innovation as recognized by innovation scholars	Open innovation is contributing towards answering some of the key questions about innovation that were recognized by innovation scholars. It is adding some significant theoretical understanding to key research questions about innovation. It is also particularly useful for practitioners.

As we have seen (and like in many other revolutionary shifts), the development of the open innovation concept was less revolutionary and more evolutionary than initially claimed. It became clear that open innovation activities were present and used a long time ago, were the target of scholarly interest and were not such a clear paradigm shift as sometimes claimed. However, open innovation has developed as a clear innovation concept and is contributing towards answering some of the key questions about innovation – as are some other innovation concepts. It is adding some significant theoretical understanding to key research questions about innovation and is particularly useful for practitioners.

Using bibliographic methods and theoretical insights allowed us to recognize gaps in our understanding of innovation where open innovation has contributed to the body of knowledge. The limitations of these methods are their focus on the existing body of knowledge that is constantly expanding and thus make our analysis immediately obsolete as new research is being published. Theoretical analysis like this is also severely limited in its usefulness for open innovation practitioners or even policy-makers. However, this theoretical approach has allowed us to recognize other gaps where open innovation can continue contributing to the theory of innovation.

These gaps include more focus on other, more economic topics and less business (organisational – level) focus. In particular, the studies of the effects of innovation on economic performance would complement the current open innovation contributions to the innovation research. A crucial drawback of economic research is the lack of specialised data that would allow the studies of open innovation. This was also one of the findings by the OECD studies that focused on open innovation (K. De Backer et al., 2008), (Koen De Backer, Cervantes, Van De Velde, & Martinez, 2008). With more and better data becoming available recently, more research on the effects of open innovation on economic performance could be implemented. This could lead to better understanding of the innovation and technology policies that have caught the attention of economists researching economic growth. They should lead to some theoretical and empirical economic research connected to open innovation.

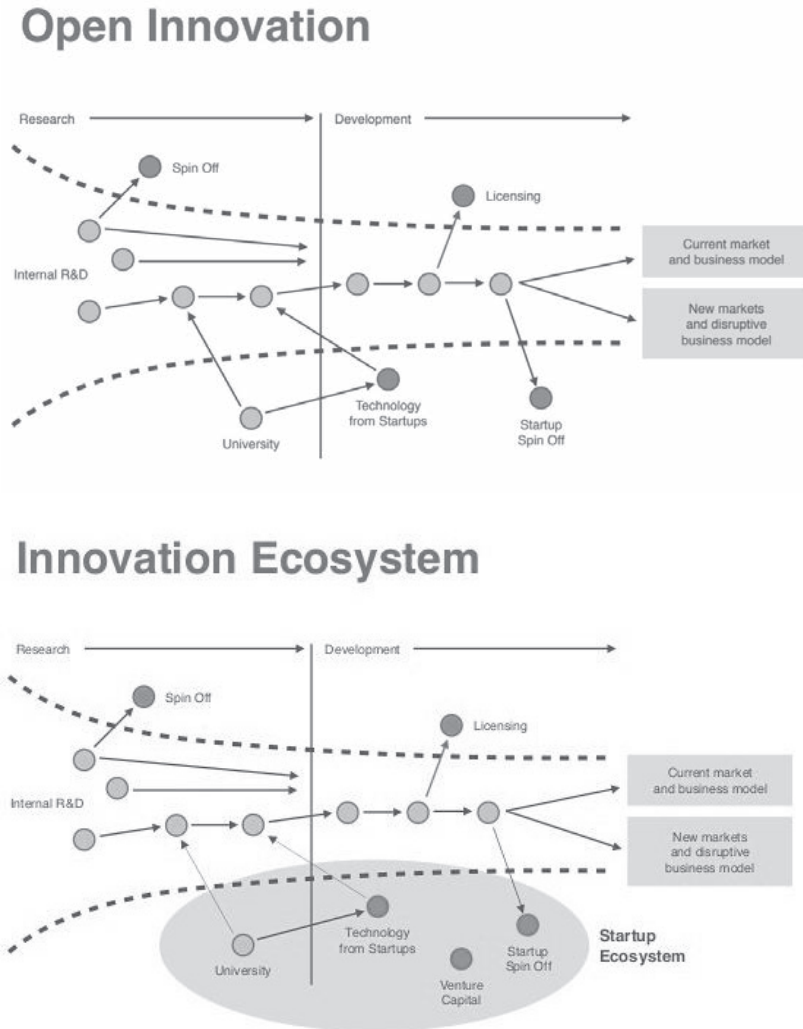
Similarly, the scope of open innovation that has expanded to service and business models can be expanded further, thus contributing to the understanding of what innovation actually is.

A major focus of open innovation has been targeted on how to organize for innovation within companies. Much less has been invested into research on how to organize the environment between businesses and other institutions or entire national, regional and global innovation ecosystems that support (and are influenced by) open innovation. As Chesbrough himself has put it: 'Further research is needed in the field of designing and managing innovation communities' (H. Chesbrough, 2012, p. 26).

A special area for research in open innovation systems is the connection between existing innovation systems and entrepreneurship. Insights on open innovation can be connected to the 'lean' approach to implementing and commercializing innovation. It has become the

organizational model of choice for the new start-up companies, emphasizing the rigorous and rapid testing of new solutions (for example: products) with their users. Firms have to find out what customers want. That involves building something, measuring how users react, learning from the results, then starting all over again until they reach what is known as 'product market fit' (Blank, 2013; Ries, 2011). Companies should start with a 'minimum viable product' to gauge the audience's interest. They should always test their assumptions, aiming for 'validated learning' and if their strategy does not work, they should 'pivot' – start again with the new product (Economist, 2014, p. 4) with the new understanding of the customer's needs. This approach is taught by hundreds of start-up schools, business incubators and venture accelerators and implemented in innovation ecosystems that are highly interconnected with various supporting institutions (large companies, SME's, universities, venture capital companies...). These innovation and entrepreneurial ecosystems are based on innovation collaboration of the kind described by the open innovation research. Organization of these ecosystems that focus on innovation collaboration shows that open innovation systems are theoretically closely related to the 'lean' approach, especially by its contributions in the field of open business models.

The 'lean' approach can be extended from the usual 'lean start-up' (Blank, 2013; Ries, 2011) methodology also to the 'lean' entrepreneurship approach in large companies (Owens & O., 2014) and even to 'lean policy-making'. Similarly, different types of organizations can benefit from open innovation even when they are not developing new products or services (Vanhaverbeke, 2013). Both describe novel forms of organization and networks between companies and their partners. They endorse the new 'combinatorial innovation' (T. Economist, 2014) describing the technological and start-up explosion as a system integration of newly emerging (digital) platforms. While the 'lean start-up' approach is more entrepreneurial oriented with the emphasis on supporting practical implications, open innovation can be regarded as the theoretical framework for such innovation collaboration. As the figure below shows, open innovation concept is very closely connected to startup ecosystems research and can contribute a lot of theoretical contributions to the 'lean start-up' research. Some initial research targeting corporate acceleration has already been conducted (Weiblen & Chesbrough, 2015) but startup ecosystems are much greater than just corporate acceleration and intrapreneurship. But many more theoretical contributions will be needed to wholly connect these concepts.

Figure 8: *Connections between open innovation and startup ecosystem*

Source: Mattina, 2014

Finally, our analysis also points to another observation about open innovation – that it is somewhat insular. A lot of open innovation articles are citing mostly other open innovation research, publishing in a limited number of journals. Most research is focusing on organisational-level innovation and its business and management aspects. This might be limiting the potential of open innovation to influence other innovation concepts – and benefit from the insights discovered by them. As described above, the future open innovation research could focus more on:



- economic (empirical) research,
- systemic view of innovation (eco)systems and its clustering characteristics that influence policy making decisions,
- the connection with the 'lean start-up' approach and the literature on fast-growing companies and the barriers to their growth such as systemic failures.

Recognizing these opportunities to increasing the impact of open innovation further, open innovation could benefit from more opening up, trying to attract scholars that could answer research questions from these areas.

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# FIRM CREDIT RATINGS AND FINANCIAL ANALYST FORECAST PERFORMANCE

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**ABSTRACT:** *This study examines the relationship between firms' credit ratings and financial analyst earnings forecast performance. We hypothesize and find that high firm credit ratings, which represent low task complexity and low solvency risk, are associated with less dispersion and more accurate earnings forecasts, while low credit ratings are associated with more dispersion and less forecast accuracy. We also find that the quality of firms' earnings reports moderates this relationship. The results of this study are useful to market participants by revealing the increased (decreased) value of information contained in financial analysts' forecasts when firms have received high (low) credit ratings.*

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**Keywords:** *credit ratings, earnings forecasts, forecast accuracy, earnings quality, financial analysts*

JEL: G17; G24

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## 1. INTRODUCTION

Extant literature finds that high credit ratings are valued by market participants (Hand, Holthausen, & Leftwich, 1992) and are developed with both financial and non-financial information. For example, credit ratings are a function of several factors including, but not limited to, firm solvency (Pottier & Sommer, 1999), quality of earnings reports (Gray, Mirkovic, & Ragunathan, 2006), availability of useful information (Bae et al., 2013), and the number of financial analysts that are following the firm (Cheng & Subramanyam 2008). This paper investigates the information content of credit ratings on financial analyst earnings forecast performance. Such an association has not been investigated in prior literature. We posit that firm credit ratings influence financial analyst forecast accuracy and financial analyst forecast dispersion.

It is reasonable to expect that credit ratings have an association with financial analyst performance in predicting future earnings. First, credit ratings are the result of a comprehensive analysis of a firm's solvency and financial strength. Due to their exemption from Regulation Fair Disclosure (Reg FD), which requires firms to make material information available to all investors at the same time in order to dissuade firms

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from making selective disclosures to certain stakeholders, credit rating agencies have had superior access to management (compared to the information given to financial analysts), and since the inception of Reg FD, the value of credit ratings has increased (Jorion, Zhu, & Charles, 2005).<sup>4</sup> Because credit ratings contain information about the firm's financial position that financial analysts by regulation are prevented from obtaining, it is reasonable to expect that credit rating information could improve financial analyst performance. Second, because market participants place value on firms with high credit ratings, it is likely that those firms would enjoy easier access to investment dollars and thus have more favorable opportunities for future performance. Additionally, market participants likely expect that a firm with a high credit rating is profitable, solvent, and expected to generate sufficient cash flows to meet future obligations. Furthermore, because high credit ratings are expected to be issued for solvent firms with high quality, transparent disclosures that reduce user uncertainty and complexity, credit ratings represent an assessment of the forecasting environment (Bae et al., 2013). Therefore, credit ratings are expected to denote the level of forecasting difficulty. While high ratings signify less task complexity, low credit ratings would likely be issued for firms with less transparent, lower quality earnings reports, all of which add to uncertainty for financial analysts. Therefore, we hypothesize that credit ratings have a significant impact on the accuracy and dispersion of financial analyst earnings forecasts.

A limited number of studies explore the link between credit ratings and analyst forecasts. However, unlike the present study, these studies do not use the level of credit ratings as an explanatory variable for analyst forecast performance, but instead examine determinants of credit rating levels and changes in ratings following earnings events. For example, research finds that greater analyst following is associated with lower default risk as proxied by credit ratings (Cheng & Subramanyam, 2008). Ederington and Goh (1998) show that following a credit rating downgrade, financial analysts earnings forecasts are also revised downward. However, they do not find that analysts revise their forecasts upward following a credit upgrade. Mansi, Maxwell, and Miller (2011) explore the link between certain analyst characteristics including forecast accuracy and forecast dispersion with credit ratings. Using consensus analyst forecast data, they find that higher forecast dispersion is related to lower credit ratings, but do not find a link between consensus forecast data and credit ratings.

This study is motivated by the intent to better understand the effect that credit rating agencies ultimately have on financial analyst forecasting performance. This examination contributes to the literature by finding an association between earnings forecast performance and credit ratings using individual analyst forecast data and by incorporating the influence of earnings quality and its interactive effect on this association. Because these associations are largely unexamined in prior literature, the results of this study make important contributions to the literature for market participants, particularly by revealing a key determinant of forecast accuracy and dispersion. Specifically, our analysis shows that high credit ratings are associated with more accurate and less dispersed earnings forecasts, and that the quality of the firms' earnings reports moderates this association.

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4 Regulation Fair Disclosure took effect on October 23, 2000.

In additional tests, our results hold for alternate specifications of forecast accuracy. These results provide an important and unique contribution to the financial analyst forecast performance literature and add new knowledge to the literature in several important ways. First, by informing analysts of the predictive value contained in credit ratings these results support analysts' efforts to produce accurate earnings predictions. Second, by informing market participants how credit ratings are processed by financial analysts, investors will benefit from the knowledge that future earnings forecasts are likely more accurate for a firm with higher credit ratings. Third, these results provide regulators with substantiation of the value of high quality earnings reports. Finally, the results of this study aid future researchers by revealing the significant influence that credit ratings have on financial analyst forecasting performance.

The remainder of this paper is arranged as follows: section 2 provides a review of the related literature, section 3 describes the research method used, section 4 presents the test results, section 5 offers the results of additional analysis and sensitivity testing, and section 6 provides a summary and conclusion.

## 2. LITERATURE REVIEW

Extant literature finds that high credit ratings are prized by market participants (Hand, Holthausen, & Leftwich, 1992), and that the market reacts negatively to poor credit ratings (Norden & Weber, 2004). Some argue that the information in bond ratings provide little incremental data and has little value to the equity markets (Partnoy, 1999), however following the announcement of credit ratings, there is a reaction in bond prices (Kliger & Sarig, 2000; Norden & Weber, 2004). One explanation for this reaction is that a firm's credit rating conveys inside information about the company to the market, favorable or unfavorable, without disclosing details to the public (Kliger & Sarig, 2000). Alternately, some argue that credit rating agencies do not take advantage of this additional access to insider information (Frost, 2007). Since the inception of Reg FD, which provided an exception to credit rating agencies in providing information that is not publicly available, the value of credit ratings has increased (Jorion, Zhu, & Charles, 2005). Finally, research shows that credit ratings produced using information from various public and private sources (Gray, Mirkovic, & Rangunathan, 2006), are influenced by several factors including firm solvency (Pottier & Sommer, 1999), earnings quality (Gray, Mirkovic, & Rangunathan, 2006), availability of useful information (Bae et al., 2013), and financial analyst following (Cheng & Subramanyam, 2008). This paper adds to the literature by demonstrating the contribution that credit ratings make to the environment in which financial analyst earnings forecasts are generated.

The literature on financial analyst earnings forecast can be classified as analyst level, firm level, or the market level. Taken together, factors in each of these classifications affect how analysts arrive at their estimates. There are unique characteristics that affect the accuracy of each individual financial analyst. For example, the experience that a financial analyst has forecasting for a specific firm has been found to be associated with forecast accuracy (Clement, 1999; Jacob, Lys, & Neale, 1999; Mikhail, Walther, & Willis, 1997). The size and

type of firm where a financial analyst is employed is associated with accuracy (Clement, 1999; Jacob, Rock, & Weber, 2008). Additionally, an increase in the number of firms and the complexity of the portfolio of firms followed by a financial analyst leads to a decrease in the accuracy of financial analysts (Clement, 1999). Finally, the information emphasized by financial analysts differs with the individual financial analyst's prior level of accuracy (McEwen & Hunton, 1999). Other literature analyzes the effect of the market environment on the accuracy of financial analyst forecasts. The firm's local GAAP is also shown to have an effect on forecast estimates (Bae, Tan, & Welker, 2008; Basu, LeeSeok, & Ching-Lih, 1998; Glaum et al., 2013). Specifically, accounting standards that are based on net asset value lead to more accurate forecasts than standards based on historical cost reporting (Liang & Riedl, 2014). Certain market regulations also have an effect on financial analysts accuracy (Guan, Lu, & Wong, 2012). At the firm level, there are also important determinants of financial analyst forecast accuracy. The clarity, quality and extent of disclosures have an effect on financial analyst (Byard & Shaw, 2003; Dhaliwal et al., 2012). The extent to which a firm has diversified its holdings and operations internationally also has a measured effect on how accurately financial analysts can forecast earnings for that firm (Duru & Reeb, 2002; Mauri, Lin & Neiva DeFigueiredo, 2013). This study contributes to the accuracy literature by identifying another firm level determinant of forecast accuracy. Our results provide further understanding of the source of forecast accuracy by revealing the role that firm credit ratings play in forecast accuracy.

The information content of earnings and the quality of earnings have been extensively examined in the literature (e.g. Dechow & Dichev, 2002; Francis et al., 2004). Several methods of measuring the quality of earnings have been employed to document a firm's use of accruals in their reported earnings (e.g. Cohen, Dey, & Lys, 2008). Dechow and Dichev (2002) utilize a model that measures whether current accruals are associated with prior, current, or next period cash flows. Their model assumes that accruals should map to cash flows in a timely manner. The mapping of accruals to cash flows is a widely utilized method to measure the quality of cash flows and to determine if managers are manipulating earnings (e.g. Francis et al., 2005).

Investors and managers alike widely believe that firms manage earnings to some degree (Graham, Harvey, & Rajgopal, 2005). Dechow and Skinner (2000) classify firms into one of several groups according to the extent to which they engage in earnings management including a conservative accounting group, a neutral earnings group, an aggressive accounting group, or a fraudulent accounting group. One form of earnings management is the manipulation of earnings to develop a smooth earnings path (Murphy 2001). Some extant research finds that smooth earnings are desirable. For example, Barth, Elliott, and Finn (1999) argue that investors prefer and reward a smooth earnings path. Conversely, Leuz, Nanda, and Wysocki (2003), contend that management manipulates earnings to conceal true firm performance from outsiders, thus decreasing the level of investor protection. Still, no clear link has been shown between earnings smoothness and firm valuation (Gao & Zhang 2015). We add to the earnings management and earnings smoothing literature by demonstrating the role that the quality of earnings plays in the link between credit ratings and the accuracy of forecasted earnings.

A limited number of studies explore the link between credit ratings and analyst forecasts. A larger number of analysts following a firm is associated with lower default risk as proxied by credit ratings (Cheng & Subramanyam, 2008). Ederington and Goh (1998) show that following a credit rating downgrade, financial analysts earnings forecasts are also revised downward. However, they do not find that analysts revise their forecasts upward following a credit upgrade. Mansi, Maxwell, and Miller (2011) do explore the link between certain analyst characteristics including forecast accuracy and forecast dispersion. Using consensus analyst forecast data, they find that higher forecast dispersion is related to lower credit ratings, but do not find a link between consensus forecast data and credit ratings. This paper contributes to the literature by finding an association between earnings forecasts and credit ratings using individual analyst forecast data and by incorporating the influence of earnings quality and its interactive effect on this association.

### 3. RESEARCH METHOD

As described above, credit ratings are a function of a firm's solvency, quality of its earnings reports, financial strength, and the availability of other useful information by which to predict the firm's future earnings and cash flows. Thus, we expect that the information contained in credit ratings, regarding any one or all of these factors, add additional information into the forecasting environment that financial analysts have available to them in generating their forecasts.

We start our analysis by first considering the effect of the existence of a credit rating (irrespective of good or bad) on financial analyst forecast accuracy and dispersion. In the latter part of 2000, Reg FD was put into effect by the Security and Exchange Commission. Prior to Reg FD, firms could selectively choose which financial information they supplied to financial analysts. The concern was that "firm-friendly" financial analysts were given better access than other financial analysts, and they in turn would be inclined to issue more optimistic earnings forecasts. Prior to Reg FD, if financial analysts issued unfavorable forecasts or recommendations, it might have resulted in their losing this preferred access to management (Barniv et al., 2009). Although Reg FD precluded such selective disclosures to financial analysts, credit rating agencies were specifically exempt from the regulation. As a result, credit rating agencies continue to have access to more timely information and to information that may not have been disclosed to financial analysts. Therefore, credit ratings may contain additional information than that which is disclosed or made available to financial analysts. It follows, then, that the existence of a credit rating adds another potential piece of information for a financial analyst to consider in developing their forecast, which would be lacking for a firm without a credit rating. Consequently, the mere existence of a credit rating may, in and of itself, have an incremental effect on analyst forecast performance.

It may seem obvious that the existence of a credit rating offers additional information for a financial analyst to consider in developing their earnings forecast and, therefore, would result in greater forecast accuracy. Indeed, there is a reasonable presumption that any

information in addition to whatever might already be on hand or publicly available would be helpful. However, when an analyst is facing a forecasting environment with less available information (i.e. the lack of a credit rating), they may become more diligent in their analysis of the information that is available to them, resulting in greater accuracy (Lehavy, Li, & Merkley, 2011; Lobo, Song, & Stanford, 2012). Thus, a reasonable inquiry could be framed concerning this dichotomy. Does the existence of a credit rating lull analysts into a false sense of security, perhaps even encouraging some laziness in their analysis of the robustness of a firm's earnings, or does the credit rating offer some helpful, pertinent information to analysts in the performance of their forecasts? Given that the mere existence of a credit rating may have differential effects on financial analysts, we do not predict a positive or negative effect of the existence of a credit rating on forecast accuracy or dispersion. To investigate this assertion, we test the following hypothesis, stated in the null form.

**HYPOTHESIS 1.** The existence of a credit rating has no effect on financial analyst earnings forecast accuracy or financial analyst forecast dispersion.

Next, we turn our attention towards financial analyst forecast performance in only cases where a credit rating does exist. Specifically, we consider the effect of the level or quality of the credit rating on analyst forecast performance.

As noted in the discussion above, due to their exemption from Reg FD, credit rating agencies have better and timelier access to information than financial analysts. Credit ratings, however, can convey either positive or negative signals about a firm. Firms with high credit ratings are firms with high liquidity, favorable cash flows, and strong overall financial health. Conversely, firms with low credit ratings are firms with low liquidity, weak cash flows, and are in financial distress. These two scenarios offer very different information to a financial analyst about a firm.

For firms with high credit ratings, the forecasting environment is likely robust with high quality information about a high quality firm and the task complexity involved in generating a forecast is likely relatively low. Firms with high credit ratings are also more likely to have more consistent earnings patterns (Gray, Mirkovic, & Raganathan, 2006). With more consistent earnings patterns, financial analysts are more likely to make more accurate forecasts for these firms. In other words, high credit ratings act as both favorable new incremental information about a firm and as additional confirmation of the quality of the other information already available to analysts.

For firms with low credit ratings, the forecasting environment is likely lacking quality information about a firm and the task complexity involved in generating a forecast is likely relatively high. Additionally, it is reasonable to expect that firms with low credit ratings experience more frequent losses (Ashbaugh-Skaife, Collins, & LaFond, 2006). Firms with losses and more volatile earnings patterns complicate the task for financial analysts (Elliott & Hanna, 1996). As a result, low credit ratings may offer very little new incremental information about a firm and may actually introduce more noise into the forecasting environment.

Furthermore, the literature indicates that user uncertainty may reduce financial analyst performance and that such uncertainty about a firm's economics increases dispersion patterns of financial analyst forecasts (Barron & Stuerke, 1998; Imhoff & Lobo, 1992; Payne & Robb, 2000). Prior studies also indicate that high quality, transparent disclosures reduce user uncertainty and task complexity (Lang & Lundholm, 1996), and that credit rating agencies issue higher ratings for firms with such disclosures (Bae et al., 2013). Credit ratings, therefore, represent an assessment of the forecasting environment. Low credit ratings are usually associated with high levels of long term risk, signaling possible future defaults, and noisier information environments (Pottier & Sommer, 1999). Therefore, credit ratings denote the level of forecasting difficulty. Thus, high ratings signify less task complexity and are expected to result in increased forecast performance, while low credit ratings are likely issued for firms with less transparent, lower quality earnings reports, which add to uncertainty for financial analysts and are expected to reduce forecast performance. Because credit ratings represent a high level assessment of a firm's long term risk and credit-worthiness, and contain information not available to financial analysts in a timely manner, it is reasonable to expect that financial analyst forecast accuracy will be improved by the information contained in credit ratings. To investigate this assertion we test the following hypotheses, stated in the alternate form.

*HYPOTHESIS 2. Financial analyst earnings forecast accuracy is increased and financial analyst forecast dispersion is decreased for firms with high credit ratings.*

The literature on how the quality of earnings could either increase or decrease forecasting performance is unclear. For example, low quality earnings reports could decrease forecast performance by creating a more complex, misleading information environment resulting in over (or under) estimates. Literature finds that low quality reports could be expected to result in more uncertainty about a firm's future, and uncertainty is found to 1) increase dispersion patterns of financial analyst forecasts (Barron & Stuerke, 1998; Imhoff & Lobo, 1992; Payne & Robb, 2000) and, 2) reduce cash flow forecast accuracy (Bilinski, 2014). Thus, low earnings quality could result in misleading, and therefore unreliable earnings reports. A weak link between earnings and cash flows will increase information risk (Francis et al., 2005) and low earnings quality could weaken that link. Barton, Hansen, and Pownall (2010) find that reported earnings are more value relevant when that link is strong.

Alternatively, low earnings quality could indicate the potential for more accuracy and less dispersion in financial analysts' forecasts. First, a misleading and complex forecasting environment could encourage financial analysts to resort to herding behavior. Herding behavior theory (Hong, Kubik, & Solomon, 2000; Mensah & Yang, 2008) suggests that financial analysts will change their own private opinions about a company's earnings potential with the purpose of issuing earnings forecasts which are closer to the consensus. Therefore, they modify their forecasts to coalesce around the estimate of other possibly more experienced financial analysts, thus increasing their forecasting performance. Furthermore, when earnings management is performed (through the use of discretionary accruals or other methods) with the intent of smoothing reported earnings, a reduction

in the variability of earnings could result (Demerjian, Lewis-Western, & McVay, 2015). Therefore, the reduced earnings quality, due to the use of discretionary accruals to meet earnings benchmarks (such as meeting financial analysts' expectations), can result in the convergence of reported earnings with financial analysts' forecasts (Burgstahler & Eames, 2006; Matsumoto, 2002; Payne & Robb, 2000). Such a convergence reduces the forecast errors used to measure forecast performance.

Second, firms that manage earnings typically have lower earnings quality (Dechow, Ge, & Schrand, 2010). Firms are likely to manage earnings to meet certain benchmarks such as positive earnings, growth in earnings or to meet financial analyst expectations (Graham, Harvey, & Rajgopal, 2005). Therefore, if firms manage earnings to meet financial analyst expectations, thus resulting in greater financial analyst accuracy, they will have lower earnings quality than firms that do not manage earnings.

For both of these reasons, poor earnings quality would be associated with increased financial analyst performance (more accuracy and less dispersion among forecasts). Therefore, because we believe that lower earnings quality is likely to indicate either herding of financial analysts' forecasts or the presence of earnings management, we predict that low earnings quality will have a positive relationship with forecast accuracy and will reduce forecast dispersion.

*HYPOTHESIS 3. Financial analyst earnings forecast accuracy is increased and financial analyst forecast dispersion is decreased for firms with low earnings quality.*

While we hypothesize that higher credit ratings and lower earnings quality will lead to an increase in financial analyst forecast accuracy and a decrease in financial analyst forecast dispersion, we predict that, when taken together, the effect of higher credit ratings on financial analyst performance will be moderated by the effect of earnings quality. This reduction of analyst performance when both higher credit ratings and lower earnings quality is present may occur for two reasons. First, more profitable firms are more likely to receive higher credit ratings (Ashbaugh-Skaife, Collins, & LaFond, 2006). These more profitable firms that receive higher credit ratings are less likely to be motivated to manipulate their earnings and participate in myopic management.<sup>5</sup> Since these more profitable firms are not willing to manipulate their earnings to meet analysts' expectations, financial analyst accuracy declines and financial analyst dispersion increases. Second, larger firms are also likely to receive higher credit ratings (Gray, Mirkovic, & Ragunathan, 2006). Larger firms that receive higher credit ratings are less likely to manipulate their earnings since larger and more diversified firms have more consistent earnings and therefore have less motivation to manipulate earnings to meet analyst expectations. Since more profitable firms and larger firms could be less likely to manipulate earnings, we hypothesize that the effect of credit ratings and earnings quality on analyst performance will be moderated as follows:

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<sup>5</sup> Myopic management is the manipulation of earnings to achieve specific targets that leads to a long term reduction in firm performance (see Mizik, 2010).



**HYPOTHESIS 4.** *Earnings quality has a moderating effect on the influence that credit ratings have on forecast accuracy and dispersion such that as earnings quality diminishes, forecast accuracy declines and forecast dispersion increases.*

### 3.1. Dependent Variables

To investigate the association between firm credit ratings and financial analyst forecast accuracy, we use the absolute forecast error scaled by share price (equation 1) from prior literature (Bae, Tan, & Welker, 2008; Dhaliwal et al., 2012; Duru & Reeb, 2002; Glaum et al., 2013) as follows:

$$AFEP_{i,j,t} = \frac{|FORECAST_{i,j,t}^{t-1} - NI_{j,t}|}{PRICE_{j,t}} (-100) \quad (1)$$

where for analyst  $i$ , firm  $j$ , and at time  $t$ :

$FORECAST$	= forecasted net income
$NI$	= reported net income
$PRICE$	= stock price.

For ease of interpretation the result is then multiplied by -100 such that an increase in  $AFEP$  indicates an increase in forecast accuracy. Therefore, higher values of  $AFEP$  indicate higher or more accurate levels of forecasted earnings.

Following prior literature, we measure forecast dispersion ( $DISP$ ) as the standard deviation of forecasts deflated by stock price (Mansi, Maxwell, & Miller, 2011) as follows:

$$DISP_{j,t} = \frac{\sigma(FORECAST_{i,j,t})}{PRICE_{j,t}} \quad (2)$$

$\sigma$	= standard deviation for firm $j$ at time $t$
$FORECAST$	= forecasted net income
$PRICE$	= stock price

Therefore, higher values of  $DISP$  indicate more forecast dispersion among financial analysts. While this dependent variable is not composed of an actual measure of earnings, dispersion can be interpreted as a proxy for differences in opinion among financial analysts for a security (Diether et al., 2002) and, therefore, uncertainty in earnings forecasts. Prior studies also find that wide dispersion patterns in forecast values indicate complexity in making earnings forecasts (Duru & Reeb, 2002; Mauri, Lin, & DeFigueiredo, 2013; Tan, Wang, & Welker, 2011).

### 3.2. Independent Variables

The credit rating variable (*CR*) is the S&P Domestic Long-term issuer credit rating from Compustat (mnemonic: SPDRM). It is defined as the Standard & Poor's Issuer Credit Rating which represents the "current opinion of an issuer's overall creditworthiness, apart from its ability to repay individual obligations. This opinion focuses on the obligor's capacity and willingness to meet its long-term financial commitments (those with maturities of more than one year) as they come due." *CR* ranges from one to 22, with one representing a D rating and 22 representing a AAA rating. Therefore, higher values of *CR* denote that a firm has received a higher credit rating from S&P.

### 3.3. Control Variables

We include the controls *FOLLOW*, *LOSS*,  $\Delta EARN$ , *HORIZ*, and *VOL* from prior literature (Duru & Reeb, 2002; Mauri, Lin, & DeFigueiredo, 2013), all of which except for *FOLLOW* control for complexity and uncertainty in the forecasting task. We also include controls for the quality of reported earnings (*EQ*) and for the smoothness of reported earnings (*SMOOTH*), both of which could also introduce uncertainty into the forecasting environment. Finally, following Duru and Reeb (2002) and Bae, Tan and Welker (2008) we also include controls for industry and fiscal year. *FOLLOW* is measured as the total number of financial analysts following the firm for a given period. The typical expectation is that larger financial analyst following is associated with lower forecast optimism and greater accuracy (Drake & Myers, 2011; Duru & Reeb, 2002; Mauri, Lin, & DeFigueiredo, 2013). Furthermore, Lang and Lundholm (1996) indicate that larger following is associated with decreases in overestimates because financial analysts prefer to follow firms with high quality earnings reports. However, Duru and Reeb (2002) find greater following to be positively and marginally associated with forecast accuracy and not a significant factor for overestimates. In light of the above studies, if significant, we expect *FOLLOW* to be negatively associated with dispersion and positively associated with accuracy. *LOSS* (an indicator variable coded 1 if the firm reported a net loss in the period, otherwise zero) is included because managers of firms that report losses may tend to understate net income in order to enhance net income in subsequent periods; a practice known in the literature as taking a "big bath" (Elliott & Hanna, 1996; Moehrlle, 2002). Firms that engage in such practices understate net income which causes forecasts to be higher than reported income. Additionally, Brown (2001) finds that financial analysts issue more optimistic forecasts in periods of losses, and Hwang, Jan, & Basu (1996) find that financial analysts are less accurate while forecasting losses than when predicting positive net income. However, Duru and Reeb (2002) find that *LOSS* is not significant for accuracy. We expect *LOSS* to be positively associated with dispersion and negatively associated with accuracy. The  $\Delta EARN$  variable is equal to the absolute value of the change in earnings per share from the previous year divided by the stock price at the beginning of the year. Duru and Reeb (2002) find that larger absolute changes in earnings per share are negatively associated with accuracy. However, because large changes in earnings could present uncertainty, we do not predict a direction. Following prior literature the forecast horizon control

(*HORIZ*) captures the number of calendar days between the forecast issue date and the actual earnings announcement date. The literature shows that longer forecast horizons are associated with less accurate (Brown, 2001; Clement & Tse, 2003; Jacob, Lys, & Neale, 1999) and more biased optimistic forecasts (Duru & Reeb, 2002; Mansi, Maxwell, & Miller, 2011). We expect longer horizons to be associated with more dispersion and less accuracy. Volatile earnings are known to be associated with less accurate earnings forecasts (Duru & Reeb, 2002; Lim, 2001; Kross, Ro, & Schroeder, 1990). Thus, we expect that highly volatile earnings add complexity and uncertainty to the forecasting task. To control for volatility in earnings we include the variable *VOL*, which is equal to the standard deviation of the annual earnings per share values for the firm.

Because low quality earnings could provide misleading information on which to base earnings forecasts, which could complicate the forecasting task, we control for earnings quality (*EQ*) following prior literature and we measure the degree to which reported earnings reflect the actual cash flows of the firm (Dechow & Dichev, 2002; Francis et al., 2004). It measures whether current accruals are associated with prior, current, or next period cash flows. Changes in working capital that do not map to those cash flows are thought to reduce the quality of earnings. Following Dechow and Dichev (2002), the dependent variable is the change in working capital ( $\Delta WC$ ), and equals  $\Delta AR + \Delta Inventory - \Delta AP - \Delta TP + \Delta Other$  Assets-net, where *AR* equals accounts receivable, *AP* equals accounts payable, and *TP* equals taxes payable. Following prior literature, all variables are then scaled by the firm's average assets:

$$\Delta WC_{jt} = \alpha + \beta_1 CFO_{j,t-1} + \beta_2 CFO_{jt} + \beta_3 CFO_{j,t+1} + v_{jt} \quad (3)$$

where  $\Delta WC_{jt}$  is firm *j*'s change in working capital from the prior year (*t-1* to year *t*),  $CFO_{jt}$  is firm *j*'s cash flow from operations in year *t*, and  $v_{jt}$  is the residuals for firm *j*, year *t*. The residual represents changes in working capital from accruals that do not map to cash flows in a timely manner (*t-1*, *t*, or *t+1*). The standard deviation of a time-series of the absolute values of the residuals is computed for each firm which represents the volatility of earnings quality over a five-year period (*EQ*). For earnings quality to have an impact on financial analyst's performance, the information must be available prior to the forecast date, therefore *EQ* is lagged by one year.

### 3.4. Econometric Models

To test Hypothesis 1, the test of whether the existence of a credit rating has an effect on the performance of analysts, we estimate the following:

$$\begin{aligned} \text{Dependent} = & \alpha + \beta_1 CREXIST_{ij} + \beta_2 FOLLOW_{ij} + \beta_3 LOSS_{ij} + \beta_4 \Delta EARN_{ij} + \beta_5 HORIZ_{ij} \\ & + \beta_6 VOL_{ij} + \beta_7 IND_{it} + \beta_8 YEAR_{it} \end{aligned} \quad (4)$$

where *Dependent* is either *AFEP* (analyst forecast accuracy variable measured as the absolute value of the forecast error scaled by the lag of the firm's market price) or *DISP* (analyst forecast dispersion variable measured as the standard deviation of forecasts deflated by the stock price), *CREXIST* is an indicator variable coded as 1 if the observation includes a Standard & Poor's Credit Rating, and 0 otherwise. *FOLLOW* is the number of financial analysts following the firm's earnings for the period, *LOSS* is an indicator variable coded one if the firm reported a net loss in the period, otherwise zero,  $\Delta EARN$  is equal to the absolute value of the change in earnings per share from the previous year divided by the stock price at the beginning of the year, *HORIZ* is the number of calendar days between the forecast issue date for the company and the actual earnings announcement date, *VOL* is the standard deviation of earnings per share for the firm, *IND* represents industry controls for the company based on the I/B/E/S SIG codes, and *YEAR* represents indicator variables for the firm's fiscal year.

To test Hypotheses 2 and 3, we estimate equation (5). Hypothesis 2 anticipates a positive association between earnings forecast accuracy and firm credit ratings as well as a negative association between earnings forecast dispersion and firm credit ratings. Hypothesis 3 anticipates a negative association between earnings quality and forecast accuracy as well as a positive association between earnings quality and earnings forecast dispersion. Equation (5) is estimated as follows:

$$Dependent = \alpha + \beta_1 CR_{ij} + \beta_2 EQ_{ij} + \beta_3 FOLLOW_{ij} + \beta_4 LOSS_{ij} + \beta_5 \Delta EARN_{ij} + \beta_6 HORIZ_{ij} + \beta_7 VOL_{ij} + \beta_8 IND_{ij} + \beta_9 YEAR_{ij} \quad (5)$$

where *CR* is the credit rating variable and ranges from one to 22 (one representing a D rating and with 22 representing a AAA rating), *EQ* represents the lag of the standard deviation of the firm's level of earnings quality over the prior five consecutive years, and all other variables are defined as in equation (4).

Finally, to test Hypotheses 4, which anticipates that at higher levels of credit ratings, the negative association between earnings quality and financial analyst forecast accuracy as well as the positive association between earnings quality and financial analyst forecast dispersion is reduced, we estimate equation (6). We include the interaction of credit ratings with earnings quality (*CR\*EQ*) in our basic models as follows:

$$Dependent = \alpha + \beta_1 CR_{ij} + \beta_2 EQ_{ij} + \beta_3 CR*EQ_{ij} + \beta_4 FOLLOW_{ij} + \beta_5 LOSS_{ij} + \beta_6 \Delta EARN_{ij} + \beta_7 HORIZ_{ij} + \beta_8 VOL_{ij} + \beta_9 IND_{ij} + \beta_{10} YEAR_{ij} \quad (6)$$

### 3.5. Data Sample

We collect a sample of company level reported data, including credit ratings, for the period 2006 to 2015 from the Compustat Annual Database. We combine individual financial analyst forecast data from the Institutional Brokers' Estimate System (I/B/E/S) for the

same period. After merging data from these sources, we omit any firm-year observations with insufficient data, any firm-year observations with a financial analyst following of less than two, with a horizon of more than one year, and then limit the sample to the most recent forecast for each financial analyst in each firm year. The resulting full sample contains 100,137 firm year observations. This sample is used in our testing of Hypothesis 1. We then reduce the sample to only observations which contain a Standard and Poor's credit rating for each firm-year. This reduces the sample size to 88,652 observations. This reduced sample is utilized to test the remaining Hypotheses 2 – 4.

Table 1

Descriptive Statistics (n=100,137)					
Variable	Mean	Median	Standard deviation	25th Percentile	75th Percentile
<i>AFEP</i>	-8.9569	-0.1772	1329.4	-0.5613	-0.0573
<i>DISP</i>	0.5133	0.0048	88.730	0.0021	0.0119
<i>CR</i>	8.1187	10.000	7.1398	0.0000	14.000
<i>EQ</i>	0.0333	0.0245	0.0324	0.0160	0.0396
<i>FOLLOW</i>	19.891	19.000	11.156	11.000	27.000
<i>LOSS</i>	0.1649	0.0000	0.3711	0.0000	0.0000
$\Delta$ <i>EARN</i>	1.2643	0.0119	223.74	0.0056	0.0277
<i>HORIZ</i>	103.86	97.000	81.971	43.000	116.00
<i>VOL</i>	0.0626	0.0318	0.1485	0.0160	0.0661

*AFEP* is the absolute forecast error multiplied by -100. *DISP* is forecast dispersion, measure using the standard deviation of analysts' earnings forecasts deflated by the stock price on the forecast date. *CR* is the Standard & Poor's Issue Credit Rating which is the opinion of an issuer's overall creditworthiness with codes ranging from 1 representing a D rating and 22 representing a AAA rating lagged by one period. *EQ* is the earnings quality of the firm calculated as the lag of the standard deviation of the residuals from firm-specific regressions of changes in working capital on past, present, and future operating cash flows over the prior five consecutive years. *FOLLOW* is the number of analysts following the firm per I/B/E/S. *LOSS* is an indicator variable coded as 1 for firm-year observations with negative earnings, and 0 otherwise.  $\Delta$ *EARN* is the change in earnings, measured as the absolute value of the difference between the current year's earnings per share and the previous year's earnings per share. *HORIZ* is the forecast horizon, expressed as the number of days between the forecast and the end of the fiscal year. *VOL* is earnings volatility, measure as the standard deviation of earnings per share for the previous 5-year period.

Table 1 provides the descriptive statistics for the test variables of our models. The mean and median values of -8.9569 and -0.1772 for *AFEP* are negative by design and indicate the difference between a financial analyst's earnings forecast and the actual earnings. The median value for *CR* is 10, the equivalent of a BB- rating which Standard and Poor's defines as indicative that the obligor faces major ongoing uncertainties. The average forecast horizon for the sample is only 103.86 days or more than three months. The mean and median values for *FOLLOW* are 19.891 and 19 and the 25<sup>th</sup> and 75<sup>th</sup> percentiles are 11 and 27 indicating that the majority of the firms in the sample have more than a dozen financial analysts providing estimates for the firms for any given firm-year. The variable

EQ has mean and median values of 0.0333 and 0.0245 as measured using the lag of changes in working capital on past, present and future operating cash flows over the prior five consecutive years. While the period for our sample covers the years from 2006 to 2015, this variable draws on data that extends back to the year 2001 due to its use of information from prior periods to construct firm-specific regressions regarding the mapping of cash flows to accruals. The mean value for *LOSS* is 0.1649 indicating that only a small portion of the sample includes firms with negative annual earnings.

Table 2

Pearson/Spearman Correlations (n=100,137)									
	<i>AFEP</i>	<i>DISP</i>	<i>CR</i>	<i>EQ</i>	<i>FOLLOW</i>	<i>LOSS</i>	$\Delta$ <i>EARN</i>	<i>HORIZ</i>	<i>VOL</i>
<i>AFEP</i>	1	-0.62357 <.0001	0.11709 <.0001	-0.07246 <.0001	0.14784 <.0001	-0.32649 <.0001	-0.43561 <.0001	-0.15724 <.0001	-0.24791 <.0001
<i>DISP</i>	-0.63008 <.0001	1	-0.15145 <.0001	0.09655 <.0001	-0.16367 <.0001	0.45636 <.0001	0.54070 <.0001	-0.01567 <.0001	0.37320 <.0001
<i>CR</i>	0.19711 <.0001	-0.24303 <.0001	1	-0.16883 <.0001	0.36279 <.0001	-0.19109 <.0001	-0.14302 <.0001	-0.09893 <.0001	-0.25994 <.0001
<i>EQ</i>	-0.12222 <.0001	0.15802 <.0001	-0.20313 <.0001	1	-0.15136 <.0001	0.07581 <.0001	0.12569 <.0001	0.02829 <.0001	0.22144 <.0001
<i>FOLLOW</i>	0.24023 <.0001	-0.23126 <.0001	0.41250 <.0001	-0.19041 <.0001	1	-0.13684 <.0001	-0.17202 <.0001	-0.08250 <.0001	-0.12465 <.0001
<i>LOSS</i>	-0.31926 <.0001	0.44566 <.0001	-0.21774 <.0001	0.07663 <.0001	-0.14276 <.0001	1	0.31492 <.0001	0.03120 <.0001	0.38453 <.0001
$\Delta$ <i>EARN</i>	-0.39958 <.0001	0.59119 <.0001	-0.18572 <.0001	0.16353 <.0001	-0.18002 <.0001	0.29278 <.0001	1	0.00675 0.0326	0.35388 <.0001
<i>HORIZ</i>	-0.16101 <.0001	-0.02395 <.0001	-0.15771 <.0001	0.04341 <.0001	-0.14183 <.0001	0.04475 <.0001	0.00025 0.9376	1	0.02866 <.0001
<i>VOL</i>	-0.34879 <.0001	0.53286 <.0001	-0.29018 <.0001	0.27947 <.0001	-0.11008 <.0001	0.41424 <.0001	0.43373 <.0001	0.00237 0.4539	1

Pearson correlations are shown above the diagonal. Spearman are shown below. Note that the correlation value is shown with the associated p-value immediately below. All variables are defined in Table 1.

Table 2 provides the Pearson and Spearman correlations. The Pearson correlations are reported above the diagonal and the Spearman correlations are reported below the diagonal. Most of the correlations between the independent variables exhibit relatively small correlations. The test variables, *AFEP* and *CR* are positively correlated for both the Pearson and Spearman measures. Additionally, *DISP* and *CR* are negatively correlated for both the Pearson and Spearman measures. This offers preliminary evidence regarding Hypothesis 2.

#### 4. RESULTS

Panel A of Table 3 shows the results of estimating equation (4) with *AFEP* as the dependent variable, while Panel B provides the results of the same model with *DISP* as the dependent variable. The coefficient on *CREXIST* is negative and significant at the one percent level

for the test with *AFEP* as the dependent variable, indicating that the existence of a credit rating is associated with less financial analyst forecast accuracy. Similarly, for the test with *DISP* as the dependent variable, the coefficient on *CREXIST* is positive and significant. This indicates that the existence of a credit rating is associated with greater dispersion in forecast patterns. As discussed in Section 3, while a credit rating contains information that may improve the forecast performance of financial analysts, the results in Table 3 indicate less accuracy and more dispersion for firms where a credit rating exists. This could be due to the theory that analysts exert more effort in making their forecasts when there is less available information. Therefore, by rejecting Hypothesis 1, which was stated in the null form, we find a significant association between the existence of a credit rating and analyst forecast performance.

Table 3

Rating Availability with AFEP and DISP including EQ		
Independent Variable	Panel A	Panel B
	Dependent variable: <i>AFEP</i>	Dependent variable: <i>DISP</i>
	Coefficient	Coefficient
Intercept	0.3588 ***	0.0000 ***
<i>CREXIST</i>	-0.0674 ***	0.0006 ***
<i>FOLLOW</i> <sup>1</sup>	10.440 ***	-0.0974 ***
<i>LOSS</i>	-1.1006 ***	0.0163 ***
$\Delta$ <i>EARN</i>	-14.110 ***	0.1596 ***
<i>HORIZ</i> <sup>1</sup>	-4.1100 ***	0.0015 **
<i>VOL</i>	-1.4896 ***	0.0378 ***
<i>IND</i>	Included	Included
<i>YEAR</i>	Included	Included
Adjusted R <sup>2</sup>	0.2752	0.4196
<i>n</i>	100,137	100,137

\*, \*\*, \*\*\* indicate statistical significance utilizing heteroscedasticity consistent standard errors at the 10%, 5%, and 1% levels, respectively. <sup>1</sup>These coefficients are multiplied by 1,000 for ease of interpretation. *CREXIST* is an indicator variable coded as 1 if the observation includes a Standard & Poor's Issue Credit Rating, and 0 otherwise. *IND* is an industry control using the I/B/E/S industry classification. *YEAR* is an annual control representing the year in which firm j's earnings are reported. All other variables are defined in Table 1.

Consistent with prior literature, *FOLLOW* is significant in both tests indicating that when more financial analysts follow a firm, financial analysts are more accurate and are less dispersed in their earnings forecasts. The coefficient on *LOSS* is significant for all tests indicating that financial analysts are less accurate and more dispersed for firms that experience a loss in the current period. Prior literature demonstrates that financial analysts in some cases fail to predict failures and as a result, firms with losses are more likely to be associated with negative earnings surprises (Skinner & Sloan, 2001; Kinney, Burgstahler, & Martin, 2002).

The  $\Delta$ *EARN* control is highly significant for all tests. The negative sign for tests with *AFEP* as the dependent variable suggests that larger absolute increases in earnings from the prior period are associated with less accurate forecasts of future earnings. *HORIZ* is significant

in both tests of dispersion, indicating that shorter time periods between forecasts and earnings disclosures leads to more accuracy and less dispersion. Finally, as predicted the *VOL* control is significant in both tests. *VOL* represents the volatility in a firms reported earnings, thus a negative result for tests involving forecast accuracy indicate that a lack of smooth earnings from year to year increases the likelihood of forecast inaccuracy and a positive result for tests involving dispersion indicate that a lack of smooth earnings increases forecast dispersion.

Panel A of Table 4 shows the results of estimating equation (5). The first two columns of results provide the results of estimating equation (5) with *AFEP* as the dependent variable, while the final two columns provides the results of the same models with *DISP* as the dependent variable. Note that, as predicted, the coefficient on *CR* are positive and significant at the one percent level for the test with *AFEP* as the dependent variable indicating that higher levels of *CR* are associated with more financial analyst forecast accuracy. This result supports Hypothesis 2 and indicates that financial analysts produce more accurate earnings forecasts for firms with higher credit ratings. Similarly, for the test with *DISP* as the dependent variable, the coefficient on *CR* is negative and significant. This also supports Hypothesis 2 and indicates that financial analysts' earnings forecast estimates are less dispersed for firms with higher credit ratings.

Table 4

Rating with <i>AFEP</i> and <i>DISP</i> including <i>EQ</i>				
Independent Variable	Panel A Dependent variable: <i>AFEP</i>		Panel B Dependent variable: <i>DISP</i>	
	Coefficient	Coefficient	Coefficient	Coefficient
<i>Intercept</i>	-0.0629	-0.4636 ***	0.0069 ***	0.0100 ***
<i>CR</i>	0.0352 ***	0.0674 ***	-0.0007 ***	-0.0010 ***
<i>EQ</i>	0.9469 **	19.4343 ***	-0.0183 ***	-0.1617 ***
<i>CR*EQ</i>		-1.4310 ***		0.0111 ***
<i>FOLLOW</i> <sup>1</sup>	10.2900 ***	10.3000 ***	-0.0173 **	-0.0173 **
<i>LOSS</i>	-1.3173 ***	-1.3158 ***	0.0173 ***	0.0173 ***
<i>ΔEARN</i>	-19.0601 ***	-19.1496 ***	0.2170 ***	0.2177 ***
<i>HORIZ</i> <sup>1</sup>	-3.8300 ***	-3.8400 ***	0.0013	0.0014 *
<i>VOL</i>	-2.2852 ***	-2.4680 ***	0.0758 ***	0.0772 ***
<i>IND</i>	Included	Included	Included	Included
<i>YEAR</i>	Included	Included	Included	Included
<i>Adjusted R</i> <sup>2</sup>	0.3350	0.3363	0.4830	0.4837
<i>n</i>	88,652	88,652	88,652	88,652

\*, \*\*, \*\*\* indicate statistical significance utilizing heteroscedasticity consistent standard errors at the 10%, 5%, and 1% levels, respectively. <sup>1</sup>These coefficients are multiplied by 1,000 for ease of interpretation. *IND* is an industry control using the I/B/E/S industry classification. *YEAR* is an annual control representing the year in which firm j's earnings are reported. All other variables are defined in Table 1.

Also as predicted, the coefficient on *EQ* is positive and significant for the test with *AFEP* as the dependent variable indicating that lower earnings quality, as indicated by higher levels



of *EQ* is associated with more financial analyst forecast accuracy. This result supports Hypothesis 3 and indicates that financial analysts produce more accurate earnings forecasts for firms with lower earnings quality due to their management of earnings to match financial analysts' earnings expectations. Similarly, for tests with *DISP* as the dependent variable, the coefficient on *EQ* is negative and significant. This also supports Hypothesis 3 and indicates that financial analysts' earnings forecast estimates are less dispersed for firms with lower earnings quality and therefore more dispersed for firms with better earnings quality.

Consistent with prior literature, *FOLLOW* is significant in all four tests indicating that when more financial analysts follow a firm, financial analysts are more accurate and are less dispersed in their earnings forecasts. The coefficient on *LOSS* is significant for all tests indicating that financial analysts are less accurate and more dispersed for firms that experience a loss in the current period. Prior literature demonstrates that financial analysts in some cases fail to predict failures and as a result, firms with losses are more likely to be associated with negative earnings surprises (Skinner & Sloan, 2001; Kinney, Burgstahler, & Martin, 2002).

The  $\Delta EARN$  control is highly significant for all tests. The negative sign for tests with *AFEP* as the dependent variable suggests that larger absolute increases in earnings from the prior period are associated with less accurate forecasts of future earnings. Recall that  $\Delta EARN$  is the absolute value of the change in earnings per share from the previous year scaled by price. This result is likely due to financial analysts' uncertainty when faced with large changes in earnings from one period to the next. *HORIZ* is not significant in our tests of dispersion, but consistent with prior literature is significant for tests involving accuracy. Finally, as predicted the *VOL* control is significant in all tests. *VOL* represents the volatility in a firm's reported earnings, thus a negative result for tests involving forecast accuracy indicate that a lack of smooth earnings from year to year increases the likelihood of forecast inaccuracy and a positive result for tests involving dispersion indicate that a lack of smooth earnings increases forecast dispersion.

Table 4 also provides the results of estimating equation (6), which includes the interaction of credit ratings with earnings quality ( $CR*EQ$ ). As in our prior test, the main effect of *CR* is positive and significant (0.0352,  $p < 0.0001$ ). Note that all the control variables' direction and significance are also consistent with the prior test. The  $CR*EQ$  interaction term is negative and significant (-1.4310,  $p < 0.0001$ ) indicating that the quality of reported earnings affects the influence that credit ratings have on forecast accuracy. Specifically, at higher levels of credit ratings, the negative association between earnings quality and financial analyst forecast accuracy is reduced. This result is consistent with our expectations regarding the moderating effect that earnings quality has on the relationship between credit ratings and financial analyst forecast accuracy and provides evidence for the moderating effect of earnings quality anticipated by Hypothesis 4.

The results with *DISP* as the dependent variable similarly support our hypothesis regarding the moderating effect of earnings quality. For the test involving forecast dispersion, the

$CR*EQ$  interaction term is positive and significant ( $-0.1617$ ,  $p < 0.0001$ ) indicating that the quality of reported earnings affects the influence that credit ratings have on forecast accuracy. Specifically, at higher level of credit ratings, the positive association between earnings quality and financial analyst forecast dispersion is reduced. This result is also consistent with our expectations for Hypothesis 4 regarding the moderating effect that earnings quality has on the relationship between credit ratings and financial analyst forecast accuracy.

For each of our tests that do not include interaction variables in Table 4, the variance inflation factors for all of the independent variables are less than 4, indicating low levels of multicollinearity among the independent variables.<sup>6</sup> We also test the null hypothesis that there is constant variance of the residuals using the White test for all models. We find that heteroscedasticity is present and we therefore calculate all significance levels for our tests using heteroscedasticity consistent standard errors. Additionally, we test for autocorrelation and find evidence that the residuals may not be independent. We therefore re-estimate our model correcting for autocorrelation and find similar results.

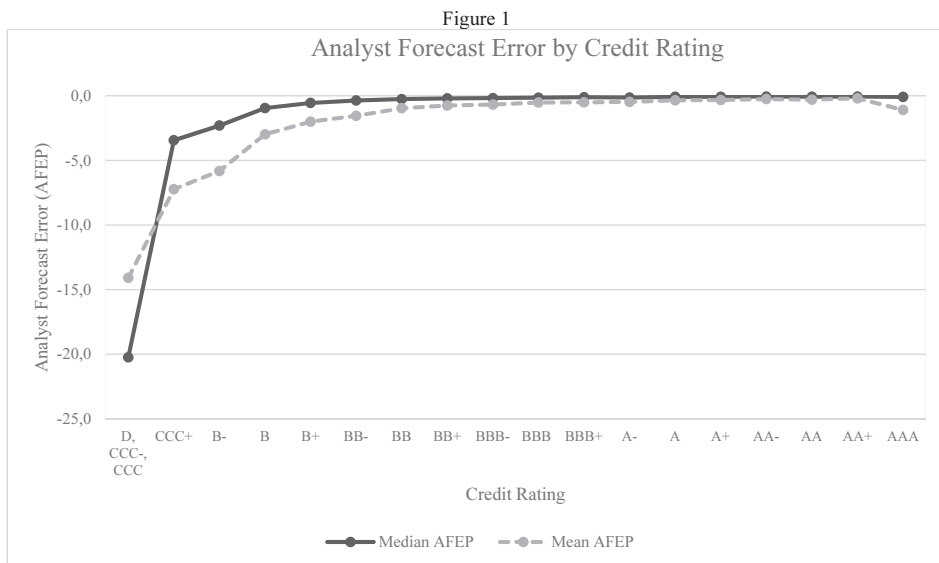


Figure 1 provides further analysis of the relationship between credit ratings and analyst forecast accuracy. Figure 1 shows an increase in analyst forecast accuracy as the credit rating of a firm increases. The increase in accuracy is most pronounced from the lowest ratings which are “D, CCC-, CCC” which have a median *AFEP* value of  $-20.248$  to “CCC+” ratings which have a median *AFEP* value of  $-3.4464$ .<sup>7</sup> However, increases in

<sup>6</sup> The largest variance inflation factors in these models occur among the industry control dummy variables with the largest value at 3.3. The variance inflation factor for all other independent variables is less than 2.

<sup>7</sup> We combine firms with a “D”, “CCC-”, or a “CCC” rating due to the small number of firms that receive these ratings. Only a combined 77 of the 88,652 observations with a credit rating in our sample received one of these three ratings. In contrast, 452 firms received a “CCC+” rating.

accuracy continue throughout each of the non-investment grade ratings to firms with a “BB+” rating which have a median *AFEP* value of -0.2039. There is much less variation in investment grade ratings as “BBB-” rated firms have a median *AFEP* value of -0.1860 and firms with a “AAA” rating have a median *AFEP* value of -0.0944 with no investment grade rated firm having a median *AFEP* value of more than -0.0661. While there is not as much improvement in forecast accuracy as credit ratings improve for investment grade firms, there is dramatic improvement in forecast accuracy among non-investment grade firms as credit ratings increase. Overall, across all credit ratings, Figure 1 shows that as credit ratings increase, there is a clear increase in forecast accuracy.

## 5. ADDITIONAL ANALYSES AND SENSITIVITY TESTS

In order to test the sensitivity of our results to alternative measure for certain variables, we perform four additional tests. First, we use smoothness as an alternative measurement of earnings quality. Second, we utilize credit rating changes instead of the actual credit rating as an alternative specification. Third, we test for endogeneity using Granger causality tests. Last, we replicate our testing using alternative specifications of analyst forecast accuracy.

### 5.1. Smoothness as a Measure of Earnings Quality

We replicate our results using smoothness as an alternative measure of earnings quality to test the consistency of reported earnings. As in prior literature (e.g. Leuz, Nanda, & Wysocki, 2003; Gao & Zhang, 2015), we compute smoothness of earnings as follows:

$$SMOOTH_{j,t} = \frac{\sigma(NI / ASSETS)_{j,t}}{\sigma(CFO / ASSETS)_{j,t}} \quad (6)$$

where for firm  $j$  and at time  $t$ :

$\sigma$	= standard deviation over the most recent 5 year period
$NI$	= net income
$CFO$	= cash flow from operations
$ASSETS$	= total assets.

Because higher levels of variance in earnings relative to cash flows indicate that a firm's earnings are more volatile, higher levels of *SMOOTH* indicate lower levels of earnings smoothness. Conversely, lower levels of variance in earnings relative to cash flows indicate that earnings are more consistent. Therefore, lower levels of *SMOOTH* indicate higher levels of earnings smoothness. As consistent earnings are a desirable earnings attribute (Graham, Harvey, & Rajgopal, 2005), firms may manipulate earnings to achieve a smooth earnings path. As is the case with overall earnings quality, this manipulation of earnings can increase the uncertainty of the forecasting environment and increase the difficulty of the forecasting environment leading to a reduction in financial analyst forecast

accuracy and more dispersion among financial analyst forecasts. Therefore, we expect that *SMOOTH* will have a negative effect on financial analyst accuracy or *AFEP* and a positive effect on *DISP*.

Table 5

Rating with AFEP and DISP including SMOOTH					
Independent Variable	Panel A		Panel B		
	Dependent variable: <i>AFEP</i>		Dependent variable: <i>DISP</i>		
	Coefficient	Coefficient	Coefficient	Coefficient	Coefficient
<i>Intercept</i>	0.0272	0.5913 ***	0.0062 ***	0.0032 ***	
<i>CR</i>	0.0370 ***	-0.0016	-0.0007 ***	-0.0005 ***	
<i>SMOOTH</i>	-0.0974 ***	-0.4565 ***	0.0001	0.0020 ***	
<i>CR*EQ</i>		0.0258 ***		-0.0001 ***	
<i>FOLLOW</i> <sup>1</sup>	9.1900 ***	9.2200 ***	-0.0159 *	-0.0160 *	
<i>LOSS</i>	-1.2732 ***	-1.2190 ***	0.0173 ***	0.0170 ***	
<i>ΔEARN</i>	-19.2472 ***	-18.9791 ***	0.2169 ***	0.2155 ***	
<i>HORIZ</i> <sup>1</sup>	-3.8200 ***	-3.8000 ***	0.0013	0.0012	
<i>VOL</i>	0.4150	0.2987	0.0703 ***	0.0709 ***	
<i>IND</i>	Included	Included	Included	Included	
<i>YEAR</i>	Included	Included	Included	Included	
<i>Adjusted R</i> <sup>2</sup>	0.3369	0.3434	0.4828	0.4845	
<i>n</i>	88,652	88,652	88,652	88,652	

\*, \*\*, \*\*\* indicate statistical significance utilizing heteroscedasticity consistent standard errors at the 10%, 5%, and 1% levels, respectively. <sup>1</sup>These coefficients are multiplied by 1,000 for ease of interpretation. *IND* is an industry control using the I/B/E/S industry classification. *YEAR* is an annual control representing the year in which firm *j*'s earnings are reported. All other variables are defined in Table 1.

When substituting the *SMOOTH* variable for *EQ* in our equations (5) and (6), we find that, with the exception of the result for the *VOL* control, our results are consistent with Table 4. Our results in Table 5 demonstrate that firms with higher credit ratings and smoother earnings are associated with more accurate financial analyst forecasts. In Table 5, we also find some evidence that higher credit ratings and smoother earnings are associated with less forecast dispersion. While in our tests of equation (5) only higher credit ratings are associated with lower forecast dispersion, our tests of equation (6) show that both higher credit ratings and smoother earnings are both associated with less forecast dispersion. Additionally, we find that our tests regarding the interaction between credit ratings and earnings smoothness and its effect on accuracy and dispersion remain significant. Specifically, at higher level of credit ratings, both the negative association between earnings quality and financial analyst forecast accuracy and the positive association between earnings smoothness and financial analyst forecast dispersion are reduced. Taken together with our results from Table 4, our results when substituting *SMOOTH* for *EQ* in our equations (5) and (6), we find further evidence for Hypotheses 2, 3, and 4.

## 5.2. Change in Credit Rating

In some cases, prior literature utilizes the change in credit rating to study external reports of a firm's financial position (Ederington & Goh, 1998); therefore we replicate our results utilizing this measure in place of the firm's current rating.

Table 6

Change in rating with AFEP and DISP including EQ				
Independent Variable	Panel A		Panel B	
	Dependent variable: <i>AFEP</i>		Dependent variable: <i>DISP</i>	
	Coefficient	Coefficient	Coefficient	Coefficient
Intercept	0.3454 ***	0.3501 ***	-0.0020 ***	-0.0019 ***
$\Delta CR$	0.2373 ***	0.2749 ***	-0.0026 ***	-0.0022 ***
<i>EQ</i>	0.5205	0.5547	-0.0107 ***	-0.0103 ***
<i>CR*EQ</i>		-1.8085 *		-0.0214 **
<i>FOLLOW</i> <sup>1</sup>	13.6500 ***	13.5600 ***	-0.0907 ***	-0.0917 ***
<i>LOSS</i>	-1.2904 ***	-1.2955 ***	0.0177 ***	0.0176 ***
$\Delta EARN$	-19.1504 ***	-19.1763 ***	0.2209 ***	0.2206 ***
<i>HORIZ</i> <sup>1</sup>	-3.8500 ***	-3.8500 ***	0.0018 **	0.0018 **
<i>VOL</i>	-3.1104 ***	-3.0802 ***	0.0910 ***	0.0914 ***
<i>IND</i>	Included	Included	Included	Included
<i>YEAR</i>	Included	Included	Included	Included
<i>Adjusted R</i> <sup>2</sup>	0.3381	0.3382	0.4833	0.4833
<i>n</i>	88,652	88,652	88,652	88,652

\*, \*\*, \*\*\* indicate statistical significance utilizing heteroscedasticity consistent standard errors at the 10%, 5%, and 1% levels, respectively. <sup>1</sup>These coefficients are multiplied by 1,000 for ease of interpretation. *IND* is an industry control using the I/B/E/S industry classification. *YEAR* is an annual control representing the year in which firm *j*'s earnings are reported. All other variables are defined in Table 1.

Our results in Table 6 indicate that our results regarding the relationships between credit ratings, earnings quality and forecast accuracy as well as forecast dispersion are essentially unchanged. The significance level of the interaction variables decreases, but remains consistent. These results again confirm Hypotheses 2, 3, and 4 regarding the association between financial analysts' forecasts and firm credit ratings and earnings' attributes.

## 5.3. Endogeneity between Credit Ratings and Financial Analyst Forecast Performance

As outlined above, we expect that firms with higher credit ratings allow for financial analysts to make their earnings forecast for a firm with more accuracy and less uncertainty. However, the possibility exists that financial analyst activity itself could have an effect on the credit ratings that are issued. For example, Cheng and Subramanyam (2008) find that a reduction in financial analysts following a firm leads to a decrease in credit ratings. Similarly, Mansi, Maxwell, and Miller (2011) find that an increase in financial analyst activity leads to a decrease in credit yields. Therefore, it is possible that an endogenous relationship exists between credit ratings and financial analyst forecast accuracy and dispersion. We examine

this possibility by performing Granger causality tests to explore the connection between financial analyst activity and credit ratings. In untabulated results, we find results similar to those of Ederington and Goh (1998), in that Granger causality flows both ways. Our testing demonstrates significant results when regressing forecast accuracy on both prior period credit ratings and prior period forecast accuracy. At the same time, we also find significant results when regressing credit ratings on both prior period forecast accuracy and prior period credit ratings. While these results provide some evidence that credit ratings have an effect on performance of financial analysts, financial analyst activity also can have a simultaneous effect on the reports issued by credit rating agencies.

#### 5.4. Alternative Measures of Analyst Forecast Accuracy

We replicate our results using several alternate measures of forecast accuracy to test the sensitivity of our results to other measures of analyst forecast accuracy. First, we replicate our results using two alternate measures in the numerator. Prior literature has utilized a log transformation to reduce skewness in variables (Nikolaev 2010). Therefore, we begin our alternate measurement analysis by computing the natural log of the difference between the analyst forecast and the net income of the firm (*LNAFEP*).<sup>8</sup> We replicate our tests using this alternate measurement as follows:

$$LNAFEP_{i,j,t} = \frac{\ln(1000 * (FORECAST_{i,j,t}^{t-1} - NI_{j,t}))}{PRICE_{j,t}} (-1) \quad (7)$$

where for analyst *i*, firm *j*, and at time *t*:

<i>FORECAST</i>	= forecasted net income
<i>NI</i>	= reported net income
<i>PRICE</i>	= stock price.

Consistent with Bradshaw et al. (2016) we compute analyst forecast error utilizing the squared difference between the analyst forecast and the net income of the firm (*SQAFEP*). Therefore, we replicate our results utilizing the following substitute measure:

$$SQAFEP_{i,j,t} = \frac{(FORECAST_{i,j,t}^{t-1} - NI_{j,t})^2}{PRICE_{j,t}} (-100) \quad (8)$$

where for analyst *i*, firm *j*, and at time *t*:

<i>FORECAST</i>	= forecasted net income
<i>NI</i>	= reported net income
<i>PRICE</i>	= stock price.

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<sup>8</sup> Although, for interpretative purposes, we multiply all other forecast error equations in this study by (-100), because of the diminutive values resulting by the log transformation in equation 7, note that we multiply the numerator by 1000, and therefore multiply the forecast error by (-1).

Additionally, we check the consistency of our results by scaling the computation of the difference between the analyst forecast and the net income of the firm with earnings per share instead of price in the denominator (Collins, Hopwood, & McKeown, 1984). Utilizing earnings per share to scale analyst accuracy, we compute forecast error (*EPSAFEP*) as follows:

$$EPSAFEP_{i,j,t} = \frac{|FORECAST_{i,j,t}^{t-1} - NI_{j,t}|}{EPS_{j,t}} (-100) \quad (9)$$

where for analyst  $i$ , firm  $j$ , and at time  $t$ :

<i>FORECAST</i>	= forecasted net income
<i>NI</i>	= reported net income
<i>EPS</i>	= reported earnings per share.

Overall, when utilizing these three alternative specifications of analyst forecast accuracy, we find largely similar results. For example, when testing our results utilizing the natural log of the differences between analyst forecasts and earnings (*LNAFEP*) as a part of equation (5), in untabulated results the coefficient of *CR* remains positive and significant at one percent indicating that higher accuracy in analysts' forecasts of earnings is associated with firms that have higher credit ratings. Further, the coefficient of *EQ* remains positive and significant, but the level of significance drops from five percent to ten percent. When utilizing the alternative specification *SQAFEP* that determines analyst forecast error by calculating the squared difference between the forecast and the actual earnings, in untabulated results we find that the correlation between *SQAFEP* and *CR* is positive and significant. However, when *SQAFEP* is included as the dependent variable in equation (5), the coefficient on *CR* is negative and significant. In further testing, after winsorizing each of the continuous variables at 5%, and testing again *SQAFEP* as the dependent variable in equation (5), the coefficient on *CR* is again positive and significant at 1% indicating that outliers are the cause of our spurious results in the initial test of *SQAFEP* in equation (5). Finally, when replicating our results with earnings per share as an alternate to share price in the denominator of the measure as described above (*EPSAFEP*) in equation (5), in untabulated results the results are consistent with our main tests as we find that the coefficient on *CR* is positive and significant at 1% and the coefficient on *EQ* is positive and significant at 5%.

## 6. SUMMARY AND CONCLUSION

Using models of forecast performance from prior literature, we examine the relationship of credit ratings with the accuracy of financial analysts' forecasts and the dispersion of forecasts. Controlling for factors that are known in the literature to introduce task complexity into the forecasting environment, we hypothesize that high credit ratings are associated with more accurate and less dispersed earnings forecasts. This study provides several new results. First, we find that the existence of a firm's credit ratings during the

forecasting horizon has a significant impact on the accuracy and dispersion patterns of financial analysts' earnings forecasts. Second, we find that higher credit ratings are associated with more accurate forecasts and less dispersed forecast patterns. Next, we find that the level of a firm's earnings quality moderates the effect that credit ratings have on analyst performance. This particular result suggests that the coexistence of high credit ratings and high quality earnings reports provides a less complex and more forecast-friendly environment. In additional testing we use three alternate specifications of forecast accuracy to repeat our tests. The results of these alternate tests are consistent with our primary findings.

This study is motivated by making contributions that provide 1) analysts with confirmation of the usefulness of credit ratings in assessing future earnings, 2) regulators with further evidence of the importance of high quality earnings reports, 3) investors with the knowledge that future earnings forecasts are likely more accurate for a firm with higher credit ratings, and 4) researchers with additional insights of the determinants of financial analyst forecasting performance. Additionally, these results also add to the body of literature that illustrates how task complexity hinders the predictive value of earnings reports.

Our results allow for related future research in several ways. First, future studies could explore the link between credit ratings and changes in financial analysts' performance based on whether it is classified as investment grade, speculative grade, or other various subcategories. Second, future studies could utilize measures of relative analyst forecast accuracy to determine whether there is an interactive effect between credit ratings and specific analyst characteristics, such as analyst experience, on their performance. Finally, extensions of this research could examine whether and to what degree the level of credit ratings interact with other variables known in the literature to have a significant impact on forecast accuracy and dispersion.

Our research is subject to certain limitations. As we have reported in our testing, while we find that credit ratings have an effect on financial analyst performance, there is also a simultaneous effect that financial analysts' earnings forecasts may have on credit ratings themselves. Additionally, the Compustat database utilized in this study includes Standard & Poor's credit ratings exclusively and thus future research could duplicate our testing with data from all rating agencies. Finally, although we use controls in our testing that are common for this area in the literature, as is the case in all empirical research our models may be misspecified due to the possibility of omitted control variables.



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# WHAT REALLY DEFINES THE PERFORMANCE IN HOTEL INDUSTRY? MANAGERS' PERSPECTIVE USING DELPHI METHOD

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**ABSTRACT:** *This paper brings together empirical studies in hospitality literature focusing on understanding the drivers of hotel performance and combines them with experts' opinions on the most important drivers of performance in the hospitality industry. The first step focused on studying more than 60 papers available in hospitality literature focusing on hotel performance. The second step involved the Delphi method on a pool of 10 experts from the hospitality industry in order to explore their opinion on major drivers of hotel performance. The results showed that literature is mainly focusing on examining the impact of HRM practices, organizational culture, ICT, brand equity, environmental practices and hotel facilities on performance. However, experts did not find those drivers to be the crucial factors of hotel performance. They emphasized the importance of location, product segmentation, company flexibility and cooperation between tourist service providers. Those drivers have not caught the attention of academia so far and they represent a potential new avenue for future hospitality research on understanding hotel performance. Both literature and experts found that market orientation, customer satisfaction, service quality and business processes are important drivers of hotel performance that require further research and examination.*

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**Keywords:** *Delphi method, performance, hotels, drivers of performance*

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## 1. INTRODUCTION

The hospitality industry has for decades been striving to understand the major drivers of hotel performance. So far literature offered many fragmented studies examining specific resources or capabilities that drive hotel performance. Theoretical background behind this body of literature is the Resource Based Theory (RBT) proposed by Barney in 1990. This theory postulates the basis for defining sustainable competitive advantages of any firm. Resources become a competitive advantage if they are valuable, rare, inimitable and non-substitutable (Barney, 1991). Further development of RBT made a distinction

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between firms' resources. Collis (1994) classified resources as tangible and intangible. Tangible resources are physical and financial assets of the firm and represent the value of the financial capital. Intangible resources are non-physical and they are rarely part of firms financial statements. Amit and Schoemaker (1993) recognized that capabilities are also a source of a firm's competitive advantage and defined them as routines based on skills and knowledge that can drive the firm's success.

Overall, general management literature on RBT focused on defining and clarifying tangible and intangible resources and capabilities that drive firms' performance. Theoretical papers in management literature worked on clarifying the general theoretical concepts that highlighted the nature of firms' resources and capabilities. As for empirical papers, they were operationalizing and testing those concepts in practice. The major challenges in empirical studies were: 1) measurement issues (how can abstract concepts be measured?); 2) the scope of concepts that can be included in one study (the concepts are broad and a single study could not focus on all of them); and 3) weak boundaries between different concepts (how can we distinguish between intangible assets and capabilities and where is the line between them in practice?). Those challenges caused a gap between theoretical and empirical papers since the concepts defined in the theory were hard to test and measure empirically.

In hospitality industry there are no theoretical papers dealing with drivers of hotel performance. Most of the literature is based on empirical studies using general management RBT literature and empirical research in line with generally accepted management concepts of assets and capabilities. In general, intangible assets and their relation to performance attracted the most attention in experts in the field. Those papers tested the impact of HRM practices, brand equity, information communication technologies (ICT), social capital, environmental policies, employees and managers' know-how, and their impact on hotel performance (Božič and Knežević Cvelbar, 2016).

Most of the studies in hospitality literature were focusing on one single or a few drivers of hotel performance, which were chosen based on the subject of the researcher's interest or general theoretical approval of the concept's relevance. The majority of those studies showed that there is a positive correlation between the driver(s) and hotel performance. Yet they failed to determine which drivers are the most important and relevant. This is an ultimate question for practitioners and hotel managers. Knowing what is positively impacting hotel performance is good, but knowing the major drivers of hotel performance is crucial.

This paper is focusing on identifying the major drivers of hotel performance. It first presents an in-depth overview of the hospitality literature in order to indicate which drivers have been researched so far. Based on literature review, we identified the list of 30 drivers of performance that were used in academic research so far. A total of three rounds of testing were performed using the Delphi methodology. In each round experts were asked to evaluate certain drivers of hotel performance that had been recognized in hospitality literature in the basis of their perception of their impact on hotel performance. The list was

consequently reduced in line with the previous round of results. The participants were also invited to suggest additional drivers of hotel performance. The research concluded after the third round since it yielded no new information. The final results provided a list of nine major drivers of hotel performance. Furthermore, the major drivers of performance were investigated in the literature and compared with the results of the Delphi study. The results are presented and discussed in this paper.

## 2. OVERVIEW OF PREVIOUS STUDIES AND RECOGNITION OF EXISTING DRIVERS OF PERFORMANCE

Studies in the hospitality industry were following general trends in management literature, which means they revolved around testing the impact of tangible and intangible assets and capabilities on hotel performance. An extensive search for relevant literature for the purpose of this paper found 60 papers published in the last twenty years – testing the drivers of performance in the hospitality industry. The majority of those papers were published in the *International Journal of Hospitality Management* that was and is still supporting research on hotel performance. Those papers helped identify 30 major drives of hotel performance that managed to attract the attention of academics. The papers are listed and presented in Table 1.

In line with the selected literature, firms' sustainable competitive advantages were classified as tangible assets, intangible assets, and capabilities. As defined above tangible assets denote a firm's capital translated into its assets (land, buildings, equipment etc.) and financial funds (cash and other financial assets). Interestingly, hospitality studies were not particularly interested in studying the impact of tangible assets on firms' performance. The reason for this could be the fact that tangible assets are necessary and obvious drivers of hotel success. Studies in this area were unified in finding that tangible assets, including hotel facilities, location and financial assets, are positively related to hotel performance.

The line between intangible assets and capabilities is rather thin. There is no general consensus in literature as to which competitive advantages are intangible assets and which are, in fact, capabilities. Therefore classifying a specific sustainable competitive advantage as an intangible asset or a capability is arbitrary. This paper follows the simple logic proposed by Hall (1992), which says: "intangible assets are something that a firm has, while capabilities are something that a firm does" (pg. 136). In line with Hall (1992), the definition and the existing empirical studies in hospitality industry means that intangible assets can be grouped into four general categories as a firm's organizational, human, marketing and environmental assets.

- Organizational assets are understood as the firm's culture, organizational structure, management philosophy, available informational technology, service quality, social capital, and the corporate social responsibility policy. Overall organisational assets are the most researched drivers of success in the hospitality industry. Studies are generally

conclusive – organisational assets can be translated into firms' sustain competitive advantages leading to their success.

- Another frequently researched area relates to human assets including management and employee competences, HRM practices, employees' attitudes, and employee satisfaction, innovativeness and loyalty. As expected, human assets positively correlate with hotel performance. Research in hospitality is very focused on employees, but it neglects management-related sustainable competitive advantages as performance drivers. This is a research field worth of exploring in the future.
- Marketing capital includes brand equity, customer satisfaction, customer loyalty and direct distribution channels. As in the case of organisational and human capital, marketing capital is also positively related to firms' performance. Relevant literature has put the most effort on exploring customer satisfaction and its relation to performance. Distribution channels as part of the marketing capital are relatively underexplored, which is surprising due to the digital transformation of the industry that has been happening in the last decade. In addition, the value of contractual relations with business customers as a part of the sales policy has so far not been explored in hospitality studies.
- Environmental capital is still not considered as a very important research area in the hospitality industry. Although sustainable development is one of the research mainstreams in tourism, the relation between environmental capital and hotel performance failed to attract significant academic interest. Very few studies connected basic and advanced environmental policies with hotel performance, but they generally found a positive relation between the two. More research in this area is expected to emerge in the future.

Capabilities are prominent sources of firms' success and, according to RBT, they should represent the leading source of sustainable competitive advantages. The major obstacle in the research is operationalisation and measurement of firms' capabilities. Hospitality research in general neglected such capabilities as important sustainable competitive advantages of firms. Research in this area is still scarce. In general, capabilities can be divided into operational and dynamic. Operational capabilities are firms' routines and processes that enable them to perform activities in the long-term and ongoing basis, while dynamic capabilities relate to firms' ability to adapt to changes coming from the environment. Research in operational capabilities in the hospitality industry includes firms' relations with partners and business processes, while research in dynamic capabilities includes marketing orientation, knowledge sharing and entrepreneurship orientation.

Summary of the literature review on drivers of hotel performance is presented in table 1.



Table 1: *Drivers of performance in hospitality literature*

Drivers of performance	Short description	Authors and year	Relation with performance
<b>Drivers based on tangible assets</b>			
<b>Hotel facilities</b>	Buildings, equipment	Chu & Choi, 2000	(+)
		Lenidou, Leonidou, Fotiadis & Zeriti, 2013	(+)
		Kim, Cho & Brymer, 2013	(+)
		Lado-Sestayo, Otero-González, Vivel-Búa & Martorell-Cunill, 2016	(+)
<b>Location</b>	Physical location – land	Lado-Sestayo et. al., 2016	(+)
<b>Financial assets</b>	Cash and other financial funds	Lenidou et. al., 2013	(+)
<b>Drivers based on intangible assets</b>			
<b>Brand equity</b>	Brand loyalty, awareness, perceived quality, brand image	Prasad & Dev, 2000	(+)
		Kim & Kim, 2005	(+)
		Rudež & Mihalič, 2007	(+)
		O'Neill & Carlback, 2011	(/)
<b>Employee loyalty</b>	Employee's sense of belonging and commitment	Kim & Brymer, 2011	(+)
		Al-Rafaie, 2015	(+)
<b>Employee satisfaction</b>	Working conditions, teamwork and cooperation, relationship with supervisors, recognition and awards	Chi & Gursay, 2009	(/)
		Naseem, Sheikh & Malik, 2011 Al-Rafaie, 2015	(+) (+)
<b>Employee competencies</b>	Qualifications, experience, knowledge development, knowledge sharing between employees	Rudež & Mihalič, 2007	(+)
		Kim, Kim, Park, Lee & Jee, 2012	(+)
		Nieves, Quintana & Osorio, 2014	(+)
<b>Employees' attitudes towards work</b>	Overall satisfaction, pride, consistency and devotion	Sharpley & Forster, 2003	(+)
		Rudež & Mihalič, 2007	(+)
<b>Employee innovativeness</b>	Creativity, innovative ideas of employees	Rudež & Mihalič, 2007	(+)
		Nieves, Quintana & Osorio, 2014	(+)
<b>HRM practices</b>	Recruitment and selection, manpower planning, job design, training and development, pay system	Hoque, 1999	(+)
		Cho, Woods, Jang & Erdem, 2006	(+)
		Chand & Katou, 2007	(+)
		Chand, 2010	(+)
		Ahmad, Solnet & Scott, 2010	(/)
		Al-Rafaie, 2015 Ružić, 2015	(+) (+)
<b>Managerial competencies</b>	Analysis, strategic management, problem solving, leadership, creativity, crisis management, attitude, self management	Kay & Russette, 2000	(+)
		Chung-Herrera, Enz & Lankau, 2003	(+)
		Jeou-Shyan, Hsuan, Chih-Hsing, Lin & Chang-Yen, 2011	(/)
		Wu & Chen, 2015	(+)
<b>Management philosophy</b>	Empowered employees, customers come first, stimulated staff	Rudež & Mihalič, 2007	(+)

<b>Team culture</b>	Support of knowledge, information sharing, coordination, meetings, pre-designed work plans and processes	Hu, Horng & Sun, 2009 Hussain, Kronar & Ali, 2016	(+) (+)
<b>Organisational culture</b>	Atmosphere, support of knowledge and communication	Kemp & Dwyer, 2001 Sørensen, 2002 Rudež & Mihalič, 2007 Asree, Zain & Rizal Razalli, 2010 Zoghbi-Manrique-de-Lara & Ting-Ding, 2016	(+) (/) (+) (+) (/)
<b>Customer loyalty</b>	Attitude and customers loyalty behaviour	Kandampully & Suhartanto, 2000 Al-Rafaie, 2015 Kim, Voght & Knutson, 2015	(+) (+) (/)
<b>Customer satisfaction</b>	Degree of satisfaction with the services, price, location and amenities	Wilkins, Merrilees & Herington, 2007 Rudež & Mihalič, 2007 Chi & Gursoy, 2009 Assaf & Magnini, 2012 Sun & Kim, 2013 Kim, Cho & Brymer, 2013 Al-Rafaie, 2015 Kim, Voght & Knutson, 2015 Assaf, Josiassen, Cvelbar & Woo, 2015	(+) (+) (+) (+) (+) (+) (+) (/) (+)
<b>Service quality</b>	Tangibility, reliability, responsiveness, assurance, empathy	Herrington & Akehurst, 1996 Chu & Choi, 2000 Claver, Jose, Tari & Pereira, 2006 Al-Rafaie, 2015 Wang, Chen & Chen, 2012 Pereira-Moliner, Claver-Cortés, Molina-Azorin & Tari, 2012 Molina-Azorin, Tari, Pereira-Moliner, Jopez-Gamero & Pertusa-Ortega, 2015	(+) (+) (+) (+) (+) (+) (+)
<b>Social capital</b>	Passion to achieve common goals and vision, close relationships between work colleagues, cooperation between departments	Kim, Kim, Park, Lee & Jee, 2012 Terry, Kim, Lee, Paek & Lee, 2013 Dai, Mao, Zhao & Mattila, 2015	(+) (+) (+)
<b>Direct distribution channels</b>	Online marketing, direct mail, mobile marketing, call-centres	Rudež & Mihalič, 2007	(+)
<b>Information technology (IT)</b>	IT for front-office and bookings, databases, management information system, customer relationship management applications	Rudež & Mihalič, 2007 Sirirak, Islam & Ba Khang, 2011 Mihalič & Buhalis, 2013 Oltean, Gabor and ConJiu, 2014 Mihalič, Garbin Praničević & Arnerić, 2015 Melián-González & Bulchand-Gidumal, 2016	(+) (+) (/) (/) (+) (+)
<b>Organisational structure</b>	Type of structure: mechanistic, organic	Jogaratnam & Ching-Yick Tse, 2006 Øgaard, Marnburg & Larsen, 2008 Tavitiyaman, Qiu Zhang & Qu, 2012	(/) (/) (/)

<b>Corporate governance</b>	Ownership structure, board, CEO or general manager's characteristics	Knežević Cvelbar & Mihalič, 2007 Assaf & Cvelbar, 2011 Xiao, O'Neill & Mattila, 2012 Jarboui, Guetat & Boujelbéne, 2015	(+) (+) (+) (+)
<b>Basic environmental practices</b>	Ecological product usage, reduction in the use of dangerous products, energy and water saving practices, selective waste collection	Molina-Azorin, Claver-Cortés, Pereira-Moliner & Tari, 2009 Tari, Claver-Cortés, Pereira-Moliner & Molina-Azorin, 2010 Pereira-Moliner, Claver-Cortés, Molina-Azorin & Tari, 2012	(+) (+) (+)
<b>Advanced environmental practices</b>	Employee environmental trainings and initiatives, ecological marketing campaigns and events, long-term environmental policies and goals	Molina-Azorin, Claver-Cortés, Pereira-Moliner & Tari, 2009 Tari, Claver-Cortés, Pereira-Moliner & Molina-Azorin, 2010 Pereira-Moliner, Claver-Cortés, Molina-Azorin & Tari, 2012 Leonidou, Leonidou, Fotiadis & Zeriti, 2013	(+) (+) (+) (+)
<b>Corporate social responsibility (CSR) practices</b>	CRS values, hiring locals, ethnical and overseas employees, environmental savings (recycling, reducing energy costs, reusing towels, linen etc.)	Kang, Lee & Huh, 2010 De Grosbois, 2012 Garay & Font, 2012 Assaf & Josiassen & Cvelbar, 2012 Benavides-Velasco, Quintana-Garcia & Marchante-Lara, 2014 Fu, Ye & Law, 2014	(/) (/) (+) (+) (+) (+)
<b>Drivers based on capabilities</b>			
<b>Relationships with commercial and other partners</b>	Relations with customers, suppliers and other partners	Rudež & Mihalič, 2007 Kim, Kim, Park, Lee & Jee, 2012	(+) (+)
<b>Business processes</b>	Hotel standards and procedures, service performance, customer complaint solving procedures, innovative ideas, continuous process improvement	Rudež & Mihalič, 2007 Claver-Cortés, Pereira-Moliner, Tari & Molina-Azorin, 2008 Wang, Chen & Chen, 2012 Benavides-Velasco, Quintana-Garcia & Merchante-Lara, 2014	(+) (+) (+) (+)
<b>Knowledge sharing</b>	Knowledge sharing between teams, willingness to learn and help others	Sristava, Bartol & Locke, 2006 Hu, Horng & Sun, 2009 Terry, Kim, Lee, Paek & Lee, 2013 Hussain, Konar & Ali, 2016	(+) (+) (+) (+)
<b>Market orientation</b>	Orientation to customers, competitors, seeking profitable customers and products, responsiveness to market changes	Gray, Matear & Matheson, 2000 Matear, Osborne, Garrett & Gray, 2002 Barros & Dieke, 2008 Assaf & Cvelbar, 2011 Wang, Chen & Chen, 2012 Josiassen & Assaf & Knežević Cvelbar, 2014 Vega-Vázquez, Cossio-Silva & Revilla-Camacho, 2016	(+) (+) (+) (+) (/) (+) (+)
<b>Entrepreneurial orientation</b>	Innovativeness, risk-taking, pro-activeness, autonomy	Jogarathnam & Ching-Yick Tse, 2006 Vega-Vázquez, Cossio-Silva and Revilla-Camacho, 2016 Hernández-Perlines, 2016	(+) (+) (+)

(+) – positive impact on performance; (/) – positive impact on performance is not confirmed.

### 3. METHODOLOGY

So far, literature identified many drivers of hotel success. However, very few of them attempted to determine the relevant competitive advantages in the hospitality industry. This paper is therefore addressing this important question. Qualitative research, i.e. the Delphi survey, was used to that end. The Delphi survey is a group research technique that collects opinions of anonymous experts from a certain area and transforms them through a series of rounds into a common group consensus (McKenna, 1994). Anonymous group experts receive a questionnaire in each round, complete it and send it back to the group facilitator. The facilitator collects all questionnaires, summarizes the answers and sends them back to the members of the group. The members again reconsider their answers based on the summarized group answers from the previous round and complete the questionnaire once again. The rounds finish when there is no further progress in the opinions of experts that would change the group's common result. The main limitation of the Delphi method is the subjective evaluation of the respondents and impact of the panel on respondent opinion (respondent could evaluate a specific item higher or lower in the second or third round based on the results from the previous round of research). Delphi is also narrowly applicable to few specific setting, usually in the case when policy recommendation has to be set. This was our case, where we needed guidance on defining relevant drivers of performance in hospitality industry. This method is also very lengthy and complex to conduct.

In our case, the panel included 10 hospitality experts from Slovenia and Croatia. The group of experts was carefully selected to include three hotel managers, three hotel general managers and four representatives of academia, all with profound knowledge and great interest in hotel performance. The panel experts' general characteristics are presented in Table 2 below.

Table 2: *Respondents' characteristics*

Respondent	Position	Experience in the industry	Age	Gender	Country of origin
No. 1	Hospitality & Tourism Professor	25	55	female	Slovenia
No. 2	CEO	11	36	male	Slovenia
No. 3	Hospitality & Tourism Professor	22	46	female	Croatia
No. 4	CEO	12	39	male	Slovenia
No. 5	Hospitality & Tourism Professor	19	45	female	Slovenia
No. 6	Hotel Manager	27	53	male	Slovenia
No. 7	Hotel Manager	15	35	female	Slovenia
No. 8	CEO	20	42	male	Croatia
No. 9	Hospitality & Tourism Professor	7	35	female	Croatia
No. 10	Hotel Manager	12	39	male	Croatia

The questionnaire was devised in-line with relevant literature. It included 30 recognised and significant drivers of hotel performance thus far investigated in hospitality research. The

panel members' role was to evaluate the importance of each driver of hotel performance on the scale of 1 to 7 (1 = not at all important impact, 7 = extremely important impact on hotel performance). They were also invited to contribute by providing their recommendations and proposing additional drivers of performance that were in their opinion neglected in hospitality research. Three rounds of evaluations were performed. In the third and final round the experts confirmed the results from the second round and did not offer new insights. The research took place from September to December 2016.

### 3. DELPHI ANALYSIS RESULTS

The analysis of the Delphi results requires a basic statistical analysis including mean averages, frequencies and ranking. The evaluations of the experts from round 1 are summarized in Table 3. The average scores are distributed between 6.3 (the highest average score) and 4.3 (the lowest average score). The drivers that were found to have the strongest impact on hotel performance were: location, market orientation, service quality (average score of 6.3) as well as customer satisfaction and business processes (average score of 6.1). The drivers with the lowest level of importance on hotel performance appeared to be advanced and basic environmental practices, organisational structure and organisational culture (all received an average score of 4.8 or less). The experts suggested that product development, cooperation, investment management and flexibility should also be considered as important drivers of hotel performance. All four additional drivers were included in round 2 of panel evaluation. The results of round 1 of the Delphi study are presented in Table 3.

Table 3: *Delphi round 1 results*

Indicator	Mean values	% of respondents that rated the importance as high (scores 6 or 7)	% of respondents that rated the importance as moderate or neutral (scores 5, 4 or 3)	% of respondents that rated the importance as low or insignificant (scores 2, 1 or 0)
Location	6.3	80%	20%	0%
Market orientation	6.3	80%	20%	0%
Service quality	6.3	80%	20%	0%
Customer satisfaction	6.1	80%	20%	0%
Business processes	6.1	70%	30%	0%
Management philosophy	6.0	70%	30%	0%
Managerial competencies	5.9	70%	30%	0%
Employee competencies	5.9	70%	30%	0%
Hotel facilities	5.7	50%	50%	0%
Information Technology (IT)	5.7	50%	50%	0%
Human resource management practices (HRM)	5.6	60%	40%	0%
Knowledge sharing	5.6	50%	50%	0%

Social capital	5.6	50%	50%	0%
Employee attitudes towards work	5.6	50%	50%	0%
Relationship with commercial parties and other partners	5.5	50%	50%	0%
Team culture	5.5	50%	50%	0%
Corporate governance	5.3	70%	30%	0%
Employee satisfaction	5.3	40%	60%	0%
Employee innovativeness	5.2	50%	50%	0%
Entrepreneurial orientation	5.2	40%	60%	0%
Customer loyalty	5.2	40%	60%	0%
Employee loyalty	5.1	30%	70%	0%
Direct distribution channels	5.0	50%	40%	10%
Financial assets	5.0	40%	60%	0%
Brand equity	4.9	30%	70%	0%
Corporate social responsibility practices (CSR)	4.9	20%	80%	0%
Organisational culture	4.8	40%	50%	10%
Basic environmental practices	4.5	30%	70%	0%
Organisational structure	4.5	30%	70%	0%
Advanced environmental practices	4.3	10%	80%	10%

The results from round 1 presented the inputs for round 2. A total of 16 drivers of performance with the highest average score from round 1 and additional 4 drivers that were suggested from the panel of experts were included in the questionnaire. The results from the round 2 showed that the drivers with higher average scores were almost the same as in round 1. They included: location (6.4), market orientation (6.4) and customer satisfaction (6.3). Moreover, 80% of the panel experts also rated service quality (6.2), business processes (6.0) and employee competencies (6.0) as important or highly important performance drivers. Employee competencies were in round 2 evaluated higher than in round 1; they also outweighed the importance of management philosophy and competencies. Additionally proposed drivers in the phase 1 of this research: product development, cooperation and flexibility were all rated with an average score of 6.0 or higher (those are marked bold in table 4 and 5). Round 2 of Delphi yielded 20 performance drivers presented in Table 4.

Table 4: *Delphi round 2 results*

Indicator	Mean values	% of respondents that rated the importance as high (scores 6 or 7)	% of respondents that rated the importance as moderate or neutral (scores 5, 4 or 3)	% of respondents that rated the importance as low or insignificant (scores 2, 1 or 0)
Location	6.4	90%	10%	0%
Market orientation	6.4	90%	10%	0%
<b>Product development</b>	6.3	90%	10%	0%
Customer satisfaction	6.3	80%	20%	0%
Service quality	6.2	80%	20%	0%
<b>Flexibility</b>	6.1	80%	20%	0%
Business processes	6.0	80%	20%	0%
Employee competencies	6.0	70%	30%	0%
<b>Cooperation between tourism providers on and between destinations</b>	6.0	70%	30%	0%
Management philosophy	5.9	80%	20%	0%
Managerial competencies	5.9	70%	30%	0%
HRM practices	5.8	70%	30%	0%
Hotel facilities	5.8	60%	40%	0%
Employee attitudes toward work	5.8	60%	40%	0%
Information technology (IT)	5.7	60%	40%	0%
Investment management	5.6	70%	30%	0%
Knowledge sharing	5.6	60%	40%	0%
Relationship with commercial and other partners	5.5	60%	40%	0%
Social capital	5.5	50%	50%	0%
Team culture	5.4	50%	50%	0%

Source: own research.

The process was repeated in round 3. The questionnaire was sent to the panel of experts for another round of evaluation. They were once again asked to evaluate the importance of each driver of hotel performance. In round 3, only location received higher scores (average score of 6.5) and became the most important driver of hotel performance according to the panel of experts. The evaluation showed that the final list was reduced to feature only nine major drivers of hotel performance. Those drivers consistently received the highest scores from the expert panel. They include: location, market orientation, customer satisfaction, product development, service quality, flexibility, business processes, employee competencies, and cooperation. The results from round 3 of expert evaluation are presented in Table 5.

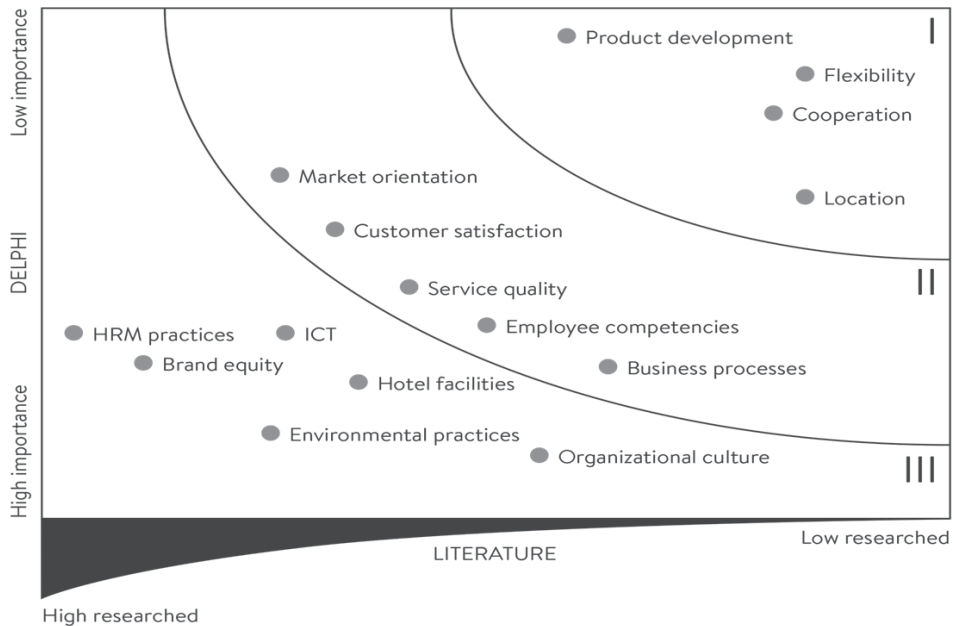
Table 5: *Final Delphi results – round 3*

Indicator	Mean Values	% of respondents that rated the importance as high (scores 6 or 7)	% of respondents that rated the importance as moderate or neutral (scores 5, 4 or 3)	% of respondents that rated the importance as low or insignificant (scores 2, 1 or 0)
Location	6.5	90%	10%	0%
Market orientation	6.4	90%	10%	0%
Customer satisfaction	6.3	80%	20%	0%
<b>Product development</b>	6.3	90%	10%	0%
Service quality	6.2	80%	20%	0%
<b>Flexibility</b>	6.1	80%	20%	0%
Business processes	6.0	80%	20%	0%
Employee competencies	6.0	70%	30%	0%
<b>Cooperation between tourism providers on and between destinations</b>	6.0	70%	30%	0%

The results were compared with the literature analysis and the Delphi group results shown in Figure 1. The aim was to understand the following: which drivers are examined in relevant literature, but experts do not believe that they are important?; which drivers are recognised as important by experts, but are not getting sufficient attention in relevant literature?; and which drivers are recognised by experts and literature as crucial for hotel success? The results are presented in Figure 1. As visible in section III, the following drives received considerable interest in the literature: HRM practices, brand equity, hotel facilities, environmental practices, organisational culture, and ICT. However, the panel of experts did not recognise those as crucial drivers of hotel success. On the contrary – the panel of experts defined location, firm flexibility, product development and cooperation between tourism providers as crucial drivers of success – as seen in section I. Literature so far did failed to show much interest in those drivers of hotel success. Finally, market orientation, customer satisfaction, service quality and business processes were recognised by both literature and experts as important drivers of hotel success (section II).



Figure 1: Drivers of hotel performance through literature and the Delphi study



#### 4. DISCUSSION AND CONCLUSION

Hotel performance attracted substantial research attention in the past three decades. Most of the academic work focused on empirical investigation connecting sustainable competitive advantages with financial performance of hotels. Studies so far mainly focused on researching intangible assets (mostly organisational and human capital) and their relation with performance. In general, studies somehow neglected tangible assets and capabilities and their relation with performance. Tangible assets were considered as a prerequisite and necessary input for operations and its connection with performance was treated as obvious. In turn, capabilities were neglected because they are difficult to measure and operationalise in empirical studies.

Empirical research in many cases focused on specific drivers of hotel performance and investigated their impact on performance. Most of the studies did yield unexpected results. Tested drivers – sustainable competitive advantages – were translated into financial success of a firm. Most of the studies did not ask the question: which are the most relevant drivers of hotel performance? To this end, this paper is dealing with this question.

Qualitative research based on the Delphi method was performed on a panel of 10 experts in the hospitality industry. They evaluated 30 drivers of hotel performance that had been recognised in hospitality research. Three rounds of evaluation reduced the

list to nine most important drivers of performance in the hospitality industry by the opinion of the expert panel. The main drivers are: location, customer satisfaction, service quality, employee competencies, business processes, product development, cooperation, flexibility, and market orientation. Of those nine drivers, one is considered as tangible, three are intangible assets and five are capabilities. This is a quite different structure than the structure of the inputs for this research. Among 31 driver of performance, only three were tangible assets, 23 were intangible assets and five of them were capabilities.

Theoretical implication of this paper is in indicating the importance of capabilities and tangible assets as performance drivers in hotel industry. Literature was not critically assessing those performance drivers so far. Our guidelines for future research in this area are proposed in section five of this paper.

Managerial implication of this paper is focused, structured and clear communication of relevant performance drivers in hospitality industry. Drivers indicated in this research are areas in which future investments in financial and human capital are needed for sustainable growth and prosperity of the industry.

Limitations of this paper are that we have possibly missed some of the research papers in the field. We have studied available paper in the WoS database but body of knowledge is growing and we may overlook some of the work. In terms of method used the main limitation is the subjective evaluation of the respondents and possible impacts of the panel on respondent opinion. Delphi is also narrowly applicable to few specific setting, it is very lengthy and complex to conduct and results off course cannot be generalized.

## 5. FUTURE RESEARCH POTENTIAL

This paper sets the goals for future empirical research in understanding hotel performance. Crossing the literature with hospitality experts' opinions enabled to define potential gaps, which represent a future field of research and operationalisation. Further quantitative research using those concepts is needed in order to generalize the results and further contribute to the field of knowledge in this area. In addition, it would lead to a better understanding of hotel performance in emerging and developed hospitality markets.

General management theory is emphasizing the importance of capabilities as prominent performance drivers. The lack of empirical studies investigating the relation between capabilities and performance is evident. However, the results of this research show that hospitality experts believe that capabilities are potential sources of sustainable competitive advantages. Specifically, the panel of experts recognised dynamic capabilities as quite important. Those include a firm's ability to adjust to ongoing changes in the external environment. Adaptability of organisations as systems, their employees and managers is highly relevant in today's ever-changing world. As a result, dynamic capabilities constitute an important research area that should encourage a plethora of research in the future.

These research results and general overview of relevant literature underline the need for a shift in research efforts. Research literature improved the understanding of intangible assets and their role in driving the performance in hospitality industry. However, there is still limited information available about capabilities and their potential role as sustainable competitive advantages of a hotel. The development of measurement instruments enabling the evaluation of capabilities and the magnitude of their impact on performance is a potential future avenue in hospitality research. This paper indicated five potential areas of future research including business processes, product development, cooperation, flexibility and market orientation.

This paper also compare research efforts delivered in empirical papers measuring drivers of hotel performance with expert opinion on the importance of those drivers. This research identified a gap between the focus in literature and expert evaluations. Experts clearly emphasised the role of tangible assets in hotel performance. The hotel industry is capital intensive and investments in tourism infrastructure are seen as extremely important. The results may be driven by the current situation in the hotel sector in Slovenia and Croatia. The hospitality industry in both countries requires a significant investment cycle to improve its competitiveness on the global market. Furthermore, the experts argued that clear product development is a very important driver of hotel performance. So far, empirical research was not focusing on the product development and its impact on hotel performance. This is also one of potential lines of research indicating the operationalisation of the product development as a driver of success. Business processes related to the revolution in information communication are also recognised as highly important. Qualitative research indicated that it is necessary to address them as a business processes in relation to the customer – all digital communication, internal business processes between hotel employees, and possibly technological solutions that can improve the available tourism products. The panel of experts strongly emphasised market orientation and flexibility as important drivers of performance. Further operationalisation of those drivers is necessary in order to test them empirically.

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# THE INTERPLAY AMONG PROSOCIAL MOTIVATION, CULTURAL TIGHTNESS, AND UNCERTAINTY AVOIDANCE IN PREDICTING KNOWLEDGE HIDING

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**ABSTRACT:** *In this paper, we examine the socio-cultural aspects of knowledge hiding. Specifically, we aim to deepen the understanding regarding the role that national cultural dimensions and motivation play in stimulating or preventing knowledge hiding. We investigate a three-way interaction among prosocial motivation, cultural tightness, and uncertainty avoidance to explain knowledge hiding in organizations. Our field studies involved working professionals from Slovenia (n = 123) and China (n = 253). Results show that the highest level of knowledge hiding happens when employees are met with a combination of a low level of prosocial motivation, a low level of cultural tightness, and a low level of uncertainty avoidance. The highest levels of knowledge hiding thus occur when employees are not motivated by the welfare of others, are inclined to take the risk and simultaneously perceive that deviation from cultural norms will not be sanctioned. We discuss the contributions and implications of our two studies for the fields of knowledge hiding and cross-cultural organizational behavior.*

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**Keywords:** *prosocial motivation, cultural tightness-looseness, uncertainty avoidance, knowledge hiding*

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## INTRODUCTION

Knowledge hiding is an emerging construct that is quickly gaining ground in contemporary research. This construct presents treatment as an interpersonal phenomenon (Connelly et al., 2012) and it has been recognized as a pressing matter in the workplace (Cui, Park, & Paik, 2016; Černe, Nerstad, Dysvik, & Škerlavaj, 2014). Interpersonal distrust and poor relationships in the workplace positively influence knowledge hiding. Moreover, knowledge hiding harms interpersonal relationships (Connelly et al., 2014), increases

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distrust (Černe et al., 2014; Grant & Sumanth, 2009; Oye, Salleh. & Noorminshah, 2011), diminishes creativity (Černe et al., 2014) and innovative work behavior (Černe et al., 2017), causes lower level of motivation (Oye et al., 2011), and creativity (Connelly et al., 2012; Černe et al., 2014).

Based on the previous research, we learned that prosocial motivation is a significant predictor of knowledge hiding (Černe et al., 2014; Černe, Babič, Connelly. & Škerlavaj, 2015). However, boundary conditions of the relationship between prosocial motivation and knowledge hiding (Connelly et al., 2012; Grant, 2007) remain largely unexplored. It is important to be aware of the outputs and consequences that this relationship could bring out. Prosocial motivation protects and promotes the well-being of others, so it should play an important role in predicting knowledge hiding (Batson, 1987). It refers to a desire to help others (Ardichvili, Page. & Wentling, 2003; Batson, 2010; Miller, 1994). Based on that knowledge, we focus on how prosocial motivation (Bolino & Grant, 2016; Grant, 2007), in connection with national cultural dimensions of tightness-looseness and uncertainty avoidance (Gelfand, Erez. & Aycan, 2007; Tsui, Nifadkar. & Ou, 2007), influences knowledge hiding. Even though in our research we combined two compatible cultural dimensions, there are some important differences between them. With cultural tightness, we measure the strength or intensity, and with uncertainty avoidance, we measure the content of national culture. The difference is also that uncertainty avoidance is a cultural dimension that deals with a society's tolerance for uncertainty and ambiguity (Hofstede, 1983a). On the other hand, cultural tightness is a construct that presents the strength of social norms and degree of sanctioning within societies (Gelfand, Nishii. & Raver, 2006). Cultural tightness is a broader construct than uncertainty avoidance; although cultures could be tight, not all tight cultures are uncertainty-avoidance oriented.

Today, organizations work globally and it is crucial to learn about the cultural context to reduce misunderstanding and inappropriate behavior in advance (Johnson, Lenartowicz. & Apud, 2006). Organizations need to be aware that each culture has its own norms, values, and official rules that influence work behavior (Aktas, Gelfand. & Hanges, 2015; Chua, Roth. & Lemoine, 2015; Gelfand et al., 2007; Gelfand, Nishii. & Raver, 2006). The extant research shows that work behavior is influenced by various cultural norms (Chua et al., 2015; Pan. & Zhang, 2014). Cultural tightness and uncertainty avoidance have already been demonstrated to have a significant influence on organizational behavior (Fischer, Ferreira, Leal, Redford. & Harb, 2005; Gelfand et al., 2007; Liu, Jiang, Shalley, Keem. & Zhou, 2016). Uncertainty avoidance, one of the core Hofstede's cultural dimensions, is defined as the extent to which the members of a culture feel threatened by ambiguous or unknown situations, and holds important research opportunities (Doney, Cannon. & Mullen, 1998; Litvin, Crotts. & Hefner, 2004).

We included the construct of uncertainty avoidance in our research because it is correlated with the construct of cultural tightness (Chua et al., 2015). Cultural tightness essentially represents strengths of cultural norms. Cultural tightness is related with uncertainty avoidance, because both constructs describe strong rules, norms, and sanctions for inappropriate behavior (Chan, 1996; Gelfand et al., 2006; Gelfand, Lim. & Raver, 2004;

Toh & Leonardelli, 2013; Triandis, 1977; Triandis, 1998; Triandis, 2000). Based on previous research (Černe et al., 2015), we have learned that implication of many rules and sanctions could prevent knowledge hiding. In fact, it was found that a three-way interaction term between low prosocial motivation, low cultural tightness, and low collectivism caused the occurrences of knowledge hiding at higher levels - more often, frequently and with a higher chance (Černe et al., 2015).

Therefore, a connection between the constructs of uncertainty avoidance and cultural tightness exists based on their common characteristics (i.e., with regard to their settled rules and their lack of deviation from those rules). In this study, we propose that knowledge hiding is conditioned by prosocial motivation, cultural tightness, and with uncertainty avoidance. The three-way interaction term in a combination of the researched constructs showed the importance of the effect of socio-cultural aspects on knowledge hiding. Uncertainty avoidance means avoiding criticism, negative feedback, and conflict. Avoiding challenges carries the risk of errors and failure. When we are facing low uncertainty avoidance (Shane, 1995; Wennekers, Thurik, van Stel. & Noorderhaven, 2007) this increases the negative way of behavior (Lewicki, McAllister. & Bies, 1998; Tsai, 2002) within an organization. With our study, we empirically demonstrate that managers need to be aware of the occurrences of the combination of low levels of prosocial motivation, low cultural tightness, and low levels of uncertainty avoidance, which leads to knowledge hiding at the highest level. Moreover, managers need to pay special attention, if knowledge hiding occurs among their employees. They should be aware when a combination of three-way interaction term occurs within their organization.

This paper intends to contribute to the field of knowledge hiding. We studied two samples of working professionals, from two distinctly different settings - China and Slovenia, to increase the generalizability of findings. To predict knowledge hiding, we considered the type of culture using uncertainty avoidance and cultural tightness. Second, this study intends to contribute to cross-cultural organizational behavior research. We demonstrated the importance of combining various socio-cultural aspects using a three-way interaction term, and we connected cultural tightness (i.e., the strength) to uncertainty avoidance (i.e., the content). Previously, this combined approach, using two theoretical frameworks focused on national cultures, has been underexplored (Gelfand et al., 2007; Tsui et al., 2007).

Furthermore, in our research, we focused on variations within cultural dimensions from the individual-level assessments at the micro level (Brewer & Venaik, 2014; Taras, Steel. & Kirkman, 2016; Tsui et al., 2007). Variations in cultural values were found to mainly occur within countries and much less across, as a meta-analysis showed. Taras et al. (2016) gathered all the Hofstede-typology based studies to demonstrate that 80% of variance occurs on between-person level, and only 20% among different countries. When studying culture and values, individual perceptions are thus a stronger placeholder for cultural dimensions than countries are.

## THEORY AND HYPOTHESES

### Knowledge hiding

Knowledge hiding is defined as an intentional attempt to conceal or withhold information that others have requested (Connelly et al., 2012). It (Connelly, 2012 #713) occurs when an employee receives a request for knowledge, but actively conceals or withholds that knowledge. This definition specifically excludes cases in which employees fail to share knowledge due to mistakes, accidents, or ignorance, as well as cases when they simply do not have the requested knowledge. Prior research describes three facets of knowledge hiding, which are: playing dumb (i.e., an individual pretends not to know the relevant information), evasive hiding, (i.e., individual pretends that the information will be forthcoming even as he or she intends to conceal it) and rationalized hiding (individual provides an accurate explanation to explain why the information will not be forthcoming) (Connelly et al., 2012).

Knowledge hiding, not simply the opposite of knowledge sharing (Connelly et al., 2012), includes intentional refusals to share in response to requests. Up to this date, knowledge hiding remains a novel and unexplored phenomenon. An example of knowledge hiding is when an employee receives a request for knowledge and this employee engages in activities designed to conceal the requested knowledge (Connelly et al., 2012). In other words, employees who possess knowledge decline to share it without the expectation of reciprocity (Davenport & Prusak, 1998).

### Prosocial motivation and knowledge hiding

We included the construct of prosocial motivation as a crucial social predictor of knowledge hiding. Prosocial motivation represents a desire to expend effort based on a concern for helping or contributing to other people (Grant, 2007). Prosocially motivated employees are more likely to foster cooperative behavior with their colleagues in teams (Bolino & Grant, 2016; Hu & Liden, 2015). These employees have a high chance of being treated like good and trusted employees. However, these employees could also be exploited by free-riders (Lenway & Rehbein, 1991). Prosocially motivated employees appreciate values, norms, and a positive workplace climate (Ardila, Gouveia, & Diógenes de Medeiros, 2012; Schwartz, 2007; Škerlavaj, Connelly, Černe, & Dysvik, In press). People without social empathy engage in knowledge hiding (Cui, Park, & Paik, 2016). In previous studies, researchers have indicated that prosocial motivation is potentially negatively related to knowledge hiding (Černe et al., 2015).

The research of combination of two constructs prosocial motivation and knowledge hiding is novel. Actually, Černe et al. (2015) were the first ones who were interested in examining this relationship, and supported the fact that prosocial motivation negatively influences knowledge hiding (Černe et al., 2015). Previous research of this link (Černe et al., 2015) was made based on two studies, but with a lower sample (Study 1:  $n = 115$ ; Study

2:  $n = 313$ ). The present study on a larger sample, with more participants from different cultures, replicates and strengthens previous research findings. Therefore, we used the following hypothesis as a basis for further hypothesized interactions:

*Hypothesis 1: Prosocial motivation is negatively related to knowledge hiding.*

### **Cross-cultural knowledge hiding**

In our research, we have focused on the study of cross-cultural aspects in knowledge hiding, especially on how culture could influence behavior within an organization. We have used respondents from two countries and measured their personal cultural tightness and uncertainty avoidance. As many companies operate globally (Williams, Han, & Qualls, 1998), cross-cultural research is gaining important value (Berry, 2002; Hui & Triandis, 1986). Taras, Steel, and Kirkman (2016) found that over 80% of the variations in cultural values were found within countries and less than 20% were found between countries. Therefore, it is important to study each culture separately, to learn which types of behavior and which personal characteristics prevail within each culture (Taras et al., 2016).

Nevertheless, knowledge hiding among employees remains a problem. When employees experience knowledge hiding behavior from their coworkers (Connelly et al., 2012), this leads to a lack of trust and to a bad working environment. Regardless of cultural characteristics, leaders are those who should support knowledge-sharing environment within an organization (Connelly & Kelloway, 2003; De Vries, Bakker-Pieper, & Oostenveld, 2010). In other words, irrespective of the national culture in which an organization exists, leaders and followers should create their own organizational culture (Al-Alawi, Al-Marzooqi, & Mohammed, 2007; Davenport & Prusak, 1998; Oye et al., 2011; Suppiah & Singh Sandhu, 2011). Based on this, cultural aspects are tightly related to organizational behavior. Researchers proved that there is an influence of cultural individualism-collectivism, self-construal, and individual values on communication styles across cultures (Gudykunst, Matsumoto, Ting-Toomey, Nishida, Kim, & Heyman, 1996). In addition, it depends on the cultural aspects of organizational behavior whether individuals will be prepared to share or instead hide their knowledge (Brock, Zmud, Kim, & Lee, 2005).

### **Two-way interaction: Cultural tightness-looseness and uncertainty avoidance predicting knowledge hiding**

In the following, we describe both researched constructs studied in our two-way interaction term research. Firstly, we present the cultural tightness characteristics and how this could influence knowledge hiding. Secondly, we present uncertainty avoidance characteristic and its influence on knowledge hiding. After this, we combined two researched constructs in a two-way interaction term of cultural tightness and uncertainty avoidance predicting knowledge hiding.

### **Cultural tightness-looseness and knowledge hiding**

The prevailing norms of a national culture could influence knowledge hiding. Norms are shared beliefs and expectations of what behavior is appropriate within a culture (Cialdini, Kallgren, & Reno, 1991). Culture is an expression of deeper norms and values in a society. It cannot be directly seen and is quite difficult to identify (Trompenaars & Hampden-Turner, 2011). Observing the particularities of a culture means studying that culture on the individual level (Earley & Mosakowski, 2000; McSweeney, 2002; Salk & Brannen, 2000). Due to the fact that cultural differences are found to occur within a country (Taras et al., 2012), this tells us that it should be studied at the individual level.

Pelto (1968) was the first to divide cultures into tight and loose societies based on their social norms. Cultural norms, values, and cultural differences influence organizational behavior, especially when individuals work in teams (Cox, Lobel, & McLeod, 1991). Cultural tightness is defined as a construct with strong social norms and sanctions for inappropriate behavior (Gelfand et al., 2006; Toh & Leonardelli, 2013; Triandis, 1977; Triandis & Gelfand, 1998). Social norms and sanctions highly influence the behavior of individuals within organizations (Gelfand et al., 2006). Tight societies have clearly defined norms, values, rules, and require strict discipline (Chua et al., 2015; Gelfand et al., 2006; Shin, Hasse, & Schotter, 2015). Examples of tight cultures are the Japanese, Indian, and Hutterite societies (Pelto, 1968).

Chua and colleagues (2015) defined loose cultures as those that have the opposite characteristics of tight cultures. A loose culture lacks discipline, formality, and regimentation, and it has a high tolerance for deviant behavior (Pelto, 1968). Examples of loose cultures are the Finnish and Thai societies (Pelto, 1968). Individuals who possess the requested knowledge have the power, and they decide if they are prepared to share or hide the requested knowledge (Nonaka, 1994). The general characteristics of a culture reveal how people behave overall (Avolio & Bass, 1995; Berry, 1995). Based on the above characteristics, it is expected that cultural tightness could be negatively related to knowledge hiding.

### **Uncertainty avoidance and knowledge hiding**

Hofstede (1980a; 2011) introduced a model of six dimensions of national culture (i.e., individualism or collectivism, power distance, uncertainty avoidance, masculinity or femininity, long term or short term orientation, and indulgence or restraint) to describe the values of people within particular cultures. These six cultural dimensions (Hofstede, 2011) can be used to describe cultural differences, which prevail in a national culture. According to a literature review, one of six cultural dimensions (i.e., uncertainty avoidance) remains largely unexplored (Conner, Reardon, Miller, Salciuviene, & Auruskeviciene, 2017; Hofstede, 2011; Javidan, House, Dorfman, Hanges, & De Luque, 2006; Johnson, Kulesa, Cho, & Shavitt, 2005; Taras et al., 2012).

Countries that exhibit strong uncertainty avoidance are intolerant of inappropriate behavior and ideas. People in cultures with high uncertainty avoidance tend to behave more rationally (Doney, Cannon. & Mullen, 1998; Hofstede, Hofstede. & Minkov 1991; Litvin, Crotts. & Hefner, 2004). The society will try to control the future or just behave in the “let it happen” manner (Hofstede, Hofstede. & Minkov 1991). Hofstede (1983a) described cultures with high uncertainty avoidance as those that strive to have formal and official rules. For these cultures, opposition to rules creates stress. Rules in national culture present feelings of security by helping people to avoid the unfamiliar. Individuals that perceive their cultures as uncertainty avoidant do not want to take risks; they prefer familiar situations (Hofstede, 1983a). Uncertainty avoidance can be understood as a country-level characteristic that affects the appraisal of stressors at the individual level (Debus, Probst, König. & Kleinmann, 2012; Hofstede, 2001). It reflects the extent to which ambiguous situations are considered threatening within a society (Hofstede, 2001).

Previous studies have shown that uncertainty avoidance is a cultural value that explains the variations in national rates of innovation (Shane, 1993). Additionally, uncertainty avoidance is associated with certainty and predictability (Steers, Meyer. & Sanchez-Runde, 2008). Shane (1993) has also shown that national culture influences activity in development and research. Using similar lenses but different foci, researchers have shown that those employees in cultures that have high levels of uncertainty avoidance feel that everything should be clear and organized in advance (Chua et al., 2015; Gelfand et al., 2007; Hofstede, 1980a; Hofstede, 1980b; Pelto, 1968).

Wennekers, Thurik, Van Stel, and Noorderhaven (2007) conducted a study over three years and found important correlations between uncertainty avoidance and some other important economic constructs (i.e., risk, entrepreneurship, GDP per capita). Researchers have also found some good examples of cultures with high levels of uncertainty avoidance: Russia, Korea, Belgium, and Italy (Hofstede, 1993). On the opposite side, there are cultures with low levels of uncertainty avoidance. These cultures have few rules and relatively little structure or stress. Examples of low uncertainty-avoidance countries are India, Indonesia, Singapore, and the United Kingdom (Hofstede, 1993).

In this study, we focus on studying the effect of the national cultural dimension of uncertainty avoidance on knowledge hiding. Researchers have shown that, in high uncertainty avoidance countries, employees accept roles and are innovative, rational, and organized (Chua et al., 2015; Gelfand et al., 2007). Based on these characteristics of uncertainty avoidance, we learn that many cultural values can influence individuals' lives. Furthermore, cultural values also influence whether a person may be prepared to share his or her knowledge. Moreover, sharing of knowledge is especially needed in industry, especially for information technology firms, laboratories, newly opened or start-up firms etc. (Hall & Saias, 1980; Waters, 1980). Moreover, it was researched that knowledge sharing leads to higher levels of creativity and innovation (Damanpour & Aravind, 2012). In these cases, employees who do not want to share the requested knowledge would be considered as inappropriate and unwanted. In particular, hiding knowledge from coworkers is unfair toward those who strive for the success of the whole organization.

Regarding the mentioned, countries that have high levels of uncertainty avoidance, have specific rules and strict norms with sanctions, and they strive to prevent negative behavior (i.e., knowledge hiding).

### **Combination of cultural tightness and uncertainty avoidance predicting knowledge hiding**

The construct of cultural tightness-looseness was established in the 1960s; however, it is still an underexplored construct with some open research questions. Until now, researchers have still not focused enough on understanding whether cultural tightness-looseness can have a determining influence on knowledge hiding or not. Moreover, our combined approach—using the interaction of two national cultural dimensions, cultural tightness, and uncertainty avoidance—has not been explored together (Gelfand et al., 2007; Tsui et al., 2007).

Both of the researched constructs, cultural tightness, and uncertainty avoidance, share common characteristics about strict rules, norms, and values, as well as strong discipline and sanctions for deviant behavior (Chua et al., 2015; Gelfand et al., 2006). However, there are also differences; as an example, cultural tightness relates to cultural strength or intensity, whereas uncertainty avoidance focuses on cultural content. The main reason that tight cultures need strongly defined rules is the presence of human-made social threats in those nations. Employees who have clearly defined rules and norms (i.e., tightness) do not want to take risks to break up those rules (i.e., uncertainty avoidance).

The characteristics of these two constructs are intertwined, and an organization needs to settle them so that employees can follow the written rules. With clearly defined rules and norms, these cultures encourage their populations to behave in an expected way. With strict norms, these cultures can control their populations and coordinate their social actions to ensure survival. For organizations in which rules and sanctions prevail, the sharing of knowledge and information is an encouraging way of behavior. When negative behavior (i.e., knowledge hiding) occurs, it is immediately sanctioned by their leaders or superiors.

The combination of uncertainty avoidance and cultural tightness stimulates positive elements of organizational behavior (Hofstede, 1980a). When the organization does not ensure properly designed rules (i.e., when it has low cultural tightness), people might take risks (i.e., low uncertainty avoidance) and could sometimes break the rules without suffering any sanctions; thus, a high level of knowledge hiding could occur. The term “high level” means that this leads to greater occurrences of knowledge hiding. In other words, a high level of knowledge hiding could occur when an organization has a low level of both cultural tightness and uncertainty avoidance. For that reason, we expect that employees with high levels of both uncertainty avoidance and cultural tightness could prevent high levels of knowledge hiding from occurring. Hence, we propose the following hypothesis:  
*Hypothesis 2. Interaction of cultural tightness and uncertainty avoidance is associated with lower levels of knowledge hiding.*



### **Three-way interaction: Prosocial motivation, cultural tightness and uncertainty avoidance predicting knowledge hiding**

In this part, we focus on how the three previously proposed constructs jointly predict the occurrence of knowledge hiding. The combination of cultural tightness and uncertainty avoidance, in connection with prosocial motivation, could prevent knowledge hiding. The suggested way of behavior could support positive behavior. Previous research has shown that prosocial motivation negatively influences knowledge hiding because of the accompanying desire to help others (Černe et al., 2015).

The second and third researched constructs (i.e. cultural tightness and uncertainty avoidance) share some characteristics. Both constructs focus on culture; both support norms and strict rules with sanctions; and both strive to keep everything in order (Aktas et al., 2015; Chan, 1996; Zhang & Zhou, 2014). Furthermore, cultural tightness and uncertainty avoidance support control and require the organization to avoid doubts. Connecting cultural tightness and uncertainty avoidance with prosocial motivation results in an organization's preferred types of behavior. If an organization implements the suggested three-way interaction of prosocial motivation, cultural tightness, and uncertainty avoidance, it could prevent knowledge hiding. Because both of this combination's cultural constructs have strict rules and both appropriately sanction any unexpected or deviant behavior, such as knowledge hiding (Chua et al., 2015). The suggested three-way interactions can help an organization to establish appropriate behavior.

More precisely, all three researched constructs describe types of individual behavior that are focused on group benefits, motivation to help others, and caring about the common good (Chen et al., 1998; Kagitcibasi, 1997). Each of the constructs plays a positive role in stimulating beneficial organizational-behavior outcomes (cf. Chua et al., 2015; Gelfand et al., 2006; Gelfand et al., 2007; Grant, 2007). We join all three constructs—prosocial motivation, cultural tightness, and uncertainty avoidance—based on individual perceptions in form of a three-way interaction term. Previous studies of Grant (2007), Gelfand et al. (2006, 2007), and Chua with colleagues (2015) found that each of the researched constructs has a positive influence on organizational behavior. Therefore, this term can be expected to have an even stronger effect on appropriate behavior within the organization. The three-way interaction, supporting positive behavior, could prevent knowledge hiding in organizations. To achieve this aim, the organization should ensure that they have high levels of prosocial motivation, cultural tightness, and uncertainty avoidance.

When an organization has low levels of prosocial motivation, low cultural tightness, and low uncertainty avoidance, it has a high potential for knowledge hiding at the highest level in the organization. This happens when uncertainty avoidance and cultural tightness are low; in this situation, individuals have no specific rules regarding appropriate behavior (Taras et al., 2012). Moreover, knowledge hiding happens when norms and sanctions are not provided and when negative behavior is not appropriately sanctioned. In such organizations, individuals are interested in achieving their personal needs, not the organization's needs (Chen et al., 1998; Kagitcibasi, 1997). Individuals, who value

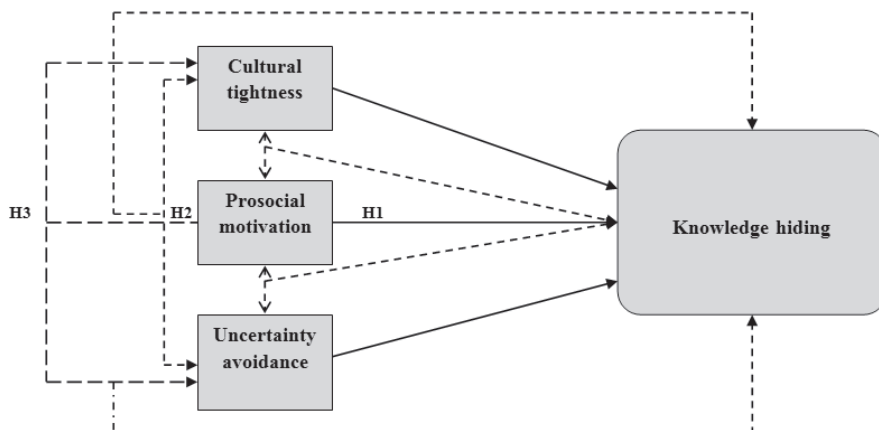
competitive advantages, hide their knowledge to protect their individual value (Černecký et al., 2014). For those employees whose knowledge represents a competitive advantage (Milne, 2007; Polanyi, 1997) the knowledge hiding is expected.

Moreover, when individuals have low levels of prosocial motivation, their actions do not benefit others. Those employees prioritize only their own needs and willingness (Grant, 2007). Organizational leaders (Aktas et al., 2015) should aim to provide a three-way interaction to prevent knowledge hiding in advance. If an organization will not support prosocial motivation, will not be uncertainty-avoidance-oriented, and will not have rules or sanctions provided by cultural tightness, it can expect high levels of knowledge hiding among its employees. In the light of the above, we propose the following hypothesis:

*Hypothesis 3. A three-way interaction among prosocial motivation, cultural tightness, and uncertainty avoidance is associated with lower levels of knowledge hiding.*

The conceptual model with hypotheses is presented in Figure 1. The explanation of the figure is as follows. Regarding that prosocial motivation is a desire to help or contribute to other people (Grant, 2007), we hypothesized that it could negatively influence knowledge hiding. Therefore, we have designed hypothesis 1, stating that prosocial motivation is negatively related to knowledge hiding. The hypothesis 1 is present in Figure 1, marked with H1, with its direct effect on knowledge hiding. To continue with the explanation, cultural tightness is the construct with strong social norms, rules, and sanctions for inappropriate behavior. It is closely linked with uncertainty avoidance, which represents intolerance for ambiguity and uncertainty from formal rules. Therefore, we combined these two national cultural dimensions into a two-way interaction with a hypothesis that low levels of a combination of cultural tightness and uncertainty avoidance lead to the emergence of a high level of knowledge hiding. We marked this two-way interaction with H2. The last and the most important three-way interaction is marked with H3, dealing with a combined influence of all three constructs on knowledge hiding.

Figure 1: *The conceptual model of the hypotheses regarding the three-way interactions*



## METHODS

To test our hypotheses regarding how the three-way interaction of prosocial motivation, cultural tightness, and uncertainty avoidance predicts knowledge hiding, we collected primary data from Chinese and Slovenian employees ( $n = 376$ ). We obtained data from two samples of working professionals from Slovenia ( $n = 123$ ) and China ( $n = 253$ ). We analyzed the data using confirmatory factor analysis (CFA) and with hierarchical regression analyses, including the three-way interaction.

### Sampling procedure

We applied the convenience sampling procedure. A sample contains working professionals from China and Slovenia. For sample 1, in China, data were collected from Chinese employees working in various types of companies. For sample 2, in Slovenia, data were collected from employees working in various sectors and who had various job functions. The country-level score for China cultural tightness is 35.3 and for uncertainty avoidance, it is 30. The country level score for Slovenia cultural tightness is 109.6 and for uncertainty avoidance, is 88. China has a low score on uncertainty avoidance; on the other hand, Slovenia has a high score on uncertainty avoidance (Hofstede, 1983b). Based on the country-level score on cultural tightness, Slovenia has a high score compared to China (Uz, 2015). So far, no research has been made about how social-cultural aspects influence knowledge hiding based on the case of Slovene and Chinese cultures. We approached the survey respondents by sending the web link to employees. We used a web-based online data collection tool and shared the survey links via social media and other online channels (i.e., LinkedIn, Facebook, email address, etc.).

### Sample 1: China

We included Chinese culture and Chinese employees in our research, because of the differences from the compared country (i.e., Slovenia). China is becoming a major player in global business and it is a major change in globalization (Stiglitz, 2007). In this study, only employees with e-mail addresses participated. Participants held a wide variety of jobs. They were not likely to know the purpose of our research because the items of this study were presented in a large-scale questionnaire. Traditional Chinese language was used. For Chinese sample, we collected completed responses from 253 employees who worked in 60 teams. About 62% of the participants were female. The age of participants ranged from 18 to 54 years, and the mean age was 29.89 years ( $SD = 5.596$ ). On average, participants had more than 4.5 years of work experience (mean work experience = 4.75;  $SD = 4.57$ ), and had worked for less than 3 years with their current supervisors (i.e., dyad tenure; mean = 2.79;  $SD = 2.29$ ).

## Sample 2: Slovenia

In Slovenia, we sampled employees who worked in tax and legal departments, government agencies, accounting firms, academia, electrician trades, administration, pharmacies, etc. In the part of research conducted in Slovenia, some employees were contacted via e-mail, some received the questionnaire in paper form, and some received it through social networks (e.g., LinkedIn and Facebook). The questionnaire for Slovenian employees was the same as the one used in China.

The respondents were not likely to know the purpose of research, because the items of this study were presented in a large-scale questionnaire. We obtained completed responses from 123 employees in various professions. About 61% of the participants were female. The survey included respondents aged between 18 and 55. The majority (56%) of the employees were between 26 and 35 years old. On average, the participants had more than 6 years of work experience (mean work experience = 6.8; SD = 7.45) and a dyad tenure of 3.8 years (SD = 3.62).

## Measures

For measuring each construct, we used various item scales. We analyzed participants' responses to a level of agreement with behavior rating scale, as follows. The scales for measuring knowledge hiding, uncertainty avoidance and prosocial motivation were assessed on a 7-point Likert-type scale, ranging from 1 (completely disagree) to 7 (I fully agree). The scale for measuring cultural tightness-looseness was assessed on a 6-point Likert-type scale ranging from 1 (completely disagree) to 6 (I fully agree).

The participants came from countries with different languages (Slovenian and Chinese), therefore we have used a translation/back-translation procedure (Brislin, 1986). To ensure reliable results and to ensure understanding of questions; we translated the questionnaire from English into their national languages. For the Slovenian sample, we translated the items from English into Slovenian and back into English. We mirrored this approach for the Chinese sample.

**Knowledge hiding.** To measure knowledge hiding, we used the 12-item scale ( $\alpha = .92$ ) that Connelly et al. (2012) developed. The scale includes items such as "I agreed that I could help my work colleague, but I did not intend to do so"; "I told my coworker that I would help him later, but then I just postponed my help"; and "I told my coworker that I did not know the answer, even though I actually knew."

**Prosocial motivation.** We measured prosocial motivation with the 5-item scale ( $\alpha = .90$ ) that Grand and Sumanth (2009) developed. The scale includes items such as "I get energized by working on tasks that have the potential to benefit others" and "I like to work on tasks that have the potential to benefit others."

**Cultural tightness - looseness.** We measured cultural tightness-looseness using the 6-item scale ( $\alpha = .76$ ) developed by Gelfand et al. (2011b). The items measured the cultural perspectives, norms, values, sanctions for inappropriate behavior, and rules in the respondent's country of origin. Sample items include "In my country, there are very clear expectations of how people should act in most situations"; "People agree upon what behaviors are appropriate versus inappropriate in most situations in this country"; and "In my country, if someone acts in an inappropriate way, others will strongly disapprove."

**Individual perception of uncertainty avoidance.** We measured individual perceptions of national cultural dimensions regarding uncertainty avoidance with the four-item scale ( $\alpha = .98$ ) that Dorfman and Howell (1988) developed. Sample items for uncertainty avoidance include "Leaders expect that employees closely follow the instructions of the procedure"; "Work instructions are important for employees"; and "Standard procedures for employees are very useful in their work."

**Control variables.** We controlled for five control variables, including gender, age, and level of education, average dyad tenure, and country. The reason why we used average dyad tenure as a control variable is that the length of the supervisor-subordinate relationship can influence work perceptions (Fagenson-Eland, Marks, & Amendola, 1997). We also included the country as a control variable to find if country-level cultural differences influenced our results. China was coded with "1", whereas Slovenia was coded with "2".

## RESULTS

The means, standard deviations, and correlations of the pooled Slovenian and Chinese sample, for all studied variables used in the analyses, are shown in Table 1. Reliability indicators - using Cronbach's alphas are also included on the diagonal.

Table 1: Means, Standard Deviations, and Correlations of employees within the pooled Slovenian and Chinese sample

Variable	Mean	SD	1	2	3	4	5	6	7	8	9
1. Knowledge hiding	1.89	0.99	(.92)								
2. Prosocial motivation	5.88	1.02	-.241**	(.90)							
3. Tightness	4.40	1.05	-.150**	.153**	(.76)						
4. Uncertainty avoidance	5.23	2.47	-.176**	.117*	.270**	(.98)					
5. Gender	1.10	1.3	-.108*	.022	.028	.826**					
6. Age	1.64	1.5	-.088	-.014	-.071	.782**	.811**				
7. Education	2.93	2.1	-.013	-.083	-.340**	.658**	.768**	.778**			
8. Average dyad tenure	3.11	3.10	.101	.009	-.072	-.055	.025	.391**	.170**		
9. Country	1.40	0.50	.205**	-.077	-.379**	-.395**	-.267**	-.250**	.061	.146**	

Note:  $N = 376$  employees from Chinese and Slovenian cultures. Reliability indicators (Cronbach's alphas) are on the diagonal in the parentheses.

\*  $p < .05$

\*\*  $p < .01$

The Cronbach's alpha for the constructs of knowledge hiding, prosocial motivation, and uncertainty avoidance is above .90 and shows high reliability. The Cronbach's alpha for cultural tightness is above .76 and is acceptable. From the results in Table 1, we could see high mean values for the constructs of prosocial motivation (5.88), cultural tightness (4.40), and uncertainty avoidance (5.23). The mean results show that values on average are high. On the contrary, from Table 1, we can see that mean value for knowledge hiding is 1.89. Turning to correlations, we found a significant negative correlation between prosocial motivation and knowledge hiding ( $-.241$ ;  $p = .001$ ). Knowledge hiding has also a significant negative correlation with cultural tightness ( $-.150$ ;  $p = .001$ ), and with uncertainty avoidance ( $-.176$ ;  $p = .001$ ). Prosocial motivation is in a significant positive correlation with cultural tightness ( $.153$ ;  $p = .001$ ) and with uncertainty avoidance ( $.117$ ). Cultural tightness has a significant positive correlation with uncertainty avoidance ( $.270$ ;  $p = .001$ ).

We applied confirmatory factor analysis using the AMOS 21 software package for ensuring validation of the measurement instruments. We used CFA with the aim of ensuring that the designed model fits the data in a sufficient way. In the analysis of the designed model, we used 26 items to measure the four constructs included in this research (knowledge hiding, prosocial motivation, cultural tightness, and uncertainty avoidance). The results

of the CFA—specifying separate factors for each construct—achieved a good model fit (CFI = .910; chi-square = 964.649; RMSEA = .07;  $df = 266$ )<sup>5</sup>.

The CFA analysis indicated that all the factor loadings of the four constructs were statistically significant, with a mean standardized loading of .75. This further supports the convergent validity of the constructs. The average standardized loading for knowledge hiding was .70, with a range from .45 to .85. The average standardized loading for prosocial motivation was .79, with a range from .75 to .83. The average standardized loading for cultural tightness was .68, with a range from .45 to .84. The average standardized loading for uncertainty avoidance was .94, with a range from .93 to .95.

To test the hypotheses, we used a series of hierarchical regression analyses. In this type of analysis, we test direct relationships and the role of the three-way interaction term (combining three independent constructs—prosocial motivation, cultural tightness, and uncertainty avoidance) in predicting knowledge hiding. The results of the analysis are presented in Table 2.

Our analysis is divided into four models. In Model 1, we entered five control variables: gender, age, education, average dyad tenure, and country. We found a significant relationship and influence of average dyad tenure ( $\beta = .09$ ;  $p < .10$ ) and of country ( $\beta = .04$ ;  $p < .05$ ). In Model 2, we entered the prosocial motivation, cultural tightness, and uncertainty avoidance. Through the hierarchical regression analysis, we found a significant negative relationship between prosocial motivation and knowledge hiding ( $\beta = -.21$ ; exact  $p = .000$ ). Therefore, Hypothesis 1 was supported. In Model 3, we entered two-way interactions (prosocial motivation  $\times$  tightness; prosocial motivation  $\times$  uncertainty avoidance; and tightness  $\times$  uncertainty avoidance). We found a significant negative relationship between the two-way interaction of cultural tightness and uncertainty avoidance on knowledge hiding ( $\beta = -.23$ ; exact  $p = .001$ ). Hypothesis 2 was therefore supported.

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<sup>5</sup> The within-construct residuals were allowed to correlate. Without those modification indices, the model fit would be as follows: CFI .884; chi-square = 1194.537; RMSEA = .08;  $df = 293$ .

Table 2: Hierarchical regression analyses predicting knowledge hiding

	Model 1	Model 2	Model 3	Model 4
Gender	-.05 (.31)	-.03 (.55)	-.02 (.77)	-.00 (.87)
Age	-.05 (.35)	-.05 (.41)	-.04 (.42)	-.04 (.49)
Education	.06 (.39)	.01 (.85)	.00 (.97)	.00 (.96)
Average dyad tenure	.09 † (.09)	.09 † (.08)	.09† (.07)	.09† (.08)
Country	.14 * (.04)	.12† (.08)	.13† (.06)	.13† (.06)
Prosocial motivation		<b>-.21** (.00)</b>	<b>-.23** (.00)</b>	<b>-.25** (.00)</b>
Tightness		-.04 (.51)	.09 (.18)	-.04 (.65)
Uncertainty avoidance		-.08 (.11)	-.10† (.06)	-.09† (.08)
Prosocial motivation x Tightness			.18** (.00)	.16** (.00)
Prosocial motivation x Uncertainty avoidance			.11 † (.04)	.14** (.00)
Tightness x Uncertainty avoidance			<b>-.23** (.00)</b>	-.07 (.43)
Prosocial motivation x Tightness x Uncert.Avoid				<b>-.21** (.00)</b>
R2	.04	.11	.15	.17
F (df)	3.300 (5; 375)	5.565 (8; 375)	5.919 (11; 375)	6.285 (12; 375)

Notes. Team-level n = 375. \*\*p<.01, \*p<.05, †p<.10. Standard errors are in parentheses next to standardized coefficients (betas).

Values in bold are relevant to the tests of hypotheses.

In Model 4, we examined the role of the combined three-way interaction term (prosocial motivation  $\times$  cultural tightness  $\times$  uncertainty avoidance) in stimulating knowledge hiding. We analyzed the three-way interaction through the use of tests of simple main-effects, e.g., the effect of one variable (or set of variables) across the levels of another variable (Dawson & Richter, 2004; Kirk, Roger, 1995).

Figure 2: The three-way interaction among prosocial motivation, tightness, and uncertainty avoidance predicting knowledge hiding

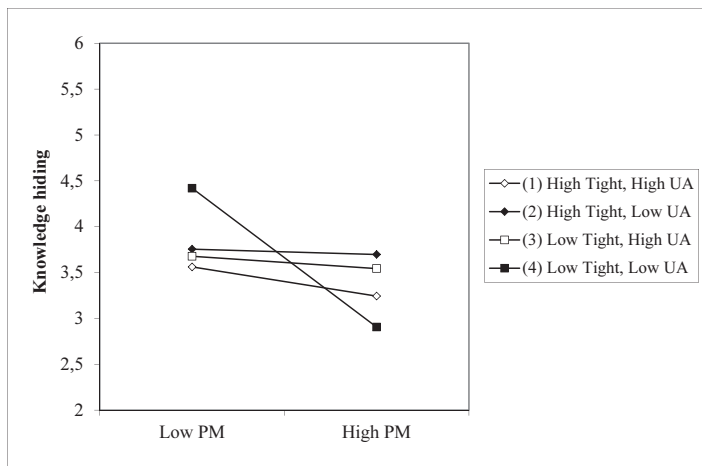


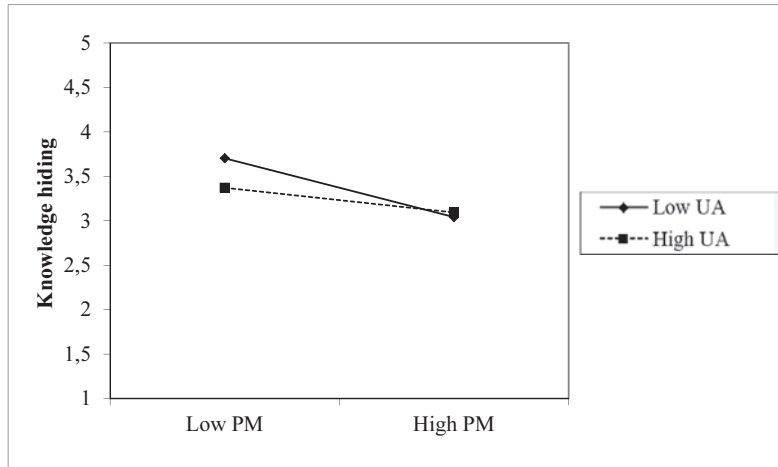


Figure 2 shows that the moderation of the combination of low levels of prosocial motivation, low cultural tightness, and low uncertainty avoidance causes employees to engage in more knowledge hiding in the organization. Based on the analysis of simple slopes, we can see that three lines portray a relationship between prosocial motivation, cultural tightness, and uncertainty avoidance with knowledge hiding. The moderation, which supports Hypothesis 3, is significant ( $p < .01$ ) for both low and high levels of the three-way interaction term.

The three-way interaction term of our research was statistically significant. Moreover, the change of F-value between models is in all cases significant ( $p = .000$ ). The significant results showed us that the combination of low levels of prosocial motivation, low cultural tightness, and low levels of uncertainty avoidance, leads to greater occurrences of knowledge hiding in an organization. In other words, the three-way interaction term moderates and reduces the occurrences of knowledge hiding (the three-way interaction term prosocial motivation  $\times$  tightness  $\times$  uncertainty avoidance  $\beta = -.21$ ,  $t = -2.984$ ,  $p = .003$ ). We controlled for five control variables, including gender ( $\beta = -.00$ ,  $p = .873$ ), age ( $\beta = -.04$ ,  $p = .488$ ), level of education ( $\beta = .00$ ,  $p = .957$ ), dyad tenure ( $\beta = .09$ ,  $p = .081$ ) and country ( $\beta = .13$ ,  $p = .059$ ). Only the control variables of dyad tenure and country show influence on the researched relationship.

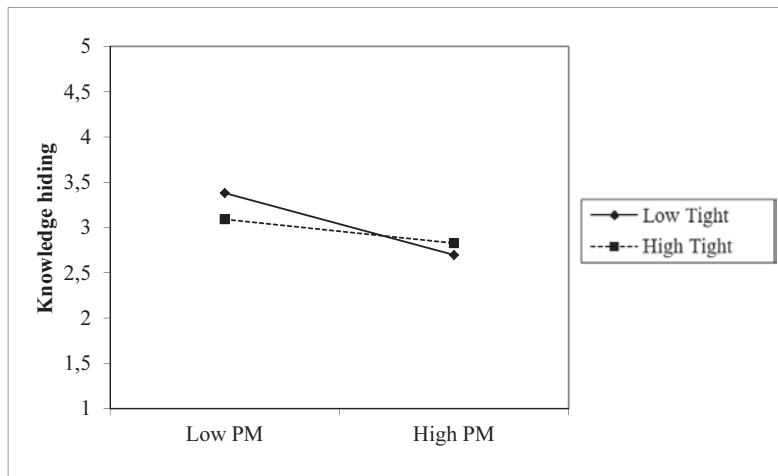
In the following, we describe more in details Figure 3, and Figure 4. Both figures present plotting of two-way interaction, of hypothesis 2. Figure 3 shows the combination of low prosocial motivation and low uncertainty avoidance, which causes employees to be engaged in more knowledge hiding. Figure 4 shows the combination of low prosocial motivation and low cultural tightness, which also causes employees to hide their knowledge from other employees. Based on the analysis of simple slopes, we could see in both figures two lines, which presents a connection with knowledge hiding (e.g. a line of prosocial motivation and uncertainty avoidance; and a line of knowledge hiding on prosocial motivation and cultural tightness). Figure 3 presents a scenario of simple slope analysis referring to the low prosocial motivation and low uncertainty avoidance. Figure 4 presents a scenario of the simple slope analysis referring to the low prosocial motivation and low cultural tightness.

Figure 3: *The two-way interaction of prosocial motivation with uncertainty avoidance predicting knowledge hiding*



Notes. UA = Uncertainty avoidance, PM = Prosocial motivation.

Figure 4: *The two-way interaction of prosocial motivation with cultural tightness predicting knowledge hiding*



Notes. PM = Prosocial motivation, Tight = Cultural tightness.

## DISCUSSION

In the present study, we focused on socio-cultural predictors of knowledge hiding at work. We studied the relationships among social (e.g., prosocial motivation) and cultural dimensions (e.g., cultural tightness and uncertainty avoidance) in predicting knowledge hiding behavior. We collected data from two samples of working professionals in Slovenia and China. As hypothesized, the results showed that prosocial motivation is negatively related to knowledge hiding. Furthermore, as we hypothesized, the results significantly supported the main hypothesis that the three-way interaction among prosocial motivation, perceptions of tight cultures, and uncertainty avoidance would be negatively associated with knowledge hiding at work. Our findings suggest that most knowledge hiding occurs when there are low levels of each element in the three-way interaction term: low prosocial motivation, low cultural tightness, and low uncertainty avoidance.

### Theoretical contributions

The concept of knowledge hiding is still novel and remains largely unexplored (Connelly et al., 2012). In this paper, we make two important theoretical contributions. The first contribution is to the literature of knowledge hiding. We show how socio-cultural aspects influence knowledge-hiding behavior. Research shows that individuals with low levels of all three researched constructs would be more likely to hide knowledge. In previous studies, researchers have focused on knowledge hiding at the individual level and in teams (Babič et al., 2017). Our study extends previous research by focusing on the role of individual perceptions of national culture, specifically examining the interactions among cultural dimensions, its content, and intensity. In particular, low levels of perceived cultural tightness and uncertainty avoidance are related to higher levels of knowledge hiding. Our study thus theoretically contributes to the social-cultural aspects of knowledge hiding. Indeed, with our research, we show how cultural characteristics shape occurrence of knowledge hiding at work.

The second theoretical contribution is as a contribution to cross-cultural organizational behavior research (Brewer & Venaik, 2014; Tsui et al., 2007). This study also emphasizes the importance of understanding knowledge hiding in its socio-cultural context of motivations, cultural tightness, and uncertainty avoidance. We find that personal and cultural components play roles in fostering or stifling knowledge hiding. We aimed to conceptualize and empirically validate the proposed relationship (i.e., the three-way interaction among the micro-level perceptions of national culture content - uncertainty avoidance, and strength - tightness, and prosocial motivation) and its association with knowledge hiding. As Černe et al. (2015), and Babič et al. (2017) have previously shown that increased levels of prosocial motivation are associated with less knowledge hiding, we aimed to empirically test the combined role of social and cultural dimensions.

The third contribution is of empirical nature and answers the call for more micro-level cultural research (Taras et al., 2016). With this paper, we strengthen previous research

based on a larger sample, different participants and cultures participated. In our research, we have used respondents from two countries and measured their individual perceptions of cultural tightness and uncertainty avoidance. This is a strong push away from cultural stereotyping toward a more genuine understanding of individual behaviors (including knowledge hiding), and the way we perceive the world around us – both in terms of social relations as well as cultural postulates. We would hope to see that our study is contributing to launch the stream of micro-based studies of work behaviors in their social and cultural context (e.g., Brewer & Venaik, 2014; Tsui et al., 2007) as perceived by every single individual. Nations and countries are simply too inaccurate placeholders to understand strength and content of values and the way they shape our behaviors. In fact, stereotyping is a dangerous phenomenon that we urge to avoid.

### **Practical implications**

Based on results of our study we suggest the following important practical implications for leaders and working professionals in global organizations. They could all benefit from our findings by understanding the joint effect of cultural and social context and the way it shapes knowledge hiding behaviors. Leaders should be aware of detrimental effects knowledge hiding has for organizations, teams, and individuals with reduced quality of relationships, trust, creativity, and innovation (Connelly et al., 2012; Connelly et al., 2014; Černe et al., 2014; Lewicki, McAllister, & Bies, 1998). As the essence of leadership is to achieve results through others and it is by default a social process, leaders can influence prosocial motivations and behaviors via a variety of approaches, ranging from perspective taking, tools for collaboration, and increasing giving and helping behaviors at work (Bolino & Grant, 2016; Škerlavaj, 2017). An example of an organization that is strengthening prosocial motivations and behaviors of their members is innovation and strategic consultancy IDEO (Amabile, Fisher, & Pillemer, 2014).

Second, to shape cultures that would decrease knowledge hiding, organizations need to emphasize individual perceptions of cultural strength (tightness). If an organization has not designed specific rules for appropriate behavior and sanctions for deviant behavior (Aktas, Gelfand, & Hanges, 2015; Chua, Roth, & Lemoine, 2015), damage of knowledge hiding could be even higher for organizations. In order to prevent knowledge hiding, it is important that managers clearly communicate desired organizational behavior and design sanctions for inappropriate behavior (Gelfand et al., 2007; Gelfand, Nishii, & Raver, 2006) during recruitment, selection, onboarding, training and development, as well as rewarding cycles of organizations. Specifically, managers need to pay attention whether knowledge hiding occurs among their employees and should be aware of low levels of the combination of the three-way interaction among the constructs examined in this study. When knowledge hiding happens, the road to recovery is longer and steeper as relations are harmed, creativity decreased, and trust among employees lost (Černe et al., 2014). Recovery is possible, yet proactive actions are better. Based on research findings, leaders and organizations should set rules of expected organizational behavior and design appropriate sanctions for deviant behavior based on cultural characteristics (Aktas,

Gelfand. & Hanges, 2015). Leaders need to signal that knowledge sharing and helping within their organization is a norm (Brock, Zmud, Kim. & Lee, 2005; Cabrera. & Cabrera, 2005; Staples & Webster, 2008).

Slightly less equivocal is the element of uncertainty avoidance as it is on one hand associated with higher entrepreneurial activity and on the other hand also with increased knowledge hiding. Hence, as developing collaborative norms and supporting helping behaviors is essential for reducing knowledge hiding, increasing entrepreneurial activity, productivity, higher profitability, and many more beneficial outcomes for both organizations and individuals (according to extensive meta-analysis of Podsakoff, Whiting, Podsakoff. & Blume, 2009), we would suggest practitioners to start there.

### **Limitations and future research directions**

Despite the aforementioned theoretical and practical contributions, our paper is not without limitations. The first limitation is related to the study's cross-sectional design, which limits our ability to infer causation. Experimental studies should be conducted to achieve a settled, general conclusion. The second limitation of our study is that we cannot make a general conclusion about the researched relationship, because we included only two cultures in our study. Thus, the generalizability of our current findings across countries and cultures is not clear. Consequently, the future direction is to include other cultures in studies, with the aim to draw final conclusions. Researchers can also include other national-culture dimensions along with the prosocial motivation to study these dimensions' effects on knowledge hiding. This is an important opportunity because the construct of knowledge hiding is still novel and hence interesting field of exploration for both researchers and practitioners.

An experimental or a longitudinal study could strengthen future research on this topic. Such studies that could tap into either causal influence among the variables, or examine how the variables evolve and influence each other over time, would allow researchers to overcome the potential challenge of omitted variables and to rule out both alternative explanations and potentially recursive relationships among the studied variables. New constructs could also be included in future research. We suggest linking knowledge hiding with artificial intelligence, digitalization, modern technology and the virtual world. It will be interesting to see if the "modern world of digitalization" supports or inhibits knowledge hiding with its new technology. Moreover, a multilevel study of national cultures, organizational cultures, and individual behaviors could represent a promising avenue of taking research on knowledge hiding forward.

We suggest that future research studies the national culture and compares it with organizational culture (Davenport & Prusak, 1998; Al-Alawi, Al-Marzooqi. & Mohammed, 2007; Suppiah & Singh Sandhu, 2011). It could be interesting to see how organizational culture with leadership (Oye et al., 2011) influences knowledge hiding. The field of knowledge hiding still has many opportunities to be explored. Organizational culture

influences behavior of employees, probably more than general culture. Therefore, in the future, there should be more research made on how organizational culture could influence employees and their behavior.

Another limitation is that in our research we did not control for the nationality of respondents specifically (i.e., instead of this, a culture was included as a control variable). However, our limitation opens new research questions for future research. One of the limitations of our study is also heterogeneity of a rather small sample size. We collected data from a sample of employees from two diverse yet specific countries (Slovenia and China). Future research should thus collect data from working professionals, pertaining to a larger number of cultures, preferably in a way that even more cultural bands from the GLOBE study would be covered. We suggest for future research implementing the same research or researching other constructs, but on a larger sample. This would allow further insight into the cultural mechanisms, norms, and values influencing the occurrence of knowledge hiding in organizations (House et al., 2004). We believe that our research provides useful theoretical and practical contributions, and we open a call for more individual (micro level) cross-cultural organizational behavior research.

## CONCLUSION

Our study focused on understanding how individuals make sense of their cultural and social context in deciding whether to hide or not their knowledge at work. This is the first study to combine the prosocial motivation, cultural tightness, and uncertainty avoidance in their joint interaction with knowledge hiding behaviors at work. Based on two independent samples of working professionals from Slovenian and Chinese organizations we found, that the most knowledge hiding happened when individuals experience low levels of prosocial motivation, low cultural tightness, and low uncertainty avoidance. The high levels of knowledge hiding occur when employees are not motivated by the welfare of others, who are inclined to take the risk and who perceive that deviation from cultural norms might not be sanctioned. Leaders and organizations in global environments should be aware of the occurrences of knowledge hiding related to different cultural characteristics when they work abroad or with employees from other cultures. However, they should avoid stereotyping based on countries as cultural placeholders, but rather focus on individual perceptions of their social and cultural context. To prevent knowledge hiding in organizations, leaders should develop organizations, where prosocial motivation and helping behaviors are a strong norm.

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# RESEARCH AND DEVELOPMENT EXPENSES UNDER IFRS MANDATORY IMPLEMENTATION: A VALUE RELEVANCE APPROACH

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**ABSTRACT:** *The paper focuses on the degree to which the accounting treatment of R&D expenditure is stock price informative following the adoption of IAS. Therefore, using recent data of French listed companies, starting from the year in which IFRS were applied, 2005-2015, the present study examines the value relevance of the different R&D accounting treatments. Unlike evidence regarding the pre-IFRS period in France, we find that the capitalized portion of R&D is not correlated with market values, suggesting that under IFRS mandatory implementation, R&D assets are not value relevant. The expensed portion of R&D is positively related to market values only for manufacturing companies. Accordingly, we conclude that IFRS implementation has implications on the valuation of R&D expenditure by investors in French firms.*

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**Keywords:** *R&D, capitalized R&D, expensed R&D, value relevance, IFRS, France*

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**JEL:** M41; M48

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## 1. INTRODUCTION

Since the mandatory implementation of International Financial Reporting Standards (IFRS) by listed European companies in 2005, the consolidated financial statements are published in accordance with international accounting standards. The main goal is to provide a common accounting language and ensure greater consistency in the presentation of accounting information in response to the growing internationalization of financial markets. In some European countries such as Germany, Austria and Switzerland, the adoption of international standards was voluntary before 2005. This was not the case for French companies, and the possibility of preparing their accounts according to rules other than national standards, Generally Accepted Accounting Principles (GAAP), was not included in the law. It therefore seemed appropriate to study the consequences of the introduction of IFRS on French companies.

Our objective is to highlight the effects on market value of accounting treatment for a specific asset class, namely the research and development (R&D) expenses, given it is affected by the mandatory change. Before IFRS adoption in France, the rules impose the

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immediate recognition of R&D expenditure as a cost, unless the R&D project meets certain conditions. The French rules (GAAP) stipulate that R&D expenses can be exceptionally an intangible asset only if they relate to a specific individual project with a real chance of technical success and economic profitability and whose costs can be obviously determinate. Nevertheless, since 1 January 2005, the accounting treatment of R&D expenditure under IAS<sup>2</sup> 38 becomes different. Actually, the capitalization of R&D expenses, which was an option treatment under French GAAP, has become an obligation under IFRS. The capitalization of R&D expenses is a consequence of the standard's requirements and not manager's choice. As a result, the development phase of an intangible project should be recognized once six criteria are met<sup>3</sup>.

In the accounting literature, the controversy over intangible assets and particularly R&D expenditure has been present in the accounting debate since several decades (Aboody and Lev, 1998; Lev and Sougiannis, 1996; 1999). Numerous studies provide evidence about the relevance of capitalized R&D expenditure during the period before the transition to IFRS. Zhao (2002) shows that R&D expenses are not value relevant, while Oswald (2008) proves little difference between the value relevance of the expensed and capitalized portion of R&D expenditure. However, few studies have investigated the period following the mandatory adoption of IFRS. We can mention the study of Shah et al. (2013) that examines the value relevance of R&D expenditure in the periods before and after IFRS in the UK. More recently, Gong and Wang (2016) estimate the changes in the value relevance of R&D expenses for periods pre-IFRS and post-IFRS adoption in countries that previously mandated immediate expensing against those that allowed optional capitalization of R&D expenditure ones.

Indeed, there are studies that have investigated the value relevance of R&D expenses in France. Ding and Stolowy (2003), for instance, reveal the lack of relevance regarding the decision to capitalize R&D expenses in relation to the market value of the French company. Later, Cazavan-Jeny and Jeanjean (2006) provide evidence suggesting that R&D expenditure, in France, are negatively associated with market value. Nevertheless and to the best of our knowledge, there is no study focusing on the post-IFRS period in France. On that basis, we contribute to the R&D accounting literature by adding an empirical study examining the value relevance of R&D assets and expenses after the mandatory transition

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2 International Accounting Standards.

3 **IAS 38 Development Capitalization Criteria stipulate:** "An intangible asset arising from development (or from the development phase of an internal project) shall be recognized if and only if, an entity can demonstrate all of the following:

- (a) The technical feasibility of completing the intangible asset so that it will be available for use or sale.
- (b) Its intention to complete the intangible asset and use or sell it.
- (c) Its ability to use or sell the intangible asset.
- (d) How the intangible asset will generate probable future economic benefits. Among other things, the entity can demonstrate the existence of a market for the output of the intangible asset or the intangible asset itself or, if it is to be used internally, the usefulness of the intangible asset.
- (e) The availability of adequate technical, financial and other resources to complete the development and to use or sell the intangible asset.
- (f) Its ability to measure reliably the expenditure attributable to the intangible asset during its development."

to IFRS in France, where companies are required to activate whether the capitalization criteria are met compared to the discretion available in the past.

In this regard, Lev and Zarowin (1999) provide that it is necessary to control the industry effects in any study on the R&D costs, because these expenses are specific to the nature of sectors. Companies operating in different sectors have different behaviors in terms of investment in R&D. As a consequence, the second objective of this study is to examine the separate value relevance of R&D across manufacturing and nonmanufacturing sectors in the post-IFRS period. To pursue these objectives, we employ recent data by focusing on the fiscal years from 2005 to 2015 of listed French firms with R&D activity. We find that the capitalized portion of R&D is not related to market values, with no significant differences across manufacturing and nonmanufacturing firms. Nevertheless, the expensed portion of R&D is positively related to market values of manufacturing companies.

The remainder of the paper is structured as follows. Section 2 exposes the R&D treatment, related literature and the development of the research hypotheses. Section 3 presents the details of the research methodology, related valuation models and the data selection process. Section 4 provides the results of the empirical analysis and discussion of the main findings. Finally, Section 5 concludes the study.

## **2. INSTITUTIONAL BACKGROUND, PRIOR LITERATURE, AND HYPOTHESES**

### **2.1. R&D EXPENSES TREATMENT : BEFORE VS. AFTER IFRS ADOPTION**

The accounting treatment of R&D expenditure is controversial at an international level. For example, International Accounting Standard (IAS 38) permits the capitalization of development expenditures when certain conditions are met, whereas the US GAAP adopts a stricter approach to the issue. Indeed, the Financial Accounting Standards Board (FASB), which initially authorized the activation of R&D expenditure, adopted an approach in October 1974 with SFAS No. 22 (FASB 1974, §12), which requires all R&D expenses are expensed during the period of their commitments. The only exception is SFAS No. 863, which concerns software. The same approach was adopted in 1998 by the Business Accounting Deliberation Council, requiring Japanese firms to cover all their R&D expenditure. However, certain national accounting standards such as the French one, offer some flexibility to allow the capitalization of R&D costs when certain conditions are simultaneously fulfilled, namely:

- The product is well defined ;
- The feasibility of the product is confirmed ;
- The related costs can be identified ;
- The costs can be covered through the revenues generated by the exploitation of the project.
- The firm intends to market the product.

The French regulations concerning the treatment of R&D expenditure have undergone numerous changes for the consolidated financial statements. Since 2005, all listed companies in the European Union (EU) have been obliged to prepare their annual reports in accordance with international standards (IFRS/IAS). The revised IAS 38 distinguishes between a “research phase” and a “development phase”. Research costs must be recognized as an expense when incurred. The revised IAS 38 (§55) considers that a company cannot demonstrate the existence of an intangible asset during the search phase of a project that will generate probable future economic benefits. Nevertheless, development costs are recognized as assets, if and only if the company can demonstrate simultaneously a set of conditions. Actually, IAS 38 Development Capitalization Criteria stipulate: “An intangible asset arising from development (or from the development phase of an internal project) shall be recognized if and only if, an entity can demonstrate all of the following: “

- a. The technical feasibility of completing the intangible asset so that it will be available for use or sale.
- b. Its intention to complete the intangible asset and use or sell it.
- c. Its ability to use or sell the intangible asset.
- d. How the intangible asset will generate probable future economic benefits. Among other things, the entity can demonstrate the existence of a market for the output of the intangible asset or the intangible asset itself or, if it is to be used internally, the usefulness of the intangible asset.
- e. The availability of adequate technical, financial and other resources to complete the development and to use or sell the intangible asset.
- f. Its ability to measure reliably the expenditure attributable to the intangible asset during its development.”

Although the accounting treatment of R&D expenditure under IFRS appears similar to French GAAP, there is an important disparity. Actually, IFRS requires the capitalization of the R&D expenditure which meets specified criteria, while the French GAAP provides an option to capitalize that R&D expenditure.

## **2.2. RELATED LITERATURE ON THE VALUE RELEVANCE OF R&D EXPENSES AFTER IFRS TRANSITION**

Even today, the accounting treatment of R&D expenses still a sensitive issue. Most of the empirical studies focusing on the value relevance of R&D costs investigated the period before the implementation of IFRS (e.g. Zhao, 2002; Ding and Stolowy, 2003; Cazavan-Jeny and Jeanjean, 2006). However, research that has examined the issue of the value relevance of R&D expenditure (capitalized or expensed) in considering the post-IFRS effects is limited. At this day, the related major studies can be summarized in Tsoligkas and Tsalavoutas (2011), Shah et al. (2013) and Gong and Wang (2016).

Tsoligkas and Tsalavoutas (2011) assess value relevance of R&D in the UK after IFRS mandatory implementation. The results reveal that the capitalized portion of R&D is positively related to market values, which implies that the stock market absorbs these



assets to successful projects promising future economic benefits. Nevertheless, they report a negatively correlation between expensed R&D costs and market value under IFRS, supporting the idea that these portions of assets do not reflect any future economic benefit and should be expensed. Consequently, the transition to IFRS induced implications for the valuation of R&D expenditure in the UK.

Afterward, Shah et al. (2013) continue the research of Tsoiligkas and Tsalavoutas (2011), limited to the first three years post-IFRS (2006-2008), by extending the sample period to seven years after adopting IFRS, 2005-2011. This study also examines the impact of the size of companies and sectors on the value relevance of R&D during the period between 2001 and 2011 in the UK, by separating the periods before and after IFRS. The results affirm the value relevance of the capitalized R&D costs in the 11 years of the sample period. However, no improvement is recorded at the R&D capitalized value relevance in the post-IFRS period. Large companies have a higher relevance of the R&D expenses capitalized than small firms. However, the sector specification does not appear to have a significant effect on the relevance of R&D costs.

Recently, Gong and Wang (2016) test whether the nature of differences between national GAAP and IFRS rises to differential changes in the value relevance of R&D expenses after the adoption of IFRS across nine countries<sup>4</sup>, covering pre-IFRS and post-IFRS periods during 1997–2012. They find that the value relevance of R&D expenses declines after IFRS adoption in countries that previously mandated immediate expensing or allowed optional capitalization of R&D expenditure. They do not find change in the value relevance of R&D costs for countries that convert from the mandated capitalization of R&D expenditure to IFRS. However, even Gong and Wang (2016) integrate the French context in the group of the countries examined, their study presents a subtle limitation. Actually, they have not available data on capitalized R&D assets. As a result, one cannot draw conclusions about how different accounting treatments of R&D, capitalization versus expensing, affect the value relevance of R&D costs.

Therefore, we will try to contribute to the existing literature on accounting by examining whether there is a value relevance of R&D costs (expensed or capitalized) in the post-IFRS period in France for a recent sample of 11 years during 2005-2015. Moreover, this study provides evidence on industry membership impact by investigating potential differences in the relevance of R&D expenditure (expensed or capitalized) between manufacturing companies and nonmanufacturing ones.

### 2.3. HYPOTHESES DEVELOPMENT

Stark (2008) and Wyatt (2008) argue that the adoption of IFRS would decline the value relevance of R&D treatment. The point of view advanced by Stark (2008) is that the

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<sup>4</sup> The nine countries are Australia, Finland, France, Germany, Netherlands, Norway, Sweden, Switzerland, and the UK. These countries adopted IFRS since 2005.

adoption of IFRS would eliminate discretion in the treatment of R&D expenditure, so would remove a useful way that companies communicate information to stock markets. The capitalization of R&D expenditure was treated as a signal to the market to indicate the quality of R&D spending. Under French GAAP rule, opting for capitalization reflects a management decision for the purpose of transmitting a signal on their profitable R&D projects for the market and distinguishes themselves from competitors. Actually, the major difference between pre-IFRS and post-IFRS, in particular IAS 38, is that in the former case, management has discretion to choose to either capitalize or expense the development costs, while in the latter case, managers are required to capitalize R&D expenditure (development costs) once certain criteria are met. In other words, reported R&D expenses are effectively value relevant under the optional capitalization rule, and not in the context of a mandatory adoption. This argument is consistent with that of Wyatt (2008), who suggests that the most discretionary elements of intangible assets are the most relevant, due to discretion in the accounting treatment. As a result, we expect an absence of the value relevance of R&D expenses after the mandatory capitalization rule.

**H1.** R&D expenditure (expensed or capitalized) has no value relevance in the post-IFRS period.

Another important point of discussion in accounting literature is whether the impact of value relevance of R&D costs is different across diverse sectors. Examining manufacturing versus nonmanufacturing firms, Shah et al. (2008) find positive and significant effects of R&D expenditure on market value for both sectors. Nevertheless, Shah et al. (2009) reveal clear-cut sector effects, and present that, compared to nonmanufacturing companies, manufacturing ones are likely to adopt an intensive investment in R&D strategy to maximize their market value. Actually, Ho et al. (2005) explain that manufacturing and nonmanufacturing firms are likely to adopt a different mix of R&D and advertising investments because of the differences in their relative impacts. They argue that while nonmanufacturing firms benefit most from advertising investment for value creation purposes, manufacturing ones are likely to choose a more R&D-intensive strategy beside advertising investment to maximize their market value. Later, and by splitting R&D expenditure into capitalized and expensed portions, Shah et al. (2013) report that, in the case of the big companies, capitalized R&D portion is positively and significantly related to market value for both nonmanufacturing and manufacturing sectors. However, when the coefficient for nonmanufacturing sector is significant and negative, it is insignificant for manufacturing sector. On the other hand, capitalized R&D is positively significantly related to market value of the small manufacturing companies, but there is a negative and significant relationship between expensed R&D and market value for nonmanufacturing firms.

As a result, one would not draw consistent conclusion, on the bases of the mixed findings above, confirming if manufacturing or nonmanufacturing firms are associated with a higher R&D relevance.

**H2.** The industry membership has no effect on the value relevance of R&D expenditure.

### 3. RESEARCH DESIGN

#### 3.1. METHODOLOGY

To examine the value relevance of accounting figures, we follow most prior studies (Cazavan-Jeny and Jeanjean, 2006; Oswald, 2008; Tsoligkas and Tsalavoutas, 2011; Shah et al., 2013) that have adopted Ohlson valuation model (1995). The idea is based on the principle that firms' accounting numbers are judged to be 'value relevant' if they are significantly related to their market value (Beaver, 2002). Actually, Ohlson considers the market value of a company as function of book value of equity and expected future residual income. Consequently, the fundamental Ohlson (1995) valuation framework will be the bench mark model throughout the study. In its simple form, the market value of a company is represented by a linear function of its book value of equity and net income:

$$MV_{it} = \alpha_0 + \alpha_1 E_{it} + \alpha_2 BV_{it} + \varepsilon_{it} \quad (1)$$

Where,  $MV_{it}$  is the market value for company  $i$  at time  $t$  (the market capitalization of the company), which is measured four months after the end of the year for each company<sup>5</sup>.  $E_{it}$  is the earnings of company  $i$  at time  $t$ .  $BV_{it}$  stands for book value of equity of company  $i$  at time  $t$ .  $\varepsilon_{it}$  is an error term.

Barth et al. (2001) highlight that the main advantage of Ohlson model is that earnings and book value of equity can be divided to examine the value relevance of separate accounting numbers. In our study, we follow prior research (Cazavan-Jeny and Jeanjean, 2006; Tsoligkas and Tsalavoutas, 2011; Shah et al., 2013) and we decompose accounting incomes into: (1) earnings before R&D expenses and (2) the amount of expensed R&D. Similarly, we divide book value of equity into (1) the book value before capitalized R&D and (2) the amount of R&D in the assets. Therefore, the impact of capitalized R&D and expensed R&D on market value is isolated from earnings and book value of equity and the following equation is formed:

$$VM_{it} = \beta_0 + \beta_1 AE_{it} + \beta_2 ABV_{it} + \beta_3 CapRD_{it} + \beta_4 ExpRD_{it} + \varepsilon_{it} \quad (2)$$

Where,  $MV_{it}$  is the market value for company  $i$  at time  $t$ .  $AE_{it}$  is the adjusted earnings for firm  $i$  in year  $t$ , before the processing of R&D expenditure.  $ABV_{it}$  represents the adjusted book value of equity for firm  $i$  in year  $t$ , which is net of capitalized R&D.  $CapRD_{it}$  is the annual amount of capitalized R&D costs.  $ExpRD_{it}$  is the annual amount of expensed R&D costs.  $\varepsilon_{it}$  is an error term.

In order to control the model for heteroscedasticity problem,  $MV$ ,  $AE$ ,  $ABV$ ,  $CapRD$ ,  $ExpRD$  variables are deflated by the number of outstanding shares. Barth and Kallapur (1996) and Barth and Clinch (2009) show that the number of outstanding shares is an

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<sup>5</sup> Actually, the information on the value of R&D expenses and other values is only available when the financial statements are published, namely four months after the closing date of the accounting period. Moreover, the impact is incorporated into market value in the following period.

effective proxy to capture the effect of scale<sup>6</sup>. By this way, we measure all variables of the regressions on a *per share* basis.

For reducing the possibility of industry effects and to test whether there is a significant difference in the value relevance of R&D expenditure across industries (manufacturing firms vs. nonmanufacturing ones), we follow Shah et al. (2009), Tsoligkas and Tsalavoutas (2011) and Shah et al. (2013) by estimating model (2) separately for two sub samples: manufacturing firms versus nonmanufacturing firms. Similarly, we include a dummy variable in the model (2) identifying the industry to which the firm belongs, then the model (3) is expressed as follows:

$$MV_{it} = \delta_0 + \delta_1 SEC_{it} + \delta_2 AE_{it} + \delta_3 AE_{it} \times SEC_{it} + \delta_4 ABV_{it} + \delta_5 ABV_{it} \times SEC_{it} + \delta_6 CAP\_RD_{it} + \delta_7 CAP\_RD_{it} \times SEC_{it} + \delta_8 EXP\_RD_{it} + \delta_9 EXP\_RD_{it} \times SEC_{it} + \varepsilon_{it} \quad (3)$$

Where,  $MV_{it}$  is the market value for company  $i$  at time  $t$ .  $SEC_{it}$  is a dummy variable which is equal to 0 if firm  $i$  is a nonmanufacturing one, and equal to 1 if it is a manufacturing one.  $AE_{it}$  is the adjusted earnings for firm  $i$  in year  $t$ , before the processing of R&D expenditure.  $AE_{it} \times SEC_{it}$  is the adjusted earnings multiplied by the sector dummy variable.  $ABV_{it}$  represents the adjusted book value of equity for firm  $i$  in year  $t$ , which is net of capitalized R&D.  $ABV_{it} \times SEC_{it}$  represents the adjusted book value of equity multiplied by the sector dummy variable.  $CapRD_{it}$  is the annual amount of capitalized R&D costs.  $CapRD_{it} \times SEC_{it}$  is the annual amount of capitalized R&D costs multiplied by the sector dummy variable.  $ExpRD_{it}$  is the annual amount of expensed R&D costs.  $ExpRD_{it} \times SEC_{it}$  represents the annual amount of expensed R&D costs multiplied by the sector dummy variable.  $\varepsilon_{it}$  is an error term. All variables are deflated by the number of outstanding shares.

The sample contains observations on multiple times to different companies. As a result, we use panel data, and according to the Hausman test, the fixed effects model seems most appropriate to our data.

### 3.2. DATA AND SAMPLE SELECTION

In order to assess the value relevance of R&D expenses after IFRS adoption, we use a sample of French firms listed in the Stock Exchange of Paris over 11 year period 2005-2015. The empirical study focuses on the SBF 120 companies. In order to perform the analyses, we exclude firms in financial sector as their financial statements are published with particular accounting regulations. Then, we identify firms with a R&D activity. We also remove companies that market value, earnings and book value of equity are missed, which give rise to a sample of 36 companies with fiscal year ended after 1 January 2005.

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<sup>6</sup> Barth and Clinch (2009) try both book value of equity and number of shares as deflator, and they conclude that employing number of outstanding shares as deflator is more effective to examine the scale effects as compared to book value of equity.

Deflating the variables of the models by the number of outstanding shares certainly produces extreme values. In order to mitigate the effect of extreme outliers, we winsorize the sample variables and ratios at the top and bottom one percentile of their respective distributions.

To recuperate the necessary data, we directly use the electronic sites of companies to download the annual reports (or references) issued by companies or the website of the World Library of Annual Reports ([www.annupedia.com](http://www.annupedia.com)). We collect stock prices to assess the market value of sample firms from the ABC Stock Exchange website.

### 3.3. DESCRIPTIVE STATISTICS

Table 1 presents the sample distribution of the variables included in the study during the period from 2005 to 2015. What really stands out from this table is that expensed R&D costs are, on average, higher than the capitalized R&D expenses. This finding proves that French companies are more likely to expense the costs of R&D than capitalizing them in the period after IFRS mandatory implementation. Moreover, Table 1 reveals that there is a significant disparity in the intensity of R&D expressed by the remarkable difference in standard deviation of the variables CapRD and ExprD.

Table 1: *Descriptive statistics of variables over the period 2005-2015*

Variable	Number of observations	Mean	Median	Std. dev	Min	Max
<b>MV</b>	396	1.975	1.537	3.549	0.002	39.532
<b>AE</b>	396	1.298	0.831	1.905	-0.064	17.206
<b>ABV</b>	396	0.199	0.092	0.405	-0.903	2.249
<b>CapRD</b>	396	0.018	0.000	0.032	0	0.171
<b>ExprD</b>	396	0.080	0.024	0.111	0.004	0.611

*MV* is the market value. *AE* is the adjusted earnings before the processing of R&D expenditure. *ABV* represents the adjusted book value of equity net of capitalized R&D. *CapRD* is the annual amount of capitalized R&D costs. *ExprD* is the annual amount of expensed R&D costs. All variables are deflated by the number of ordinary outstanding shares.

Table 2 exposes the descriptive statistics of both R&D variables by industry from 2005 to 2015. The values of CapRD and ExprD of manufacturing companies are, on average, significantly higher than in the nonmanufacturing sector, which let us conclude that the manufacturing firms spend more in R&D activity than the nonmanufacturing ones.

Table 2: Descriptive statistics of R&amp;D variables by sectors

Variables	Number of observations		Mean		Std. dev		Difference	P> t
	Manu	Non-manu	Manu	Non-manu	Manu	Non-manu		
CapRD	297	99	0.045	0.009	0.090	0.015	0.036	0
ExpRD	297	99	0.217	0.110	0.292	0.171	0.107	0.001

CapRD represents the annual amount of capitalized R&D costs; ExpRD represents the annual amount of expensed R&D costs. All variables are deflated by the number of ordinary outstanding shares.

Table 3 shows the correlations among the regression variables. All independent variables, adjusted earnings, adjusted book value of equity, capitalized R&D costs and expensed R&D costs, are positively related to the dependent variable, market value of equity. We can also notice that these variables have a value of VIF “Variance Inflation Factor” that is less than  $10^7$ , which allow us to conclude that our empirical model does not have a potentially problem of multicollinearity. Furthermore, the highest correlation coefficient is 0.6847, and it is between market value of equity and earnings.

Table 3: Correlation matrix and VIF

Variable	MV	AE	ABV	ExpRD	CapRD	VIF	1/ VIF
MV	1.0000						
AE	0.6847	1.0000				1.96	0.510
ABV	0.5962	0.4428	1.0000			1.65	0.606
ExpRD	0.2265	0.2594	0.2300	1.0000		1.32	0.757
CapRD	0.1632	0.1318	0.1887	0.1998	1.0000	1.21	0.826

MV is the market value. AE is the adjusted earnings before the processing of R&D expenditure. ABV represents the adjusted book value of equity net of capitalized R&D. CapRD is the annual amount of capitalized R&D costs. ExpRD is the annual amount of expensed R&D costs. All variables are deflated by the number of ordinary outstanding shares.

## 4. EMPIRICAL RESULTS

### 4.1. RESULTS FOR THE VALUE RELEVANCE OF R&D AFTER IFRS IMPLEMENTATION

We test two different models. Model (1) is employed to estimate the fundamental Ohlson’s (1995) model explaining market value of equity by earnings and book value of equity. Table 4 shows that the model is statistically significant under 1% level by using F-test. For this basic model, the coefficient on earnings,  $E$ , is statistically close to 2, and the coefficient on capital equity,  $BV$ , is roughly equal to 1. Earnings and book value of equity are positively significantly related to market value. This finding is consistent with prior research which

7 A limit suggested by Gujarati (1995) and Kennedy (1998).

examined the value relevance of R&D in France prior to 2005 (e.g. Cazavan-Jeny and Jeanjean, 2006; Gong and Wang, 2016), indicating that accounting numbers are strongly associated with share prices (adjusted R<sup>2</sup> is relatively high, 65%).

Model (2) is employed to examine the value relevance of R&D expenditure for the sample from year 2005 to 2015 (table 4). It is similar to model (1) except that we isolate the effect of both capitalized and expensed R&D on market value of equity. This decomposed model allows us to highlight the portion of capitalized R&D (CapRD) and expensed R&D (ExpRD). Model (2) has four independent variables, versus two for model (1). The regression is again significant under F-test at 1% level. Overall, adjusted R<sup>2</sup> for model (2) is higher than adjusted R<sup>2</sup> for basic model (1) (65% versus 71%). This improvement in explanatory power of the regression indicates that reporting of R&D is a significant factor in the statistical explanation of market value of equity.

Table 4: Value relevance of R&D over the period 2005-2015

Variable	Coefficient	t value	P> t
<i>Basic Model 1</i>			
E	2.084**	2,97	0,004
BV	0.890**	2,61	0,009
Intercept	0.638***	5.22	0,000
F	144	6.38	0.000
Adjusted R <sup>2</sup>		0.65	
N		396	
<i>Decomposed Model 2</i>			
AE	2.912***	6,02	0,000
ABV	0.416***	3,22	0,000
ExpRD	2.896***	4,56	0,000
CapRD	-1.332	-0,30	0,081
Intercept	0.719**	2.52	0,002
F	121	7.61	0.000
Adjusted R <sup>2</sup>		0.71	
N		396	

*MV* is the market value for company *i* at time *t*. *E* is the earnings of company *i* at time *t*. *BV* stands for book value of equity of company *i* at time *t*. *AE* is the adjusted earnings for firm *i* in year *t*, before the processing of R&D expenditure. *ABV* represents the adjusted book value of equity for firm *i* in year *t*, which is net of capitalized R&D. *CapRD* is the annual amount of capitalized R&D costs. *ExpRD* is the annual amount of expensed R&D costs. All variables are deflated by the number of ordinary outstanding shares. The models are with fixed effects and under control of heteroscedasticity.

Model 1:  $MV_{it} = \alpha_0 + \alpha_1 E_{it} + \alpha_2 BV_{it} + \varepsilon_{it}$

Model 2:  $MV_{it} = \beta_0 + \beta_1 AE_{it} + \beta_2 ABV_{it} + \beta_3 CapRD_{it} + \beta_4 ExpRD_{it} + \varepsilon_{it}$

\*\*\* and \*\* indicate statistical significance at the 1% and 5% level, respectively.

The estimation results for the period after adoption of IFRS (2005-2015) show that the variables equity capital and earnings, adjusted for R&D costs, keep their positive relation to the market value, revealing that accounting numbers always provide relevant information even after isolating R&D expenditure.

Focusing on the main variables of interest (*CapRD* and *ExpRD*), table 4 reveals that the coefficient for expensed R&D costs is significant, while it is insignificant for capitalized ones. *ExpRD* have a positive impact on share price, revealing that, from the investors' point of view, these expenses provide relevant information after the adoption of the international IAS/IFRS standards in France. Unlike previous studies (Shortridge, 2004; Tsoligkas and Tsalavoutas, 2011) where market participants perceive that expensed R&D only contains unsuccessful projects that give no future benefit, but reduces the firm's value in the same way as any other cost, these expenses are well appreciated by investors in French market after IFRS adoption.

On the other hand, capitalized R&D costs are not associated with market news. Actually, the results show that *CapRD* costs are negatively but insignificantly related to *MV*. Therefore, R&D capitalization has different effects on price compared to any other asset. Actually, one euro increase in any asset is associated with an increase in share price, whereas one euro increase in a R&D asset has not an effect on share price. The insignificant coefficient reported in Table 4 (coef. = -1.332 ; *t* value = -0.30) means that R&D capitalization is not associated with "good" or "bad" news, suggesting that investors in French companies do not value R&D assets after IFRS implementation, while they did it prior 2005. Actually, Cazavan-Jeny and Jeanjean (2006) report a negative impact of capitalized R&D expenditure on market value for French firms in a period preceding IFRS adopting (1993-2002).

Consequently, we can deduce from this non association between *CapRD* and the market value that, in a period which made mandatory the capitalization of R&D, there is not value relevance of capitalized R&D costs. This result is consistent with our hypothesis H1 implying that R&D reporting does not create value for French firms under IFRS. Our finding is in line with the idea of Stark (2008) arguing that the adoption of IFRS would hinder the value relevance of R&D treatment. Actually, the adoption of IFRS would remove management discretion in the treatment of R&D costs, so eliminating a way that companies use to communicate information to stock markets by choosing between expensing or capitalizing R&D expenditure. Actually since 2005, managers are required to capitalize R&D expenditure (development costs) provided certain criteria are met. In other words, reported capitalized R&D expenses are effectively value relevant under the optional capitalization rule, and not in the context of a mandatory adoption. Our result is also consistent with the idea of Wyatt (2008), suggesting that the most discretionary items of intangible assets are the most relevant due to discretion in the accounting treatment. The finding is in line with Gong and Wang (2016), offering evidence that countries switching from the mandatory expensing or optional capitalization rule to IFRS (the case of France) see decreases in the value relevance of R&D costs as capitalizing R&D expenditure with future economic benefits is mandatory under IFRS.

In summary, it is found that R&D expenses disclosure, regulated by the IAS, contains value-relevant information in the expensed portion of R&D and not in the capitalized one. This finding can be explained by the fact that, once the management discretion is



constrained by the adoption of the IAS, market participants consider and believe more on expensed R&D costs than on the capitalized R&D expenditure.

#### 4.2. RESULTS FOR THE INDUSTRY MEMBERSHIP EFFECTS ON VALUE RELEVANCE OF R&D

Our third model is used to test Hypothesis H2 in order to examine the value relevance of R&D expenses (capitalized or expensed) under the control of industry membership, namely manufacturing and nonmanufacturing. Adjusted R<sup>2</sup> are relatively high and very close in both samples (0.66 and 0.67) indicating the same strong relationship between accounting numbers and share prices whatever the industry. In the case of manufacturing firms, the coefficient of expensed R&D costs (*ExpRD*) is positive and significant, whereas it is insignificant in the case of nonmanufacturing companies.

On the other hand, results show that *CapRD* variable is insignificantly correlated with the company's market value for both nonmanufacturing and manufacturing sectors, and there is no significant difference between their coefficients (Table 5). This indicates that R&D does not generate intangible assets for both industries. Overall, our results partially support Hypothesis H2 stipulating that association between R&D expenditure and market value does not depend on activity area. Actually, significant difference between both sectors only exists in expensed R&D portions, as we observe a value relevance of expensed R&D costs for manufacturing firms against to nonmanufacturing sector. The results are similar to Shah et al. (2013) revealing that R&D expenditure is positively related to market value only for manufacturing sector.

Table 5: *Value relevance of R&D - sector effects (model 3)*

	Manufacturing firms		Nonmanufacturing firms		Difference	
	Coefficient	<i>t</i> value	Coefficient	<i>t</i> value	Coefficient	<i>t</i> value
<b>AE</b>	2.912***	3.02	1.310***	4.25	1.602	1.12
<b>ABV</b>	0.416***	4.22	0.961***	3.11	-0.545	-0.96
<b>ExpRD</b>	2.236***	4.56	3.201	1.13	-0.965*	-1.79
<b>CapRD</b>	-1.963	-1.14	-1.336	-0.98	-0.627	-0.30
<b>Intercept</b>	0.519***	5.28	0.931***	5.33	-0.412	-1.21
<b>F</b>	82***		54***			
<b>Adjusted R<sup>2</sup></b>	0.66		0.67			
<b>N</b>	297		99			

*MV* is the market value for company *i* at time *t*. *AE* is the adjusted earnings for firm *i* in year *t*, before the processing of R&D expenditure. *ABV* represents the adjusted book value of equity for firm *i* in year *t*, which is net of capitalized R&D. *CapRD* is the annual amount of capitalized R&D costs. *ExpRD* is the annual amount of expensed R&D costs. *SEC* is a dummy variable which is equal to 0 if firm *i* is a nonmanufacturing one, and equal to 1 if it is a manufacturing one. All variables are deflated by the number of ordinary outstanding shares. The model is with fixed effects and under control of heteroscedasticity.

Model 3:  $MV_{it} = \delta_0 + \delta_1 SEC_{it} + \delta_2 AE_{it} + \delta_3 AE_{it} \times SEC_{it} + \delta_4 ABV_{it} + \delta_5 ABV_{it} \times SEC_{it} + \delta_6 CAP\_RD_{it} + \delta_7 CAP\_RD_{it} \times SEC_{it} + \delta_8 EXP\_RD_{it} + \delta_9 EXP\_RD_{it} \times SEC_{it} + \varepsilon_{it}$

\*\*\* and \* indicate statistical significance at the 1% and 10% level, respectively.

## 5. CONCLUSION

The subtle difference between French rule (GAAP) and IFRS regarding the accounting treatment of R&D expenditure is that under IAS 38, the development phase of an internal project shall be recognized as asset if six criteria are met. Therefore, the capitalization of R&D expenses, which was an option under French GAAP, has become an obligation under IAS/IFRS. In this paper, we explore if R&D expenses are value relevant for investors in French companies listed on the SFB 120 after adopting IFRS and for a recent period 2005-2015.

The results indicate that, against the concerns that the adoption of IFRS may lead to more value relevant R&D reporting, the mandatorily capitalized portion of R&D expenditure is not value relevant. This was not the case under French GAAP (Cazavan-Jeny and Jeanjean, 2006). Nevertheless, expensed portion of R&D costs is positively associated with the market value of the firms, revealing that investors don't treat the expensed portion of R&D as an association with unsuccessful R&D projects, as it was revealed by almost all previous studies.

Following the transition to IFRS, there are sector related valuation differences regarding R&D costs in French companies. Actually, the expensed portion of R&D is significantly value relevant only for manufacturing companies. Relating to our findings, we conclude that our results reject the expectations of Barth et al. (2008) and Ball (2006) that IFRS better reflect companies' fundamentals and support the argument advanced by Stark (2008) and Wyatt (2008) that the adoption of IFRS would hinder the value relevance of R&D reporting. The argument behind is that eliminating the discretion to treat R&D expenditure would remove a useful way by which a company conveys information to the stock market (Stark, 2008).

Overall, this research examines the value relevance of R&D expenditure during recent period 2005-2015, which fulfills a gap in the relevant literature for French market. To the best of our knowledge, this is the first study on the value relevance of R&D expenditure involving post-IFRS period in France. A way to research, future studies can develop this issue by examining other interesting markets such as China which in 2007 adopted a set of accounting standards entirely new, Brazil which applied IFRS in 2010, or Canada, India and Korea that have just implemented IFRS in 2011.

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**E / B / R**

**POVZETKI V  
SLOVENSKEM JEZIKU**



## INTELLECTUAL STRUCTURE OF THE OPEN INNOVATION FIELD: STATE OF THE ART AND A CRITICAL LITERATURE REVIEW

### KRITIČNI PREGLED LITERATURE IN TRENUTNI OBSEGA ZNANJA NA PODROČJU ODPRTIH INOVACIJSKIH SISTEMOV

ALEŠ PUSTOVRH, MARKO JAKLIČ

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*POVZETEK: Prispevek predstavlja pregled koncepta odprtih inovacijskih sistemov in ga umesti v širšo strukturo znanstvenih raziskav s področja inovacij. Koncept odprtih inovacij umesti tudi v zgodovinski okvir razvoja razumevanja inovativnosti ter širšega razumevanje raziskav inovativnosti. Z uporabo različnih bibliografskih metod ocenjuje vpliv koncepta in njegov prispevek k teoriji inovativnosti. Čeprav odprti inovacijski sistemi ne predstavljajo nove paradigme v razumevanju inovativnosti pa je koncept v 15 letih raziskav postal jasno definiran in prinaša pomembne dopolnitve k razumevanju inovacij in pomaga odgovoriti na nekaj ključnih vprašanj, ki so jih postavili raziskovalci inovativnosti.*

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**Ključne besede:** odprto inoviranje, inovacijski koncepti, inovacijske prakse, inovacijska politika, uporabniške inovacije, bibliometrična analiza

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## FIRM CREDIT RATINGS AND FINANCIAL ANALYST FORECAST PERFORMANCE

### OCENE KREDITNE SPOSOBNOSTI PODJETIJ IN USPEŠNOST NAPOVEDI FINANČNIH ANALITIKOV

NATHAN H. JEPSON, MATTHEW C. GEISZLER, DAVID F. SALERNO

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*POVZETEK: Avtorji v članku proučujejo razmerje med ocenami kreditne sposobnosti podjetij in uspešnostjo napovedi gibanja dobičkov s strani finančnih analitikov. Avtorji na podlagi postavljene hipoteze ugotovijo, da so visoke ocene kreditne sposobnosti, ki predstavljajo nizko kompleksnost nalog in nizko tveganje, povezano s solventnosjo, povezane z manj razpršenosti in bolj točnimi napovedmi gibanja dobička. Nizke ocene kreditne sposobnosti so povezane z več razpršenosti in manj točnimi napovedmi. Avtorji nadalje ugotavljajo, da kakovost poročil o dobičku deluje kot moderator v proučevanem razmerju. Rezultati študije so uporabni za udeležence na trgu, saj razkrivajo povečano (zmanjšano) vrednost informacij, ki jih vsebujejo ocene finančnih analitikov kadar podjetja dobijo visoke (nizke) ocene kreditne sposobnosti.*

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**Ključne besede:** ocena kreditne sposobnosti, gibanje dobička, poslovanje podjetja, finančni analitiki

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## WHAT REALLY DEFINES THE PERFORMANCE IN HOTEL INDUSTRY? MANAGERS' PERSPECTIVE USING DELPHI METHOD

### KAJ RESNIČNO OPREDELJUJE USPEŠNOST V HOTELSKI INDUSTRIJI? MANAGERSKI POGLED Z UPORABO DELPHI METODE

VALENTINA BOŽIČ, LJUBICA KNEŽEVIĆ CVELBAR

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**POVZETEK:** Ta članek združuje empirične študije s področja hotelirstva s poudarkom na razumevanju dejavnikov uspešnosti poslovanja hotelov in jih združuje z mnenji strokovnjakov o najpomembnejših dejavnikih uspešnosti v hotelski industriji. V prvem koraku se članek osredotoča na študijo več kot 60 člankov, razpoložljivih v literaturi s področja hotelirstva in s poudarkom na uspešnosti hotelov. V drugem koraku vključuje metodo Delphi na skupini 10-ih strokovnjakov s področja hotelirstva z namenom preučiti njihovo mnenje o glavnih dejavnikih hotelske uspešnosti. Rezultati so pokazali, da se literatura osredotoča predvsem na preučevanje vpliva praks s področja upravljanja s kadri (HRM), organizacijske kulture, informacijsko-komunikacijskih tehnologij (IKT), blagovne znamke, okoljskih praks in hotelskih zmogljivosti na uspešnost. Vendar pa strokovnjaki niso potrdili, da so ti dejavniki ključni za uspešnost hotelov. Poudarili so pomen lokacije, produktne segmentacije, fleksibilnosti podjetij in sodelovanja med ponudniki turističnih storitev. Ti dejavniki doslej še niso pritegnili pozornosti akademskih krogov in predstavljajo potencialno novo pot za prihodnje raziskave v hotelirstvu in pri razumevanju hotelske uspešnosti. Literatura in strokovnjaki pa skupno ugotavljajo, da so tržna usmerjenost, zadovoljstvo strank, kakovost storitev in poslovni procesi pomembni dejavniki hotelske uspešnosti, ki zahtevajo nadaljnje raziskave in preučevanja.

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**Ključne besede:** Delphi metoda, hoteli, uspešnost poslovanja

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## THE INTERPLAY AMONG PROSOCIAL MOTIVATION, CULTURAL TIGHTNESS, AND UNCERTAINTY AVOIDANCE IN PREDICTING KNOWLEDGE HIDING

*PREUČITEV VPLIVA TROJNE INTERAKCIJE MED PROSOCIALNO MOTIVACIJO, KULTURNO TOGOSTJO IN NAGNJENOSTJO K TVEGANJU NA POJAV SKRIVANJE ZNANJA*  
KATJA BABIČ, MATEJ ČERNE, MIHA ŠKERLAVAJ, PENGCHENG ZHANG

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*POVZETEK: V članku preučujemo družbene in kulturne vidike skrivanja znanja. Raziskava je bila narejena s ciljem poglobiti razumevanje vpliva dimenzij nacionalne kulture in vpliva prosocialne motivacije na pojav skrivanja znanja. Želeli smo ugotoviti ali preučevani konstrukti povečujejo ali preprečujejo skrivanje znanja. S pomočjo kombinacije trojne interakcije med prosocialno motivacijo, kulturno togostjo in nagnjenostjo k tveganju pridemo do glavnih zaključkov, zakaj prihaja do skrivanja znanja v organizacijah. Raziskava je opravljena na primeru slovenske ( $n = 123$ ) in kitajske kulture ( $n = 253$ ). Rezultati raziskave pokažejo, da se skrivanje znanja pojavi na visoki ravni, kadar se zaposleni srečajo s kombinacijo nizke ravni trojne interakcije, sestavljene iz: nizke ravni prosocialne motivacije, nizke kulturne togosti in nizke ravni nagnjenosti k tveganju. Povedano drugače, se skrivanje znanja pojavi na visoki ravni (tj. z visoko verjetnostjo), kadar zaposleni niso motivirani s strani ostalih sodelavcev in niso nagnjeni k tveganju ter kadar vedo, da kršenje kulturnih norm ni sankcionirano. Na podlagi dveh opravljenih raziskav, v članku predstavimo tako teoretične kot tudi praktične prispevke za področje skrivanja znanja in medkulturnega organizacijskega vedenja.*

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**Ključne besede:** prosocialna motivacija, kulturna togost, skrivanje znanja

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## RESEARCH AND DEVELOPMENT EXPENSES UNDER IFRS MANDATORY IMPLEMENTATION: A VALUE RELEVANCE APPROACH

### *IZDATKI ZA RAZISKAVE IN RAZVOJ PRI OBVEZNI VPELJAVI MEDNARODNIH STANDARDOV RAČUNOVODSKEGA POROČANJA: VPLIV NA VREDNOST PODJETJA*

HASNA CHAIBI

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**POVZETEK:** Članek analizira povezavo med računovodsko obravnavo izdatkov za raziskave in razvoj ter gibanjem cen delnic po uveljavitvi Mednarodnih standardov računovodskega poročanja (MSRP). Na podlagi analize podatkov za francoska podjetja, katerih delnice so med letoma 2005 in 2015 kotirale na borzi, članek analizira vlogo različne računovodske obravnave izdatkov za raziskave in razvoj. Rezultati kažejo, da v nasprotju z obdobjem pred uveljavitvijo MSRP, kapitaliziran del izdatkov za raziskave in razvoj ne vpliva na tržno vrednost podjetja. Del, ki je vključen med stroške, je pozitivno povezan s tržno vrednostjo, vendar samo za podjetja iz predelovalnih dejavnosti. Članek tako sklene z ugotovitvijo, da je vpeljava MSRP vplivala na vrednotenje izdatkov za raziskave in razvoj s strani investorjev v francoskih podjetjih.

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**Ključne besede:** raziskovanje, razvoj, izdatki, vrednost podjetja, MSRP, Francija

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Journal publication:

Van der Geer, J., Hanraads, J.A.J. & Lupton, R.A. (2000). The art of writing a scientific article. *Journal of the Sociological Communication*, 163 (2), 51–59.

Book:

Strunk Jr., W. & White, E.B. (1979). *The Elements of Style* (3rd ed.). New York: Macmillan.

Chapter in an edited book:

Mettam, G.R. & Adams, L.B. (1999). How to prepare an electronic version of your article. In Jones, B.S. & Smith, R.Z. (Eds.), *Introduction to the Electronic Age* (pp. 281–304). New York: E-Publishing.

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Factiva (2010). *Dow Jones Reuters Business Interactive LLC*. <http://www.factiva.com> (accessed June 5, 2010).

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