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# Microfoundations of SME open innovation: the role of help, knowledge sharing and hiding

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## Abstract

**Purpose** – The purpose of this research is to better understand the human aspects of open innovation in small- and medium-sized enterprises (SMEs) by exploring how intrinsic and extrinsic motivation influence enjoyment in helping others, knowledge sharing and knowledge hiding and consequently firms' open innovation.
**Design/methodology/approach** – We collected data with a survey among CEOs in 140 SMEs and performed confirmatory factor analysis applying structural equation modeling in IBM SPSS AMOS (v. 26).
**Findings** – Results reveal that intrinsic motivation is positively associated with helping behavior and knowledge sharing and negatively associated with knowledge hiding. We also confirm the positive relationship between extrinsic motivation and knowledge sharing. Moreover, we find that knowledge sharing increases and knowledge hiding decreases the firm-level open innovation. Especially in high-tech industry, knowledge sharing is a vital determinant of open innovation.
**Originality/value** – Responding to the calls for a deeper understanding of the individual-level factors that determine organization-level open innovation, in this research we focus on the human aspect of open innovation in SMEs. Open innovation is a widely recognized and implemented concept among large corporations and facilitates better understanding of new technological and market developments both within and outside of organizations. However, understanding of the microfoundations of open innovation in smaller firms is still limited, but this steam of research is growing rapidly.

**Keywords** Open innovation, Helping behavior, Knowledge sharing, Knowledge hiding, Motivation, SMEs
**Paper type** Research paper

## 1. Introduction

Over the last decade, open innovation has become a widely recognized and implemented concept among large corporations, facilitating a better understanding of new technological and market developments, both within and outside of organizations. Applying open innovation may speed up and enhance organizations' innovation process and the commercialization of their innovations (Chesbrough, 2006; Ystrom *et al.*, 2015). Consequently, academics and scholars have been interested in exploring the key factors and practices that stimulate the successful adoption of open innovation. Although recent literature suggests that adopting open innovation can help SMEs boosting their innovation

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performance, the literature still lacks adequate evidence on open innovation from the SME perspective (Bigliardi *et al.*, 2021; De Marco *et al.*, 2020; Kraus *et al.*, 2020; Odriozola-Fernández *et al.*, 2019; Stanisławski, 2020), but interest in this topic is growing.

Recent work on open innovation also suggests that successfully implementing open innovation practices in SMEs necessitates considering individual-level factors that determine organization-level openness (i.e. microfoundations of open innovation). Santoro *et al.* (2020), for example, pointed out that "openness at micro-level may influence openness at macro-level in the context of SMEs" (p. 2). Moreover, Chesbrough (2012) argued that if we want to move knowledge, we should move people first, thereby suggesting that employees play a vital role in facilitating open innovation. In fact, open innovation activities are interpreted, applied and realized by employees and their leaders (West and Bogers, 2017). To embrace open innovation in SMEs, employees and their leaders should be involved in knowledge flows within and across the organization's boundary (Bogers *et al.*, 2018; Slavec Gomezel and Rangus, 2019; Tian *et al.*, 2020).

However, this seems to be easier said than done. The open innovation literature implies that individuals need to become more open (i.e. help others, share knowledge and avoid knowledge hiding) and emphasizes the importance of transferring knowledge and making it reusable by others. Moreover, Santoro *et al.* (2019) argue that open innovation is a matter of mindset that needs to be cultivated and shared by organization's members, and Slavec Gomezel and Rangus (2018) also highlighted the importance of an open innovation mindset among entrepreneurial ventures for business success; thereby indicating that open innovation also greatly depends on the attitudes of entrepreneurs and employees and their willingness to exchange knowledge. By contrast, previous studies revealed that people are reluctant to share knowledge, which negatively influences the extent to which open innovation practices are used (de Araújo Burcharth *et al.*, 2014; Scuotto *et al.*, 2020). This points to the need to better understand the relationship between motivation and knowledge transfer (Chesbrough, 2003; Liu and Tang, 2020; Scuotto *et al.*, 2020). Although the success of open innovation depends on people' motivation (Peris-Ortiz *et al.*, 2019; Sun *et al.*, 2020), the majority of research in open innovation focuses on the organizational level rather than the individual level, neglecting the role of people's motivation in open innovation (Locatelli *et al.*, 2021).

The aim of this research is therefore to better understand the human aspects of open innovation in SMEs by exploring how intrinsic and extrinsic motivation influence the enjoyment in helping others, knowledge sharing and knowledge hiding and consequently firms' open innovation. In responding to the abovementioned calls, the first intended contribution of this study is to examine the microfoundations of open innovation from the entrepreneurs' perspective in SMEs. In line with the microfoundations approach, we propose that factors at the individual level may impact macro-level outcomes. Drawing on the famous Coleman "bathtub" model (1994), we argue that perceptions of extrinsic and intrinsic motivation (i.e. individual-level conditions) influence the entrepreneur's openness to transfer knowledge (i.e. individual-level outcomes), thereby influencing open innovation (i.e. macro-level outcomes). Recent studies suggested that self-motivation and open-mindedness play a vital part in successfully implementing open innovation (da Mota Pedrosa *et al.*, 2013; Slavec Gomezel and Rangus, 2018). Thus, this study focuses on the human aspects of open innovation, exploring how intrinsic and extrinsic motivation influence entrepreneur's openness to transfer knowledge (in the form of helping others, knowledge sharing and the absence of knowledge hiding) and consequently firms' open innovation.

This study extends the literature by building on the motivation literature, proposing a novel model that integrates the interplay of motivational aspects, willingness to help others, knowledge sharing and knowledge hiding and their mutual impact on a firm's open innovation. Since employees' motivation is seen as one of the building blocks in the

knowledge sharing process (de Almeida *et al.*, 2016), it is not surprising that recent studies suggest that the success of open innovation and indeed the company itself depends on the motivation of the employees (Peris-Ortiz *et al.*, 2019). To this line of reasoning, we add another perspective: that of the relationship between entrepreneurs' motivation, knowledge sharing and open innovation. By integrating the motivational aspect, the entrepreneur's openness to transfer knowledge and their mutual impact on a firm's open innovation, this research contributes to the literature in the field of innovation management, specifically open innovation in SMEs and entrepreneurship.

Furthermore, despite the emphasis on and interest in motivation factors when studying the phenomena related to helping others, knowledge sharing and knowledge hiding, questions regarding how motivational variables interact and the different ways they affect those phenomena have not been systematically studied in entrepreneurship research. Consequently, little is known about how motivational factors (i.e. intrinsic and extrinsic motivation) identified with help/knowledge providers and knowledge hiders work in conjunction with each other, because the influence of motivational factors on these behaviors is rarely studied together. This research advances the field of motivation by conceptualizing and testing the comprehensive influence of motivational factors on three related yet different, organizationally relevant behaviors (i.e. helping others, knowledge sharing and knowledge hiding). We thus broaden the set of motivations and contexts in entrepreneurship research and contribute to more practical and legitimate research on the topic (Baker and Welter, 2017).

The paper is organized as follows: In the next section, we review the literature of open innovation in the SME context, explain the role of motivation in entrepreneurs' openness to transfer knowledge (i.e. enjoyment in helping others, knowledge sharing and knowledge hiding) and in open innovation. Next, we present our research methodology. In the Results and Discussion sections, we show the relationships between two different types of motivation (i.e. intrinsic and extrinsic), entrepreneurs' openness to knowledge transfer and open innovation. We conclude the paper by outlining some relevant theoretical and practical implications of our study, limitations and avenues for future research.

## 2. Theoretical background and hypotheses

Open innovation is defined as "the use of purposive inflows and outflows of knowledge to accelerate internal innovation, and to expand the markets for external use of innovation" (Chesbrough, 2006, p. 2). Open innovation's main idea is to open up the innovation process to other firms, individuals, research labs, etc. (Chesbrough, 2006), which can enable companies to reduce technology development and improvements costs, accelerate the time to entering the market, improve the products' quality and increase access to external expertise (see Hossain and Kauranen, 2016). Academics and business practitioners concur that open innovation is instrumental for sustained competitive advantage in innovation and overall organizational competitiveness. Specifically, open innovation positively influences firms' ability to innovate and gain the benefits from doing so (Cheng and Huizingh, 2014). Thus, some organizations may be interested in enhancing open innovation and thereby stimulating the positive, organizationally relevant outcome of open innovation (e.g. radical and incremental innovation performance, venturing activities, etc.).

Several studies suggested that the open innovation paradigm is perhaps even more important for SMEs than for large companies (De Marco *et al.*, 2020; Oduro, 2020; Stanisławski, 2020; Vanhaverbeke, 2017). Although open innovation is a strategic choice for large companies; SMEs may be even more reliant on open innovation than large companies as open innovation may help SMEs to compensate for their shortcomings (De Marco *et al.*, 2020; Spithoven *et al.*, 2013). Since SMEs play a major role in most economies (Ayyagari *et al.*, 2011),

developing current and future economies also largely depends on SMEs' ability to exploit their innovativeness to achieve and sustain competitive advantage (Parida *et al.*, 2012). However, SMEs face many challenges in their innovation activities. Namely, contemporary organizations operate in a rapidly evolving and challenging environment, characterized by unpredicted changes, technological novelties, ever-changing customer demands and uncertainty. To capitalize on opportunities that technology and changing environments offer, organizations need a flexible workforce and many other resources that allow them to quickly respond and adapt to the changes; however, SMEs typically have limited resources (Odriozola-Fernández *et al.*, 2019). Moreover, SMEs tend to have less structured internal capabilities and innovation processes (Hossain and Kauranen, 2016), and due to their size, often cannot cover all the required innovation activities (Brunswicker and Van de Vrande, 2014).

Odriozola-Fernández *et al.* (2019) argued that SMEs should thus innovate using a lower-cost method. Specifically, the abovementioned limitations often push SMEs to open up their organizational boundaries and embrace open innovation strategies (De Marco *et al.*, 2020), thereby indicating that open innovation can help SMEs to overcome the challenge of limited resources and smallness (Oduro, 2020). Although there is a growing interest in assessing open innovation in the SMEs context, the majority of open innovation practices are still tailored for large companies (Odriozola-Fernández *et al.*, 2019). However, SMEs differ greatly from large corporations in the way they utilize open innovation activities for valuable outcomes (Hossain and Kauranen, 2016). Despite the widespread attention and acknowledgement of positive implications of open innovation in the SME context, there is still a limited number of publications investigating open innovation in SMEs (Kraus *et al.*, 2020; Odriozola-Fernández *et al.*, 2019). Therefore, the existing literature calls for studying the factors that influence adopting open innovation practices in the SME context.

When doing so, scholars should be aware that although open innovation is a collective-level construct, its microfoundation is rooted in an individual's intentional actions, experiences and preferences (Ahn *et al.*, 2018), thereby emphasizing the importance of human elements in open innovation adoption. Santoro *et al.* (2020) found that a firm's ability to engage in open innovation lies in the employees' capacities for recognizing and integrating external knowledge. According to these authors, this was especially true for smaller firms with simple hierarchy and informal procedures. Although open innovation primarily relates opening up the innovation process to accelerate internal innovation and expand the markets for the external use of innovation (Chesbrough, 2006), recent studies suggested that the process is not solely concerned with organizational culture, structure and management. It also greatly depends on the attitudes of employees (Peris-Ortiz *et al.*, 2019) and SME leaders (Slavec Gomezel and Rangus, 2018). Employees can facilitate innovation via internal collaboration among divisions that enables sharing and borrowing ideas (O'Connor, 2006), while SME leaders can stimulate open innovation through an open innovation mindset (Slavec Gomezel and Rangus, 2018). Despite individuals (i.e. entrepreneurs, managers and their employees) are operating on the front lines of open innovation, relatively little is known about how their choices, behaviors and actions shape aggregate organizational outcomes (Bogers *et al.*, 2018; Salter *et al.*, 2014; Santoro *et al.*, 2020).

Taken together, these arguments imply that advancing the current understanding of open innovation in the SME context requires more focus on the microfoundations. The microfoundation literature speculates that macro-level outcomes (e.g. open innovation) need to be understood in terms of the underlying actions, interactions and characteristics of micro-level entities (e.g. entrepreneurs or employees) (Contractor *et al.*, 2019). Felin *et al.* (2015) emphasized that the microfoundational approach is a species of multilevel explanation that privileges the micro-level and uses Coleman's (1994) "bathtub" diagram to illustrate the causality between and within the micro-level (i.e. individual) and macro-level

(i.e. organizational). As depicted in Figure 1, we also use Coleman's (1994) "bathtub" logic to gain a better understanding of how individual-level conditions and outcomes determine open innovation in the SME context. Specifically, we examine how motivation and entrepreneurs' openness to transfer knowledge (i.e. individual-level mechanisms) influence open innovation.

### *2.1 The role of motivation in entrepreneurs' openness to transfer knowledge*

Chesbrough (2003) argued that implementing open innovation must rely on the transfer of various types of knowledge. Employees can facilitate innovation via internal collaboration among divisions that facilitates sharing and borrowing ideas (O'Connor, 2006). Therefore, we propose that individuals in an SME may play an important role in determining firm-level openness. However, employees and entrepreneurs are often convinced that exclusively internal innovation is superior and thereby may be reluctant to transfer knowledge externally (Lichtenthaler *et al.*, 2011), which thus jeopardizes the successful implementation of open innovation. According to Peris-Ortiz *et al.* (2019), the success of open innovation and indeed the company itself depends on the motivation of the people who perform the work.

Building on a microfoundations approach, we argue that the abovementioned SME constraints (e.g. limited resources and smallness) influence entrepreneurs' openness to transfer knowledge through its direct effect on their work motivation. Work motivation is defined as "a set of energetic forces that originates both within as well as beyond an individual's being, to initiate work-related behavior, and to determine its form, direction, intensity and duration" (Pinder, 2008, p. 11). As suggested by Carsrud *et al.* (2017), in this study, we assume that entrepreneurs are equal in their type of motivations as non-entrepreneurs and thereby focus on two most commonly studied types of motivation: intrinsic and extrinsic motivation. Intrinsic motivation originates from "an individual's interest in the behavior itself" (de Almeida *et al.*, 2016, p. 1286). It refers to the need to continually perform a certain work-related activity because the individual is fascinated by the activity and not because of an external regulation or reward (Fullagar and Kelloway, 2013). Intrinsically motivated individuals are inspired to execute the activity because of excitement, enjoyment and satisfaction (Gagné and Deci, 2005). In contrast, extrinsically motivated individuals accomplish tasks to attain some sort of reward (e.g. receiving an award, avoiding guilt or gaining approval) (Deci *et al.*, 1996). Extrinsically motivated individuals are also more

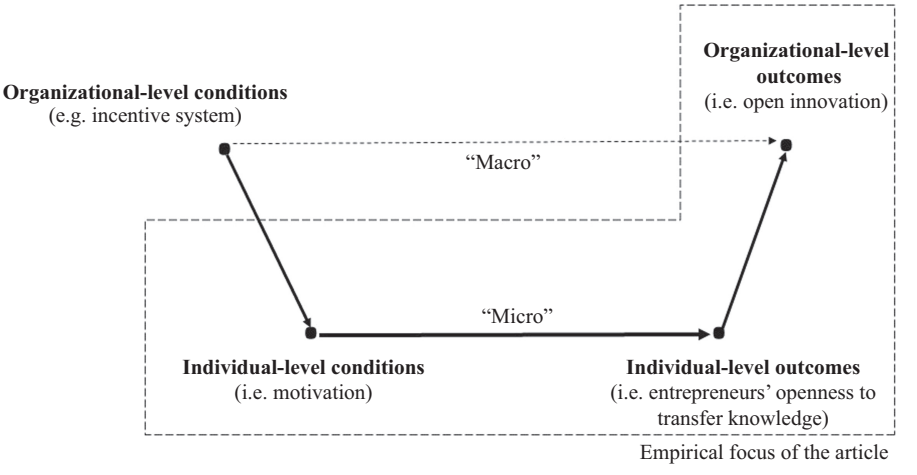



**Figure 1.**
Research logic

passive, involved in quantity-type tasks with lesser complexity and have lower personal cognitive investment (Cerasoli *et al.*, 2014). Minbaeva *et al.* (2012) argued that the signaling effect of organizational-level conditions (e.g. SMEs' constraints) creates a shared view that knowledge transfer is needed and valued, which is manifested in the individual-level perceptions and conditions (e.g. motivation).

Motivation has been identified as an important determinant of general and work-related behavior, and the literature suggests that it is the primary trigger for knowledge transfer (Kanfer *et al.*, 2017; Osterloh and Frey, 2000). We thus draw on work motivation theory to explain the individual-level mechanisms that promote entrepreneurs' openness to transfer knowledge, which is manifested in three types of knowledge-transferring behavior: enjoyment in helping others, knowledge sharing and knowledge hiding. Motivation theory suggests that individuals can be either intrinsically or extrinsically motivated (Ryan and Deci, 2000). In this study, we examine how intrinsic (i.e. doing something because it is inherently interesting or enjoyable) and extrinsic (i.e. doing something because it leads to a separable outcome) motivation affect the entrepreneurs' openness to transfer knowledge.

Motivation to help due to pleasure (i.e. intrinsic motivation) has been shown to predict helping behavior (Pavey *et al.*, 2012). We, therefore, argue that intrinsic motivation increases enjoyment in helping others. Enjoyment in helping others is derived from altruism (i.e. a trait primarily directed toward helping others with organizational tasks or problems), including discretionary behaviors that help specific others with organizationally relevant tasks or problems (Lin, 2007a; Organ, 1988). Motivation theory suggest that employees may participate and help others because they perceive such participation as fun and that helping others is enjoyable and brings personal satisfaction (Wasko and Faraj, 2000). Individuals who are intrinsically motivated by the satisfaction they receive from assisting colleagues are more likely to share their knowledge (Obrenovic *et al.*, 2020). Such individuals are willing to transfer their knowledge because they believe this is the right thing to do. We argue that so do entrepreneurs—keeping the success of their firm in mind, they are willing to help subordinates. The desire to benefit from helping others is most likely to enhance persistence, performance and productivity when accompanied by intrinsic motivation (Grant 2008). According to the motivation theory, intrinsically motivated people find the activity of exchange to be exciting and fun, so they often enjoy disseminating knowledge (Obrenovic *et al.*, 2020). In addition, Organ (1988) suggests that helping behavior often arises from within and is sustained by an individual's intrinsic needs. For intrinsically motivated individuals, the benefit of the person in need servers as a goal by itself (Bar-Tal, 1986). Therefore, we propose that entrepreneurs' intrinsic motivation is positively associated with helping behavior.

*H1*. Intrinsic motivation is positively related to enjoyment in helping others.

Furthermore, the knowledge management literature suggests that knowledge transfer relies almost entirely on the consent and willingness of individuals to share knowledge (Obrenovic *et al.*, 2020; Scuotto *et al.*, 2020). Knowledge sharing, defined as the "activity of transferring or disseminating knowledge from one person, group, or organization to another" (Lee and Win, 2004, p. 324), can thus greatly enhance knowledge transfer (Obrenovic *et al.*, 2020). It refers to the exchanging of knowledge, experience and skills within a department or organization, for example, by actively communicating and consulting with colleagues to share and learn from them so that something can be done better, faster or more efficiently (Lin, 2007b). Knowledge sharing facilitates people in a firm to collaborate and exchanging their knowledge, which in turn enhances organizational learning and aims to meet individual and organizational goals (Werner *et al.*, 2018). This phenomenon is thus a deliberate act that allows other people to reuse knowledge by transferring it (Lee and Al-Hawamdeh, 2002; Scuotto *et al.*, 2020).

However, individuals may be reluctant to share their knowledge due to the fear of losing their unique value (Renzl, 2008). Many scholars and practitioners thus share a strong interest in finding factors that promote knowledge sharing. Existing knowledge sharing literature suggests that intrinsic motivation enhances someone's inclination to voluntarily share knowledge, which is the effect of a positive mood, proclivity for learning and searching for new knowledge (Lin, 2007a; Osterloh and Frey, 2000; Welschen *et al.*, 2012). Several scholars suggested that individuals within an organization share knowledge when they are intrinsically motivated (see de Almeida *et al.*, 2016). For example, Lin (2007a) showed that motivational factors such as mutual benefits, knowledge self-efficacy and enjoyment in helping others positively influence knowledge sharing. Self-driven individuals are more inclined to share and contribute knowledge, because they enjoy solving complex problems and intellectual challenges (Wasko and Faraj, 2005). Also, individuals who have high fundamental evaluations of their own ability, competence and values (Judge *et al.*, 1998) are more attentive to the positive side of knowledge sharing (Zhang *et al.*, 2020). Thereby, their choice to share knowledge is driven by knowledge sharing's benefits that are intrinsically driven, such as learning opportunities and gaining new insights and skills for the sharer (Bolino and Grant, 2016). Intrinsically motivated individuals are also more likely to share the valuable, unique job resources of error (i.e. job knowledge learning and routine-breaking stimulation) (Mao and Hsieh, 2017). From this, they promote organizational learning and increasing innovation. Based on this discussion, we propose that entrepreneurs, who are intrinsically motivated, are also more likely to share their knowledge with others. The following hypothesis summarizes our discussion:

*H2.* Intrinsic motivation is positively related to knowledge sharing.

While knowledge sharing is beneficial to the innovating firm, knowledge hiding brings opposite outcomes (Maqbool *et al.*, 2019). Previous studies revealed that individuals are unwilling to share their knowledge even when organizational practices are designed to facilitate transfer (Connelly *et al.*, 2012; Scuotto *et al.*, 2020). Thus, we argue that entrepreneurs' openness to transfer knowledge is also manifested in a level of knowledge hiding, which is not simply the absence of sharing, but is defined as "an intentional attempt by an individual to withhold or conceal knowledge that has been requested by another person" (Connelly *et al.*, 2012, p. 65). Knowledge hiding literature implies that an individual will give less than their full effort to contribute to organizational knowledge (Lin and Huang, 2010). Individuals who are intrinsically motivated see more meaning in their work and are consequently more eager, autonomous, persistent and interested, resulting in enhanced work effort (Dysvik and Kuvaas, 2011). Moreover, individuals with high levels of intrinsic motivation accept more responsibility, dedicate their full effort to the work and perform better.

In addition, knowledge hiding can be driven by one's desire to achieve a higher performance than others (Rhee and Choi, 2017). Intrinsically motivated employees engage in activities they find interesting and challenging, which results in innovative ideas, and external positive feedback that enhances their motivation, which makes the individual feel responsible and competent in their performance (Deci and Ryan, 2000). Thus, we propose that intrinsically motivated entrepreneurs are more reluctant to hide knowledge from colleagues because they are focused on their innate, basic needs and on their own firm's success and therefore are not competing with others in their organization.

*H3.* Intrinsic motivation is negatively related to knowledge hiding.

Similarly, we postulate that extrinsic motivation influences entrepreneurs' openness to transfer knowledge. Motivation theory suggests that individuals may also perform an action (e.g. knowledge transfer) because of external forces, e.g. to obtain rewards, threats or

punishments, reciprocal benefits, etc. (Tangaraja *et al.*, 2015; Tremblay *et al.*, 2009). Employees may therefore engage in knowledge exchange based on a cost–benefit analysis by comparing the rewards (i.e. benefits in the form of salary incentives, bonuses, promotion incentives, job security, reputation, or creating a commitment for colleagues to reciprocate) expected from an exchange with the effort (i.e. costs in the form of time, mental effort, etc.) associated with that exchange (Lin, 2007a). If the perceived benefits equal or exceed the costs, the exchange process continues; otherwise it is stopped (Aalbers *et al.*, 2013; Kelley and Thibaut, 1978; Lin, 2007a) Extrinsic rewards signal to employees that the time they spend exchanging knowledge is considered important by the organization, thereby stimulating knowledge transfer (Burgess, 2005). Because the potential for financial rewards, personal wealth accumulation and personal income (i.e. extrinsic motivation) have long been recognized as important motivators of entrepreneurial behavior (DeTienne *et al.*, 2008; Shepherd and DeTienne, 2005), we argue that extrinsic motivation influences entrepreneurs' enjoyment in helping others, sharing knowledge and hiding knowledge.

Specifically, we first argue that extrinsic motivation influences enjoyment in helping others. Although helpfulness is socially and personally desirable, individuals sometimes refuse to help others, especially when helping comes at a cost to the self, such as an expenditure of one's own energy, time, money or other valuable resources (DeWall *et al.*, 2008). Because individuals are often motivated by self-interest, they are less likely to help others and exchange knowledge if they do not receive tangible or intangible reciprocation (Wasko and Faraj, 2000). The more positive the outcomes (e.g. monetary incentives, praise, recognition) associated with helping others, the more likely individuals are to help others (Aalbers *et al.*, 2013). Therefore, we argue that extrinsic motivation can stimulate enjoyment in helping others.

*H4.* Extrinsic motivation is positively related to enjoyment of helping others.

Moreover, the knowledge sharing literature suggests that organizational rewards are related to the contribution of knowledge to the organization (de Almeida *et al.*, 2016) and that individuals' self-interest is s major barrier to knowledge sharing (Lu *et al.*, 2019). However, extrinsically motivated individuals may share their knowledge to improve their reputation to enhance their self-concept. Therefore, certain forms of extrinsic motivation may stimulate knowledge sharing (Lin, 2007a). For example, individuals who have a strong belief in reciprocity are more likely to expect that their sharing actions will be reciprocated and are therefore more likely to perform them out of this extrinsic motivation (Oarga *et al.*, 2015). Potential financial rewards also motivate entrepreneurs to identify opportunities (Shepherd and DeTienne, 2005), including those arising from successful knowledge transfer. Moreover, when individuals believe that sharing knowledge facilitates the achievement of important organizational goals, they are more likely to share their knowledge (Gagné *et al.*, 2019). Thus, when entrepreneurs see the possibility of receiving financial rewards or other benefits from sharing their knowledge, they will develop more positive attitudes and intentions to share knowledge (Lin, 2007a). Extrinsic motivational factors also influence knowledge sharing behaviors (i.e. donating and collecting knowledge) via normative organizational commitment (Tangaraja *et al.*, 2015), which is positively correlated with commitment (Tremblay *et al.*, 2009). Consistent with the knowledge transfer literature, we therefore propose that as long as extrinsically motivated entrepreneurs receive knowledge transfer benefits, they are more likely to share their knowledge.

*H5.* Extrinsic motivation is positively related to knowledge sharing.

In addition, we propose that extrinsic motivation may also reduce the incidence of knowledge hiding. Knowledge hiding is often viewed as a goal-directed behavior that employees use strategically to achieve their competitive advantage and maximize their own interests (Toma

and Butera, 2009). However, a recent study by Zhu *et al.* (2019) suggests that performance feedback, typically seen as an antecedent to receiving rewards (e.g. higher salary, recognition, promotion) that motivate individuals to exert greater effort into their work (Saavedra *et al.*, 1993), may influence individuals' decision to conceal their knowledge. Specifically, the authors found that the goal orientation of "proving performance" was negatively related to knowledge hiding when performance feedback was more focused on group performance (Zhu *et al.*, 2019). Moreover, managers' ability to offer incentives may influence subordinates' decision to hide their knowledge, as they may expect negative consequences if this decision is revealed (Webster *et al.*, 2008). Therefore, we propose a negative relationship between extrinsic motivators, such as a meritocratic system, and knowledge hiding. In other words, extrinsically motivated individuals who perceive a higher level of incentives to share and benefit from knowledge are more reluctant to hide knowledge from them.

*H6.* Extrinsic motivation is negatively related to knowledge hiding.

### *2.2 The role of entrepreneurs' openness to transfer knowledge in open innovation*

In the context of open innovation, all employees (not only those from research and development departments) are encouraged to search for knowledge and ideas inside and outside of the focal organization (Chesbrough, 2003, 2006). Many organizations have developed initiatives to make appropriate use of external sources of knowledge through their transformation, assimilation and use of the internal resources (Chesbrough 2003; Chesbrough and Crowther, 2006). However, it is the individual within the firm who identifies and applies newly acquired knowledge to innovative ideas, collaborating with sources inside and out of the firm's boundaries, and it is the individual who becomes more efficient at generating new ideas by collaborating with internal and external participants (Salter *et al.*, 2015). Helping others, sharing information and expertise and searching for new knowledge and information enable individuals to gather diverse perspectives and ideas in the generation process, thus stimulating innovation (Černe *et al.*, 2013). Accessing external knowledge from numerous sources may provide individuals with access to richer and more diverse knowledge, allowing them to create new combinations of internal and external knowledge elements (Salter *et al.*, 2015).

The success of open innovation therefore also depends on the entrepreneur's openness to transfer knowledge among people in an organization. Namely, individuals within organizations facilitate collaborative knowledge creation processes and play a vital role in open innovation (Du Chatenier *et al.*, 2010). Networking with others both within an organization and with external partners enables individuals to discover new ideas, knowledge and technology. Individuals recognize and exploit innovative ideas in collaboration with external partners and may, through collaboration and teamwork, generate new ideas more efficiently (Salter *et al.*, 2015). Therefore, we argue that entrepreneurs' openness to transfer knowledge (i.e. enjoyment in helping others, knowledge sharing and knowledge hiding) enhances open innovation.

In particular, employees who find joy in helping others are more likely to donate and accumulate knowledge (Lin, 2007b), suggesting that the enjoyment in helping others promotes open innovation. Moreover, the open innovation literature suggests that helping behavior helps co-innovators obtain needed innovation knowledge faster and become familiar with open innovation practices more quickly, creating favorable conditions for open innovation (Lindegaard, 2010; Naqshbandi *et al.*, 2016; Podsakoff *et al.*, 1997). Thus, we posit the positive relationship between the enjoyment in helping others and open innovation.

*H7.* Enjoyment in helping others is positively related to open innovation.

Moreover, individuals who are more open and inclined to collaboration, communication and sharing knowledge internally are more likely to recognize and sense the value of externally generated knowledge (Lazzarotti *et al.*, 2016). Compared to more inward-focused individuals, those who are more open are also more likely to integrate internal and external knowledge sources into innovative ideas and may facilitate new developments for the organization (Salter *et al.*, 2015). Knowledge sharing and organizational learning processes foster microfoundational sources of innovative capabilities and thus play a central role in the success of open innovation practices (Mazzucchelli *et al.*, 2019; Scuotto *et al.*, 2020). In particular, knowledge sharing enables information exchange, which can help to use knowledge resources effectively, trigger more innovation thinking and thereby promote open innovation (Sun *et al.*, 2020).

*H8.* Knowledge sharing is positively related to open innovation.

Knowledge exchange is crucial for an open innovation network because the realization of innovation depends on the acquisition and application of knowledge (Liu and Tang, 2020). On the other hand, when individuals hide knowledge, they trigger a reciprocal distrust loop in which coworkers are unwilling to share knowledge with them, which consequently inhibits creativity (Černe *et al.*, 2014). Therefore, knowledge hiding negatively influences creativity and innovation at individual, team and organizational levels. The literature on knowledge hiding suggests that knowledge hiding within an organization impairs the ability to innovate effectively and thus is one of the major barriers for innovation (Butt and Ahmad, 2019; Černe *et al.*, 2017; Labafi, 2017). Therefore, we argue that knowledge hiding hinders open innovation.

*H9.* Knowledge hiding is negatively related to open innovation.

Based on the foregoing discussion, we propose the conceptual model presented in Figure 2.

## 3. Methods

### *3.1 Data and sample*

To test the proposed theoretical model, we collected data among Slovenian entrepreneurs with an online questionnaire using QuestioPro.com. In constructing the database of firms, we used the official national database of firms, the Business Directory of the Republic of Slovenia database. We limited our search to firms that were privately owned, did not operate in the public sector, had less than 249 employees and had an email address published in the official

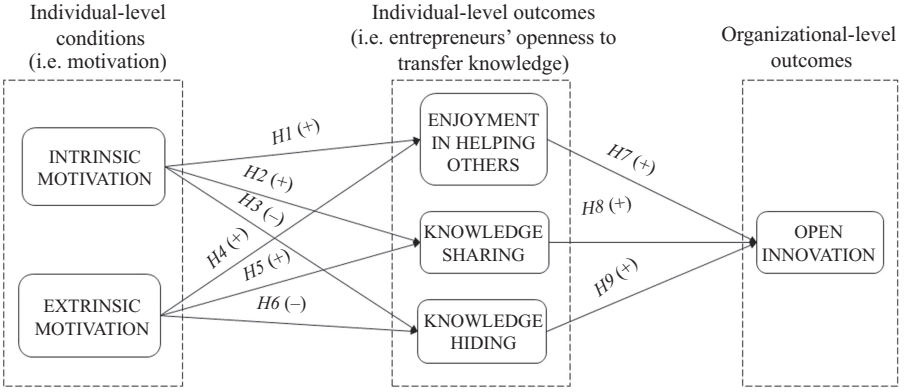



**Figure 2.**
Proposed theoretical model

database or on their web pages. We chose 3,000 firms that meet these criteria and sent an email invitation to firms' principals. 171 respondents viewed the email or started the survey. The final sample for statistical analysis was comprised of 140 useable responses, which yields a 5.7% response rate calculated as the percentage of viewed emails out of all sent emails. The survey was conducted in Spring 2017.

We composed the sample for data analysis as follows: 80.0% of the firms were small firms with up to 49 employees, 12.1% were medium-sized firms with up to 249 employees and 7.9% of firms had more than 250 employees. Of the 140 firms, 70% reported they were engaged in open innovation activities and 30% of the firms rated themselves as very low in open innovation activities; 77.0% of respondents were male, were an average of 51.1 years old (SD = 9.78) and had 26.8 years of experience on average (SD = 20.93); 82.1% of the respondents had a bachelor's degree or less. The composition of the sample is similar to other studies conducted on this population in Slovenia (Jeraj and Antoncic, 2013; Rebernik *et al.*, 2019; Slavec *et al.*, 2017).

### *3.2 Measures*

Intrinsic motivation and a specific type of extrinsic motivation (i.e. external regulation) were measured using the scales that Tremblay *et al.* (2009) developed and validated. We asked respondents to rate on a Likert scale ranging from 1 = Strongly disagree to 7 = Strongly agree their motivations for doing their work. Each measure consisted of three items. A sample item for intrinsic motivation was "Because I derive much pleasure from learning new things," and a sample item for extrinsic motivation was "For the income it provides me." Reliability values for both measures were adequate: $\alpha = 0.91$ for intrinsic motivation and $\alpha = 0.74$ for extrinsic motivation.

We measured enjoyment in helping others using the scale that Wasko and Faraj (2000) developed. The scale consists of four items: a sample item was "I enjoy sharing my knowledge with colleagues" ($\alpha = 0.94$). Respondents were provided with a five-point Likert scale (1 = Strongly agree, 5 = Strongly disagree).

For knowledge sharing, we used the five-item measurement scale that Calantone *et al.* (2002) developed. One item, which was reverse coded—"We put little effort in sharing lessons and experiences"—did not load properly on the factor, and we had to exclude it from further analysis. Cronbach's alpha was 0.812. Respondents assessed their knowledge sharing on a five-point Likert scale ranging from 1 = Strongly disagree to 7 = Strongly agree.

We measured respondents' knowledge hiding with the scale that Connelly *et al.* (2012) proposed. This is a second-order three-factor scale with subdimensions of evasive hiding, playing dumb and rationalized hiding. We asked the respondents to rate on a five-point Likert scale (1 = Strongly agree, 5 = Strongly disagree) the degree to which they agreed that in a particular situation, they turned down a colleague who asked them for help. A sample item for evasive hiding is: "In this specific situation, I agreed to help him/her but never really intended to" ($\alpha = 0.87$). A sample item for playing dumb is: "In this specific situation, I pretended that I did not know the information" ($\alpha = 0.92$). A sample item for rationalized hiding is: "In this specific situation, I explained that I would like to tell him/her, but was not supposed to" ($\alpha = 0.79$). The item "In this specific situation, I said that I would not answer his/her questions" did not load properly on the intended dimension of rationalized hiding, so we excluded it from further analysis.

We applied the Hung and Chou (2013) scale to measure open innovation. They proposed two dimensions of open innovation: the external technology acquisition dimension and the external technology exploitation dimension. Sample items are "We regularly search for external ideas that may create value for us" for external technology acquisition ($\alpha = 0.83$) and "We welcome others to purchase and use our technological knowledge or intellectual property" for external technology exploitation ($\alpha = 0.80$). We had to exclude one item

("We are proactive in managing outward knowledge flow") from the external technology exploitation dimension due to cross-loading with the external technology acquisition dimension. The respondents assessed the items on a five-point agreement-disagreement Likert scale.

We controlled for entrepreneurs' gender, age, experience, education and firm age, as well as the technological levels of the industries in which the firms operate (low-tech and high-tech industries). Only the industry technological level (1 = high-tech industry, 2 = low-tech industry) had a significant impact on the model; therefore, we retained this control variable in the continuation of the research, and all other control variables were excluded from further analysis. We conducted a group comparison analysis to see if differences existed in the specified relationships between high-tech and low-tech industries.

### *3.3 Data analysis and statistical procedures*

We did all data analysis and statistical procedures in IBM SPSS Statistics 26.0 and IBM SPSS AMOS 26.0. We performed reliability (using Cronbach Alpha) and validity tests (convergent and discriminant validity) as well as confirmatory factor analysis and structural equation modeling. We treated also the common method variance issue.

We performed a confirmatory factor analysis on intrinsic motivation, extrinsic motivation, enjoyment in helping others, knowledge sharing, knowledge hiding and open innovation. We tested for the convergent and discriminant validity of the constructs based on the recommendations of several authors (e.g. Bagozzi *et al.*, 1991; Clark and Watson, 1995; Hair *et al.*, 2010). Convergent validity is evidenced when items have high factor loading on specified factors (above 0.50). All items in our study except for one had factor loadings above the proposed threshold of 0.50. The item pertaining to the open innovation external technology acquisition dimension ("We often acquire technological knowledge from outside for our use") had a slightly lower loading ($r = 0.462$), but we kept it to preserve the construct's content domain. Appendix includes a table that reports items and their factor loadings.

Discriminant validity was tested by comparing the square roots of the average variance extracted values for any two constructs (e.g. intrinsic motivation and knowledge hiding) with the correlation estimate between these two constructs. The square root of average variance extracted values should be larger than correlations with other constructs to prove discriminant validity. The results reported on the diagonal of Table 1 showed that the square

| Variable | Mean | SD | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|---|---|
| 1. Intrinsic motivation | 5.855 | 1.219 | 0.940 | | | | | |
| 2. External regulation | 5.246 | 1.195 | 0.351*** | 0.840 | | | | |
| 3. Enjoyment in helping others | 4.377 | 0.724 | 0.495*** | 0.211* | 0.938 | | | |
| 4. Knowledge sharing | 3.714 | 0.706 | 0.458*** | −0.169 | 0.459*** | 0.831 | | |
| 5. Knowledge hiding | 1.585 | 0.597 | −0.274*** | −0.013 | −0.341*** | −0.097 | 0.926 | |
| 6. Open innovation | 3.191 | 0.646 | 0.357*** | −0.124 | 0.241* | 0.472*** | −0.198# | 0.883 |
| 7. Industry | 1.610 | 0.490 | −0.027 | 0.002 | 0.144# | 0.015 | −0.081 | −0.449*** |

**Note(s):** $N = 140$; #$p < 0.10$; *$p < 0.05$; ***$p < 0.001$. All effects are two-tailed tests. Square roots of average variance extracted are on the diagonal

**Table 1.** Descriptive statistics and correlations among constructs

roots of constructs' average variance extracted values are larger than the correlations among the pairs of constructs are confirming that constructs are distinct from one another.

Because we collected the dependent and independent variables for our study using the same method, we applied procedural and statistical remedies to achieve control over common method variance *ex ante* and ex-post the collection and analysis of the data. In so doing, we followed the recommendations of several scholars (e.g. Chang *et al.*, 2010; Podsakoff *et al.*, 2012; Richardson *et al.*, 2009). *ex ante* procedures included the assurance of the anonymity of respondents, the reduction of question and instruction ambiguity by pre-testing the questionnaire, the development of a good cover story and clear instructions, the labeling of all scale points rather than just the end points, the variation of the scale types and anchor labels (i.e. five-point and seven-point Likert scales and binary answers) and so forth. The ex-post statistical analysis of common method variance was investigated in two ways. First, we conducted the common method factor statistical test in IBM AMOS version 20. The average variance that the method factor explained was 0.06. Second, we conducted the Harman's single factor test in IBM SPSS version 21, and the single factor explained only 20.55% of variance. These tests showed that the common method bias was not a threat in our data, and we continued the analysis.

We applied structural equation modeling to test the structural relationships between latent constructs. Structural equation modeling is a combination of factor analysis and multiple regression analysis, so it is suitable for research such as ours.

## 4. Results

First, we investigated whether the data had a good fit with our proposed theoretical model. The results of the confirmatory factor analysis showed an adequate fit ($\chi^2 = 790.671$, df = 536, $p < 0.001$, CFI = 0.920, RMSEA = 0.058 and SRMR = 0.087).

The results of hypotheses testing (Figure 3) supported Hypotheses 1, 3 and 5, which predicted that intrinsic motivation has significant positive effects on enjoyment in helping others (Hypothesis 1: $\beta = 0.488$, $p < 0.001$) and knowledge sharing (Hypothesis 3: $\beta = 0.598$, $p < 0.001$), as well as a significant negative effect on knowledge hiding (Hypothesis 5: $\beta = -0.304$, $p < 0.001$). Regarding extrinsic motivation and its relationship with enjoyment in helping others, knowledge sharing and knowledge hiding, we found some surprising and interesting results. Hypothesis 2 proposed a positive relationship between extrinsic motivation and enjoyment in helping others, but we were not able to confirm these results,

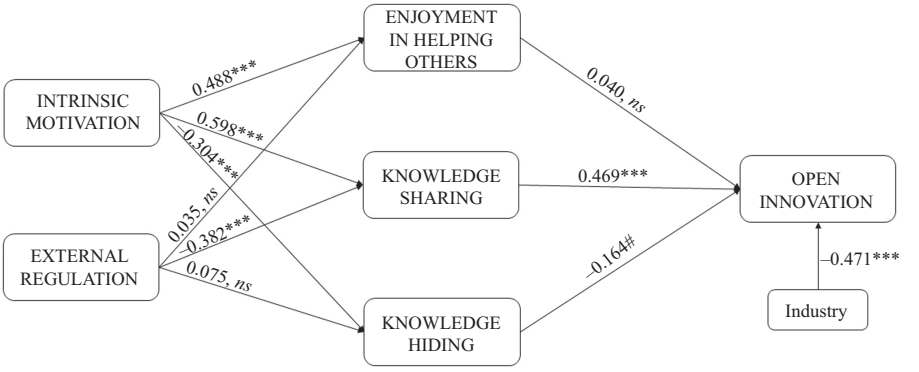


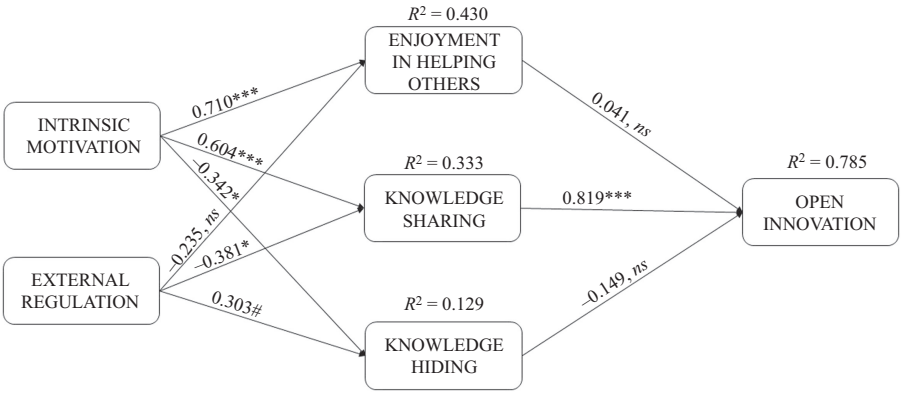

**Figure 3.**
Results of model testing for the overall model

**Note(s)**: $n = 140$. *ns* = non-significant. #$p < 0.10$; ***$p < 0.001$

as the effect was not significant ($\beta = 0.035$, *ns.*). Contrary to the literature review expectations, extrinsic motivation had a significant and negative, rather than a positive, relationship with knowledge sharing (Hypothesis 4: $\beta = -0.382$, $p < 0.001$). This means that the more the entrepreneurs are motivated by extrinsic motivation, the less they share their knowledge. Hypothesis 6 proposed that extrinsic motivation is positively related to knowledge hiding, meaning that the higher entrepreneurs' extrinsic motivation is, the higher their knowledge hiding is. However, our results did not show a significant relationship ($\beta = 0.075$, *ns.*).

The final set of hypotheses investigated the relationship among entrepreneurs' enjoyment in helping others, knowledge sharing, knowledge hiding and firms' open innovation. We found no effect between entrepreneurs' enjoyment in helping others and firms' open innovation (Hypothesis 7: $\beta = 0.040$, *ns.*). In line with the literature, we confirmed that knowledge sharing boosts open innovation (Hypothesis 8: $\beta = 0.469$, $p < 0.001$). The results also showed that the more entrepreneurs hide their knowledge, the less successful their firms are in terms of open innovation. The hypothesis was accepted at a 10% confidence rate (Hypothesis 9: $\beta = 0.164$, $p < 0.100$). The control variable of industry technological level was significantly connected to open innovation, indicating that open innovation is prevalent in high-tech industries ($\beta = 0.471$, $p < 0.001$). Figure 3 summarizes the results of the hypothesis testing.

In addition, we conducted a split-sample test to determine whether some differences existed in the high-tech and low-tech industry samples. Specifically, we performed a group comparison test. The results revealed that some relationships have different magnitudes when compared in a high-tech or low-tech environment. Specifically, the relationship between intrinsic motivation and enjoyment in helping others is stronger for the high-tech industry (Hypothesis 1: $\beta = 0.710$, $p < 0.001$ in high-tech industry and $\beta = 0.253$, $p < 0.05$ in low-tech industry). Another difference pertains to the relationship between external motivation and enjoyment in helping others, where the relationship is strong in the low-tech industry (Hypothesis 4: $\beta = -0.340$, $p < 0.01$), while in high-tech industry it is non-significant ($\beta = -0.235$, ns.). The results of group comparison also showed a difference in the relationship between knowledge sharing and open innovation. The relationship is strong and significant for the high-tech industry (Hypothesis 8: $\beta = 0.819$, $p < 0.001$), whereas this relationship is significant only at the $p < 0.10$ level for the low-tech industry ($\beta = 0.259$, $p < 0.10$). Figures 4 and 5 summarize the results of the relationship testing for the high-tech industry sample and the low-tech industry sample.




**Note(s)**: $n = 55$. *ns* = non-significant. #$p < 0.10$; *$p < 0.05$, ***$p < 0.001$

**Figure 4.**
Results of model testing for the high-tech sample

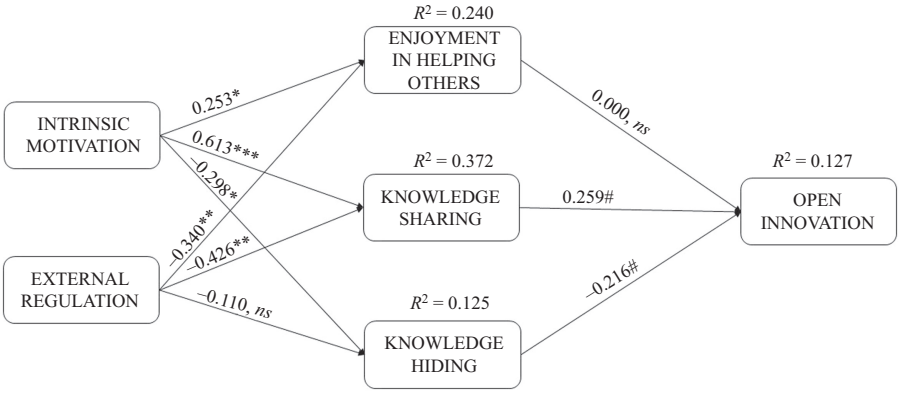



**Figure 5.**
Results of model testing for the low-tech sample

**Note(s)**: $n = 85$. *ns* = non-significant. #$p < 0.10$; *$p < 0.05$, **$p < 0.01$, ***$p < 0.001$

## 5. Discussion

Building on a microfoundation approach, this study focused on the human aspects of open innovation, exploring how intrinsic and extrinsic motivation influence entrepreneurs' openness to transfer knowledge (in the form of helping others, knowledge sharing and the absence of knowledge hiding) and consequently firms' open innovation in SMEs. We found that intrinsic motivation is positively associated with helping behavior and knowledge sharing, and it is negatively associated with knowledge hiding. We also confirmed the positive relationship between extrinsic motivation and knowledge sharing. Moreover, we found that knowledge sharing increases and knowledge hiding decreases firm-level open innovation. Confirming the majority of our hypotheses, we found that intrinsic and extrinsic motivation influence individual-level openness to transfer knowledge. In addition, our results suggest that entrepreneurs' openness to transfer knowledge influences open innovation in the SMEs. The results showed that the industry variable of high-tech and low-tech industry had an impact on the specified relationships in the model. In the high-tech industry, intrinsic motivation has a stronger impact on enjoyment in helping others, whereas external regulation has an impact on enjoyment in helping others only in the low-tech industry.

### *5.1 Theoretical implications*

Our study makes several distinct contributions to the open innovation literature. First, by suggesting a model for the antecedents of entrepreneurs' openness to transfer knowledge on an individual level, we have endeavored to further deepen our understanding of the microfoundations of open innovation. Open innovation has become one of the most topical concepts in the innovation management literature and recent studies emphasized the importance of the microfoundations of this phenomenon, especially as they relate to the human aspects of open innovation (Bogers *et al.*, 2018; Salter *et al.*, 2014; Santoro *et al.*, 2020). By building on the motivation literature, our research contributes to the literature in the field of innovation management, specifically open innovation in SMEs and entrepreneurship, by deepening our understanding of the mechanisms that promote entrepreneurs' openness to transfer knowledge in terms of helping behavior and knowledge sharing, and that hinder knowledge hiding, thereby increasing open innovation. The results suggest that intrinsic motivation positively relates to the inclination to help others and to knowledge sharing. Our findings are in line with existing studies suggesting that intrinsic motivation promotes knowledge transfer (de Almeida *et al.*, 2016; Lin, 2007a; Obrenovic *et al.*, 2020;

Zhang *et al.*, 2020), thereby promoting the open innovation. In addition, our research suggests that intrinsic motivation is negatively related to knowledge hiding. Hiding knowledge prevents knowledge transfer and jeopardizes the successful implementation of open innovation (Chesbrough, 2003). Therefore, we contribute to the open innovation research by providing empirical conceptualization and empirical evidence suggesting that intrinsic motivation may reduce knowledge hiding intentions. In addition, to the best of our knowledge, this study is the first study to empirically examine the consequences of intrinsic motivation when applied to knowledge hiding, even more so in the SME context.

Although previous studies proposed that external rewards can stimulate favorable organizational culture and thereby anticipated outcomes, such as knowledge transfer (Aalbers *et al.*, 2013; Nguyen, 2019; Wasko and Faraj, 2000; Zhang *et al.*, 2016), our results suggest that extrinsic motivation is negatively related to knowledge sharing. A possible explanation for this may be that although individuals are rewarded for sharing and collaboration, they are afraid that the reward will be divided among all contributors; therefore, they decide not to collaborate and execute the given task on their own. Another possible explanation may be related to the well-known NIH syndrome, indicating that individuals do not trust work that others perform. This is especially true in the context of SME principals who trust themselves the most with regard to the ongoing activities within their firms (Douglas and Shepherd, 2000). A similar observation was made by Lin (2007a), who found that expected organizational rewards did not significantly influence employee attitudes and intentions toward knowledge sharing. Lin (2007a) linked the results to the position of the respondents; 67% of the sample respondents were executives, who may be motivated by other objectives, such as the belief that knowledge sharing occurs mainly in informal interactions. This is a possible explanation for our results as well, as our sample was composed of SME principals. However, an avenue for future research would be to investigate the theoretical underpinning of the relationship between knowledge sharing and open innovation in connection with knowledge transfer from external SMEs' partners, such as customers and suppliers (Corral de Zubielqui *et al.*, 2018).

In addition, Law *et al.* (2017) argued that intrinsic and extrinsic motivations may influence employees' intention to engage in knowledge sharing individually or synergistically. Specifically, they argued that intrinsic and extrinsic motivations might interact positively or negatively depending on the type of extrinsic motivator and the form of knowledge sharing (Law *et al.*, 2017). Vallerand (1997, p. 347) also suggested that "we should not pit intrinsic against extrinsic motivation because both motivations are present within the individual to different degrees. What may be more useful is to uncover which configurations involving the different types of motivators lead to the most desirable outcomes."

Moreover, despite the fact that open innovation is more important for SMEs than it is for large organizations, studies on open innovation in SMEs context are still relatively rare (De Marco *et al.*, 2020; Martinez-Conesa *et al.*, 2017; Stanisławski 2020; Vanhaverbeke 2017). Thus, by providing empirical evidence of the relationship among motivational aspects (i.e. intrinsic motivation and extrinsic motivation), entrepreneurs' openness to transfer knowledge (i.e. helping others, knowledge sharing and knowledge hiding), and their impact on an SME's open innovation performance, this study contributes to the understanding of open innovation in the SME context. Specifically, we contribute to the open innovation literature, providing additional evidence of the human aspects of open innovation, specifically for SMEs (Popa *et al.*, 2017). Based on a survey among SMEs, we found that knowledge shearing and knowledge hiding have significant and meaningful impacts on firm-level open innovation. In particular, the higher the knowledge sharing level is, the higher the open innovation level is. We also found a negative association between knowledge hiding and open innovation. According to Černe *et al.* (2014) employees hide knowledge to protect themselves. Moreover, Connelly *et al.* (2012) identified distrust as an important predictor of

knowledge hiding. Decreasing the incidence of knowledge hiding in SMEs increases firm-level open innovation and engenders trust with entrepreneurial team members, co-workers, peers and project members. Thus, this should be one of SME owners' top priorities.

Moreover, the results suggest that helping others is not enough for open innovation to flourish. SME leaders and employees must share their knowledge for open innovation implementation. They must acquire, assimilate, transform and exploit knowledge to sustain a competitive advantage (Zahra and George, 2002). SME leaders and employees with superior absorptive capacities are more capable of allocating external insights inside the company and thus facilitating open innovation activities and long-term success (Ma and Huang 2016; Knudsen 2007). To increase their innovation performance, entrepreneurs should create climates of cooperation, communication and the generation of ideas (Ruiz-Jiménez & del Mar Fuentes-Fuentes 2016). Other results are in line with the theory supporting the proposition that knowledge sharing positively affects a firm's open innovation. By contrast, knowledge hiding inhibits a firm's open innovation performance. An interesting observation was found in connection to industry, as the control variable indicated that firms from the high-tech sector are more inclined to embrace open innovation. Several studies anticipated this notion (e.g. Santos, 2015; West and Bogers, 2017). However, because the research on open innovation emerged from the high-tech sector (Chesbrough, 2003; Chesbrough and Crowther, 2006), only a few studies have empirically examined and supported this proposition with large samples of companies from various industries. When we tested two separate samples of high-tech and low-tech industry firms, we realized that SMEs from the high-tech industry report stronger relationships between intrinsic motivation and enjoyment in helping others. Meanwhile, external regulation has an impact on enjoyment in helping others only in the low-tech industry. This result leads to the supposition that the more the industry is high tech, the more the people enjoy helping others due to their internal motives, not external ones. Also, knowledge sharing is significantly and positively related to open innovation in the high-tech industry rather than in the low-tech industry, which leads us to conclude that to foster open innovation in the high-tech industry, companies should promote knowledge sharing.

### *5.2 Managerial and entrepreneurial implications*

The study offers several important managerial and entrepreneurial implications. Although our results suggest that SME principals should carefully monitor employees' motivation and not exaggerate extrinsic motivation in the form of awards and praise, we could argue that SME principals should be aware of the synergetic effect of intrinsic and extrinsic motivation. If SME owners are interested in boosting open innovation, they should pay attention to how incentive systems influence intrinsic and extrinsic motivation. In addition, more importantly, they should use rewards in such a way as to uncover the proper configuration of intrinsic and extrinsic motivation, thereby stimulating knowledge sharing and open innovation.

Our results further suggest that SMEs should stimulate knowledge sharing and an increase in individuals' absorptive capacity. They should encourage subordinates not only to help each other but also to understand and assimilate newly acquired knowledge. Leaders should thus create work environments in which employees will be able to build their expertise and feelings of competence, thereby influencing knowledge sharing. For knowledge sharing to increase, rewards should be based on team performance.

Moreover, based on the results we argue that mitigating knowledge hiding should be one of SME owners' top priorities. Entrepreneurs should realize that leading by example starts with being open to knowledge sharing among SME members, as well as being open to helping others. In so doing, they form a base for an open organizational culture in terms of knowledge sharing and knowledge absorbing. In addition, entrepreneurs should carefully design the reward structures of SMEs. Specifically, reward structures should not be linked to performance alone, as such rewarding structures would motivate employees to hide their

knowledge (Černe *et al.*, 2014). SME leaders should thus provide incentives for employees to share knowledge with their co-workers.

## 6. Conclusion

The aim of the study was to investigate the human aspects of open innovation in SMEs by exploring how intrinsic and extrinsic motivation influence the enjoyment in helping others, knowledge sharing and knowledge hiding and consequently firms' open innovation. The theoretical contribution of the study relates to the understanding and explaining the human side of open innovation in SMEs. We provide a comprehensive conceptualization and empirical examination of the individual-level conditions (i.e. extrinsic and intrinsic motivation) and outcomes (i.e. entrepreneur's openness to transfer knowledge in the form of helping others, knowledge sharing and the absence of knowledge hiding) that relate to open innovation (i.e. macro-level outcomes). Specifically, our results show that intrinsic motivation is positively associated with helping behavior and knowledge sharing and negatively associated with knowledge hiding. We also confirm the positive relationship between extrinsic motivation and knowledge sharing. Moreover, we find that knowledge sharing increases open innovation at the firm level and knowledge hiding decreases it. By integrating the motivation aspect, the entrepreneur's openness to transfer knowledge, and their mutual effect on a firm's open innovation, this study contributes to the literature in the field of innovation management, specifically open innovation in SMEs and entrepreneurship. In addition, the study also contributes to the field of motivation by conceptualizing and testing the comprehensive influence of motivational factors on three related, but distinct, organizationally relevant behaviors (i.e. helping others, knowledge sharing and knowledge hiding). In so doing, we open up interesting future research opportunities that would go further in the investigation of additional mechanisms, such us environmental conditions (e.g. technological turbulence or pace of customers' change in needs and desires), which might affect open innovation via knowledge sharing, enjoying in helping other and decreasing knowledge hiding.

As with any research, some limitations of this study must be noted. First, we collected self-reported data with a questionnaire, which may be subject to common method bias. However, we minimized common method bias using procedural and statistical remedies as reported in the paper. Future research could replicate the model by using several sources of data, such as collecting open innovation data from different partners involved in open innovation along with personality-related data from questionnaires. In so doing, future research could overcome another limitation of our study, which pertains to the usage of subjective measures, especially those related to a firm's performance. The use of more objective measures may yield results that are more precise. Also, a mixed-method research design is applicable, whereby qualitative methods of data collection and analysis could be introduced to investigate in deep the mechanics that accompany the relationship between knowledge sharing or hiding and open innovation. Third, the data are cross-sectional and do not account for potential reverse causality among variables. Yet, the cross-sectional design is appropriate for this kind of research, as we tested the novel construct in an established domain involving motivational and openness-oriented concepts (helping, knowledge sharing, hiding, open innovation) in the field of SME innovation (Spector, 2019). Yet, future research could apply a longitudinal perspective and investigate how open innovation is affected by openness-oriented concepts (helping, knowledge sharing, hiding, open innovation) in a long run. Nevertheless, the study opens additional interesting avenues for future research. These include, for example, the incorporation of leadership style and team composition, keeping in mind the motivation literature, or even testing the interplay of other internal and external organizational mechanisms, which may affect the proposed relationships.

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## Appendix

| Scales | Loading |
|---|---|
| *Intrinsic motivation* | |
| Because I derive much pleasure from learning new things. | 0.892 |
| For the satisfaction, I experience from taking on interesting challenges | 0.942 |
| For the satisfaction, I experience when I am successful at doing difficult tasks | 0.817 |
| *External motivation* | |
| For the income, it provides me | 0.716 |
| Because it allows me to earn money | 0.835 |
| Because this type of work provides me with security | 0.568 |
| *Enjoyment in helping others* | |
| I enjoy sharing my knowledge with colleagues | 0.937 |
| I enjoy helping colleagues by sharing my knowledge | 0.952 |
| It feels good to help someone by sharing my knowledge | 0.774 |
| Sharing my knowledge with colleagues is pleasurable | 0.886 |
| *Knowledge sharing* | |
| There is a good deal of organizational conversation that keeps alive the lessons learned from history | 0.651 |
| We always analyze unsuccessful organizational endeavors and communicate the lessons learned widely | 0.607 |
| We have specific mechanisms for sharing lessons learned in organizational activities from department to department (unit to unit, team to team) | 0.782 |
| Top management repeatedly emphasizes the importance of knowledge sharing in our company | 0.723 |
| *Knowledge hiding – evasive hiding* | |
| Agreed to help him/her but never really intended to | 0.701 |
| Agreed to help him/her but instead gave him/her information different from what s/he wanted | 0.679 |
| Told him/her that I would help him/her out later but stalled as much as possible | 0.773 |
| Offered him/her some other information instead of what he/she really wanted | 0.951 |
| *Knowledge hiding – playing dumb* | |
| Pretended that I did not know the information | 0.973 |
| Said that I did not know, even though I did | 0.931 |
| Pretended I did not know what s/he was talking about | 0.897 |
| Said that I was not very knowledgeable about the topic | 0.691 |
| *Knowledge hiding – rationalized hiding* | |
| Explained that I would like to tell him/her, but was not supposed to | 0.929 |
| Explained that the information is confidential and only available to people on a particular project | 0.514 |
| Told him/her that my boss would not let anyone share this knowledge | 0.666 |
| *Open innovation – external technology acquisition* | |
| We often acquire technological knowledge from outside for our use | 0.462 |
| We regularly search for external ideas that may create value for us | 0.639 |
| We have a sound system to search for and acquire external technology and intellectual property | 0.614 |
| We proactively reach out to external parties for better technological knowledge or products | 0.820 |
| We tend to build greater ties with external parties and rely on their innovation | 0.855 |
| *Open innovation – external technology exploitation* | |
| We make it a formal practice to sell technological knowledge and intellectual property in the market | 0.623 |
| We have a dedicated unit (i.e. gatekeepers, promoters) to commercialize knowledge assets (e.g. selling, cross-licensing patents, or spin-off) | 0.605 |
| We welcome others to purchase and use our technological knowledge or intellectual property | 0.722 |
| We seldom co-exploit technology with external organizations (*R*) | 0.722 |

**Table A1.** Final scales' items and standardized loadings based on CFA for Study 1