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**Industry Capital Intensity and Firms' Utilization of HCWS:
Does Firm Size Matter?**

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Review

Industry Capital Intensity and Firms’ Utilization of HCWS: Does Firm Size Matter?

Abstract

Purpose- Following the industry-based view’s isomorphic trend among firms in the same industries, the first purpose of this research was to investigate whether industry capital intensity encourages or inhibits a firm’s utilization of strategic HRM systems, particularly of high commitment work systems (HCWS). Drawing on the interactionist view of the industry-based view (IBV) and the resource-based view (RBV), and the interactive perspective in the contextualized HRM field, the second purpose was to examine the nonlinear moderating role of firm size on the relationship between industry capital intensity and firms’ utilization of HCWS.

Design/methodology/approach- The research design was time-lagged. Firm-level subjectively-rated data were collected from 168 large firms with more than 200 employees in Beijing. Industry-level objectively-rated data were collected from the statistics year books of Beijing city.

Findings- Industry capital intensity was positively related to firms’ utilization of HCWS, other things being equal. The relationship between industry capital intensity and firms’ utilization of HCWS was negatively moderated by firm size at an increasing rate.

Originality/value- This research contributes to contextualized HRM literature by empirically examining the complex interactive effects of industry capital intensity and a firm’s utilization of HCWS. First, it establishes the direct cross-level relationship between industry capital intensity and firms’ utilization of strategic HRM systems. Moreover, it explores the boundary conditions of such a relationship by investigating the nonlinear moderating role of firm size.

Key Words- Quantitative, Contextualized HRM, Interactionism, Industry Capital Intensity, Firm Size, High Commitment Work Systems, China.

Article Classification Research Paper

Introduction

Scholars of strategic HRM, from a contextualist perspective, suggest that the use of HRM systems is determined by an organization's environmental factors (Jackson and Schuler, 1995; Jackson *et al.*, 2014). As a crucial aspect of the firm's environment, industry capital intensity, "the relative investment in fixed assets in an industry" (Guthrie and Datta, 2008, p. 113), plays a prominent role in determining a firm's use and effectiveness of strategic HRM systems (e.g., Datta *et al.*, 2005; Koch and McGrath, 1996). However, the current literature contains two contradictory streams of understanding about the effects of industry capital intensity on firms' utilization of strategic HRM. Some scholars argue that industry capital intensity encourages firms' use of strategic HRM practices/systems (e.g., Arai, 2003; Koch and McGrath, 1996), because firms in capital-intensive industries benefit greatly from employee input for problem solving and the reduction of mistakes at work (Koch and McGrath 1996). Others, however, contend that industry capital intensity inhibits the use of strategic HRM systems, because there are "greater constraints placed upon employee performance by the degree of task structure or the degree of automation of the production technology" (Terpstra and Rozell, 1993, p. 43; see also Datta *et al.*, 2005). Despite their contradictory arguments, both groups of scholars may be right, since their contradictory findings might be attributed to both theoretical and methodological limitations.

First, despite the theoretical reasoning underlying the effect of industry capital intensity upon a firm's use of HRM practices (Datta *et al.*, 2005; Koch and McGrath 1996; Terpstra and Rozell, 1993), empirical results supporting the role of industry capital intensity as a distinct industrial antecedent that determines a firm's utilization of HRM practices remain a void. This lack of attention is surprising, given that industry capital intensity has been repeatedly argued to be

“directly related to variations in the types and range of competitive actions pursued in an industry” (Datta and Rajagopalan, 1998, p. 835; see also Datta *et al.*, 2005; Guthrie and Datta, 2008; Terpstra and Rozell, 1993). Empirically, research investigating the role of capital intensity has typically treated capital intensity as a firm-level variable (e.g., Arai, 2003; Koch and McGrath, 1996), a control variable (Chadwick *et al.*, 2015; Chadwick *et al.*, 2013; Park, 2012; Su and Wright, 2012), or a background variable (e.g., Gittleman *et al.*, 1998; Osterman, 1994). An exception is Datta *et al.*’s (2005) research, which measured capital intensity at industry level. However, they used it as a moderator of the HRM-performance relationship. Thus our study addresses this important yet under-researched area by clearly capturing the direct and cross-level positive relationship between industry capital intensity and firms’ utilization of HRM practices. In so doing, we begin to provide some preliminary but very much needed empirical evidence to consolidate the contradictory understanding about industry capital intensity-HRM practices relationship.

Second, previous research on capital intensity and HRM practices has often adopted a piecemeal approach that focuses on separate, single HR practices, such as careful selection and training (e.g., Koch and McGrath, 1996), team work and rotation (e.g., Gittleman *et al.*, 1998; Osterman, 1994), high wages, and comfortable working conditions (e.g., Arai, 2003). Little research has considered HR practices in the form of a system. This is a significant shortcoming, because the central theme of strategic HRM stresses the use of HRM systems as a pre-condition for firms to generate competitive advantage through people (Barney and Wright, 1998). Such HRM systems are known as high performance work systems or, interchangeably, high commitment work systems (HCWS), or “an ensemble of HR practices that aims at getting more from workers by giving more to them” (Baron and Kreps, 1999, p. 189). As the strategic HRM field has achieved a

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3 system-based view (as opposed to a piecemeal-based view) (Barney and Wright, 1998), the extant
4 understanding of the relationship between industry capital intensity and firm's utilization of HRM
5 systems has lagged behind and is still focusing on separate, single HRM practices. These two
6 limitations gave rise to our first question: *Does industry capital intensity encourage or inhibit a*
7 *firm's use of strategic HRM systems?* Our first research purpose is therefore to seek to answer this
8 question by investigating the direct relationship between industry capital intensity and firms'
9 utilization of HCWS.

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21 The third limitation of previous research is that the conceptualization has lacked an interactionist
22 perspective, which has been promoted by strategy and HRM scholars. Strategy researchers argue
23 that both industry factors and firm factors can determine a firm's strategy (Mauri and Michaels,
24 1998), while strategic HRM researchers contend that firms' HRM systems are jointly determined
25 by organizations' external and internal environments (Jackson *et al.*, 2014). This lack of an
26 interactionist perspective leads to our second question: *When does industry capital intensity*
27 *promote or inhibit firms' utilization of strategic HRM systems?* Contextualized HRM scholars
28 have found that "HRM varies systematically with organization size" in terms of how
29 sophisticated HRM systems are deployed (Jackson and Schuler, 1995). Moreover, the changes of
30 firm size also influence how firms respond to external environments. For example, firms can
31 grow in size to a point "where they can dominate their environments rather than adjust to them"
32 (Dimaggio and Powell, 1983, p. 149). However, to date the various implications of firm size have
33 not been investigated. Thus our second research purpose is to explore the moderating effects of
34 firm size on the relationship between industry capital intensity and firms' utilization of HCWS.

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56 Our conceptualization is based on the theoretical framework of the industry-based view (IBV)

versus the resource-based view (RBV) (Mauri and Michaels, 1998). IBV stresses an isomorphic trend where individual firms tend to become similar in an industry (Demsetz, 1973; Stigler, 1968). In high-capital-intensive industries, firms tend to invest in the management of human resources to support the efficient operation of fixed assets (e.g., Arai, 2003; Gittleman *et al.*, 1998; Koch and McGrath, 1996; Osterman, 1994). We therefore propose a positive relationship between industry capital intensity and firms' utilization of HCWS, other things being equal. When taking into account the interactive effects of firm size, the situation may become more complicated. Drawing on resource-based strategic HRM and human capital literature (discussed later), we propose a nonlinear moderating role of firm size in the relationship between industry capital intensity and firms' utilization of HCWS.

We tested our conceptualization by using cross-level, multi-sourced and time-lagged data collected from 168 large firms in various industries and under different ownership in Beijing city, and from the city's statistics yearbooks. We focused on firms with more than 200 full-time employees, because large firms, unlike small ones (Cardon and Stevens, 2004; Patel and Cardon, 2010), tend to have sophisticated and systematic styles of HRM practices (Jackson and Schuler, 1995). In sum, this research contributes to the existing literature by theoretically synthesizing the two contradictory views of the effects of industry capital intensity on firm use of HCWS, and by empirically linking industry capital intensity to a firm's utilization of HCWS, as well as exploring the boundary conditions through investigating the quadratic moderating role of firm size.

Theoretical framework

Industry-based view versus resource-based view: establishing a dynamic context for HRM

The interactive effects of organizations' external and internal environments in determining the

utilization of HRM systems (Jackson *et al.*, 2014) are theoretically rooted in IBV (Porter, 1980) and RBV (Barney, 1991). It has been proposed that they jointly determine a firm's strategy, conduct and performance (e.g., Hawawini *et al.*, 2005; McNamara *et al.*, 2005; Spanos and Lioukas, 2001). According to IBV, there is an isomorphic trend among individual firms' strategies in an industry through market competition, i.e., followers imitating leaders for surviving (Demsetz, 1973), institutional mechanisms, i.e., "coercive isomorphism", "mimetic isomorphism", and "normative isomorphism" (DiMaggio and Powell, 1983), and their complementarities (DiMaggio and Powell, 1983).

"[I]ndustry characteristics may have far reaching implications for HRM. Industries ... are the contexts within which meanings are construed, effectiveness is defined, and behaviors are evaluated" (Jackson and Schuler, 1995). From a competition-based approach, researchers have found that stable and unstable industries differ in terms of their HRM patterns (Ghoshal and Bartlett, 1990) and between industries with various production processes and products (Jackson *et al.*, 1989). From an institutional perspective, the literature has documented the difference in HRM between public and private sectors (Rosen *et al.*, 1986), between regulated and unregulated industries (Guthrie and Olian, 1991), and between industries that are at different levels of development and are differently supported by government (Cooke, 2014). Based on this discussion, we expect that industry capital intensity, as a crucial characteristic of industry (Chadwick *et al.*, 2013; Datta *et al.*, 2005), can also influence firms' utilization of HRM systems.

RBV, however, focuses on the heterogeneities in strategy, conduct and performance among firms in an industry. These heterogeneities derive from the existence of unique firm characteristics capable of producing core (valuable, rare, non-imitable, and non-substitutable) or firm-specific

resources/capital (Barney, 1991; Barney, 1986). Human resources or human capital can be general (for example, industry-specific) or firm-specific. Industry-specific human capital can be used by many firms in same or similar industries, while firm-specific human capital can make value exclusively for this particular firm (Becker, 1975). Firm size is a crucial firm-level characteristic that determines the social conditions of work. As firm size grows, employees will enjoy more opportunities to experience interaction and collaboration with multiple actors at work (Lee, 2005; Slaughter *et al.*, 2007). Such opportunities will facilitate employees to develop firm-specific human capital, because firm-specific human capital is embedded in uncoded routines (Liebesking, 1996), and developed in collaborative working relationships within firms (Szulanski, 1996). Employee-centered HRM systems assume that optimal value creation can be achieved through developing and using firm-specific human capital (Datta *et al.*, 2005). To maximize performance through the increased firm-specific human capital, HRM is required to be more employee-centered. The increase of industry capital intensity, however, will make firms focus on “leveraging their investments [in fixed assets], resulting in a greater concern for cost and efficiency considerations” (Datta *et al.*, 2005), as well as high strategic rigidity (Datta and Rajagopalan, 1998; Hambrick and Lei, 1985). Consequently, it will require employees to support the operation of fixed-assets through emphasizing the fixed-assets-centered orientation of HRM. Given the higher level of value creating capacity of firm-specific human capital compared with industry-specific human capital, a firm will emphasize the utilization of the former over the latter (Coleman, 1998). As firm size adjusts the nature of human capital and the firm’s orientation of HRM systems, we expect that firm size will adjust the way in which a firm responds to the driver effect of industry capital intensity in utilizing HCWS.

High commitment work systems

HCWS usually consists of three groups of practices: ability-enhancing HR practices (i.e., recruitment, selection and training), motivation-enhancing HR practices (i.e., compensation and reward), and opportunity-enhancing HR practices (i.e., employees' participation and upwards and lateral communication) (Lepak *et al.*, 2006). The theoretical origins of HCWS lie in the fields of industry and labor relations (MacDuffie, 1995; Osterman, 1994), human resources management (Baron and Kreps, 1999; Huselid, 1995) and, more generally, organizational theory (Pfeffer, 1997). HCWS is based on an internal type of employment system (Lepak and Snell, 2002), which is different from that based on a market-type of employment system (Delery and Doty, 1996) which emphasizes "long-term relationships with employees and hence is akin to the mutual-investment approach" (Xiao and Tusi, 2007, p. 6). It is deemed to be "employee-centered" (Datta *et al.*, 2005, p. 136) and useful for firms to develop firm-specific or unique human capital (Lepak and Snell, 2002). HCWS, according to Datta *et al.* (2005, p. 136), "resonates strongly" with Burns and Stalker's (1961) "organic style of management", or, according to Xiao and Tusi (2007), it is consistent with Ouchi's (1981) clan-like organization. It is hence more efficient in responding to the changing requirements of organizations' environmental factors (Burns and Stalker, 1961). Moreover, although it was originally developed in Western contexts (Huselid, 1995; Walton, 1985), HCWS has been found to be suitable for, and widely used in, our research context: China (Xiao and Björkman, 2006; Xiao and Tsui, 2007).

Hypothesis development

Industry capital intensity and high-commitment work systems

In previous studies (e.g., Datta *et al.*, 2005), the use of HCWS has been found to be disadvantageous in capital-intensive industries, because capital-intensive industries have been argued to create strategic rigidity that fixed costs are high and deviations tend to be expensive

(Datta and Rajagopalan, 1998; Hambrick and Lei, 1985), and they also place “greater constraints ... upon employee performance” through “the degree of task structure or the degree of automation of the production technology” (Terpstra and Rozell, 1993, p. 43). However, there are several reasons for believing that industry capital intensity will positively impact on firms’ use of HCWS. On the one hand, in capital-intensive industries firms must recoup investments in assets and equipment, as well as their costs of operations (Datta *et al.*, 2005). In such situations, productivity per employee becomes decisive for profitability (Porter, 1985). To simply improve productivity per employee, a control-based HRM system seems feasible. However, in capital-intensive firms, the investment in fixed assets will require highly skilled employees to contribute to problem solving and conscientious employees to reduce the cost of mistakes (Koch and McGrath, 1996). In this case, employees are required proactively to improve their contributions to overall performance. Thus, some *motivation-enhancing HR practices* will be adopted. For example, in a study using a nationally representative sample from Sweden, Arai (2003) found that wages were higher in capital-intensive industries even after controlling for employee quality, job characteristics, and organization size. In Xiao and Tsui’s (2007, p. 11) study, a hardware producer employed “extensive shared ownership”. The requirements of skills to reduce the cost of mistakes will lead to the use of some *ability-enhancing HR practices*, such as careful selection of quality employees and extensive training to improve the skills of these employees (Koch and McGrath, 1996). For instance, in the automobile industry, firms often invest in employee capacity-building activities to develop labor flexibility, which refers to “the plant’s way to breathe because it is often the only alternative to adjust capacity in the short run” (Francas *et al.*, 2011, p. 2). Generating solutions to complex problems also requires a capital intensity firm to adopt *opportunity-enhancing HR practices* to make the most of employee knowledge. For example, it was found that, in a manufacturing firm, the top leader (e.g., Chief

Executive Officer, CEO) was “a strong advocate of egalitarianism” (Xiao and Tsui, 2007, p. 11). Team work is becoming commonplace in manufacturing plants (Banker *et al.*, 1996), and communications will be encouraged to improve high-quality, fast product innovation and improved customer satisfaction (Boyett and Conn, 1992). Based on the discussion above, we propose that:

H1: All else being equal, there will be a positive relationship between industry capital intensity and a firm’s utilization of HCWS, such that a higher level of industry capital intensity will lead to a higher level of a firm’s utilization of HCWS.

Non-linear moderating effects of firm size

The relationship between industry capital intensity and a firm’s emphasis on the utilization of HCWS is likely to be adjusted by firm size for at least two reasons. First, organization theorists (e.g. Dimaggio and Powell, 1983; Hannan and Freeman 1984; Pfeffer and Salancik, 1978) and empirical researchers (e.g. Meznar and Nigh, 1995; Kelm et al., 1995) have reiterated that firm size can adjust the way in which firms respond to external influencing forces. Second, both the nature of firms’ human capital and, consequently, the way in which firms view and manage their human capital may vary across levels of firm size (Jackson and Schuler, 1995). Therefore, firms’ emphasis on the utilization of HCWS in responding to industry capital intensity may vary across levels of firm size. To explore the intervention effects of firm size, we define firm size as the total number of full time employees employed by the focal firms.

As discussed earlier, increased industry capital intensity drives firms to emphasize fixed-asset-centered orientation of HRM systems, where employees are managed around the conditions and requirements of the fixed-assets (Chadwick *et al.*, 2013; Koch and McGrath,

1996). Since (most of) the fixed assets are of a high degree of industry-wide homogeneity in nature, the human capital developed in such cases is industry-specific. As firm size increases, the work situation of employees becomes more sophisticated. With the enlargement of the workforce and production scale, employees will interact in a wider network, and cooperate and collaborate with more co-workers and multiple stakeholders (Lee, 2005; Slaughter *et al.*, 2007). Such changes often trigger some of what Carroll (1993) called “spin-off” effects, which is similar to Selznick’s (1957) idea that management practices can become “infused with value beyond technological requirements of tasks at hands” (p. 17). In this logic, the utilization of HRM systems, aiming to improve employees’ knowledge, skills, and abilities for supporting the sound operations of fixed assets in the first place, might also generate more spin-off consequences along with the increase of firm size. Such human capital (knowledge, skills and abilities) is embedded in the processes or jobs of a particular firm, and can hardly be used by other firms. Therefore it is firm-specific human capital.

Firm-specific human capital generates value exclusively for a particular firm, while industry-specific human resources can increase productivity for many firms in same/similar industries (Becker, 1975). Therefore firms are more willing to develop and utilize firm-specific human capital than industry-specific human capital (Coleman, 1998; Slaughter *et al.*, 2007). As firm size grows, employees have more opportunities to develop firm-specific human capital. Given that changes in the arrangements of managing employees are more likely to occur than those in managing fixed assets (Carroll, 1993), firms are very likely to adjust the orientation of HRM systems to maximize value through using firm-specific human capital. Specifically, as firm size grows, rather than remaining with fixed-asset-centered HRM systems, a firm’s HRM systems will be more employee-centered. Since industry capital intensity requires fixed-asset-centered

HRM systems, the driving effects of industry capital intensity on the utilization of HCWS will be weakened as firm size grows.

More importantly, as indicated by the existing literature, firm size's adjusting effects on the way in which firms respond to external influencing forces might be nonlinear (Dimaggio and Powell, 1983, Hitt et al., 1990, Kelm et al., 1995). On the one hand, largeness increases organizational power relative to a firm's environment. As firms grow larger, they become less conforming to the external pressures (Pfeffer and Salancik 1978). On the other hand, largeness increases the internal organizational capabilities to resist external pressures at an increasing rate (e.g. Hitt et al., 1990, Kelm et al., 1995). Therefore, the overall resistance of a firm to external pressures is likely to grow at an increasing rate as the firm grows larger. In the case of this study, we expect that the change of the relationship between industry capital intensity and the emphasis of utilization of HCWS, along with the growth of firm size, is at an increasing change rate. The reasons are two-fold. First, when a firm shifts the HRM orientation towards employee-centered, the firm's effort in developing firm-specific human capital has an increasing marginal revenue. Firm-specific human capital is a result of shared investment of both employer and employees (Hashimoto, 1981). The input of firm efforts in developing firm-specific human capital is coupled with corresponding active effort by employees (Slaughter *et al.*, 2007). The increase of one unit of a firm's efforts in developing firm-specific human capital will result in bigger total effort input. Second, when a firm shifts the HRM orientation towards employee-centered, the firm's willingness to develop and use firm-specific human capital grows at an increasing change rate. The reason is the increasing marginal utility of firm-specific human capital, which means that the increase of one unit of firm-specific human capital results in a greater value creation (Fukuda and Owen, 2008). The extant literature also supports such nonlinear change. Using a sample of 2,251

IT professionals in Singapore, Slaughter *et al.* (2007) found that the accumulation of firm-specific human capital led to better pay at an increasing change rate. Based on the discussions above, we propose that:

H2: The positive relationship between industry capital intensity and a firm’s emphasis on the utilization HCWS will be negatively moderated by firm size in a non-linear way, such that, as firm size increases, the negative moderating effect of firm size will grow at an increasing change rate.

Method

Research Design

Our research used both objective and subjective data. We collected objective data from Beijing city’s statistics yearbooks, and used a survey to collect the subjective data. Questionnaires were completed by HRM directors/managers or senior managers in charge of HR affairs. Given the fact that the title ‘HR manager’ differed from firm to firm, we indicated on the front page of the survey that the person who was in charge of HR affairs in general would be deemed to be the respondent. A couple of HR managers were invited to participate in the pilot study before the survey was formally delivered. Feedback was also received from semi-structured interviews. The wording and expression of some survey items were further revised and then the formal survey was designed. Since the scales used in this study were originally in English, we adopted a translation and back-translation procedure to guarantee the scale’s validity.

Data collection procedure

We obtained from the Statistics Bureau of the Beijing Government a list of firms (with more than 200 full-time employees) registered in Beijing. We employed firms with more than 200

employees for several reasons. First, choosing large firms ensures the existence of HRM systems (i.e., high-commitment work systems). According to previous studies, large firms, unlike small ones (Patel and Cardon, 2010; Cardon and Stevens, 2004), tend to have sophisticated and systematic styles of HRM practices (Datta *et al.*, 2005; Jackson and Schuler, 1995). In small firms, the management of employees is more likely to depend on the direct control of top managers, and the use of HRM systems might impose sizeable burdens on a critical constrained resource in small firms, managerial attention, making it difficult for small firms to effectively administer HRM systems (Chadwick *et al.*, 2013). Small firms are therefore more likely to adopt informal HRM practices. For example, in small firms, training investment has a higher proportion of on-the-job training (Kotey and Slade, 2005), participation and discretionary effort can be more readily managed via organizational culture (cf. Kotter and Heskett, 1992), recruitment is done informally through personal connections (Marlow and Patton, 1993), meaningfulness of work is more influenced by intrinsic incentives, and so on (Chadwick *et al.*, 2013). However, large firms tend to have systematic and sophisticated HRM systems (Jackson and Schuler, 1995; Jackson *et al.*, 2014).

Second, although SHRM studies in a Western context often use 100 employees as a criterion to differentiate large from small firms (e.g., Chadwick *et al.*, 2013; Datta *et al.*, 2005; Huselid, 1995), the case might be different in emerging economies, especially those with large populations and large scale of labor, such as China and India. In such economies, firm size is usually larger than their counterparts in developed economies. Therefore, to ensure that we include only large firms in this study, we used firms with 200 or more employees. Such a criterion has also been used in strategic HRM studies based on Indian firms (e.g., Bhatnagar and Sharma, 2005; Budhwar and Sparrow, 1997; Sparrow and Budhwar, 1997). In addition, some international

research projects concerning human resource management, for example, the Cranet project that surveys HRM in firms in more than 40 advanced and emerging countries, also choose 200 employees as a criterion to ensure that firms have HRM systems (e.g., Dany *et al.*, 2008; Vernon and Brewster, 2013). In China, on 18 June 2011, four departments of the State Council, the Ministry of Industry and Information Technology, the State Statistics Bureau, the National Development and Reform Committee, and the Ministry of Finance, issued the “standards of small and medium sized enterprises” (http://www.gov.cn/zwgk/2011-07/04/content_1898747.htm). According to these “standards”, the minimum point of employee numbers that makes a firm large-sized is 200. Therefore this research only includes firms with 200 or more employees.

There were two steps to the data collection procedure. First, we randomly selected 820 firms as the potential sample, and the surveys were delivered to these sample firms in February 2008. Given the low response rate characteristic of mailed surveys in a transition economy like China, we indicated the confidentiality and anonymity of this research project on the front page to ensure the trust of potential respondents. Surveys were mailed with a stamped, return-addressed envelope. In the second step, after two months we sent a reminder to potential respondents who had not replied, requesting that they return the survey as quickly as possible.

Two hundred and nine completed surveys were received, giving a valid response rate of 25.49%. After eliminating surveys with an excessive amount of missing data, we obtained 168 valid samples. In keeping with the approach recommended by Kanuk and Berenson (1975), we checked the non-response bias by examining the difference between late and early respondents. By so doing, the order of the survey’s responses was recorded; the correlation between the order and firm size or firm age was insignificant, suggesting that the non-response bias was minimal.

Descriptive analysis

The mean firm size, measured by the number of full-time employees, was 2641.71 ($SD = 2528.64$). The mean firm age, measured by the years since firm start-up, was 15.71 ($SD = 16.36$). For firm ownership, town and village enterprises (TVEs) accounted for 4.80%, state-owned enterprises (SOEs) 31.50%, privately owned enterprises (POEs) 30.40%, collectively owned enterprises (COEs) 9.5%, joint ventures (JVs) 15.50%, and foreign invested enterprises (FIEs) 8.30%. Firms in the garment industry accounted for 6.00%, chemical and pharmaceuticals covered 29.2%, electronics and engineering 17.3%, finance, banking and insurance 11.3%, sales and business services 22.6%, and others 13.7%.

Measures

Industry capital intensity. Following the approach used by Datta *et al.* (2005) and Chadwick *et al.* (2013), we measured industry capital intensity by the ratio of total assets to total sales in each industry. The higher the level of this value, the higher the capital intensity in a specific industry. We used objective data from the Statistics Year Book of Beijing municipality for the three-year period from 2005 to 2007, which was one year ahead of the collection of subjective data to mitigate the concern of reciprocal causality. The researched firms in this study are from five industries: garments; chemicals and pharmaceuticals; electronics and engineering; sales and business services; and finance, banking and insurance. We collected data from these accordingly from the Statistics Year Book of Beijing municipality.

Firm size. Following the mature approach in the literature (e.g., Arthur, 1994; Chadwick *et al.*, 2013; Datta *et al.*, 2005; Youndt *et al.*, 1996), we used the total number of full-time employees as

the measure of firm size. We also took the natural log form of the firm size to reduce heteroscedasticity.

High commitment work systems. To measure HCWS, ten items were adapted from the previously established scales of Xiao and Tsui (2007) and Lepak and Snell (2002). Respondents were asked to evaluate “to what extent your firm emphasizes the use of the following practice”. These practices include “extensive training”, “internal promotion/recruitment”, “extensive selection procedures”, “appraisal feedbacks for development purposes”, “group-based performance appraisal”, “extensive employee ownership”, “egalitarianism”, “extensive communication”, “participative management”, “extensive team work”. The Cronbach’s alpha value was 0.80, indicating good reliability.

Control Variables. We controlled for firm age, firm unionization presence, firm ownership, firm innovation strategy (e.g., Jackson and Schuler, 1995; Jackson *et al.*, 1989) and strategic HR integration (e.g., Budhwar, 2000), because they have been reported to be significantly related to the use of HRM systems. Firm age was measured by one item, “how many years has your company been operating in China?” Unionization presence was a dummy variable used to measure whether there was a union in the sampled firms. We also controlled firm ownership dummies, such as state owned enterprises (SOE), privately owned enterprises (POE), township and village enterprises (TVE), and joint ventures (JV); collectively owned enterprises (COE) was set as the reference group. HCWS might be affected by firm innovation strategy (Aiken and Hage, 1971; Jackson *et al.*, 1989). Innovation strategy was measured by three items adapted from previous research (Li and Atuahene-Gima, 2001; Takeuchi, 2009). A sample item is “introducing new products and brands”. The Cronbach’s alpha value was 0.86. Finally, we controlled for

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3 strategic HR integration which is defined as “the degree to which HRM issues are considered as
4 part of the formulation of the business strategy” (Brewster & Larsen, 1992, pp. 411-412). This is a
5 critical control variable, as HR scholars have suggested that strategic HR integration predicts the
6 strategic utilization of HRM of firms (Guest, 1990; Welbourne and Cyr, 1999). We used five items
7 adapted from the previous studies, including Budhwar (2000a), Budhwar (2000b), Budhwar and
8 Sparrow (1997), and Brewster *et al.* (1992), to measure it. A sample item is “*HR is considered*
9 *part of top management*”. The Cronbach’s alpha value was 0.82, indicating good reliability.

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12 To test the scale validity of HCWS, HR’s strategic integration, and innovation strategy, we formed
13 the three-factor model to determine whether this model was better than the one-factor model.
14 Confirmatory factor analysis revealed that the three-factor model ($\chi^2=261.11$, d.f.=149,
15 RMSEA=0.067, CFI=0.92, TLI=0.90) was better than the one-factor model ($\chi^2=656.15$,
16 d.f.=152, RMSEA=0.141, CFI=0.62, TLI=0.57), suggesting good construct validity in this study.

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Results

The analyses were conducted using Stata 13. Table 1 shows the correlations between variables used. The correlation of the variables was below 0.50, lower than the 0.65 benchmark, indicating that concern about collinearity might be minimal. Given the nature of the nested data in this study, industry capital intensity was on the industry level, while firm size and firm HCWS were on the firm-level variables, suggesting that the variance within a certain industry was smaller than the variance between industries. Thus multi-level regression analysis was conducted to test the hypotheses. Following the suggestion of Aguinis *et al.* (2013), we estimated the cross-level interaction effects by using multilevel modeling. To produce the interactive term, we group-centered firm size and industry capital intensity, and multiplied industry capital intensity

and firm size squared to produce the interactive term.

Insert Tables 1 and 2 about here

Table 2 reports the unstandardized values of the regression results. We find that industry capital intensity has a positive effect on HCWS ($b=0.012$, $p<0.001$), thereby supporting Hypothesis 1. Also, it can be seen in Table 2 that the interaction of industry capital intensity and firm size on HCWS was partially significant ($b=0.093$, $p<0.10$), and the interaction of industry capital intensity and firm size squared on HCWS was significantly negative ($b=-0.182$, $p<0.05$). These results demonstrate that the relationship between industry capital intensity and HCWS varies according to the different levels of firm size in a quadratic manner. Following the approach used by Zhang *et al.* (2010) and Schilke (2014), we plotted the significant interaction effect in Figure 1. To create this figure, the regression equation predicting the HCWS was estimated at various levels of firm size. The vertical axis of the figure represented values for the unstandardized regression coefficient for the industry capital intensity predicting HCWS, and the horizontal axis represented values for the firm size. As the figure shows, an increasingly negative relationship between industry capital intensity and HCWS emerged with the increase of the firm size, which supported Hypothesis 2.

Insert Figure 1 about here

Additional analysis

We also conducted two supplementary analyses to validate the results' robustness. First, in order to further reduce the concern of reciprocal causality between the variables in this study, following the recommendation of Landis and Dunlap (2000), we set industry capital intensity as the

dependent variable, HCWS as the independent variable, and firm size as the moderating variable. Results indicated that the effect of the interaction of HCWS and firm size squared on industry capital intensity was not significant, indicating that reciprocal causality is not a major concern. Second, we deleted the control variables in the regression model, and found that the results remained unchanged, thus further verifying the robustness of the study's results.

Discussion

Our overall purpose was to investigate whether and when industry capital intensity influences firms' utilization of HCWS. According to our findings, industry capital intensity positively impacts on firms' utilization of HCWS, with other things being equal. However, this positive relationship becomes negative at an increasing change rate, as the firms grow larger. Our findings generate both theoretical and practical implications.

Theoretical Implications

First, we contribute to the contextualized HRM field by clearly capturing the direct and cross-level positive relationship between industry capital intensity and firms' utilization of HCWS. As discussed earlier, knowledge about industry capital intensity's implications for the use of strategic HRM has lagged behind, which leads to contradictory understanding about the impact of industry capital intensity on HRM systems. The extant literature has either focused on single HRM practices (versus HRM systems) (e.g., Arai, 2003; Gittleman *et al.*, 1998; Koch and McGrath, 1996; Osterman, 1994) or treated capital intensity as a firm-level variable (e.g., Arai, 2003; Koch and McGrath, 1996), control variable (Chadwick *et al.*, 2015 ; Chadwick *et al.*, 2013; Park, 2012; Su and Wright, 2012), or a background variable (e.g., Gittleman *et al.*, 1998;

Osterman, 1994). Our study is an attempt to address these shortcomings. Our findings are consistent with those of previous studies which have suggested a positive association between capital intensity and the use of strategic HRM practices (e.g., Arai, 2003; Koch and McGrath, 1996), and complement their argument that, in capital-intensive industries, firms are likely to adopt HCWS to gain skilled employees, enhance work motivation, and create better work opportunities for employees to solve complex problems.

Secondly, the finding about the moderating role of firm size enhances our understanding of the relationship of industry capital intensity with firms' utilization of HCWS by finding the quadratic moderating role of firm size. This makes a twofold contribution to the contextualized HRM literature. Previous contextualized HRM research does not consider the interdependence of an organization's internal and external environments, but treats all environmental factors as independent of each other (Ding and Akhtar, 2000; Fields *et al.*, 2000; Zhu *et al.*, 2013). Although we focused only on industry capital intensity of an organization's external environment and firm size of an organization's internal environment, we examined their interactive effects in impacting on firms' utilization of strategic HRM systems. This is aligned with Jackson *et al.*'s (2014, p. 4) argument that "constantly in flux, an organization's external and internal environments create a dynamic context for the development, evolution, and demise of HRM policies and practices". This could be a meaningful starting point for exploring the interactions of organizations' external and internal environment variables in influencing the use and effectiveness of HRM systems. However, it also deepens our understanding of the complex moderating role of firm size. It indicates that, as they employ more employees, industry capital intensity will increasingly inhibit the use of strategic HRM systems, such as HCWS. Our result indicates that the change of firm size is likely to generate richer implications, for example,

adjusting the way the HRM systems are organized, than merely quantitatively increasing the workload of HRM systems.

Thirdly, the quadratic moderating effects of firm size might be able to synthesize the contradictions in contextualized HRM literature concerned with the effects of industry capital intensity. When firm size was controlled, industry capital intensity was positively related to HWCS. This is consistent with the argument and evidence of the positive associations of capital intensity and firms' use of strategic HRM (e.g., Arai, 2003; Koch and McGrath, 1996). When firm size is included in the analysis as a moderating variable, it was found that industry capital intensity was negatively related to large firms' use of strategic HRM systems, and the negative relationship became stronger as firm size grew larger. This is also consistent with the argument about the negative associations between capital intensity and the use of strategic HRM practices (e.g., Terpstra and Rozell, 1993; Datta *et al.*, 2005). Our interactive view of industry-based and resource-based theories can reveal a dynamic process of how firms, as Teece *et al.* (1997) contend, develop core or firm-specific (human) resources/capital through internal processes with the intervention of industry forces (i.e., capital intensity). This specifically captures how firms grow (in size) from being followers in the industry to gradually resisting the isomorphic effects of industry and developing their unique or firm-specific ways of managing people in order to create value.

Finally, it may offer implications for the broader strategic management field, where the debates on industry *versus* firm effects have long existed and resulted in less conclusive messages – in particular on whether industry or firm effects are more crucial to firm strategy-conduct-performance (e.g., Hawawini *et al.*, 2005; McNamara *et al.*, 2005). Our research

deviated from the conventional approach by exploring the complex role of a firm feature (i.e., firm size). In other words, instead of (advancing the methods of) measuring and comparing the effects sizes of these two forces or testing the tenets with different samples, we examine how they complement each other in impacting on firms' conduct. By so doing, we attempt to shift the long-standing focus from asking whether industry forces or firm conditions are primary considerations when predicting firm's strategy, conduct and performance to examining the way in which the two groups of variables jointly exert their effects.

Practical Implications

Generally, our research suggests a dynamic and non-linear pattern of utilizing HCWS in an increasingly capital-intensive environment as firm size grows. First, in capital-intensive environments, decision makers in firms need to adopt HRM practices/systems to support fixed assets to maximize the productivity. The change of fixed assets requires proportional adjustment of human capital, which needs appropriate adaptations of utilization of HCWS. Secondly, HCWS can be of different orientations. It can be used either as fixed-asset-centered or employee-centered. The former supports the use of fixed assets, but it can generate industry-specific human capital. The latter will generate firm-specific human capital. Decision-makers of firms in a capital-intensive context are encouraged to shift the orientation of the utilization of HCWS as firm size grows. Specifically, as a firm grows bigger, the orientation of HCWS should depart from emphasizing a fixed-asset orientation and move towards stressing an employee-centered orientation. Finally, yet importantly, as a firm grows bigger, the shift from fixed-asset-centered to employee-centered orientation will be at an accelerating change rate.

Limitations and Suggestions for Future Research

Our research makes several contributions. However, the findings must be interpreted with caution. First, this study included only two key variables to represent characteristics of industry (industry capital intensity) and firm (firm size). We encourage future research to incorporate other important industry-level characteristics, such as industry dynamism, industry growth and industry knowledge or R&D intensity (Chadwick *et al.*, 2013; Guthrie and Datta, 2008), firm-level characteristics such as top management teams (Chadwick *et al.*, 2015; Ostroff and Bowen, 2016), firm capital intensity (Chadwick *et al.*, 2013; Kock and McGrath, 1996), and knowledge intensity (Laursen, 2002). We encourage future research to start investigating not only the main effects of these characteristics, but also how industry- and firm-level characteristics can interact to influence how a firm's HRM is defined and utilized. Second, we focus on the interactive effects of external and internal variables on the utilization of HRM systems in the Chinese context, an emerging and investment-driven fast-growing economy. Further studies could investigate how the two groups of variables jointly determining the utilization of strategic HRM systems in other emerging and developed economies to see if the rationale of this research can be generalized across countries. Third, we did not investigate the influences of other measures that are closely related to industry capital intensity, such as firm-level capital intensity (Chadwick *et al.*, 2013; Datta *et al.*, 2005), and knowledge intensity (Laursen, 2002), which have also been proposed and found to predict the utilization of HRM practices/systems. Future studies are encouraged to investigate whether these firm-level characteristics exert additional predicting power in influencing firms' utilization of HCWS above and beyond the effect of industry capital intensity, or vice versa. Finally, we focused on the interactive effects of industry- and firm-level contextual variables in predicting the use of HRM systems. This sheds light on what and when these lead to the formation and development of HRM systems. We further suggest that future studies can introduce this interactive view to study how industry forces and firm conditions jointly adjust the

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HRM-outcomes relationship, since the extant studies often examine their moderating effects separately.

Personnel Review

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Table 1: Descriptive Statistics and Correlations

Variables	Mean	SD	1	2	3	4	5	6	7	8	9	10	11
1 Firm Age	15.710	16.361	—										
2 Union Presence	0.580	0.494	.194*	—									
3 State-owned Firms	0.320	0.466	.259**	.418**	—								
4 Privately-owned Firms	0.300	0.461	-.110	-.440**	-.448**	—							
5 Foreign-invested Firms	0.080	0.277	-.111	-.182*	-.205**	-.199**	—						
6 Joint Venture	0.150	0.363	-.059	-.006	-.290**	-.283**	-.129	—					
7 Township and Village Firms	0.050	0.214	-.085	-.038	-.152*	-.148	-.067	-.096	—				
8 HR's Strategic Integration	3.080	0.812	-.197*	.139	.032	-.054	-.031	-.003	-.036	—			
9 Innovation Strategy	3.090	0.966	-.115	.017	-.064	-.129	.089	.199**	-.007	.026	—		
10 Firm Size (LN)	7.282	1.200	-.002	.007	.014	-.092	.016	-.056	.047	-.078	-.070	—	
11 Industry Capital Intensity	11.780	17.985	.008	-.058	.012	-.002	-.028	-.061	-.003	-.162*	.026	.181*	—
12 HCWS	2.850	0.698	-.235**	-.010	-.096	.094	-.024	.025	-.032	.612**	.100	-.047	.099

Note. n=168. All correlation coefficients greater than or equal to |.15| are significant at $p < .05$. HCWS=high-commitment work systems

Table 2: The Interactive Effects of Industry Capital Intensity and Firm Size on HCWS

	Model 1		Model 2		Model 3		Model 4		Model 5	
Intercept	0.000	(0.077)	0.227	(0.195)	0.079	(0.187)	0.079	(0.187)	0.002	(0.187)
(Level 1 Effects)										
Firm Age			-0.100	(0.071)	-0.103	(0.070)	-0.103	(0.070)	-0.116†	(0.068)
Union presence			0.023	(0.074)	0.020	(0.073)	0.020	(0.073)	0.039	(0.071)
State-owned Firms			-0.001	(0.099)	0.008	(0.099)	0.008	(0.099)	0.008	(0.097)
Privately-owned Firms			0.167	(0.109)	0.173	(0.110)	0.173	(0.110)	0.186†	(0.108)
Foreign-invested Firms			0.020	(0.082)	0.030	(0.081)	0.030	(0.081)	0.031	(0.079)
Joint Venture			0.045	(0.091)	0.066	(0.090)	0.066	(0.090)	0.096	(0.088)
Township and Village Firms			0.020	(0.071)	0.022	(0.071)	0.022	(0.071)	0.015	(0.069)
HR's Strategic Integration			0.621***	(0.062)	0.629***	(0.061)	0.629***	(0.061)	0.637***	(0.060)
Innovation Strategy			0.081	(0.059)	0.081	(0.059)	0.081	(0.059)	0.073	(0.058)
Firm Size (Ln)					-0.003	(0.061)	-0.003	(0.061)	0.003	(0.060)
Firm Size (Ln) Squared					0.028	(0.076)	0.028	(0.076)	0.015	(0.075)
(Level 2 Effects)										

Industry Capital Intensity			0.012***	(0.003)	0.012***	(0.003)	0.022***	(0.006)
(Cross-Level								
Interactive Effects)								
Industry Capital Intensity							0.093†	(0.056)
X firm Size								
Industry Capital Intensity							-0.182*	(0.073)
X Firm Size Squared								
(Variance Components)								
Within-team (L1) Variance	.994	.551	.543		.543		.512	
Intercept (L2) Variance	.000	.033	.000		.000		.000	
Slope (L2) Variance					.000		.000	
Intercept-Slope (L2) Covariance					-.000		-.000	

Note: N=168. † $p < .10$ (two-tailed), * $p < .05$ (two-tailed), ** $p < .01$ (two-tailed), *** $p < .001$ (two-tailed). Model 1= null model; Model 2= with controls; Model 3= random-intercept and fixed slope; Model 4= random-intercept and random slope; Model 5= cross-level two-way interaction.

Unstandardized coefficients are reported, and standard errors are in parenthesis.

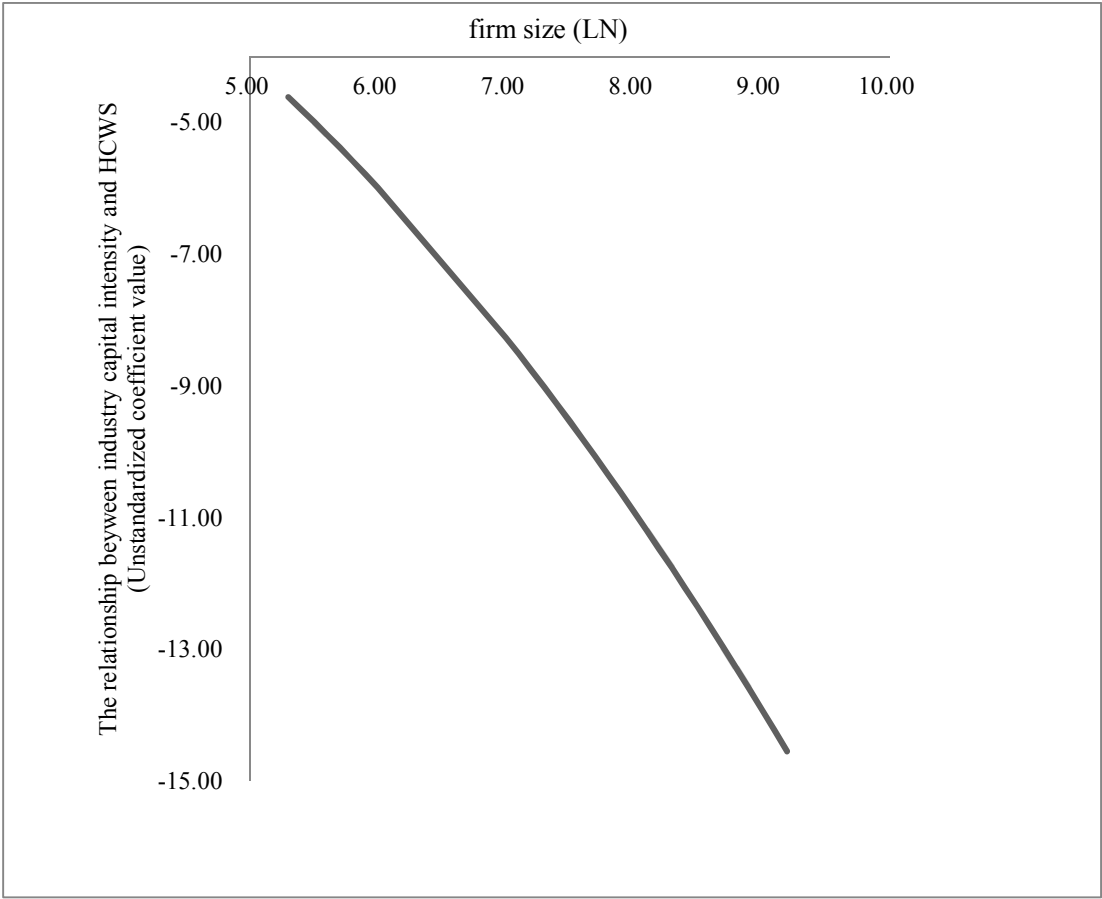


Figure 1: The relationship between the industry capital intensity and firm utilization of HCWS as a function of firm size

Authors' Responses to Editor's Decision Letter
(Manuscript ID PR-01-2017-0069.R3)
Personnel Review

Title: Industry Capital Intensity and Firms' Utilization of HCWS: Does Firm Size Matter?

Authors' Summary of Major Changes

Once again, we would like to express our appreciation for the highly constructive and insightful reviews provided by the Associate Editor and the two reviewers regarding our manuscript. We are delighted to be given another opportunity to revise our paper for further consideration for publication in Personnel Review. We would like to thank you again for your and reviewers' guidance, which has helped us to further strengthen our study and presentation. Specifically, we are delighted to learn that the reviewers are satisfied with the revisions we have done.

Since the revised version of the manuscript will not be sent to reviewer again, we provide a point-by-point response to editor's comments, which are also aligned with reviewer 2's comments.

Point-by-Point Responses to Associate Editor's Comments

03-Jun-2018

Dear Prof. CHEN,

Thank you for revising your paper again, for further consideration.

The reviewers are satisfied with the revisions you have undertaken. One reviewer recommends acceptance while a second reviewer has requested for some minor revisions. I invite you to revise the paper one more time. Specifically, please address the following two points:

Authors' Response

We thank you for giving us another opportunity to revise and resubmit our manuscript for Personnel Review. We are very happy to learn that the both reviewers are satisfied with the revisions we have done. Additionally, we appreciate your willingness to work with us to further improve our manuscript. In the current revision, we have done our best to respond to the two minor concerns. We hope you agree that we have addressed the concerns appropriately in this revision.

1. One remaining concern is firm size. As firm size is a key variable in your study, I suggest you explicitly define it in the paper. More importantly, the theoretical justification for the moderating effect of firm size is still not very clear. Please clarify

why firm size moderates the relationship between industry capital intensity and HCWS, and why it is a nonlinear moderation.

Authors’ Response

Firm size is indeed a key variable in this study. Following the suggestions above, we first, defined firm size on page 9 (highlighted in yellow):

To explore the intervention effects of firm size, we define firm size as the total number of full time employees employed by the focal firm.

Moreover, to clarify why firm size moderates the relationship between industry capital intensity and HCWS, we added some further theoretical explanations on page 9 (highlighted in yellow).

First, organization theorists (e.g. Dimaggio and Powell, 1983; Hannan and Freeman 1984; Pfeffer and Salancik, 1978) and empirical researchers (e.g. Meznar and Nigh, 1995; Kelm et al., 1995) have reiterated that firm size can adjust the way in which firms respond to external influencing forces. Second, both the nature of firms’ human capital and, consequently, the way in which firms view and manage their human capital may vary across levels of firm size (Jackson and Schuler, 1995). Therefore, firms’ emphasis on the utilization of HCWS in responding to industry capital intensity may vary across levels of firm size.

Finally, to explain why firm size moderates the relationship between industry capital intensity and HCWS in a non-linear way, we added some further theoretical explanations on page 11 (highlighted in yellow).

More importantly, as indicated by the existing literature, firm size’s adjusting effects on the way in which firms respond to external influencing forces might be nonlinear (Dimaggio and Powell, 1983, Hitt et al., 1990, Kelm et al., 1995). On the one hand, largeness increases organizational power relative to a firm’s environment. As firms grow larger, they become less conforming to the external pressures (Pfeffer and Salancik 1978). On the other hand, largeness increases the internal organizational capabilities to resist external pressures at an increasing rate (e.g. Hitt et al., 1990, Kelm et al., 1995). Therefore, the overall resistance of a firm to external pressures is likely to grow at an increasing rate as the firm grows larger.

2. A second issue is Figure 1. The vertical axis of this figure indicates that the relationships between industry capital intensity and HCWS are negative (at various levels of firm size). Should these relationships be positive (as indicated in Hypothesis 1)? In addition, if vertical axis represents ‘standardized regression coefficients’ (p. 17), as indicated in the Result section, why are the values over 1?

Authors’ Response

Authors' Response

Thank you and the reviewer for the inquiries about the presentation of Figure 1. The question about the presentation of Figure 1 is mainly concerned with the negative value of the correlation coefficient value of industry capital intensity and HCWS. This could be because all the Y values are negative, while H1 proposes a positive relationship of industry capital intensity and HCWS. This is for at least two reasons. First, statistically, H1 is supported. But the effect size is very small (0.012), which means that the positive relationship is very weak and the positive effect of industry capital intensity on HCWS is marginal. Second, in order to ensure the existence of High Commitment Work Systems, we choose firms will 200 or more employees, which means we will only investigate firm size's moderating effect as it grows from 200. It is possible that the negative moderating effect of firm size has offset all the positive effect of industry capital intensity or even has become stronger than the positive effects. In this case, the value of the correlation coefficient of industry capital intensity and HCWS in the figure will be negative. As a result, the relationship of industry capital intensity and HCWS becomes negative when firm size is 200, and turns more negative at an increasing change rate as firm size grows. We reports the unstandardized coefficients in the Table, which has been suggested by top-tier journals, so the coefficient values might be larger than 1.

Moreover, we simulate the results by assuming that our firm size starts from 0 (see figure 1). When firm size is zero, the value of the Y is weakly positive. That could mean, though not precisely, that firm size reduces the positive effects of industry capital intensity on HCWS first, and increases the negative effects of industry capital intensity on HCWS later at an increasing change rate.

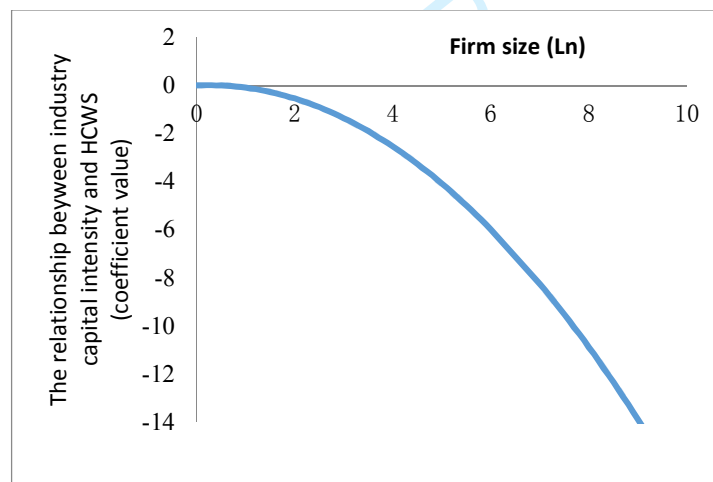


Figure: simulation based the assumption that firm size starts from 0

In addition, the reviewer questioned, “if vertical axis represents ‘standardized regression coefficients’ (p. 17), as indicated in the Result section, why are the values over 1?”. The truth is that, in our figure, the vertical axis represents unstandardized regression coefficients rather than standardized coefficients. We have added some words and notes to demonstrate this on page 18 (highlighted in yellow)

Table 2 reports the unstandardized value of the regression results.

and on page 31 (highlighted in yellow)
Unstandardized coefficients are reported, and standard errors are in
parenthesis.

Once I have received your revised paper, I will not be sending this back to the review but will undertake an editorial review instead. Please highlight in yellow the changes you are making in your revised submission. I look forward to receiving your revised paper.

Sincerely,

*Eddy Ng
Associate Editor
Personnel Review*

Authors' Response

Again, we would like to thank you and the two reviewers for your insightful comments which have enabled us to substantially improve the quality of our manuscript. In this revision, we have tried to address the two minor issues raised by one of the reviews team to the best extent possible. We believe that your comments have helped us greatly in streamlining and strengthening the study both theoretically and empirically. We hope that you agree.