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Efectos de la interacción entre la integración de la cadena de suministro y las prácticas de recursos humanos de alto rendimiento sobre el resultado

RESUMEN

Este estudio trata de entender los efectos moderadores de las prácticas de recursos humanos de alto rendimiento sobre la relación entre la integración de la cadena de suministro y el rendimiento operacional. La importancia reside en la asunción de que la cadena de suministro se puede entender como un conjunto de personas trabajando a lo largo de empresas individuales y, por tanto, esenciales. Utilizando datos del sector de la comercialización hortofrutícola, se examinan las hipótesis propuestas, haciendo uso de tres dimensiones de la integración de la cadena de suministro (interna, con proveedores y con clientes) y cinco medidas de rendimiento operacional (coste, calidad, entrega, servicio y flexibilidad). Para contrastar las hipótesis propuestas se lleva a cabo una regresión probit ordenada. Los resultados confirman los efectos moderadores en la mayoría de los casos puesto que las prácticas de recursos humanos moderan la relación si ésta se establece entre la integración interna o con cliente y la entrega.

Palabras clave: Integración cadena suministro, proveedor, cliente, prácticas de recursos humanos, rendimiento operativo.

Effects of interaction between supply chain integration and high-performance human resources practices on performance

ABSTRACT

This study proposes a model and hypotheses to understand the nature of the relationships of supply chain integration and high-performance human resources practices with operational performance in the horticultural marketing sector. The importance lies in the assumption that supply chain is all about people working across independent firms, and therefore, essential. Using empirical data from the horticultural marketing sector, the moderating effects of high-performance human resources practices on the relationship between three supply chain integration dimensions of integration (internal, supplier and customer) and five operational performance measures (cost, quality, delivery reliability, service, and flexibility) are examined. An ordered probit analysis is used to test the proposed hypotheses. The results confirm the moderating effects in most of the cases as human resources practices have a moderating effect if the relationship is established between internal or customer integration and delivery.

Keywords: Supply chain integration, supplier, customer, human resources practices, operational performance.

JEL classification: L22; M21

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Effects of the interaction between supply chain integration and high-performance human resources practices on performance

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1. INTRODUCTION

The emergence of global markets, the rapid changes in technology and intense competition have made it indispensable for firms to find alternatives to remain competitive. This has made firms extend beyond their own limits and consider their supply chain partners at a strategic level. Subsequently, supply chain integration (hereinafter SCI) has been considered critical to business success. This has been established by the growing empirical evidence suggesting a positive impact of SCI on firm performance (Rosenweig *et al.*, 2003; Droge *et al.*, 2004; Devaraj *et al.*, 2007; Swink *et al.*, 2007).

The supply chain is a human chain and its success is all about the people who manage supply chains (Sweeney, 2013). Therefore, an adequate human resources system is a key element in the implementation of SCI practices and, consequently, for greater customer satisfaction and an improved operational performance (Ou *et al.*, 2010). According to Scarbrough (2000), the supply chain generates significant demands on human resources management to obtain the necessary skills and flexibility of behavior to achieve a better integration. Thus, in a process of integration, SCI dimensions have to take into account collaboration across all members in the chain itself (Tracey *et al.*, 2005). In these terms, it becomes especially relevant to implement high-performance human resources practices.

In this regard, literature mainly focuses on the importance of additional elements such as information technology, competitive strategy or uncertainty due to their special connection with SCI processes (Abdallah *et al.*, 2014; Najafi Tavani *et al.*, 2014; Rosenzweig, 2009). Despite this, less attention has been paid to high-performance human resources practices (hereinafter HPHRP) although it has been considered a critical element in supply chain management (Hohenstein *et al.*, 2014).

Several studies suggest the existence of a direct and positive relationship between HPHRP and firm performance (Delery and Doty, 1996; Guthrie *et al.*, 2008). However, other studies (Boselie *et al.*, 2005; Combs *et al.*, 2006; Guest, 2011) have highlighted that there are still some inconsistencies that prevent researchers from explaining why this association exists. Accordingly, it has been found that said the relationship is mediated by other strategic capabilities (Becker and Huselid, 2006; Paauwe, 2009). In circumstances where HPHRP cannot be considered to provide a competitive advantage, they may still influence firm

performance by acting as enablers of other mediating strategic capabilities (Martínez-del-Río, *et al.*, 2012).

An accurate understanding of the philosophy and effective implementation of SCI tools and techniques relies heavily on human behavior (Bendoly *et al.*, 2006). Therefore, firms try to do their best to foster the proper development of employees to obtain the maximum effect of SCI on performance. This leads to the supposition that the relationship between SCI and performance may be contingent on HPHRP.

According to Mackelprang *et al.* (2014), performance associated with SCI may vary because of the presence of unknown moderating factors. Thus, this study has shed some light on the clarification of some unknowable results. The study also provides empirical evidence that HPHRP have enough power to modify the effects of SCI on performance, and more importantly, not always as expected.

Consequently, the aim of this study is to explore the effects of HPHRP as a moderating factor affecting the relationship between SCI and performance. The remainder of this study is structured as follows: Section 2 introduces the literature review as well as the development of the hypotheses; Section 3 presents the research design and measurement assessment. In Section 4, the data analysis and results are presented. In Section 5 a discussion of the findings and managerial implications is provided. Finally, conclusions, limitations, and suggestions for future research are offered.

2. THEORETICAL BACKGROUND AND HYPOTHESES

2.1. Supply chain integration

The relationship between SCI and performance has been argued both theoretically and empirically (Eisenhardt, 1989; Williamson, 2008). However, while most of the benefits from SCI are expected to be cost savings (Madhok and Tallman, 1998), SCI processes may increase them for a time. Also, the increase in performance due to integration might not be sufficient to recover the high costs (Leuschner *et al.*, 2013). Therefore, the act of carrying out SCI practices does not guarantee that organizations will attain superior performance

(Rosenzweig *et al.*, 2003). Consequently, the statement that SCI always produces a positive effect on performance can be questioned.

Besides, these studies show a lack of consensus in their results, as well as in the measuring SCI (Huo, 2012; Vickery *et al.* 2003). Nevertheless, SCI constructs are measured considering different instruments (unidimensional, multidimensional construct or even as a set of practices). Additionally, most of the studies usually consider three main dimensions (internal, customer and supplier integration), where studies analyzing relationships among these SCI dimensions find that internal integration improves external integration (Droge *et al.*, 2004; Huo *et al.*, 2014).

2.1.1. Internal integration

Internal integration has been defined as the firms' concern with how well their departments work together and tightly coordinate their activities (Barki and Pinsonneault, 2005). Practices like decision synchronization and incentive alignment help departments to optimize their mutual understanding, and therefore, their joint performance (Cao and Zhang, 2011; Simatupang and Sridharan, 2008). At the same time, departments have to maintain both constant and fluid information sharing in order to actually build relationships with each other beyond mere interactions.

Information sharing is considered a key element as it leads to achieving strategic cooperation by closely working together with customer and suppliers (Prajogo and Olhager, 2012; Richey *et al.*, 2010; Simatupang and Sridharan, 2008; Zhao *et al.*, 2011). Thus, if firms have no effective information sharing between internal functions, it would be difficult to understand external requirements. With regards to strategic cooperation, if people in different functional units within the firm do not interact with each other to set objectives and consistent practices, it is less likely that the firm will have a high degree of integration with suppliers and customers (Swink *et al.*, 2005).

In this sense, cross-functional integration is a key element for developing solutions to potential conflicts, setting up synchronized processes, and facilitating operations with customers and suppliers. A firm with good internal communication and coordination capabilities should be better able to transform and exploit knowledge obtained through

customer and supplier relationships (van Donk and van der Vaart, 2005). Hence, it would be more able to achieve a higher level of external integration (Zhao *et al.*, 2011).

The importance of internal integration is based on its ability to eliminate functional barriers within the firm as well as to prepare the firm for external relationships. And so, internal integration encourages communication between different parts, assuring an increase in trust and confidence among them (Ritchie and Brindley, 2000; Vallet-Bellmunt and Rivera-Torres, 2013). It also allows firms to improve and control their coordination of personnel and knowledge development (Das *et al.*, 2006; Rosenzweig *et al.*, 2003). Hence, the absence of internal integration may lead to different functions and departments working at cross purposes, which may result in a waste of resources, involving both an increase in costs and a negative impact on performance (Pagell, 2004). Consequently, it may be considered the link that permits firms to reap the full benefits of their integration efforts and achieves the eventual goal of success (Flynn *et al.*, 2010).

2.1.2. External integration

External integration refers to the efforts of a firm to integrate with external partners, both with customers and suppliers. This is because SCI requires that companies be simultaneously integrated upstream and downstream to achieve significant benefits (Danese and Romano, 2011). Also, Fabbe-Costes and Jahre (2008) state that stronger links and a higher degree of integration across organizational boundaries lead firms and their supply network to improve performance.

External integration supports external routines and processes that collect accurate demand and supply information essential for the coordination of important tasks such as marketing, procurement, production or logistics (Stank *et al.*, 1999). Also, a broader collaboration may enact a shared interpretation of the competitive situation, market potential, and customer needs and thus develop a shared sense of purpose (Koufteros *et al.*, 2005). Therefore, with a low level of supplier and customer integration, a firm is more likely to receive distorted supply and demand information, which results in poor production plans, high level of inventory and poor delivery reliability. Integration with suppliers and customers creates mutual understanding and facilitates task coordination which helps to reduce wastage and

redundancy of efforts in managing supply chain activities across partner firms (Swink *et al.*, 2007).

Hence, external integration improves process flexibility by allowing supply chain partners to better anticipate and coordinate supply and demand (Flynn *et al.*, 2010). The information exchange among partners in the supply chain is cross-functional in nature which is important to improve trust and commitment across the supply chain and to help partners to delegate decision making (Lee, 2000).

Meanwhile, supplier integration can facilitate the understanding and anticipation of a firm's needs in order to meet its requirements. This mutual exchange of information about products, processes, and capabilities helps firms to develop their production plan and produce goods on time. In addition, it contributes new information and expertise that in the end will improve delivery performance and the quality of the final product (Flynn *et al.*, 2010; Rosenzweig *et al.*, 2005). Working with increased understanding, suppliers can improve the level of customer service which will eventually help the firm improve its performance. According to Krause *et al.* (2000), supplier integration facilitates the transfer of competencies and results in increased competitiveness. Also, it leads to a better transfer of knowledge across boundaries, reduces the cost of managing tacit knowledge and exposes the firm to new knowledge (Parente *et al.*, 2011). In contrast, an increase in supplier integration would raise the likelihood of an accumulation of disadvantages such as coordination cost, organizational rigidities or lack of market pressure (Das *et al.*, 2006).

2.2. High-performance human resources practices

Over time, the implementation of SCI has demonstrated some divergences between theory and practice. Some scholars have attributed this to the neglect of human resources in SCI (Shub and Stonebroker, 2009; Tokar, 2010; Ellinger and Ellinger, 2013). Therefore, human nature is positioned as the primary barrier to successful SCI, both internally and with external supply chain partners (Fawcett *et al.*, 2008). In this regard, it might be considered that HPHRP are a crucial key to the success of supply chains. This is because SCI emphasizes the necessity of building close relationships with supply chain partners and collaborative workforces within companies (Huo et al, 2015). In addition, this importance must be adopted

by employees because they create value directly and interact closely with supply chain partners (Ellinger *et al.*, 2010).

Based on a contingency approach, firms adopting a particular strategy require different human resources practices from those required by firms adopting alternative strategies (Jackson and Schuler, 1995; Bantel *et al.*, 1989). However, based on the universalistic perspective, some human resources practices are always better than others, and all organizations should adopt these best practices (Osterman, 1994; Pfeffer, 1994). In both cases, HPHRP deserve special mention.

Although the specific HR practices included in high-performance HR systems have varied across studies, one commonality among these approaches is a focus on promoting workforce ability (selective hiring or further employee training), motivation (formal evaluation systems or incentives linked to goal attainment), and opportunity (use of internal communication system and information sharing) to perform behaviors consistent with organizational goals (Kehoe and Wright, 2013; Martínez-del-Río, *et al.*, 2012). Thus, further employee training is meant to increase employees' knowledge, skills, and abilities. However, employees must be motivated to leverage their knowledge and abilities in order that internal communication systems and information sharing can play an important role in this process. Additionally, other practices such as incentives or employment security increase motivation, which can eventually be translated into employee commitment (Combs *et al.*, 2006).

2.2.1. High-performance human resources practices and internal integration

HPHRP play a key role as a support and as a mechanism for operational responsibilities and relationships within the supply chain (Lengnick-Hall and Lengnick-Hall, 2013). In this regard, Menon (2012) highlights that internal integration seems to be one of the first organizational changes required for successful implementation of SCI. It emphasizes horizontal workflows and helps to build trust because of the need to share sensitive information. This situation might be improved through practices like the use of cross-functional teams or the development of a stronger corporate culture.

Therefore, ability-enhancing practices like training practices can focus on reinforcing knowledge to better understand the nature of integration (Ellinger and Ellinger, 2013). Using

said practices, firms can filter to build a good employee base in line with the integrative conditions. In consequence, employees from every department are trained to understand the importance of cooperation and collaboration and start the initiative towards fundamental internal integration. Eventually, these practices will make employees be in line with the idea of firms to improve performance through cooperation with each other. In contrast, firms with rudimentary or non-developed ability-enhancing practices will have difficulties in finding proper personnel and problems with the adaptation of their employees to the firm and their work.

Meanwhile, motivation-enhancing practices try to align employees' interests with the firm's objectives. Thus, the use of incentives practices can motivate employees and guide them to cooperation with their partners from different functions to reach a collaborative objective (Siemsen *et al.*, 2008). This encourages information sharing within firms and also increases communication amongst different departments. Otherwise, in the absence of motivation, an opportunistic behavior would arise. Therefore, each employee would seek their own interest and compete with other functions for resources. In this sense, incentives motivate employees to work better and smarter (Snell and Dean, 1992) so that they can be more creative in exploring information and other resources.

Through opportunity-enhancing practices, firms can increase employee involvement. Consequently, using problem-solving groups, firms collect employees from different functions and encourage them to solve problems jointly. In addition, problem-solving groups provide an opportunity for employees to share knowledge and ideas (Birdi *et al.*, 2008). Therefore, firms that develop opportunity-enhancing practices will be better placed to take advantage of internal integration because employees can promote information exchange between departments, which eventually will improve internal communication. However, a firm that does not carry out these sorts of practices can diminish their internal relationships as information will not flow under the same conditions.

Consequently, those firms which have developed or maintain their HPHRP, allowing them to motivate, develop and involve their employees, should demonstrate an improved impact of their integrative practices on performance. However, those firms that have not been able to develop their HPHRP would expect that their internal integrative practices to have a lesser effect of internal integrative practices on performance. This leads to the following hypothesis:

Hypothesis 1. The relationship between internal integration and operational performance is positively moderated by HPHRP carried out by the firm.

2.2.2. High-performance human resources practices and external integration

The function of HR can provide more flexibility for coping with challenges arising from changes to the environment. This is possible because a good HR function would make firms see their supply chain partners as a source of manpower. Therefore, firms can send their own employees on assignment to partner organizations (Menon, 2012). In this way, firms may find an opportunity to get closer to their partners in the supply chain so that they can easily share resources. However, an underdeveloped HPHRP can lead firms to be unaware of opportunities and not take advantage of its positive influence on the external integration/performance relationship.

Most of the relationships established with both suppliers and customers are based on tools such as information technology. Thus, HPHRP may help to remove traditional boundaries, melt the bureaucratic structure and support learning because real knowledge transference is possible only when there is a close relationship among the different parts (Gupta and Govindarajan, 2000). Therefore, firms may establish the environment that best promotes knowledge transfer (Minbaeva, 2005).

Firms invest in ability-enhancing practices which are focused on training skills such as teamwork, leadership, problem-solving and negotiation in order to have the more flexible personnel. According to Jin *et al.* (2010), employees with strong people skills could help supply chain partners identify problems and make correct decisions. As all this depends on human behavior, employees who possess a wide range of skills and can continually update their knowledge are in better position to use these techniques and tools to facilitate supplier and customer integration (Gowen and Tallon, 2003; Prajogo and Sohal, 2013). This will result in a more settled relationship with both supplier and customer which in turn will have a greater effect on the performance. Employees with suitable skills facilitate the comprehension of the operational processes of suppliers and customers so that firms are more prepared to meet their expectations (Ellinger *et al.*, 2010). Likewise, employees not well

trained to establish external relationships may affect the process of external integration and therefore negatively affect performance.

On the other hand, firms need to develop a sense of commitment in employees with the purpose of having the well-motivated personnel. In consequence, the commitment created by motivation-enhancing practices can be transmitted to their suppliers and customers in order that they could feel more engaged and thus generate an improvement in performance. Moreover, providing feedback to employees encourages them to share information with their supply chain partners and expand SCI as they are prone to establish external relationships with both customers and suppliers (Huber and Hyer, 1985). However, it is the responsibility of the firm to keep their employees informed about the importance and priority of integrating suppliers and customers (Huo *et al.*, 2015).

Opportunity-enhancing practices such as problem-solving can create a cooperative culture within the organization (Waldman, 1994). Employees might understand it as the best way to solve problems because it becomes a habit when carrying out their daily tasks (Huo *et al.*, 2015). Consequently, when firms carry out integrative practices with suppliers and customers, employees are likely to include them in their groups (Jiménez-Jiménez and Martínez-Costa, 2009). Therefore, firms carrying out opportunity-enhancing practices will improve the effect of their external integration on performance because their employees will be more confident in sharing information and include them as one more habit. Alternatively, external integration will have less of an effect on performance because employees will not have developed the proper attitude or habits.

HPHRP can make it possible for employees to be more prepared to face the process of getting close to both suppliers and customers. Otherwise, the development of external relationships might have a lesser impact on operational performance. As a consequence, the following hypotheses are posited:

Hypothesis 2. HPHRP have a positive moderating effect on the relationship between customer integration and operational performance.

Hypothesis 3. HPHRP have a positive moderating effect on the relationship between supplier integration and operational performance.

3. METHODOLOGY

3.1. Questionnaire design, sample, and procedures

To test the hypotheses, the data was collected from Spanish horticultural marketing firms. In particular, this research has focused on the southeast of Spain within the agri-food sector as it has been an example of success and growth over the last forty years. This is due to its productive specialization, which is based on two main pillars: (a) the closer ties between production, manufacture, and commercialization; (b) the regular introduction of innovations such as new product varieties, crops, and quality systems. The industry consists of approximately 250 marketing companies. According to Perez-Mesa and Galdeano-Gómez, there is considerable internal competition within the network. Horizontal competition between firms exists because they are rivals for the growers' produce at the origin. Likewise, there is vertical competition because their customers are ultimately the same, large-scale European distributors. Consequently, this industry represents a set of relationships of a reciprocal nature and providing an example of macro-hierarchy (Lazzarini *et al.*, 2001) in an international context.

To collect the data, two different sources were used. First, structured personal interviews, using a questionnaire, were conducted between March and May of 2016 for each firm selected. Secondly, five independent external experts, working for companies that provide support to horticulture sector (i.e. financial advice, market research, etc.), were consulted. The motivation for this was due to the difficulty in obtaining objective opinions about sensitive information. Based on the vast experience accumulated by practitioners in the horticultural sector, it was felt that it would be sensible to hear from experts on the subject of operational performance.

The assessment of the questionnaire was carried out in two stages. First, the questionnaire was submitted to academic experts in both the supply chain and agricultural sectors. Next, a pre-test was carried out on five firms from the sample, which were personally visited to conduct discussions. Based on their feedback, the wording of some questions was modified, adding or deleting some others. In doing so, it was ensured that the items were understandable and relevant to practices in the sector. The research unit was the horticultural marketing firms which carry out manipulation or transformation processes. In this respect, steps were taken to

ensure that the horticultural marketing firms considered were involved in the whole process (production, transformation, and distribution), avoiding those exclusively acting as intermediaries.

The starting population was made up of firms in the Statistical Classification of Economic Activities in the European Community (NACE) Rev. 2 business code 46.31 (wholesale of fruit and vegetables) and located in the southeast of Spain. For each selected firm, a key informant was identified, typically bearing the title of manager, president or director, and with knowledge about the firm's internal and external processes.

The initial sample provided by the NACE code totaled 302 firms. This number was reduced using several processes. The first was to find duplicates, 41 of which were summarily deleted. The second process consisted of asking the experts about those firms not carrying out manipulation/transformation processes and then deleting them (106). After both processes were carried out, a sample of 155 firms was obtained. In the last process, key informants were contacted by telephone and asked whether or not the firm maintained a manipulation process, in order to obtain a second confirmation. This process reduced the sample to 113. If the answer was positive, their agreement to participate was then sought.

Following these processes, consent was obtained for 67 to be interviewed. The personal interviews were carried out at the registered office of the firms at a time and date of their convenience. Finally, data for 53 firms were successfully obtained. The differences between the number of firms that initially agreed to be interviewed and those that finally completed them were due to diverse reasons, from a last-minute decision not to participate, to be unable to make an appointment or because the interviewees were unavailable to attend due to their work commitments.

Bearing in mind the total number of horticultural marketing firms maintaining manipulation processes is roughly 100, data was obtained from approximately 50% of the sample. Firms included in the sample maintain an average of 200 employees and represent over 75% of the sector's turnover, which indicates that firms not included in the study were mainly small firms. The size of the sample has favored the use of external experts because it would have been impossible to obtain information from said sources in the case of a larger sample. Therefore, the incorporation of experts has helped to enrich the quality of the data.

One of the most commonly used sources of introducing the possibility of bias is using a single survey respondent for obtaining both the independent and dependent data in one instrument. This study has collected data from two different sources, dramatically reducing the possibility of this bias. However, in order to confirm the reliability of the research instrument, the existence of different biases was tested.

To assess potential late response bias, a test was conducted using the extrapolation method suggested by Armstrong and Overton (1977). According to these authors, people responding late can be assumed to be similar to people who do not respond. Thus, the sample was divided into two groups: the first and the second half of the respondents. Following that, the demographic characteristics of assets, annual sales, and number of employees of early and late responses were compared. At the same time, five items in the questionnaire were randomly selected and also compared. No significant differences were found between early and late responses. Accordingly, non-response bias is unlikely to be a major concern in this study.

To test for the potential existence of a common method variance, confirmatory factor analysis technique was used. Since data were collected from a single respondent per organization, the potential for common method bias might be an issue (Podsakoff *et al.*, 2003). Therefore, all the variables were loaded into an exploratory factor analysis (EFA). The results show eleven factors with eigenvalues above 1.0 and explaining 79.33% of total variance. The first factor explained 25.87 % of the variance (not the majority of the total variance), which is acceptable for this kind of study where most of the construct are correlated, both conceptually and empirically. This suggests that the common method bias does not appear to be a problem.

3.2. Measures

The measuring instrument, that is, the questionnaire, was developed based on previously validated measures. The literature was surveyed to identify valid measures for related constructs and adapted existing scales. Thus, the variables used in this research were developed according to the following description:

Dependent variables:

Operational performance measures were adapted from Wiengarten *et al.* (2014). Likewise, Narasimhan and Das (2001) and Sanders and Premus (2005) posited that successful firms

engage in the simultaneous search of multiple performance objectives (Nakano, 2009). Therefore, operational performance has been considered across the dimensions of cost, quality, delivery reliability, services and flexibility (Rosenzweig and Roth, 2004; Shin *et al.*, 2000). Experts were asked to indicate their perception of each dimension of firms' operational performance in comparison with those of competitors' on a 5-point Likert-scale where 1 indicates much worse, 3 equal and 5 much better.

Independent variables:

Supply chain integration was measured according to its dimensions: internal integration practices (Flynn *et al.*, 2010) and external integration practices (Flynn *et al.*, 2010; Narasimhan and Kim, 2002). With regards to external integration, this research follows those that have kept the supplier and customer elements of integration separate, with the purpose of detecting their potentially distinct relationships with performance (Narasimhan and Kim, 2002; Shah *et al.*, 2002). Consequently, respondents were asked to rate the extent to which statements regarding information exchange and involvement with both suppliers and customers, applied to their firm.

The measure of high-performance human resources practices was adapted from Derely and Doty (1996). This measure comprises ability-enhancing practices such as training programs; motivation-enhancing practices such as incentives based on results; and opportunity-enhancing practices such as information sharing.

Independent variables were considered on a 5-point Likert-scale, where 1 indicates strongly disagree and 5 strongly agree.

Control variables:

The size of firms was used as a control variable in this study. To avoid the influence of size variance, the logarithm of number of employees was used as a proxy for firm size.

3.3. Data analysis

Confirmatory factor analyses (CFA) was conducted to assess the convergent and discriminant validity. The CFA results suggested that the model provided a good fit for the data. The ratio of χ^2 (258,215) to degrees of freedom (164) is less than the recommended value of 3.0 for the

satisfactory fit of a model to data (Hair *et al.*, 1998). All individual items in the measurement model had standardized coefficients that were significant ($p < 0.001$), indicating that the constructs exhibited convergent validity. Collectively, these results provided evidence of convergent and discriminant validity (see Table 1). The Cronbach’s alpha reliability coefficients were then computed, ranging from 0.77 to 0.93. The values of composite reliability (CR) were also computed, ranging from 0.79 to 0.93 and the values of average variance explained (AVE) were ranging from 0.52 to 0.68.

Table 1. Confirmatory Factor Analysis

Factor and Scale Items	Factor Loading ^a	MEASUREMENT MODEL*	
		Standard Coefficient	t-Value
Customer Integration (CI) ($\alpha=0.93$; 1st eigenvalue= 4.75; CR= 0.93; AVE=0.68)			
The linkage with our major customer is constantly reinforced by information networks	0.78	0.81	16.1
Customer's ordering is essentially developed by computerization	0.68	0.69	9.08
We carry out exhaustive follow-ups with our major customers	0.76	0.85	19.33
We have a high level of periodical contacts with our major customers	0.88	0.93	38.87
We share reliable information and point of sale information with our major customers	0.90	0.85	20.24
Our major customer share demand forecast from us	0.81	0.83	17.17
We share our production plan with our major customers	0.72	0.80	15.06
Supplier Integration (SI) ($\alpha=0.87$; 2nd eigenvalue= 3.43; CR= 0.88; AVE=0.61)			
We exchange information with our suppliers via information technology	0.65	0.61	6.64
We maintain long-term relationships with our suppliers	0.82	0.73	10.3
We share our production plan with our suppliers	0.76	0.90	22.36
We share our demand forecast with our suppliers	0.72	0.79	13.09
We help our major suppliers to improve their processes to better meet our needs	0.82	0.84	16.93
Internal Integration (II) ($\alpha=0.93$; 3rd eigenvalue= 2.75; CR= 0.93; AVE=0.68)			
Data information among internal functions are integrated	0.77	0.78	11.18
We have periodic interdepartmental meetings	0.82	0.87	16.61
We use cross-functional teams in internal process improvement	0.83	0.85	15.33
There is a real-time integration among internal functions	0.75	0.78	11.57
High-Performance Human Resources Practices (HPHRP) ($\alpha=0.77$; 4th eigenvalue= 2.33; CR= 0.79; AVE=0.59)			
Employees have clear career paths within the organization ^b	-	-	-
Training programs are provided for new employees	0.82	0.71	7.98
Performance is more often measured with objective quantifiable results	0.79	0.66	6.94
Employees can expect to stay in the organization for as long as they wish	0.58	0.65	6.91
Employees are provided the opportunity to suggest improvements	0.87	0.87	12.7
Employees receive bonuses based on the profits of the organization ^b	-	-	-

*Measurement model indices: $\chi^2/df=1.57, p=0.04, CFI=0.874, RMSEA=0.07, SRMR=0.08$

Explained variance: 66.15%

^b Items dropped after CFA

Table 2. Descriptive Statistics and Correlations

	Mean	SD	Min-Max	1	2	3	4	5	6	7	8	9
1. Customer Integration	3.43	0.89	1.4-5.0									
2. Supplier Integration	3.62	0.81	1.8-5.0	0.6331**								
3. Internal Integration	3.68	0.83	1.7-5.0	0.6335**	0.6248**							
4. Human Resources Practices	3.60	0.75	1.5-5.0	-0.1248	0.1621	0.2123						
5. Cost	3.19	0.90	2-5	0.3454**	0.2535*	0.2030	-0.2760*					
6. Quality	3.78	0.64	3-5	0.3607**	0.4540**	0.4020**	-0.1727	0.3160*				
7. Delivery reliability	3.58	0.77	2-5	0.5295**	0.4012*	0.4483**	-0.1814	0.5312**	0.5383**			
8. Services	3.23	0.78	2-5	0.4551**	0.5120**	0.4145**	-0.1849	0.5713**	0.6808**	0.6752**		
9. Flexibility	3.66	0.62	2-5	0.2121	-0.0437	-0.0569	0.0697	0.2901*	-0.1376	0.3039*	0.0431	
10. Size	3.87	1.52	0-7.6	0.3769**	0.2857*	0.2462†	-0.2424	0.5359**	0.3370*	0.5546**	0.5980**	0.0964

Note: Significant at: † p <.10; * p <.05; ** p <.01. n= 53

Table 2 shows descriptive statistics and correlations among aggregated constructs. The level of correlations provides initial evidence of the discriminant validity of the constructs and suggests that multicollinearity is not an issue in this study.

To test the hypotheses, a probit analysis to compare SCI and performance relationship of firms was performed, considering their HPHRP. When a dependent variable has more than two categories and the values of each category have a meaningful sequential order where a value is indeed higher than the previous one, and the data is following a normal distribution, ordered probit is the most appropriate model to use (Dey *et al.*, 2013; Poon and MacPherson, 2005).

As moderating effects are the purpose of the test, two hierarchical regressions were carried out. Thus, firstly the control variable was entered, as well as internal integration, external integration, and HPHRP, which is the main relationship (step 1). Then, in step 2, the interaction terms between HPHRP and internal integration (H1), customer integration (H2) and supplier integration (H3) were entered. These two steps were taken for the five dependent variables, namely: cost, quality, delivery reliability, services and flexibility (Table 3).

To address the possibility of multicollinearity, the variables used in the interaction terms were mean centered (Aiken and West, 1991). In all models, variance inflation factors were below 3, which are well below the generally accepted threshold of 10 (Cohen *et al.*, 2013).

Table 3. Ordered probit regression models on different dependent variables

	Cost		Quality		Delivery		Service		Flexibility	
	Step 1	Step 2	Step 1	Step 2	Step 1	Step 2	Step 1	Step 2	Step 1	Step 2
	Coef.	Coef.	Coef.	Coef.	Coef.	Coef.	Coef.	Coef.	Coef.	Coef.
Size	0.3971**	0.4288**	0.1398	0.1371	0.4042*	0.4544**	0.5097**	0.5716**	0.0993	0.1136
CI	0.1318	0.2466	-0.2047	-0.1347	0.3305	0.3570	-0.0636	0.0157	0.8264**	0.8452**
SI	0.0680	0.0281	0.5344*	0.5290*	0.0561	0.1357	0.5309*	0.5102†	-0.4117†	-0.3639†
II	0.0782	0.0946	0.3990†	0.3772	0.3620†	0.3953†	0.3362	0.4286	0.4703†	-0.4693†
HPhRP	-0.2177	-0.1278	-0.3934*	-0.3802*	-0.1994	-0.0672	-0.2843	-0.1862	0.3997**	0.5293**
CIxHPhRP		-0.2551		0.0632		-1.2667*		-0.3836		-1.1857*
SIxHPhRP		-1.2405*		-0.6143		0.2709		-0.9338		0.4480
IIxHPhRP		1.1888†		0.1607		1.0953*		1.2748*		0.9054
Wald χ^2	11.51*	17.32*	29.22**	33.83**	31.33**	31.47	44.35**	54.91**	19.80**	15.91*
Pseud R²	0.1659	0.2076	0.1835	0.1927	0.2704	0.3105	0.3173	0.3547	0.1215	0.1604
ΔR^2		0.042		0.009		0.040		0.037		0.039

Note: Significant at: † p <.10, * p <.05, ** p <.01. n= 53

4. RESULTS AND DISCUSSION

4.1. Results

Many previous studies have shown a positive relationship between both customer and supplier integration and performance (Cousins and Menguc, 2006; Droge *et al.*, 2004; Flynn *et al.*, 2010; Frohlich and Westbrook, 2001; Lau *et al.*, 2010). Results of the regression in step 1 are in line with those reported in the literature. Customer integration has a significant and positive effect on flexibility (Coef. =0.8264, $p<0.01$), a finding that is consistent with other empirical studies (Jayaram *et al.*, 2011; Koufteros *et al.*, 2005). Supplier integration also has a significant and positive effect both on quality and service (Coef. =0.5344, $p<0.05$ and Coef. =0.5309, $p<0.10$ respectively), as found in previous research (Koufteros *et al.* 2005; Wong *et al.* 2011). Likewise, internal integration showed different effects. Thus, it has a significant and positive effect on quality, delivery reliability, and flexibility (Coef. =0.3990, $p<0.10$; Coef. =0.3620, $p<0.10$; and Coef. =0.4703, $p<0.10$ respectively).

However, integration, both external and internal, has no significant effect on cost, which is consistent with the idea that integration, both internal and external, could be offset by the cost of these (Leuschner *et al.*, 2013).

Hypothesis 1 states that HPHRP positively moderate the relationship between internal integration and operational performance. However, results yield support when the dependent variable is delivery (Coef. =1.0953, $p<0.05$) and service (Coef. =1.2748, $p<0.05$), that is, the presence of HPHRP increases the effect of internal integration on delivery reliability, and service. In contrast, there is weak support for hypothesis 1 when the dependent variable is cost (Coef. = 1.1888, $p<0.10$), and no support when is quality (Coef. =0.1607, $p>0.10$) and flexibility (Coef. =0.9054, $p>0.10$), so that HPHRP have no moderating effect over the relationships between internal integration and quality and on flexibility.

In hypothesis 2, it was posited that HPHRP have a positive moderating effect on the relationships between customer integration and operational performance. The results did not support this when the dependent variable is cost (Coef. =-0.2551, $p>0.10$), quality (Coef. =0.0632, $p>0.10$), and service (Coef. =-0.3836, $p>0.10$). However, the results are statistically significant when the dependent variable is delivery (Coef. =-1.2667, $p<0.10$) and flexibility

(Coef. =-1.1857, $p<0.10$). Despite being significant, these were not in the direction hypothesized. Therefore, these results do not support hypothesis 2.

For hypothesis 3, a positive moderating effect of HPHRP over the supplier integration/operational performance relationship was hypothesized. The results, however, were not supported when the dependent variables were quality (Coef. = -0.6143, $p>0.10$), delivery (Coef. =0.2709, $p>0.10$), service (Coef. =-0.9338, $p<0.10$), and flexibility (Coef. =0.4480, $p>0.10$). Although the results when the dependent variable was cost (Coef. =-1.2405, $p<0.05$) was significant, it was negative, and thus, it does not support that hypothesis.

4.2. Discussion

The main aim of this study was to examine the role of the HPHRP as a moderator of the relationship between SCI and performance. Initially, it was argued that HR systems play a crucial role in training, motivating and involving employees in internal and external processes. Therefore, firms try to get the greatest potential out of employees' abilities. The importance of HPHRP is determined by their ability to harness the committed resources in integration processes.

This study provides evidence that HPHRP moderate the relationship between SCI and different dimensions of operational performance. Results have shown positive or negative effects depending on the supply chain partner with whom the firm establishes the integration process (customers, suppliers or internally), and the measure of operational performance. Thus, HPHRP positively moderate the relationship between internal integration and cost, delivery reliability and services, whereas it negatively moderates the relationship between customer integration and delivery and flexibility. It also has a negatively moderating effect on the relationship between supplier integration and cost.

These results also indicate that there is no moderating effect on the relationship between external integration or operational performance with both customers and suppliers. In this sense, this study empirically proves that HPHRP either have no effect or their effect is negative. These results are not in line with theoretical models.

However, firms can display certain behaviors regarding HPHRP that can explain the effects found. According to Ellinger *et al.* (2010), having employees with suitable skills is a key element for the development of relationships. This is of special interest to the firms where trained employees would permit a better comprehension and processing of the information used in the internal integration. In addition, it is not sufficient having well-developed employees, firms have to manage them through motivation while providing them with the tools needed to express themselves. This has to be rooted both in conceptualization (job description) and implementation (selection processes) of HR management. Therefore, the benefits of these improvements are translated into a reduction of redundant tasks, an enhancing of the information quality, and an improvement in the readiness of employees. All this eventually permits firms to move the benefits into cost and delivery, which is also extended to the services offered because employees are more prepared to advance and develop said services. Therefore, more prepared human resources are in better conditions to work accordingly to their obligations while thinking in the last part of the process (final consumer) so that they are inherently improving their phase of the process that, in the end, will improve the whole service given.

Nevertheless, factors such as initial low requirements of training and high personnel turnover can compromise the proper development of HPHRP. These are quite frequent in labor-intense industries within the primary sector, and, eventually, can generate a negative effect on performance. This could partially explain the negative effects found because sometimes employees are not appropriately prepared because of the high turnover associated with this sector. This means that although firms pay attention to their development, employees have no sufficient time to put into practice the firms' culture. Thus, even though firms may carry out HPHRP, employees can be less receptive and perceive those practices as non-desirable, whilst expecting others offering short-term benefits.

In addition, some HPHRP do not fit to the implementation of SCI. Although SCI tries to align and unify firm objectives along the whole supply chain (Flynn *et al.*, 2010), there are gaps between SCI theories and practices. Supply chain practitioners usually rely on short-term vision, which makes them focus on their own benefits instead of thinking of joint benefits. As some HPHRP mainly focus on motivation (e.g. monetary rewards based on objectives, promotions or profit sharing), and there is job insecurity derived by high staff turnover, employees feel stimulated to prioritize firm objectives to the detriment of improving external

relationships. This may affect internal processes and conditions both inherent costs and delivery as external supply chain partners may perceive the instability. In this sense, HPHRP can encourage opportunistic behavior that avoids the development of external relationships with partners (Huo *et al.*, 2015).

Consequently, the management of human resources under these conditions may favor the appearance of certain HPHRP combinations that, in the end, leads to a specific effect on the SCI/performance relationship. Thus, further development of ability-enhancing practices prepares employees for contingency. This means a reduction in errors or failures and therefore, less reprocessing costs. Alternatively, underdeveloped ability-enhancing practices generate a misfit between employees and labor needs or even idle resources. However, lack of motivation may be the reason for the appearance of conflicts of interests among employees. On the other hand, when opportunity-enhancing practices are not a priority, it may imply bad behavior in employees and reflect a lack of involvement since they are not valued. Eventually, the positive or negative effect is dependent on the balance of these HPHRP.

Likewise, power imbalances exist within the supply chain, where downstream parties exert a larger amount of power over upstream parties (Daugherty, 2011). This means that firms may have more conflicts with customers than with suppliers. Considering this uneven relationship, and as a result of their respective negotiation, a lack of well-balanced HPHRP will have a negative effect on those pairs of main relationships (integration/performance) that are more closely related to each other. Thus, results show that the negative and significant moderating effect arises in delivery reliability and flexibility in the case of customer integration; whilst, it is in manufacturing cost and product services where negative effects appear in the case of supplier integration. This leads to thinking that firms have to pay close attention when designing HPHRP because they can negatively affect the operational performance measures associated with each supply chain partner.

5. CONCLUSIONS

This research offers an understanding of how HPHRP can be leveraged to alter the effect of SCI on performance. Specifically, it has been shown that HPHRP can enhance the main relationship depending on the direction of the relation (downstream or upstream). However, at

other times, this effect can generate an undesirable effect. This has to worry practitioners at strategic levels in order to avoid divergent approaches. This suggests that firms interested in properly improving their operational performance must also pay attention to the development of their workforce.

This study advances the literature both of SCI and of HPHRP as a moderator of the SCI/performance relationship. In relation with SCI, most of the previous research shows a positive effect although it is increasingly common to find a wider variety of results. Thus, as this research finds positive, negative and non-significant effects of SCI on performance, it provides evidence that more integration is not always related to higher performance. Besides, it is questioning the effectiveness of SCI, leaving it at the mercy of the context of the supply chain (Das *et al.*, 2006; Giménez *et al.*, 2012).

Usually, and in the absence of considerable disruptions, firms maintain the same HPHRP over time. To a certain extent, this behavior could represent a pattern of their decision-making processes. Thus, this study contributes to prove the existence of some patterns associated with the development of personnel. In this way, it was found that these practices normally help to better exchange information between internal and external parties. However, other patterns exist, preferably avoidable, because they are not maximally effective. Besides, maintaining the stability of personnel contributes to reducing employee uncertainty, which can create a base upon which to develop a more stable relationship with supply chain partners. However, this study also finds that human resources strategy should be aligned with the importance of being both internally and externally integrated. Otherwise, it can develop a specific subculture that gradually separates the individual objectives of the personnel from those established for integration processes.

The findings of this study also have significant managerial implications and insights that may allow firms to better manage and coordinate SCI processes and human capital. It contributes to the knowledge of both human resources and supply chain managers. This is possible because it shows that the effects of SCI on operational performance can be modified by leveraging HPHRP. This means that human resources managers should assume more responsibilities for the success of operational objectives as it highlights the importance of people in those industries that are intensive in human capital. This indicates that human resources and supply chain managers should develop strategies and actions together. In this

regard, this joint work could focus on finding a set of rewarding systems and motivational actions. Its purpose would be to avoid employees facing the conflict of interests of choosing between the firm's objectives and those derived from external relationships. In doing so, it could effectively maintain the view of collaborative work with partners within the supply chain and seize on the introduction of a unique competitive advantage.

As with any research, there are limitations that must be pointed out. On the one hand, the use of a limited number of HPHRP can delimitate the construct. This does not cover all the aspects of human resources management, which is comprised of many concepts. On the other hand, the dependent variables were measured by a single item and consequently may have been more prone to measurement error.

Another limitation is the sample population, which is restricted to firms in a single sector and specific geographical area. Future research may extend this study to a broader population of firms for generalizability of the results and to detect a potential effect at different levels. This study controlled for firm size, which had a significant effect in all cases. Future research may want to control for other effects that may offer a higher variety of results.

In addition, by investigating the moderating impact of just one factor, this study has not explored the complete list of potential internal and external context variables. Further research can provide more insights into the SCI issue by modeling the interactive effects of variables such as organizational structure, information technology, and munificence.

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