Pay incentives, human capital, and firm innovation in smaller firms

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Abstract

This study advances the literature on HRM in SMEs by analysing how individual and collective forms of performance-related pay (PRP) influence SMEs' propensity for product and process innovation and how such influence varies depending on the firm's level of human capital. We used the microdata of more than 12,000 European SMEs, controlled for endogeneity, and found that both individual (i.e. piece-rate and commissions) and collective (i.e. group bonus and profit-sharing) PRP are positively associated with higher levels of firm innovation. Interestingly, when both individual and collective PRP schemes are adopted, their association with firm innovation is significant but negative, indicating that the adoption of multiple pay incentives may be detrimental to SMEs' innovation. Moreover, our results revealed that the effect of individual PRP on innovation is stronger in SMEs with high levels of human capital, whereas the effect of collective PRP is stronger in SMEs with low levels of human capital.

Keywords: performance-related pay, human capital, firm innovation, SMEs

Introduction

Researchers have increasingly focused on human resource management (HRM) as a strategic issue in smaller contexts (Aït Razouk, 2011; Allen et al., 2013; Mayson and Barret, 2006; Ogunyomi and Bruning, 2016; Sheehan, 2014; Way, 2002; Wang et al., 2018). The growing literature on HRM in SMEs has helped develop our knowledge regarding how and under what conditions high-performance work systems (HPWS), or more broadly HR systems, may contribute to higher organisational performance in SMEs (Allen et al., 2013; Drummond and Stone, 2007; Patel and Conklin, 2012; Wu et al., 2015).

Despite the considerable knowledge about strategic HRM in SMEs, some issues require further investigation. One such issue is how HRM contributes to firm processes and product innovation. While it has been argued that such types of innovation are among the major factors that enable SMEs to survive, develop, and maintain a competitive advantage (De Jong and Vermeulen, 2006; Freel and Robson, 2004; McGuirk et al., 2015), their role as strategic outcomes has rarely been considered in the literature (for notable exceptions see Bornay-Barrachina et al., 2012; De Winne and Sels, 2010; Messersmith and Guthrie, 2010; Schmelter et al., 2010), which implicitly implies that what works for larger firms should also work for smaller firms.

However, SMEs may differ in terms of their propensity to innovate as compared to larger firms. On the one hand, higher resource constraints and limited managerial capabilities may lead SMEs to focus on daily tasks, thereby reducing their emphasis on innovation (Schmelter et al., 2010). On the other hand, the lower levels of standardisation combined with higher degrees of flexibility and informality in organisational processes and procedures may facilitate the emergence of innovative ideas. In this sense, employees' contribution to innovation becomes essential, and attention should be directed towards understanding the role of HR practices in influencing SMEs' innovativeness. Moreover, smaller firms have been reported to have a higher preference for informal management of the employment relationship (Mallett and Wapshott, 2014; Chadwick et al., 2013). All these factors suggest that the adoption of an HPWS may be costlier for SMEs than for larger firms, and the costs may cancel out the benefits resulting in a neutral effect on organisational performance (Sels et al., 2006; Way, 2002).

Considering product and process innovation as the intended outcomes, one of the most relevant and controversial practices is compensation. It has been argued that, because of the predominance of informal practices in SMEs and the lower pay compared to large firms (Cox, 2005), formal compensation systems and, specifically, performance-related pay (PRP) practices, are particularly relevant as they can affect firms' ability to attract, retain, and motivate qualified employees whose contributions are essential for firm innovation (Cardon and Stevens, 2004; Wang et al., 2018). However, it has also been argued that in smaller contexts, employees typically experience a higher level of initial intrinsic motivation that can be undermined by formal HRM practices (Bryson and White, 2019). In this view, extrinsic rewards such as PRP may crowd out employees' intrinsic motivation to contribute to firm innovation (Deci et al., 1999; Frey and Jegen, 2001). The limited empirical evidence on SMEs shows that while PRP may contribute to a firm's economic and financial performance (Chadwick et al., 2013; Wang et al., 2018; Way, 2002), its effects on firm innovation are much more controversial. For example, Sheehan (2014) found that while PRP policies positively contribute to firm financial performance of UK SMEs, they have no effects on innovation (considered product/service, process, organisational, or marketing innovation).

Such inconclusive findings suggest the necessity of considering different types of PRP separately to have a clearer picture of their effects. Differentiating between individual and collective forms of pay incentives may lead to very different outcomes, as often suggested in the compensation literature (De Spiegelaere et al., 2018). Moreover, the inconsistency of existing findings may be due to some contingencies related to the characteristics of the workforce that is asked to work under the PRP scheme. Specifically, we argue that the level of human capital, defined as the cumulative knowledge, skills, and experience of a firm's employees (Becker, 1964; Zhou et al., 2019), is an important moderator in the relationship between PRP policies and firm innovation. Employees with a higher level of human capital are both more likely to directly contribute to firm innovation (McGuirk et al., 2015) and positively react to performance-based pay incentives.

By analysing the data of more than 12,000 European SMEs, this study aims to advance the literature on HRM in SMEs by investigating the effects of individual (i.e. piece-rate plans and commission) and collective (i.e. group and company-wide incentives) PRP incentives on

firms' process and product innovation and how such effects vary according to the level of an organisation's human capital. The contribution of this study is fourfold.

First, it advances our understanding of the strategic role of performance-based compensation systems in smaller contexts, responding to calls for analysing the strategic role of selected HRM practices in SMEs (Patel and Conklin, 2012; Schmelter et al., 2010). Although SMEs are increasingly adopting formal HRM systems as a strategic factor (Bacon and Hoque, 2005; Harney and Nolan, 2014) and compensation and PRP have been indicated as important managerial tools that SMEs may adopt to influence firm performance (Cardon and Stevens, 2004; Hayton, 2005; Mayson and Barret, 2006), little is known about their influence on firms' innovativeness.

Second, it differentiates between individual and collective PRP, whereas most of the existing literature often reflects on single or general PRP schemes (Carlson et al., 2006; Messersmith and Guthrie, 2010; Ederer and Manso, 2013), or on indices capturing the comprehensiveness of PRP schemes adopted (Faems et al., 2005; Sheehan, 2014; Wang et al., 2018). Existing evidence on large firms indicates divergent effects of multiple PRP incentives (Pendleton and Robinson, 2017; Della Torre et al., 2020), thus suggesting an extension of this approach to SMEs for a deeper understanding of the effects of PRP may be relevant.

Third, the study considers the level of an organisation's human capital as an important contextual factor which can moderate the impact of PRP policies on organisational outcomes. This approach is in line with the literature on the effects of HRM on firms' innovation (De Winne and Sels, 2010; Bornay-Barrachina et al., 2012) and helps clarify the underlying mechanisms and contingencies that may explain why the same pay incentive may lead to different innovation outcomes (Gerhart and Fang, 2014; Antoni et al., 2017).

Finally, this study considers product and process innovation as the intended outcomes. Despite the significance of innovation for SMEs' survival and growth (Hayton, 2005; Schmelter et al., 2010), it has received much less attention than other performance outcomes. Among the various types of innovation, product and process innovation are more proximal outcomes of HR practices compared to technical innovation, have a higher impact on a firm's efficiency, growth, and success as compared to organisational innovation, thus representing key outcomes for SMEs' managerial strategies (McGuirk et al., 2015).

Compensation systems and innovation in SMEs

Theoretical background

The analysis of compensation systems has received considerable attention in the literature on SMEs. Cardon and Stevens (2004), in their literature review, identified compensation as the second-most explored area in the HRM research on SMEs (the first being staffing). At the theoretical level, there are two competing views on the potential role of formal compensation systems in SMEs.

On the one hand, it is argued that SMEs are more labour-intensive than larger firms, often lack legitimacy as an employer of choice, have a greater share of flexible employees able to perform multiple roles rather than acting as specialists in a single function, and do not have tangible resources to compete with more established firms (Messersmith and Guthrie, 2010; Patel and Conklin, 2012; Wu et al., 2015). Therefore, having a formal compensation system represents an important sign of professionalisation that impacts the ability of SMEs to attract potential candidates and legitimises them with respect to relevant external stakeholders such as financial institutions (Michiels, 2017). Balkin (1988) argued that effective reward systems are essential for SMEs that have growth as a strategic objective and identified short- and long-term pay incentives as necessary elements of the pay package to promote employees' risk-taking behaviours that lead to innovation and growth. Formalisation may also increase feelings of fairness, transparency, and consistency among employees, thus leading to higher commitment and motivation to perform (Michiels, 2017).

On the other hand, it has been argued that informality in employment relationships remains a key distinguishing factor for SMEs (Mayson and Barret, 2006) and formalising an established informal routine may be quite problematic (Cox, 2005; Dundon and Wilkinson, 2018). Furthermore, SMEs with a high innovation-supportive organisational culture tend to have few formalised HRM practices (Chandler et al., 2000), suggesting that formalisation of HRM practices in such contexts may be detrimental to innovation. Similarly, Heneman et al. (2000) highlighted that in small firms, compensation systems are highly idiosyncratic regarding the CEO/founder's view of rewards (including recognition, psychological rewards,

and learning opportunities together with monetary pay and incentives), which is what generates competitive advantage for those organisations. Formal practices are also associated with higher costs for the organisation and may limit the possibility for employees to negotiate their salary, decreasing motivation and undermining the advantage of having an informal culture (Michiels, 2017).

This theoretical ambiguity is confirmed by firms' compensation management choices. For example, among the six Irish SMEs studied by Harney and Dundon (2006), some had a formal HR department and adopted sophisticated HR practices (including compensation), others simply had an administrative clerk for pay record-keeping, and one outsourced the payroll function. Similarly, Gilman et al. (2002) showed that in small firms, pay settings are subject to constant revisions and high indeterminacy, and argued that this is explained by the greater degree of market uncertainty that SMEs suffer as compared to larger firms.

Empirical issues

With regard to the effects of compensation practices on SME performance, evidence generally supports a positive relationship between PRP and firms' economic and financial outcomes (Carlson et al., 2006; Messersmith and Guthrie, 2010; Sheehan, 2014; Wang et al., 2018; Way, 2002). However, the few studies that consider innovation as the intended outcome have obtained much more mixed findings. For example, while Schmelter et al. (2010) demonstrated that pay incentives may encourage employees' risk-taking behaviours and innovativeness, Sheehan (2014) showed that performance-based compensation positively affects financial performance but has no significant effect on innovation.

Such inconclusive findings may partially be due to methodological issues. Most importantly, the types of PRP considered may be highly relevant. Depending on the nature of the incentive, employees may react differently in terms of motivation, risk-taking behaviour, and propensity to innovate (Della Torre et al., 2020; Ederer and Manso, 2013; Frey and Jegen, 2001; Kuvaas et al., 2020). For example, Ederer and Manso (2013) showed that PRP incentives (profit sharing in their case) are effective in motivating innovation only when the structure of the incentive includes a reward for long-term success and tolerance for early failure. Additionally, extant literature largely disregards the potential presence of underlying

mechanisms that may lead to different innovation outcomes even when considering the same type of innovation and PRP policy (Antoni et al., 2017).

In this study, we referred to the PRP classification adopted by Wang et al. (2018) and De Spiegelaere et al. (2018), who distinguished between individual (i.e. piece-work plans and commission) and collective (i.e. group incentives and profit-sharing) PRP. Moreover, we considered the level of human capital possessed by the firm (i.e. employees' education and training) as a contextual factor that may interplay with PRP policies regarding process and product innovation outcomes. Hence, this study overcomes some of the limitations of previous literature on SMEs, which largely focused on the direct relationship between PRP and innovation and did not differentiate between types of pay incentives (Carlson et al., 2006; Do and Shipton, 2019; Messersmith and Guthrie, 2010; Sheehan, 2014; Way, 2002).

Hypotheses development

Individual PRP and firm innovation

Despite the small yet growing literature on the influence of individual PRP plans on a firm's propensity for innovation (Beugelsdijk, 2008; Curran and Walsworth, 2014; Lau and Ngo, 2004), a detailed understanding of the relationships in smaller firms is still lacking. The literature on larger firms suggests that incentive plans related to individual task performance may be detrimental to innovation as they motivate undesirable employee behaviours such as rivalry among the workforce, thus reducing their enthusiasm and motivation to effectively participate in collective problem-solving (Beugelsdijk, 2008). Furthermore, employees might feel controlled because their remuneration is directly connected to an appraisal system, which in turn might encourage an individualistic orientation to work, while innovation often involves the introduction of team-based work or work systems such as quality circles (Shipton et al., 2005).

For example, research shows that individual PRP weakens the positive relationship between task-level resources and innovative work behaviour (De Spiegelaere et al., 2018), and while it may increase extrinsic motivation (i.e. workers effort), it has negative or insignificant effects on intrinsic motivation (Della Torre et al., 2020; Kuvaas et al., 2016), which is

essential for employees' creativity and innovation (Amabile, 1996; Amabile and Pillemer, 2012).

However, it has also been argued that claims about the negative effect of individual incentives on intrinsic motivation largely disregard the informational aspects of individual PRP; further, when a reward provides meaningful information about self-competence in a setting where an individual has choice about how and when to perform a task (i.e. the reward is not seen as controlling), the reward will potentially improve intrinsic outcomes (Fang and Gerhart, 2012; Gerhart and Fang, 2014; Thibault Landry et al., 2017).

Empirical evidence also suggests that in team settings wherein tasks are highly interdependent, and performance is objectively measurable, the pay dispersion resulting from the adoption of individual PRP has potentially positive effects in terms of employees' motivation and performance (Trevor et al., 2012). Additionally, other studies have highlighted that deviant workplace behaviours, which have frequently been associated with individual PRP (e.g. harming others or sabotage), do not depend on the mere adoption of individual PRP, but rather on employees' personal traits such as competitiveness, which determine how they perceive the incentive and react to it (Gläser et al., 2017). Finally, existing evidence largely supports the idea that firms investing more in individual PRP incentives are more likely to attract and retain highly valuable employees (Gerhart and Fang, 2014), increasing their innovative potential.

Consistent with the literature on SMEs, we argue that in smaller contexts, individual PRP may increase the potential for innovation because of the specific characteristics that distinguish smaller from larger firms. Most importantly, in SMEs, employees typically receive a lower salary in comparison to their counterparts in larger firms, which may affect their perceptions of fairness about their pay (Cox, 2005). Pay raises are also less frequent in SMEs than in large firms because of the higher market uncertainty they experience (Balkin and Logan, 1988). Finally, pay structures in SMEs may also be different from those of larger firms, as SMEs 'tend to have flat organisational structures with few levels of management and tend to treat employees in an egalitarian way with regard to compensation and rewards' (Cardon and Stevens, 2004, p. 307). Gilman et al. (2002) analysed data on SMEs from WERS 1998 and found that one-third of employees did not have regular review of their pay, three-

quarters had their salary unilaterally determined by the employer, and 60% did not discuss their compensation at all.

Therefore, an individual PRP plan may represent an important motivational tool to promote innovative behaviour, as it increases clarity and transparency in pay decisions and allows valuable and knowledgeable employees to gain a higher salary, thereby increasing their motivation for process and product innovation, which is key to the financial stability of the company. The latter, in turn, means employment security and potentially higher salaries for high-performing employees. Without incentive pay, pay levels and pay structures in SMEs may act as inhibitors of innovative behaviour.

Consistent with this reasoning, Cox (2005) analysed UK SMEs and found that employees perceived piece-work plans as an effective tool to discriminate between good and poor performers, and that employees broadly supported variable pay schemes, although their preference was for schemes based on inputs (e.g. skills or length of service) rather than on outputs. Additionally, Carlson et al. (2006) analysed a sample of US SMEs and found that the use of cash incentives was significantly related to higher performing firms, whereas non-cash incentives, benefits, and perks were not. Based on the above arguments and empirical findings, we formulated our first hypothesis as follows:

HP1: There is a significant and positive relationship between individual PRP and firm innovation.

Collective PRP and firm innovation

Collective PRP plans may take the form of organisational (e.g. profit-sharing, gainsharing, stock options, stock ownership) or other group-based bonuses. A recent meta-analysis by Nyberg et al. (2018) suggested that rewarding collective outcomes is a significant strategic motivational tool for driving collective activities towards a common goal. Theoretically, group PRP has a cooperative nature that could increase the propensity for product and process innovation because innovation is often built upon creative tasks and complex teamwork. Accordingly, managers may adopt collective PRP to enhance cooperation, communication, teamwork, and create the necessary motivation for the sharing of knowledge, information,

and ideas among employees (Balkin and Logan, 1988; Nyberg et al., 2018). According to Way (2002), collective forms of PRP help align the employees and company's interests and can increase a firm's ability to retain employees with superior skills and behaviour scripts and who are willing to apply such skills and behaviour scripts in their daily activities.

When employees perceive that the organisation recognises their efforts by sharing profits, they respond by putting in more effort and are encouraged to make suggestions and experiment with new ways of doing their jobs (Jiang et al., 2012). According to Aerts et al. (2015): '… employees are closely involved in the company's bench-level expertise and may therefore possess an information advantage on potential weaknesses and inefficiencies […] Without profit sharing, there is hardly any incentive to disclose this information to the management' (p. 1379). Empirical findings have generally supported this view, showing that collective PRP (including group incentives, profit-sharing, and employee benefits) has a positive and substantial effect on product and process innovation (Curran and Walsworth, 2014; Walsworth and Verma, 2007).

Against this backdrop, one may argue that in collective PRP schemes, the reward for an individual employee is identical to the rewards received by other employees and uniquely dependent on collective performance indicators. Thus, employees may feel that goal accomplishment is largely independent of their individual behaviour and efforts (Arrowsmith and Marginson, 2010), possibly resulting in a free-rider problem (Kidwell and Bennett, 1993). However, these types of opportunistic behaviours are discouraged in SMEs, because in smaller contexts, employees' behaviour and performance are more observable than in larger firms. We argue that collective forms of PRP may have a greater motivational effect in SMEs because employees have a higher influence and direct control of team and organisational outcomes (Heneman et al., 2000; Cardon and Stevens, 2004). In line with this reasoning, Way (2002) analysed a large sample of SMEs in the US and found that collective PRP (profit-sharing or stock options) was the only HRM practice (among the seven considered) associated with lower workforce turnover, lower voluntary turnover, high labour productivity, and higher perceived productivity. However, innovation was not included among the intended outcomes. To the best of our knowledge, no studies have addressed the

relationship between collective PRP and innovation in SMEs. Based on this, we formulated our second hypothesis as follows:

HP2: There is a significant and positive relationship between collective PRP and firm innovation.

Multiple forms of PRP and firm innovation

It has been noted that modern workplaces tend to combine and use multiple PRP schemes more than workplaces in the past (Bryson et al., 2008; Gerhart and Fang, 2014; Nyberg et al., 2018), and multiple incentives may be more effective than single incentives (Pendleton and Robinson, 2017; Wang et al., 2018). Bryson et al. (2008) argued that firms adopt multiple forms of PRP because each type of performance pay is unlikely to offer the variety of incentives required to stimulate all the desired outcomes. The theoretical arguments behind this view rely on the 'best of both worlds' perspective, arguing that a mixture of incentives captures the benefits of both individual and collective PRP (Barnes et al., 2011). Similarly, Siemsen et al. (2007) suggested that both individual and collective incentives are necessary to facilitate cooperative behaviours such as knowledge sharing in workgroups. The study argued that managers, by optimally weighting individual and collective incentives, can balance the need to induce cooperation and coordination among employees, which is conducive to innovation. Similarly, Pendleton (2006) suggested that the adoption of collective PRP (e.g., profit-sharing plans) can increase trust in management and create a cooperative and supportive environment that reduces the potential for the dysfunctional effects of individual incentives. De Spiegelaere et al. (2018) found that the combination of individual and collective PRP strengthens the positive relationship between upward communication and employees' innovative work behaviour, whereas individual PRP alone reduces the positive effects of learning opportunities.

Unlike the best of both worlds perspective, Barnes et al. (2011) argued that with multiple incentives employees may get confused about how to switch priorities between individual tasks and group or organisational objectives, resulting in a 'social dilemma' for employees, eventually leading them to prioritise individual interests over collective interests. This defection phenomenon also translates into avoiding information sharing and collective

problem-solving behaviours (Barnes et al., 2011), which are essential for generating new ideas and innovation opportunities.

Considering that pay arrangements and HRM systems in SMEs are typically loosely defined (Dundon and Wilkinson, 2018), we argue that adopting multiple incentives reduces the risk of pay uncertainty and increases trust among employees (Kuvaas, 2006) while sending a message that the company does not allow opportunistic and dysfunctional behaviours (e.g. free-riding, rivalry, and group infighting) that may result from a single incentive (Pendleton and Robinson, 2017). Through multiple incentives, SMEs may increase the situational strength of the wider HR system (Meyer et al., 2010), as employees perceive a sense of clarity and consistency about what they are expected to deliver (Sanders et al., 2018). Similarly, existing evidence on SMEs using bundles of HR practices, including various PRP measures, indicates a positive association with levels of innovation (Do and Shipton, 2019; Messersmith and Guthrie, 2010; Sheehan, 2014). Therefore, we formulated our third hypothesis as follows:

HP3: The positive relationship between PRP and firm innovation is stronger in SMEs that adopt both individual and collective PRP compared to SMEs that adopt only one type of PRP (individual or collective).

PRP, human capital, and firm innovation

The literature on compensation suggests that, when the same incentive is implemented in different organisational contexts, the outcomes may vary significantly (Antoni et al., 2017; Gerhart and Fang, 2014). Specifically, the level of an organisation's human capital is one of the most distinctive and inimitable resources available to small firms, which can positively influence employees' behaviours when innovation is the desired outcome (Bornay-Barrachina et al., 2012; De Winne and Sels, 2010; McGuirk et al., 2015). Human capital refers to the knowledge, skills, and abilities possessed and utilised by employees, enabling firms to manipulate and transform other organisational resources effectively (Becker, 1964; Schultz, 1961). Highly educated and highly skilled workers adapt rapidly and efficiently to new tasks and have the necessary knowledge and skills to identify problems and develop innovative solutions in the workplace (De Spiegelaere et al., 2018), providing a direct source

of innovation (Blundell et al., 1999). Existing research has largely supported the idea that a unique set of knowledge, skills, and experience is necessary for firm innovation (Liu, 2014; Ren and Song, 2021; Teece et al., 1997). Interestingly, McGuirk et al. (2015) found that innovative human capital (measured by education, training, willingness to change, and job satisfaction) may be more valuable to small firms' product and process innovation compared to large firms.

However, as suggested by Do and Shipton (2019), employees convert their competence and skills into creativity only when they are highly motivated; providing an effective reward system is a necessary condition to positively influence highly valuable employees to adopt innovative work behaviours (Sanders et al., 2018). Moreover, it has also been demonstrated that inducements such as compensation condition an SME's capacity to attract and retain high calibre human capital (Cardon and Stevens, 2004; Wang et al., 2018). In smaller organisational contexts, effective pay incentives may encourage employees with high human capital to remain with the firm, even though their knowledge, skills, and abilities would make them attractive to larger firms (Chowdhury and Schulz, 2020).

Consistent with these views, we argue that high levels of organisational human capital may reinforce the positive relationship between the adoption of pay incentives and firm innovation. Specifically, PRP policies are more likely to be effective for employees with high human capital, as incentive pay leverages their intellectual capabilities (Hitt et al., 2001). This is because they possess the necessary knowledge and skills to successfully contribute to organisational performance, resulting in higher levels of self-confidence and commitment to the firm that are necessary for employee-driven innovation (Bornay-Barrachina et al., 2012; De Winne and Sels, 2010).

Employees with a higher level of human capital are also expected to better interpret the incentive (e.g. in terms of goal setting and decision-making) than those with a lower level of human capital (Rauch et al., 2005). In SMEs, employees are asked to perform multiple roles and tasks simultaneously and to act as generalists rather than specialists (Messersmith and Guthrie, 2010). This, combined with the limited resources available to small firms that frequently generate job overload for employees (Chowdhury and Schulz, 2020), makes employees with low human capital less likely to positively perceive an incentive pay system

based on their individual or collective performance, which in turn increases their aversion to innovation. In contrast, employees with high knowledge, skills, and abilities may feel more confident in their performance and are more likely to react positively to incentive schemes. This also increases their propensity to engage in risk-taking behaviours associated with process and product innovation because they feel knowledgeable and skilled enough to contribute to a firm's development (Balkin, 1988).

De Winne and Sels (2010) empirically analysed a sample of Belgian startups with less than 50 employees and found that high investments in an HRM system are more fruitful when employees' human capital (measured as the educational level of the employees) is higher. Bornay-Barrachina et al. (2012) analysed a sample of Spanish firms and found that highly valuable human capital (measured as the level of knowledge, skills, and expertise of employees) could moderate the negative association between poor investments in employment relationships and product innovation, transforming it into a positive relationship. Based on the above reasoning and empirical evidence, we formulated our fourth hypothesis as follows:

HP4a: The positive relationship between individual PRP and firm innovation is stronger in SMEs with a higher level of human capital than in SMEs with a lower level of human capital.

HP4b: The positive relationship between collective PRP and firm innovation is stronger in SMEs with a higher level of human capital than in SMEs with a lower level of human capital.

Method

Data collection and sample

The sample data used for this study contains responses from 19,739 managers (mainly HR) in European SMEs (i.e. enterprises with fewer than 250 employees). The data collected by Eurofound (ECS, 2013) provide information on a range of workplace characteristics (e.g. variable pay, innovation, employment relations, and management practices). To encourage participation in the survey, respondents were contacted at least 10 times before they were dropped, resulting in a participation rate of 38% (Eurofound, 2015; for data description see

also Allen et al., 2017; Oertel et al., 2016; Wang and Heyes, 2020). The data were codified, and observations with missing values were excluded. We also excluded public and multi-located companies, resulting in a final sample of 12,542 observations.

Variables and measurement

Consistent with existing innovation literature (Walsworth and Verma, 2007; Antonioli and Della Torre, 2016; Saridakis et al., 2019), we used the Oslo Manual definitions (OECD/Eurostat, 2018) of product and process innovations to develop an index for the measurement of the overall firms' propensity to innovate from 2010 to 2013. The innovation index ranges from 0 (when neither process nor product innovations are introduced) to 2 (when both process and product innovations are introduced). This approach helps in understanding the overall SMEs' propensity to innovation and is consistent with the definition of 'business innovation' provided by the OECD as 'a new or improved product or business process (or combination thereof) that differs significantly from the firm's previous products or business processes and that has been introduced on the market or brought into use by the firm' (OECD/Eurostat, 2018: p. 20). In our survey, to measure product and process innovation respectively, managers were asked whether (1 = yes, 0 = no) their organisations had introduced 'new or significantly changed products or services either internally or externally' or 'new or significantly changed processes, either for producing goods or supplying services' between 2010 and 2013.

Individual PRP was measured with a dummy variable that captured the presence (0 = no; 1 = yes) of 'payment by results, that is, piece rates, provisions, brokerages, or commissions'. For *collective PRP*, we created an index ranging from 0 to 2 based on the presence (0 = no; 1 = yes) of 'variable extra pay linked to the performance of the team, working group, or department' and/or 'variable extra pay linked to the results of the company or establishment (profit-sharing scheme)'. The use of dummies to assess the presence/absence of different forms of PRP is common in the compensation literature (Curran and Walsworth, 2014; De Spiegelaere et al., 2018; Della Torre et al., 2020) and SME research (Way, 2002; Sels et al., 2006; Patel and Conklin, 2012). Specifically, Patel and Conklin (2012) argued that, because SMEs lack infrastructures and formal procedures for HR, it is difficult to clearly understand

the usage and assess the effectiveness of individual practices and thus, 'a continuous scale for each practice may be less valid and reliable than a binary coding approach' (p. 216). Our approach also has the benefit of focusing on specific forms of individual and collective PRP, whereas the majority of studies have used aggregate indexes (Faems et al., 2005; Wang et al., 2018; Sheehan, 2014), making the interpretation of findings difficult.

To further increase the value of our measures, we constructed a weighted score for each form of PRP by multiplying the presence of the scheme (0 = no; 1 = yes) by the percentage of firms in the specific group size (i.e. less than 50 employees; 50–250 employees) that adopt such a PRP scheme in the country in which the firm operates. In the case of collective PRP, given the two weighted scores, we summed them into a single index. In so doing, we adjusted the scores of individual and collective PRP for schemes that may be less contextually relevant in a certain country (or firm size), for instance, due to cultural or institutional differences, or because they are deemed ineffective (Chowhan, 2016). Unlike most compensation studies that assume equal weights for PRP schemes independently of specific contextual characteristics, through this approach, we mitigated the risk of downward bias in the scores for firms in countries and group sizes with idiosyncrasies in the adoption of specific PRP schemes.

To measure *human capital*, we relied on the existing literature that considers employees' level of education and training as two main proxies of the human capital possessed by a firm (De Winne and Sels, 2010; Zhou, et al., 2019; McGuirk et al., 2015), representing the stock of ability, knowledge, and skills valuable to firm innovation. We adopted an index approach based on two items that collected information about the 'percentage of employees who have a university degree' and the 'percentage of employees who in the past 12 months […]) received paid time-off to undertake training off or on the premises' (from 0 = 'none at all' to 6 = 'all').

To reduce the risk of variable bias and misspecification in the model, we included several control variables in our analysis. First, based on the previous literature highlighting the importance of the institutional and external environment on the adoption and effectiveness of HRM practices in SMEs (Bacon and Hoque, 2005; Gilman and Edwards, 2008; Gilman and Raby, 2013), we controlled for the country of origin and sector of the company.

Specifically, to control for the country of origin, we relied on the variety of capitalism literature and the Allen et el. (2017) classification of countries as 'compartmentalised,' 'collaborative', 'fragmented with rigid labour markets', and 'fragmented with flexible labour markets'. Additionally, we controlled for the presence of other HR practices, such as teamwork and retention policy, as potential reasons that might explain discrepancies in firm innovation (Faems et al., 2005; Wright and Boswell, 2002). Finally, controls were included for labour productivity, work climate, and the seniority of employees (Tortoriello and Krackhardt, 2010) as possible factors that influence firm innovation.

Analytical procedure

To empirically validate our theoretical model and test the hypotheses, we conducted a hierarchical regression with clustered robust standard errors at the country and sector levels to consider differences related to the national and sectoral institutional systems (Gilman and Raby, 2013). A preliminary adjustment procedure was undertaken in which observations with missing values were dropped, and two items were recoded or reverse-scored (i.e. labour productivity and work climate). First, we included control variables in Model 1, followed by the independent variables of individual and collective PRP and human capital (Model 2). To understand the complementarity of individual and collective PRP and human capital, we introduced three two-way interactions in Model 3. To avoid the risk of multicollinearity, we used mean-centred independent variables. Additionally, we calculated the variance inflation factors (VIF), which remained well below the accepted threshold of 10 and amounted to less than 1.51, for human capital, individual PRP, collective PRP, and their interaction effects, suggesting that issue of multicollinearity did not exist (Menard, 1995).

Robustness checks

Using self-reported and single-respondent (HR managers) data extracted from a cross-sectional survey implies that common method bias (CMB) cannot be excluded. To improve the robustness of our results, we performed Harman's single factor test in which all items measuring latent variables were loaded into one common factor. The test resulted in a cumulative variance of 36.4% for a single factor, which was less than the threshold of 50%,

indicating that CMB did not affect our results (Podsakoff and Organ, 1986).

In addition, to address the potential problem of endogeneity and validate the results obtained with cross-sectional estimations, we adopted an instrumental variable approach (two-stage least squares, 2SLS) to correct the second-step standard errors (Wooldridge, 2002). In our model, the potential endogeneity problem is mainly related to PRP mechanisms, as they may be impacted by reverse causality with respect to product and process innovation. This implies that managers may adopt one of the PRP schemes (e.g. individual or collective), depending on a firm's predisposition to invest in innovation. To find the most appropriate instruments to test the causal effects of PRP schemes, we drew on the available dataset (ECS, 2013) and used information related to the presence of employee representation mechanisms and the performance appraisal system related to career development decisions within the establishment. Importantly, these two variables are distinct and independent of our measurement of firm innovation. We anticipated that the presence of employee representation mechanisms and the appraisal system reflect well-established PRP mechanisms in organisations, both collective and individual. The first instrument (*collective voice*) was built on the presence of employee representation mechanisms in the forms of (a) trade unions, (b) works council, (c) joint platform, and (c) non-union employee representation. The survey asked respondents whether (0 = no; 1 = yes) the mentioned 'official employee representation currently exists in (their) establishment'. The second instrument was related to the presence of a *performance appraisal* system. The survey asked respondents whether (0 = no, 1 = yes) 'employees had a performance appraisal or evaluation interview at least once a year' for career development purposes. The results of the regression analysis with endogenous regressors are discussed in the next section.

Results

Table 1 presents the descriptive statistics and correlations. Product and process innovation were introduced by 26% of the companies and 51% adopted at least one type of innovation (77% when aggregated; Table 1), whereas individual and collective PRP schemes were adopted by 38% and 59%, respectively. These levels of diffusion of PRP schemes are consistent with those found in other studies (Gilman et al., 2002; Messersmith and Guthrie,

2010), further confirming the validity of our sample. The correlations indicate that individual and collective PRP are positively and significantly correlated with each other and with firm innovation.

TABLE 1 ABOUT HERE

Table 2 presents the results of the hierarchical regression estimations. Regarding the main effects, Model 2 shows a positive and significant relationship between individual and collective PRP schemes and firms' innovation ($\beta = .262$, $p < .00$; and $\beta = .163$, $p < .00$, respectively). Hence, our findings support HP1 and HP2. In Model 3, three interaction terms were included. Regarding the interaction between individual and collective PRP, the results suggest that they negatively interact with firm innovation ($\beta = -.488$, $p < .00$). For the interactions between PRP schemes and human capital, the results show that the interaction between individual PRP and human capital is significant and positive ($\beta = .046$, $p < .00$), whereas that between collective PRP and human capital is significant and negative ($\beta = -.047$, $p < .00$) (Model 3).

TABLE 2 ABOUT HERE

To better understand the significant interactions between individual PRP, collective PRP, and human capital, we plotted the patterns in Figures 1, 2, and 3. The results show that the relationship between individual PRP and firm innovation is stronger when collective PRP is lower ($\beta = .437$, $p < .00$) (Figure 1). Therefore, HP3 is not supported by our analysis. Concerning the interaction with human capital, Figure 2 shows that the relationship between individual PRP and firm innovation is stronger when human capital is higher ($\beta = .412$, $p < .00$). Figure 3 shows that the relationship between collective PRP and firm innovation is stronger when human capital is lower ($\beta = .352$, $p < .00$). Therefore, HP4a is supported by

our analyses, but HP4b is not.

FIGURES 1, 2, AND 3 ABOUT HERE

To validate these findings and address the endogeneity problem, we further estimated the instrumental variable regression model using the 2SLS technique and compared the results with those of the baseline model (Table 3). The results show that coefficients under the 2SLS estimates are greater than those of the hierarchical regression, suggesting a downward bias in the regression estimates. Moreover, the Durbin-Wu-Hausman test of exogeneity indicated that the model was endogenous (Wu-Hausman F-test, $p = .00$; Durbin-Wu-Hausman $\chi 2$, $p = .00$) (Nakamura and Nakamura, 1985). The validity of the instruments adopted was supported by the F-statistic (Stock and Yogo, 2005) and the overidentification test (Sargan-Hansen's test using the Hansen J statistic). Additionally, the instruments were found to be statistically significant both individually and jointly. Overall, these results confirm our preliminary findings and suggest that our analysis did not suffer from weak instrument concerns.

TABLE 3 ABOUT HERE

Discussion

SMEs often rely on employees' knowledge, abilities, and experiences to enhance their innovation performance. However, resource constraints characterising SMEs (e.g. lack of HR competencies and formal structures) limit their ability to invest in sophisticated and comprehensive HRM systems similar to those adopted by larger firms. Therefore, identifying effective HRM practices in terms of firm innovation is crucial for SMEs (Patel and Conklin, 2012; Schmelter et al., 2010). The results offer several implications for scholars and managers regarding the influence of individual and collective PRP schemes on firm innovation.

Theoretical implications

The analysis supported our first and second hypotheses, that is, both individual (e.g. piece-rate plans or commission) and collective (e.g. group-bonus or profit-sharing) PRP schemes positively influence a firm's propensity for product and process innovation. These findings support previous studies suggesting that pay incentives should be considered among the most relevant strategic HRM practices in smaller contexts (Balkin, 1988; Hayton, 2005; Heneman et al., 2000; Way, 2002), and contrast existing evidence on large firms showing that individual PRP may be detrimental to innovation (De Spiegelaere et al., 2018; Della Torre, et al., 2020). One reason for the relevance of PRP schemes in SMEs relates to the differences that typically characterise their pay systems compared to those of larger firms. In SMEs, pay levels are lower, pay raises are less frequent, and pay arrangements are loosely defined (Dundon and Wilkinson, 2018; Gilman et al., 2002). Thus, when the company adopts a PRP plan, employees have a clearer idea of their pay structure and the criteria adopted by managers for pay policies and perceive the incentives as an opportunity to gain higher wages, thereby increasing their motivation and commitment toward the company, which are crucial for both individual or collective task performance and firm innovation.

While these arguments hold for both individual and collective PRP, the underlying motivational process may differ depending on the form of PRP adopted. Individual PRP is typically task-focused (e.g. piece-rate plans) and mainly impacts employees' perceptions that the pay system discriminates between good and poor performers (Cox, 2005), thus increasing proactivity among valuable employees to take more initiatives and contribute significantly more to the innovation process. In contrast, collective PRP mainly increases employees' sense of belonging to the company and aligns individual interests with those of the group and organisation, making them more likely to cooperate and share information for firm innovation (Aerts et al., 2015; Way, 2002). While this study advances the literature on SMEs by differentiating between individual and collective PRP practices and arguing their potential benefits for firms' process innovation, future studies on smaller organisations could further analyse how different forms of pay incentives are perceived by employees and how different perceptions lead to different outcomes.

In addition to consolidating existing evidence on the positive effects of PRP schemes on firm

innovation, our study extends the knowledge in the field by analysing the combined adoption of individual and collective PRP and how their effects vary according to the level of human capital employed by the firm. We found that the combined presence of individual and collective PRP has a negative impact on product and process innovation and the effect of individual PRP is stronger in SMEs with high levels of human capital. Meanwhile, the effects of collective PRP are stronger in SMEs with low levels of human capital.

The negative effects of the joint adoption of different types of PRP may be related to the mixed signals received by employees from multiple incentive schemes, resulting in a social dilemma regarding the allocation of resources across different tasks and goals (Barnes et al., 2011; Nyberg et al., 2018). When individual and collective efforts are paid off, it is difficult for employees to find a compromise between individual and collective interests. This difficulty leads employees to prioritise individual interests and avoid information sharing, collective problem-solving, and helping behaviours (Barnes et al., 2008), which are essential for innovation. Prioritising individual interests is particularly detrimental in SMEs because it erodes one of the main competitive advantages of smaller contexts, that is, strong group-based organisational culture (Patel and Conklin, 2012).

Additionally, adopting multiple forms of PRP may signal to employees that the company mainly aims to establish an economic exchange relationship with them, causing employees to reciprocate this approach by strictly focusing on task-related performance (Kuvaas et al., 2020). This pattern reduces the intrinsic motivation of employees in smaller contexts (Bryson and White, 2019) because of the excessive formalisation of the economic nature of the exchange between the employee and organisation. Given the lack of studies that analyse these issues in SMEs, a promising line of inquiry for SMEs literature is, therefore, to explore the potential complementarities or 'deadly combinations' between extrinsic and intrinsic incentives, in addition to further investigation of how the combination of different extrinsic incentives impacts employees and organisational outcomes.

Concerning the role of human capital in the relationship between PRP and firm innovation, the findings suggest that employees with a higher level of human capital are more incentivised to contribute to innovation when the incentive is of an individual nature. Meanwhile, employees with lower skills, knowledge, and abilities are more likely to

contribute to innovation when the incentive has a collective nature. These different outcomes may be explained by the different levels of self-confidence and propensity to engage in risk-taking behaviour of high and low human capital employees. On the one hand, employees with a higher level of human capital prefer individual incentives as they feel they possess the necessary skills, knowledge, and abilities necessary to successfully complete their tasks, and incentives based on individual performance allow them to gain a higher salary, which consequently increases their job satisfaction and propensity to engage in risk-taking behaviours necessary for firm innovation (Honeywell-Johnson et al., 2002; McGee et al., 2006). Collective incentives are less motivating for employees with high human capital, as they may feel uncomfortable that their salary level is influenced by the (lower) performance of colleagues with a lower level of human capital (Milkovich et al., 2011). On the other hand, employees with lower human capital prefer collective to individual PRP schemes, as their lower competencies and knowledge reduce their confidence in their individual task performance and make them feel more motivated in a situation where their salary is also influenced by the performance of their (high performing) colleagues.

Practical implications

Regarding SME managers pursuing innovation and growth as strategic objectives, this study shows that the adoption of incentive pay based on individual or collective performance may lead to higher innovation levels. Thus, decision-makers in SMEs should consider PRP as a potential strategic factor in the management of the employment relationship in their organisations. Incentive pay systems also allow the firm greater flexibility by sharing economic risks with the employees and de-emphasising base pay, making it easier for firms to cope with market uncertainties (Cardon and Stevens, 2004). However, SME managers should also pay attention to the design of the incentive plan and consider that the formula 'the more, the better' does not work in smaller contexts. Mixing multiple pay incentives may have a detrimental effect on innovation, as employees get confused about the priorities of the company and perceive their relationship with the organisation as purely transactional, thus reducing their propensity to contribute to innovation or accept new production processes. Additionally, managers of small firms should consider how employees with different levels

of human capital (education and training) might react to the incentive plans and, consequently, use their limited compensation budgets by carefully selecting the type of incentive schemes that better fit the human capital of the employees.

Limitations of the study

Several limitations should be noted when interpreting our results. First, the data were cross sectional and, therefore, did not allow causal inferences on the relationship between PRP and process innovation. We tested for potential endogeneity using an instrumental variable approach, and the results of the 2SLS estimations indicated a downward bias in the hierarchical regression estimates. To the best of our knowledge, our study is one of the first to test for endogeneity in the models presented, and we recommend future studies based on cross-sectional data to adopt similar robust techniques to increase the reliability of their results. Second, the measurement of a firm's product and process innovation was based on the simple presence of innovations within a given period. Despite adopting widely-recognised measurements for product and process innovation, measurements that capture the intensity of innovation would also be useful to ascertain the robustness of our findings in future studies. Third, while our measures of individual and collective incentives were consistent with those adopted by existing literature (Curran and Walsworth, 2014; De Spiegelaere et al., 2018), relying on the simple presence of incentives at a firm might not provide a full picture of the depth and scope of PRP schemes (Wang et al., 2018). Future studies should use more comprehensive measures to capture PRP, such as evaluating the intensity (i.e. relative amount of PRP compared to total pay) and diffusion of PRP incentives (i.e. percentage of employees involved in the PRP scheme), and test how the effects on firm innovation vary according to the intensity or diffusion of individual and collective incentives. Finally, we were unable to distinguish between (or control for) family and non-family SMEs. This is an important distinction that may be addressed by future studies on compensation systems in SMEs.

Conclusion

This study contributes to the literature on strategic compensation in SMEs by confirming the positive effects of individual and collective PRP on firm process and product innovation in smaller organisations and by highlighting the need to adopt a contextual approach to better understand how such impacts vary depending on specific organisational contingencies. We demonstrated that different forms of PRP may have various impacts depending on other incentive schemes adopted by a company and the level of employees' human capital. Considering other potential contingencies, an important line of inquiry emerging from this study concerns further investigating how different compensation policies (e.g. seniority pay, merit pay, skill-based incentives) relate to various types of human capital (e.g. generic vs. specific) in affecting SMEs performance and innovation.

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Table 1: Correlations and descriptive statistics for product and process innovation

	Variables	Mean	SD	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1	Firm Innovation	.770	.841																		
2	Individual PRP	.358	.485	.106																	
3	Collective PRP	.592	.746	.133	.405																
4	Human capital	3,516	2,561	.112	.089	.173															
5	Compartmentalise(	.222	.415	-.021	.031	-.037	.023														
6	Collaborative	.266	.442	-.044	-.067	-.042	-.032	-.322													
7	Fragmented_Rigid	.235	.424	.090	-.174	-.117	.023	-.296	-.333												
8	Manufacturing	.351	.477	.084	-.010	.040	-.132	-.013	-.069	.053											
9	Construction	.119	.324	-.108	-.034	-.011	-.038	.009	-.017	-.029	-.270										
10	Commerce	.257	.437	.022	.057	-.023	-.046	-.019	.018	.004	-.432	-.216									
11	Transport	.061	.240	-.072	-.018	-.037	-.030	.006	.018	-.020	-.188	-.094	-.151								
12	Financial services	.028	.165	-.004	.007	.018	.096	.014	-.001	-.034	-.125	-.062	-.100	-.043							
13	Medium size	.331	.471	.107	.134	.243	.073	.023	-.046	-.019	.126	-.042	-.104	.015	.021						
14	Seniority %	1.495	.994	-.056	-.002	.038	-.034	-.099	.058	-.050	.090	-.003	-.090	.031	.032	.086					
15	Teamwork	.741	.438	.152	.059	.175	.138	-.060	.041	.024	-.033	.041	-.003	-.060	.007	.127	-.013				
16	Labour productivit	2,33	.704	.144	.101	.115	.091	.137	.034	-.190	.035	-.068	-.025	-.006	.027	.115	-.083	.070			
17	Work climate	1.22	.662	.091	.051	.035	.055	.207	-.026	-.131	.007	-.047	.030	-.023	.014	.004	-.116	.035	.359		
18	Retention policy	2.48	.574	.044	.037	.067	.028	-.071	.145	-.089	-.002	-.027	.014	.006	.005	-.022	.004	.057	.059	.015	.015

Notes: Coefficients greater than .028 are significant at p < .001 (two-tailed); number of observations = 12,542.

Table 2: Hierarchical regression models for the PRP, human capital, and firm innovation

	Model 1		**Model 2**		**Model 3**	
	β	**Rob S.E**	**β**	**Rob S.E**	**β**	**Rob S.E**
Compartmentalised	-.038	.052	-.006	.051	-.004	.051
Collaborative	-.044	.032	.003	.033	-.001	.032
Fragmented_Rigid	.199***	.032	.251***	.037	.253***	.037
Medium size	.136***	.020	.093***	.019	.091***	.019
Seniority %	-.034***	.010	-.033***	.010	-.033***	.010
Teamwork	.249***	.017	.213***	.017	.213***	.017
Labour productivity	.141***	.011	.128***	.011	.127***	.011
Work climate	.061***	.012	.057***	.012	.057***	.012
Retention policy	.057***	.015	.047***	.015	.047***	.015
Individual PRP (IPRP)			.262***	.046	.292***	.046
Collective PRP (CPRP)			.163***	.044	.230***	.047
Human capital (HC)			.021***	.003	.021***	.003
IPRP*CPRP					-.488***	.133
IPRP*HC					.046***	.014
CPRP*HC					-.047***	.012
Number of observations	12,485		12,485		12,485	
R2	0.082		0.097		0.100	

*Notes: *p < 0.1. **p < 0.05, ***p < 0.01. Unstandardized beta coefficients have been reported. All tests were two-tailed and robust standard errors were adjusted for 180 clusters at the country and group size levels. All the models include six industry dummies. 'Fragmented with Flexible Labour Market' and 'Small' are reference categories for country and size, respectively.*

Table 3: Test of endogeneity using ivregress 2SLS (with five instrumental variables)

	Instrumental Variables	**2SLS estimates**	
		β	**Rob S.E**
Individual PRP (IPRP)	PA (.014*)	2.274***	.847
	CV (.041***)		
	CV_HC (-.007***)		
Collective PRP (CPRP)	PA (.028***)	2.237***	.620
	CV (.053***)		
	PA_CV (.030***)		
	PA_HC (.008***)		
IPRP*CPRP	PA_HC (.001*)	-24.68***	7.86
	CV_HC (-.001**)		
IPRP * Human Capital	PA (-.121***)	.474***	.138
	CV (-.089**)		
	PA_HC (.044***)		
CPRP*Human Capital	PA (-.342***)	-.171**	.087
	CV (-.268***)		
	PA_HC (.114***)		
	CV_HC (.056***)		

Abbreviations: HC, human capital; PA, performance appraisal; CV, collective voice

**p < .1; **p < .05; ***p < .001. N = 12,485.*

Figure 1: Interactions between IPRP and CPRP on firm innovation

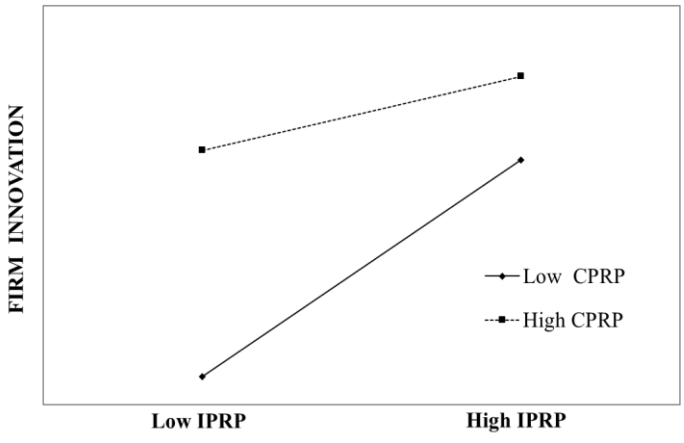

Figure 2: Interactions between IPRP and human capital on firm innovation

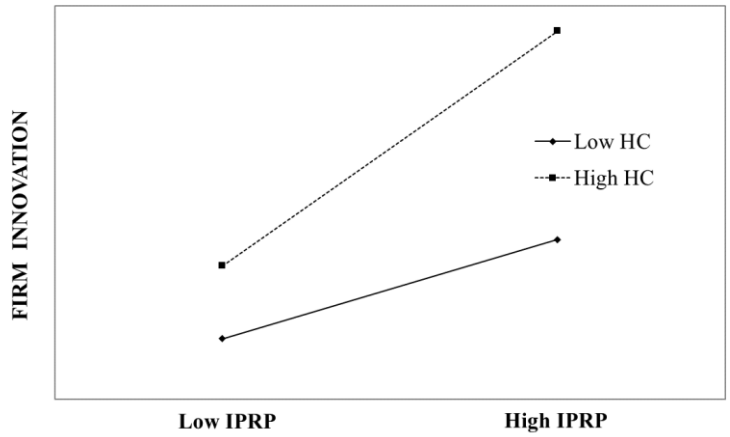

Figure 3: Interactions between CPRP and human capital on firm innovation