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# Intrafirm Knowledge Transfer and Employee Innovative Behavior: The Role of Total and Balanced Knowledge Flows*

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*Research on intrafirm knowledge transfer has generally found a positive impact of knowledge inflows on the innovation of an organizational unit. However, the role of knowledge outflows during knowledge transfer is less clear. This paper argues that knowledge outflows influence innovation through a self-learning mechanism and a fairness assessment mechanism, and play a unique and important role on team innovation. Based on this new understanding on knowledge outflows, it is necessary to examine the impacts of inflows and outflows simultaneously in innovation research. This paper expresses the sum and difference of knowledge inflows and outflows as total and balanced knowledge flows. A theoretical model is proposed to examine the distinct and synergistic effects of total and balanced knowledge flows on employees' innovative behavior of an organizational unit. The model was tested on 148 retail units of an apparel firm based on survey responses from both shop managers and staff. Results showed that total and balanced flows have independent direct effects and a synergistic effect on employee innovative behavior: employees of a unit had the highest levels of innovative behavior when knowledge flows were high and balanced at the same time. This paper contributes to the literature by taking into account both the direction and magnitude of knowledge transfer to examine team innovation.*

## Introduction

Knowledge sharing across organizational units is important for both multiunit and multinational firms. This is because organizational units, owing to their specific locations, functions, markets, or industries, often develop knowledge that is of value to other units of the firm (Almeida and Phene, 2004; Birkinshaw and Pedersen, 2008; de Clercq, Thongpapanl, and Dimov, 2011). Intrafirm knowledge sharing enables the dissemination of and access to such knowledge within multiunit (Schulz, 2003; Szulanski, 1996) and multinational (Gupta and Govindarajan, 2000; Minbaeva, 2007; Song, 2014) firms. It enhances the competitiveness of the firm (Argote and Ingram, 2000; Haas and Hansen, 2007). Prior empirical research has shown that intrafirm knowledge sharing across organizational units positively affects two important unit outcomes: performance (Haas and Hansen, 2005, 2007; Mahnke, Pedersen, and Venzin, 2005; Tran, Mahnke, and Ambos, 2010; Tsai, 2001) and innovation (Almeida and Phene, 2004; Hansen, 1999; Kyriakopoulos and de Ruyter, 2004; Phene and Almeida, 2008; Tsai, 2001). Building on prior research, this study examines the relationship between intrafirm knowledge sharing and employees' innovative behavior.

Intrafirm knowledge sharing involves two directions: inward and outward flows. Inward flows, or inflows, refer to knowledge acquired by a focal unit from peer units within the same corporation, and outward flows, or outflows, refer to the knowledge disseminated to peer units by the focal unit (Gupta and Govindarajan, 1991). Notably, prior studies on knowledge transfer have largely focused on the impact of knowledge inflows and ignored outflows (Mahnke, Pedersen, and Venzin, 2009). Studies on knowledge outflows have mainly regarded outflows as an outcome and, therefore, a dependent variable (Michailova and Mustaffa, 2012; Phelps, Heidl, and Wadhwa, 2012; van Wijk, Jansen, and Lyles, 2008). Thus, current understanding of the impact of intrafirm knowledge transfer is largely based on findings from studies on knowledge inflows.

Intuitively, most studies have focused on knowledge inflows because inflows provide intellectual assets to a receiving unit and such assets contribute to innovation and performance. However, an organizational unit is often both a knowledge source and a knowledge receiver (Gupta and Govindarajan, 1991; Harzing and Noorderhaven, 2006). This is the case even for

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organizational units with an explicit role as a knowledge source within an organization, such as a product development team. These units still require knowledge inputs, such as marketing information and production feasibility from marketing and production units, respectively, and thus function as knowledge receivers during the process. The consequences of intrafirm knowledge outflows, however, have remained underexplored (for an exception, see Mahnke et al., 2009). Argote and Miron-Spektor (2011) suggest that newly acquired knowledge through inflows enhances learning and fosters innovation. If learning also takes place during outflows, a crucial element has been omitted in the knowledge transfer process.

To take into account both the direction and the magnitude of knowledge transfer, this study proposes examining the combined and relative levels of inflows and outflows separately. The combined level of inflows and outflows is represented by total flows, and the relative level of inflows and outflows is represented by balanced flow. By focusing on total and balanced flows rather than inflows and outflows, the synergistic effect of total and balanced flows when they work together can be analyzed.

The proposed model is tested on 148 retail stores of an apparel retailer and measure innovation as store employees' innovative behavior. These stores function as autonomous work teams that make their own decisions about the extent of knowledge exchange with other teams. Employees' innovative behavior involves the production, adoption, and implementation of novel ideas (Scott and Bruce, 1994). Their innovative behavior is valuable because enhanced customer–employee interactions (Wang and Netemeyer, 2004) occur when frontline employees deliver service to customers in a novel way (Axtell et al., 2000). The results of this study provide support for our contention that total and balanced flows of a unit are important ingredients for its employees' innovative behavior and together have higher explanatory power than inflows alone on the variance of innovative behavior in regressions. Thus, prior studies that focus solely on inflows have missed outflows as an important knowledge transfer factor.

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## Theoretical Background

This study draws on the organizational learning literature to develop theoretical predictions about the effect of knowledge transfer on employee innovation. Organizational learning theory portrays organizations as vehicles for creating, transferring, and retaining knowledge (Argote, 2012; Kogut and Zander, 1992). While knowledge is often transferred between organizations through strategic alliances (Easterby-Smith, Lyles, and Tsang, 2008), it may also be shared among organizational units within large, multiunit organizations. In particular, the latter case is an important domain of organizational learning because the risk of opportunism and inadvertent knowledge leakage is much lower than the case of interorganizational knowledge transfer (see Hamel, 1991). With little need for knowledge protection (Norman, 2002), knowledge can be more freely and efficiently shared among organizational units, and thus more effective learning outcomes can be achieved.

Huber (1991) identifies five different processes of knowledge acquisition for organizational learning: congenital learning, experiential learning, vicarious learning, grafting, and searching. Prior research examining the impact of knowledge transfer on innovation outcomes has largely focused on vicarious learning that takes place during knowledge inflows (Argote and Miron-Spektor, 2011). When a business unit obtains and uses knowledge that belongs to other units of the firm, it learns from the experiences of others and is more likely to be innovative (e.g., Almeida and Phene, 2004; Phene and Almeida, 2008; Tsai, 2001). In addition to the vicarious learning that occurs during inflows, experiential learning could also take place during outflows. Experiential learning is knowledge acquired firsthand through direct experience or self-appraisal (Huber, 1991). When knowledge flows from unit A to unit B, an experiential learning process is initiated: unit A reflects on its own knowledge and receives feedback from B about the usefulness of the knowledge concerned.

To the extent that learning also occurs during outflows, inflows constitute only half the learning process associated with knowledge transfer. Thus, conclusions based on this half of the process alone could lead to a biased understanding of knowledge transfer. To appreciate the full impact of knowledge transfer, knowledge inflows and outflows should be examined simultaneously as *total flows*. In addition to experiential learning, outflows constitute a fairness assessment process in which the relative level of inflows and outflows underscores the perceived fairness of an organizational unit by other units. This assessment is manifested in the *balanced flows* of a unit. Thus, a more comprehensive knowledge sharing model for multiunit firms should take into account the direction and magnitude of knowledge flows.

To examine the learning and sharing mechanisms arising from both knowledge inflows and outflows and their subsequent impacts on innovation, two variables are created in the theoretical model in this paper: total knowledge flows (i.e., sum of knowledge inflows and outflows) and balanced knowledge flows (i.e., absolute difference between knowledge outflows and inflows). Total flows provide a combined view of knowledge transfer while balanced flows provide a relative view. Because both variables take into account the configuration of inflows and outflows, they provide greater clarity to the knowledge transfer process than either inflows or outflows alone.

This study focuses on total and balanced knowledge flows for both theoretical and empirical reasons. Theoretically, the combined and relative effects of inflows and outflows will be missed if only the separate and interactive effects of inflows and outflows are examined. Empirically, we are unable to enter inflows and outflows simultaneously in the regression models. The two variables are highly correlated ($r = .75$, $p < .001$) in the sample, which leads to a multicollinearity problem in regression. To examine whether total flows have higher explanatory power on the dependent variable than inflows, the Akaike information criterion (AIC) will be applied for model comparison, which will be explained in the Results section. The following sections propose hypotheses on how total and balanced knowledge flows would separately and synergistically affect innovation.

## Hypothesis Development

### *Total Knowledge Flows*

Research on intrafirm knowledge transfer has focused on the benefits of knowledge inflows on product innovation (Phelps et al., 2012; van Wijk et al., 2008). The acquired knowledge can either fill an existing knowledge gap of a unit (Almeida and Phene, 2004; Tsai, 2001) or create new knowledge combinations when cross-fertilized with the unit's existing knowledge (Kyriakopoulos and de Ruyter, 2004; Phene and Almeida, 2008). Sivasubramaniam, Liebowitz, and Lackman (2012) found a significant correlation of .18 between external communication, defined as the degree of information exchange with people outside a new product team, and team performance in a meta-analysis across 38 empirical studies.

This argument can be extended from product innovation to employees' innovative behavior. If employees of a unit can access knowledge from other units, they will receive more information on the practices followed by other units and learn the usefulness of those practices. Equipped with this information, they can generate, adopt, and implement new ideas in their own units, resulting in higher innovative behavior.

To understand total flows, this paper supplements the arguments of inflows with outflows. However, few studies have investigated the consequences of intrafirm knowledge outflows; thus, the effect of knowledge outflows on a source unit's innovative behavior is unclear. An exception is Mahnke et al.'s (2009) study, which shows that outflows initially increase and then decrease financial performance of a source unit based on a perceptual measure of revenue and cost savings of 20 subsidiaries of a multinational German manufacturing firm. Focusing on the costs of outflows, they argued that resource constraints, codification requirements, and managerial overburden brought about by excessive outflows could lower a subsidiary's performance.

Because few studies have examined the consequences of intrafirm knowledge outflows, insights from two studies on interfirm knowledge outflows are considered. The effect of knowledge outflows should be stronger in intrafirm than interfirm settings (Gomes-Casseres, Hagedoorn, and Jaffe, 2006). First, Yang, Phelps, and Steensma (2010) examined how knowledge outflows increase the size and relatedness of the spillover knowledge pool of a firm in the external environment. When the firm employs the knowledge pool, it becomes innovative and generates more patents. Second, Alexy, George, and Salter (2013) argued that firms may choose to actively reveal and disseminate their own proprietary knowledge to others, with the intention of directly enticing collaboration from other firms and indirectly reshaping external knowledge generation. The active disclosure of knowledge will positively affect the innovation of the source firm.

Building on these works, knowledge outflows to other units within a firm is conceptualized to initiate a self-learning mechanism for the source unit. In this mechanism, a unit improves its employees' proclivity to engage in more innovative behavior. While knowledge inflows focus on the benefits of knowledge access on innovation, knowledge outflows focus on improving the existing knowledge stock and learning ability of the source unit on innovation. The self-learning mechanism operates through three processes: learning related to a teaching role, receiving feedback for self-improvement, and revealing a knowledge profile to others for future learning.

First, effective outflows actually require the sender to assume a teaching role (Minbaeva, 2007; Simonin, 1999). The sender develops knowledge dissemination ability by taking stock of its knowledge, as well as by preparing and codifying the knowledge so as to facilitate its transfer to other units. The process of turning tacit knowledge into something more tangible and understandable to others constitutes a self-reflection exercise, which in turn helps the sender better understand and use its knowledge for innovation. In the process, the sender has to clarify ambiguous or vague knowledge and discard obsolete knowledge. Moreover, the sender may uncover gaps in its understanding of the knowledge and identify cause–effect relationships that were previously unclear in the knowledge (Lippman and Rumelt, 1982). In brief, such a knowledge conversion process is beneficial for further generating new and useful knowledge (Nonaka, 1994), which provides preliminary novel ideas for innovative behavior.

Second, a sender often receives feedback on its knowledge from receiving units (Husted and Michailova, 2002). This is an informal way of assessing the quality of the knowledge it possessed. This kind of feedback provides specific and actionable assessment of the knowledge of the sender. When receiving units encounter problems in making use of the knowledge, it is likely that they will discuss it with the sender. Sometimes the knowledge sent to others is specific to the local context of the sender, and receiving units must adapt it to suit their own needs and may seek the sender's advice in the process. Such communications help improve the original knowledge and feed back into the employee innovative behavior of the sender.

Third, a sender reveals its knowledge scope and expertise to other units through knowledge outflows. If the receiving units understand the knowledge profile of the sender better, they will be able to provide more relevant and useful knowledge to the sender later (Schulz, 2003). Thus, knowledge outflows reduce inward transfer cost, which is incurred when attempting to understand, edit, and assimilate transferred knowledge (Hansen, Mors, and Lovas, 2005). Relevance and quality of subsequent knowledge inflows could therefore be enhanced. For multinational R&D subsidiaries, Mudambi, Mudambi, and Navarra (2007) found that teamwork among units brings units closer together and increases their disposition to share useful knowledge. In short, by revealing the knowledge profile to others, knowledge outflows enhance relevant and useful feedback to the source unit, improving its innovative behavior. To assess the full impact of knowledge transfer, the sum of inflows and outflows is studied as total knowledge flows. Because both knowledge inflows and outflows increase innovative behavior of an organizational unit, high total flows is expected to enhance innovative behavior:

*H1: Total knowledge flows are positively related to employee innovative behavior.*

### Balanced Knowledge Flows

In addition to the effects of total knowledge flows, balanced knowledge flows should generate higher levels of employee innovative behavior than either net inflows or net outflows. Flows are balanced when inflows and outflows are equal. The balance of knowledge flows provides a fairness assessment mechanism among business units. Balanced flows build up reciprocity and goodwill across units and support a fair and effective knowledge sharing mechanism. Knowledge inflows and outflows contribute to a healthy and balanced circulation of knowledge to and from a unit. Without inflows, the benefits derived from outflows will be reduced, and vice versa. Research that focuses only on inflows skips this important idea of circulation.

When a unit engages in knowledge transfer in only one direction, unbalanced flows occur. This can happen when an organizational unit has the autonomy to decide the extent and process of knowledge transfer (Mudambi et al., 2007). For example, an organizational unit may actively seek knowledge from other units but be reluctant to share its own knowledge because of the competition among units (Luo, Slotegraaf, and Pan, 2006). This creates net inflows into the unit. Conversely, a buyer cooperating with a supplier in a product development team may set up lavish socialization mechanisms to impart its own information to the supplier but may ignore the information and request of the supplier (Lawson, Petersen, Cousins, and Handfield, 2009). This creates net outflows from the buyer. Both net inflows and net outflows represent similar cases of unbalanced knowledge flows and will negatively affect employee innovative behavior.

On the one hand, with regard to net inflows, a focal unit that constantly tries to acquire knowledge from other units without providing its own knowledge may be perceived as mean, greedy, aggressive, and an unfair player in interunit competition. This perception lowers the social capital among the units for collaboration (de Clercq et al., 2011). While multiunit firms encourage interunit knowledge sharing, they also allow interunit competition for achieving efficiency (Tsai, 2002). Other units are less willing to transfer valuable and relevant knowledge to the focal unit for fear of losing the competition and hosting "knowledge parasites" (Husted and Michailova, 2002). Thus, net inflows impair the relational aspect of knowledge sharing and lower the unit's potential to use the acquired knowledge to generate novel ideas.

On the other hand, net outflows resulting from high outflows and low inflows of knowledge do not benefit innovative behavior either. Key experts of the unit may spend much of their scarce time on disseminating knowledge, but they are left with less time for developing new competences for the unit itself (Forsgren, Johanson, and Sharma, 2000). Knowledge inflows from other units may remain largely unused, hurting the unit's innovative capability. As a result, innovative behavior of employees in producing and adopting new ideas will be weakened. Moreover, on having more knowledge outflows than inflows, a unit may fail to sufficiently tap into new ideas and eventually lose out to interunit competition (Mahnke et al., 2009). As a unit's position in a firm is weakened, its reputation, bargaining power, and share of corporate resources will be curtailed (Husted and Michailova, 2002; Simonin, 1999). Moreover, lack of key resources will inhibit employees from implementing any new ideas.

This discussion indicates that balanced knowledge flows are likely to achieve the highest level of innovative behavior. Reciprocity is essential to knowledge sharing (Cabrera, Collins, and Salgada, 2006). Organizational units are more likely to share their own information with others if others provide them with relevant information. Reciprocity fosters confidence and trust, which are essential for long-term exchange (Larson, 1992; Lui and Ngo, 2005). In particular, reciprocity among subunits in an organization increases the awareness of other units about what is relevant to the focal unit, resulting in useful knowledge transfer for innovation.

Intrafirm knowledge sharing is a give-and-take process among units. Reciprocity establishes the rule of exchange (Cropanzano and Mitchell, 2005; Rank, Robins, and Pattison, 2010), and each side of the exchange takes cautious and careful steps when increasing its stakes during the process, giving and receiving signals at each step. A unit will evaluate the actions of other units and plan its next step depending on others' actions. A bias toward either (the inflows or the outflows) aspect of the process is detrimental to further knowledge exchange and could impair innovative behavior of a unit. Thus, there should be a positive relationship between balanced knowledge flows and innovative behavior.

*H2: Balanced knowledge flows are positively related to employee innovative behavior.*

### *Interactive Effect of Total and Balanced Knowledge Flows*

Finally, this paper explores the interactive effect of total and balanced knowledge flows on employee innovative behavior. It is expected that over and above their independent effects, high levels of total flows combined with balanced flows will yield synergistic innovation benefits. This is because total knowledge flows provide the context for balanced flows to exert their effects on innovative behavior.

When knowledge flows are high but unbalanced, a unit will be either engaged in high net inflows or high net outflows. In both situations, high total flows will amplify the costs of a suboptimal knowledge sharing mechanism caused by unbalanced flows. In particular, when total flows are high, business units with high net inflows will appear conspicuous and be easily detected by other units. They will receive less constructive and relevant feedback on their own knowledge from other units, which will lower the innovative behavior of the unit. The cost of high net outflows will also be amplified when total flows are high. As business units spend excessive time to fulfill their teaching role, they have less time to adopt and implement knowledge received from other units, thus resulting in lower innovative behavior of the unit.

In contrast, balanced flows also complement total flows by providing a fair and reciprocal atmosphere for knowledge exchange to take place. The positive exchange atmosphere between units creates a stronger sense of belonging to the larger organization. Such a context of high superordinate social identity motivates one unit to consider the other's knowledge and to recognize the merits in the knowledge within the organization (Kane, 2010). When knowledge flows are high in a balanced flow context, business units will attempt to maximize the use of intrafirm knowledge to enhance innovative behavior. Thus, a positive interaction effect of total and balanced flows on employee innovative behavior is proposed:

*H3: Total flows moderate the positive relationship between balanced flows and employee innovative behavior such that when total flows are high, balanced flows have a more positive relationship to employee innovative behavior than when total flows are low.*

## Methods

### Sample

The retail industry serves as an appropriate setting for this study. During the past decade, the global retail industry has become one of the most rapidly changing and fiercely competitive industries. In particular, fast turnaround times and the emergence of innovation intermediaries have sparked widespread competition in the fashion industry since 2000 (Tran, Hsuan, and Mahnke, 2011). In addition to speedy product innovation, retail companies also have had to rely on their employees to provide innovative customer service (Arnold, Palmatier, Grewal, and Sharma, 2009; Grewal, Levy, and Kumar, 2009). Our research site is a leading Hong Kong-based apparel retail firm operating in China. The company sells low- to medium-priced mercantile items such as jeans and jackets. The company standardized its merchandise across its retail stores but allowed individual stores to maintain autonomy in their service. For example, stores were encouraged to set up unique merchandise displays in accordance with their own needs and to develop close relationships with customers. The store employees were expected to offer innovative customer service and sales behavior. Moreover, formal and informal channels for knowledge sharing were available to shop managers, who regularly attended sales meetings and training sessions. They also shared market information informally with those who worked in close proximity. The importance of innovative service and continuous knowledge sharing among its retail shops provides a suitable setting for examining intrafirm knowledge transfer and employee innovative behavior of business units that perform similar roles in an organization.

While this retail firm emphasizes innovative service, the retail shops function as sales teams with a primary purpose of merchandise sales rather than innovation development. This setting is different from the new product development team typically analyzed in innovation studies (e.g., Sivasubramaniam et al., 2012). Although our theoretical model can be applied to organizational units with various functions, the relationship between knowledge flows and innovative behavior predicted in our model should be weaker in sales teams than in new product development teams. This is because innovation is not the primary function of sales teams. If the model is supported in this empirical context, the results would lend strong support to the theoretical model. The sample consisted of 175 retail shops located in six Chinese cities: Hong Kong, Macau, Shenzhen, Guangzhou, Beijing, and Shanghai. There were 44 shops in Hong Kong and Macau, 42 in Shenzhen, 23 in Guangzhou, 32 in Beijing, and 34 in Shanghai. The average number of employees in the stores was 7.51 ($SD = 7.57$), and the average operating history of shops was 4.68 years ($SD = 3.50$).

### Data Collection Procedure

This study examines knowledge flows and innovative behavior on a team level. The levels of theory, analysis, and measurement all refer to a single level (i.e., the team level). Information on knowledge flows and innovative behavior was collected through questionnaires that were answered by retail shop managers and staff. Fourteen interviews with senior managers of the company were conducted before the survey. Information gathered during the interviews aided us in the design of the questionnaires. In particular, the specific types of knowledge that were relevant to the retail stores were gathered from the interviews with managers. The questionnaires were initially created in English and then translated into Chinese, as most store managers were only literate in Chinese. The standard practice of back translation was adopted to ensure wording accuracy. Both the Chinese and English versions were translated by two language specialists. The questionnaires were then pilot tested with 10 managers working in another similarly sized fashion retail company. The questionnaires were further refined on the basis of a pilot test.

The survey was conducted in 2009. To minimize common method bias, data were collected from two sources by using two different questionnaires. The first questionnaire was administered to shop managers, who were then asked to nominate three members of their staff in each shop to answer the second questionnaire. To ensure confidentiality, all questionnaires were sent back to the company headquarters in sealed envelopes and then delivered to us immediately. With support from the top management, all 175 shop managers were able to complete and return the first questionnaire set. Four hundred thirty-two staff responded to the second questionnaire set. The final sample consisted of 148 shops after cases with missing data and nonresponse from shop staff were deleted. An average of 2.42 staff members from each shop answered the second questionnaire.

The dependent variable, employee innovative behavior, and all the control variables came from the manager surveys. The independent variables related to knowledge sharing came from the staff surveys. Respondents were assumed to have a similar understanding of the questionnaire items because they belonged to the same organization and spoke the same language. Moreover, respondents were asked to report on work behavior that they observed in their daily work environment. Finally, the questionnaire items derived from widely adopted scales with established validity. The Appendix lists the questionnaire items of innovative behavior, knowledge outflows, and knowledge inflows. All items, except for the control variables, were measured on a 5-point Likert scale ranging from fully disagree (1) to fully agree (5).

### *Variables*

The dependent variable, *employee innovative behavior*, was measured with Scott and Bruce's (1994) six-item scale of innovative behavior. Scott and Bruce (1994) explicitly differentiate between innovation and creativity. While innovation is related to idea generation, adoption, and implementation, creativity is related to idea generation only. Therefore, the scale measures individual innovative behavior with a set of activities related to problem recognition, idea generation, sponsorship, and implementation. The scale was adopted to measure innovative behavior of store employees as a whole in this paper. A minor problem of the scale is that items 1 and 3 may be perceived as relating to knowledge inflows and outflows, respectively. As a robustness check, the two items from the scale were deleted and the regression models reran, obtaining qualitatively the same results. Shop managers were chosen as the respondents for this variable because they were the most knowledgeable about staff behavior in shops and were likely to provide objective opinions on other people's behavior.

Knowledge flow was measured by the overall amount of knowledge transmitted into and out of a store. Because the types of knowledge transferred vary in different research settings, this study followed the approach of Gupta and Govindarajan (2000) and Schulz (2003) to conduct interviews with managers to determine the types of knowledge most valuable to a retail store. From the interviews, six specific types of knowledge were identified: marketing know-how, merchandise stocking know-how, merchandise display, operations process design, procurement know-how, and management systems and practices. Next, shop staff were asked to assess the extent to which each type of knowledge flowed in and out of the store during the past six months in the survey. Responses from shop staff were used for this question because managers may provide socially desirable responses when reporting their own behavior on knowledge transfer. Instead, staff were likely to be aware of the origin and diffusion of new ideas in a small operation setting (average employee number of retail shop = 7.51, $SD = 7.57$ in the sample) and were also likely to provide objective opinions on manager behavior in an anonymous and confidential survey. Individual scores of the staff in the same shop were then aggregated to obtain a shop-level measure of knowledge inflows and outflows.

Next, Cao, Gedajlovic, and Zhang's (2009) method to measure total and balanced ambidexterity was used to measure total flows and balanced flows of a shop. *Total knowledge flows* was calculated by adding knowledge outflows and inflows. *Balanced knowledge flows* refer to the balanced magnitude of inflows and outflows. We first subtracted inflows from outflows and then took the absolute value of the difference so that both net outflows and net inflows would have a positive sign. Theoretically, the difference can vary from 0 (when outflows and inflows are equal) to 4 (when outflows are at 5 and inflows are at 1, or when inflows are at 5 and outflows are at 1). Empirically, the difference in the sample varied from 0 to 1.5. To facilitate interpretation, this measure was reversed by subtracting the difference score from 1.5 so that a higher value indicated more balanced flows.

As a team-level study, this paper asks store employees about their views on the extent of knowledge flows of their stores and aggregated their responses to form a team-level variable of knowledge flows. To justify data aggregation, within-group agreement and between-group variability on the basis of knowledge outflows and inflows were assessed at the store level. The $R_{wg}$ values were .67 and .51 for knowledge outflows and inflows, respectively, indicating moderate group agreement (LeBreton and Senter, 2008). Another interrater agreement index, the $AD_M$ index, was .44 for knowledge outflows and .63 for knowledge inflows. Both scores indicated high group agreement and were below the critical value of .80 for a 5-point questionnaire scale (Burke and Dunlap, 2002). In addition, the values of ICC(1) and ICC(2) for outflows were .10 ($F = 1.32$; $p < .05$) and .21

**Table 1. Descriptive Statistics and Correlation Matrix**

| | Variable | Mean | *SD* | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|---|---|---|
| 1 | Employees' innovative behavior | 3.35 | .73 | | | | | | |
| 2 | Total flows | 6.99 | 1.08 | .23** | | | | | |
| 3 | Balanced flows | 1.19 | .29 | .19* | .09 | | | | |
| 4 | Location (Hong Kong/Macau = 1) | .23 | .42 | −.16* | −.14 | .12 | | | |
| 5 | Market (prime market location = 1) | .22 | .41 | −.04 | .01 | .07 | .04 | | |
| 6 | Shop size (ln of employee number) | 1.74 | .66 | −.25** | −.14 | .12 | .74*** | .32*** | |
| 7 | Manager's industry experience (year) | 4.16 | 3.14 | −.10 | .01 | .14 | .26*** | .15 | .41*** |

Note: $n = 148$.
*$p < .05$; **$p < .01$; ***$p < .001$.

and for inflows were .09 ($F = 1.30$; $p < .05$) and .19, respectively. The significant ICC(1) values (.10 and .09) indicated between-group variability. ICC(2) values were lower than the desired value of .70 (Bliese, 2000). Both the subpar scores on $R_{wg}$ and ICC(2) could be attributed to the small unit sizes (an average of 2.42 respondents per store) in the sample. These results justify data aggregation.

Four determinants of innovative behavior that have commonly been discussed in innovation literature were controlled for. The two market-level control variables were *market environment* (coded as 1 if the store was located in a prime market zone with high sales compared with market zones of local shopping malls and residential areas) and *location* (coded as 1 if the store was located in Hong Kong or Macau, which are Special Administrative Regions of China, and 0 if located in other cities in Mainland China. Different retail environments of Mainland China and its Special Administrative Region are likely to affect employees' innovative behavior in different ways). The two store-level control variables were *shop size* (logarithm of full-time employees working in a store) and *manager's industry experience* (the number of years a shop manager has worked in the retail industry).

## Results

Table 1 shows the means, standard deviations, and correlations of the variables. Moderated hierarchical ordinary least squares (OLS) regression is used to test the hypotheses. Table 2 lists the results. The four control variables were entered in model l, and then the variables related to hypothesis testing in models 2–4. The variance inflation factors of the variables in the regressions ranged from

**Table 2. Regression Results of Employee Innovative Behavior**

| | Model 1 Controls | Model 2 Total Flows | Model 3 Total Flows and Balanced Flows | Model 4 Total × Balanced Flows Interaction | Model 5 Isolator |
|---|---|---|---|---|---|
| Control variables | | | | | |
| Location | .09 (.70) | .10 (.80) | .07 (.60) | .06 (.52) | .08 (.70) |
| Market | .06 (.71) | .05 (.60) | .04 (.48) | .03 (.44) | .01 (.19) |
| Shop size | −.34* (−2.45) | −.31* (−2.27) | −.30* (−2.28) | −.29* (−2.16) | −.26* (−1.96) |
| Manager's industry experience | −.00 (−.00) | −.01 (−.13) | −.03 (−.41) | −.03(−.38) | −.01 (−.20) |
| Independent variables | | | | | |
| Total flows | | .20** (2.50) | .18* (2.24) | .15* (1.97) | |
| Balanced flows | | | .20** (2.59) | .21** (2.71) | |
| Total flows × balanced flows | | | | .16* (2.06) | |
| Isolator | | | | | −.15* (−2.02) |
| $\Delta R^2$ | | .04 | .04 | .02 | .02 |
| $R^2$ | .07 | .11 | .15 | .17 | .06 |
| Adjusted $R^2$ | .04 | .08 | .11 | .13 | .04 |
| $\Delta F$ | | 6.21** | 6.70** | 4.26* | 4.11* |
| $F$-value | 2.71* | 3.49** | 4.14*** | 4.24*** | 2.34* |

Notes: $n = 148$; standardized coefficients reported and $t$-value in parentheses. $\Delta R^2$ of model 5 refers to model 1.
*$p < .05$; **$p < .01$; ***$p <.001$.

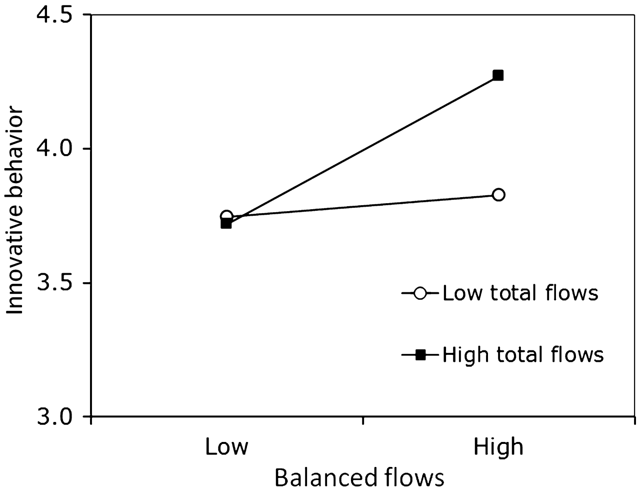


**Figure 1. Moderating Effect of Total Flows**

1.02 to 3.05, which were well below the benchmark cutoff value of 10 for multicollinearity to become salient (Jaccard, Turrisi, and Wan, 1990).

### *Hypothesis Testing*

Model 2 shows that the coefficient of total flows was positive and significant (b = .20, $p < .01$), explaining an additional 4% of variance on top of the control variables in model 1, in support of H1. Model 3 provides support for the relationship proposed by H2. The coefficient of balanced knowledge flows was positive and significant (b = .20, $p < .01$), explaining an additional 4% of variance on top of total flows and control variables in model 2.

For H3, the interaction term between total and balanced flows was positive and significant (b = .16, $p < .05$) in model 4, explaining an additional 2% of variance on top of model 3. This relationship was further explored following Aiken and West's (1991) suggested method. Figure 1 graphically represents the results and shows that balanced flows have a more positive relationship to innovative behavior when total flow is high. The results are in line with our prediction, thus providing support for H3.

Our study measured balanced knowledge outflows by calculating the absolute difference between inflows and outflows. This method raises concerns about using a simple difference score to assess congruence (Edwards, 2001). The test on H2 was rerun using Edwards's (1994) polynomial regression analysis and similar results were obtained. These regressions modeled innovative behavior as a function of the main effects of inflows and outflows, their quadratic terms, and the interaction term between inflows and outflows. The results revealed significant effects of outflows squared (−.29; $p < .001$) and the inflows–outflows interaction (.35; $p < .01$). In addition, the slope of the congruence line when inflows equal to outflows was positive and significant (.15, $p < .05$), which indicates that innovative behavior is maximized when levels of inflows and outflows are high and congruent. This study used the simple difference score instead of polynomial regression because the test of the interactive effect between total and balanced flows (in H3) includes a cubic term in polynomial regression that is difficult to interpret. The simple difference score was therefore adopted, following recent studies on congruence and fit in organizations (e.g., Cao et al., 2009; He and Wong, 2004). Further research should examine whether a simple difference score might attenuate the results of H3.

### *Further Analysis*

As a supplementary analysis to compare the effect of total flows on innovative behavior with that of knowledge inflows, model 4 was compared with a rival model that includes control variables and knowledge inflows only. The rival model had an adjusted $R^2$ of .07, whereas the corresponding value in model 4 was .13. Their AIC, which better balances model complexity and goodness-of-fit measures than adjusted $R^2$ when the models are not hierarchically nested (DeLurgio, 1998), were then compared. The AIC was −107.54 for model 4 and −100.19 for the rival model. The smaller AIC value of model 4 suggests a better fit for the data than the rival model. In brief, the traditional focus on knowledge inflows alone is likely to generate biased results.

To probe further into the implication of H1, which suggests that total flows, rather than inflows alone, enhance employee innovative behavior, the innovative behavior of an isolated store was examined. Gupta and Govindarajan (1991) identified an isolator as an organizational unit that is low in both knowledge inflows and outflows. They considered isolators the "local innovators" in multinational firms and argued that, because isolators are connected with few other units in the firm, they may create their own knowledge that suits local needs. In contrast, this study argues that isolators, which rely solely on their own resources for innovation, are unable to take advantage of knowledge sharing across the firm. They lose out on the benefits associated with interunit knowledge flows, such as access to best practices inside a firm and a rapid information network on market opportunities, feedback on the usefulness of their knowledge, and stimulation for new knowledge creation. As a result, the status of being an isolator may not be conducive to employee innovative behavior.

*Isolators* was operationalized as stores with low inflows and outflows. Instead of using an absolute cutoff point for low knowledge flows as in previous research (e.g., Harzing and Noorderhaven, 2006; Monteiro, Arvidsson, and Birkinshaw, 2008), this study measured isolation in relative terms. A store was classified as an isolator if it was in the lowest 25% percentile on both knowledge inflows and outflows in the sample. Twenty-five stores (17%) in the sample fell into this category.

To investigate the innovative behavior of isolators, total flows was replaced with isolator in model 2 because the two variables were highly correlated ($r = -.60$, $p < .001$) and would introduce multicollinearity if both were in the regression. The regression was rerun on innovative behavior; model 5 presents the results. The coefficient of isolator was negative and significant ($b = -.15$, $p < .05$), in support of our prediction. These results serve as a corollary of H1. As a robustness check, isolator was also measured by an absolute cutoff point of 2 on the 5-point Likert scale of knowledge flows. Three cases were classified as isolator. The sign and significance level of the isolator remained the same.

## Discussion

### *Theoretical Contributions*

This study makes at least three contributions to research on knowledge transfer and team innovation. First, by considering knowledge outflows, this study added new evidence to a nascent research stream on knowledge outflows at the intrafirm level (Alexy et al., 2013; Mahnke et al., 2009; Yang et al., 2010). By conceptualizing inflows and outflows together, this study distinguished between total and balanced knowledge flows and investigated their distinct and synergistic effects on innovation. When compared with the method of examining inflows and outflows independently, our method provided new insights into how knowledge transfer affects innovation. A knowledge-receiving unit is also often a source unit because knowledge transfer is a reciprocal process. By highlighting the functions of knowledge outflows, this study offered a counterintuitive alternative to traditional research, which has so far focused on the impact of knowledge inflows on innovation and performance (see Michailova and Mustaffa, 2012; Phelps et al., 2012; van Wijk et al., 2008).

Building on organizational learning theory, this study recognizes the experiential learning that occurs during outflows and advocates a focus on total and balanced flows, rather than inflows alone, to capture the full learning effect of both inflows and outflows. Two mechanisms through which outflows affect employee innovative behavior are hypothesized: a self-learning mechanism captured by total flows and a fairness assessment mechanism captured by balanced flows. Our results clearly indicated that both the direction and the magnitude of knowledge flows of a unit affect employee innovative behavior. This new understanding of intrafirm knowledge outflows is important because a team structure is often used for new product and service development (Patanakul, Chen, and Lynn, 2012), and newly acquired subsidiaries are considered an important source of innovation for the acquiring firm (Prabhu, Chandy, and Ellis, 2005). Both situations rely on effective intrafirm knowledge outflows.

Second, this study empirically examines the innovativeness of "local innovator" (Gupta and Govindarajan, 1991). Gupta and Govindarajan (1991) argued, with little empirical support, that local innovators solve unique problems with their own knowledge because knowledge from others is not useful for local situations. However, our study shows that a unit with low knowledge inflows and outflows tends to have a low level of innovative behavior. Although our multiunit firm context is different from Gupta and Govindarajan's multinational firm context, knowledge sharing mechanism and local innovation requirement pose similar challenges to isolators in both contexts. Our finding is in line with the results of recent studies that indicate poor performance of isolators within multinational firms (e.g., Harzing and Noorderhaven, 2006; Monteiro et al., 2008). Together, these results raise doubt about Gupta and Govindarajan's portrayal of local innovators.

Third, this study enriches research on team innovation, which has often focused on new product development teams (Sivasubramaniam et al., 2012). Technologically related measures, such as simple counts of innovation (e.g., Hansen, 1999; Kyriakopoulos and de Ruyter, 2004; Tsai, 2001) and patent citations (e.g., Almeida and Phene, 2004), may not be applicable to other team settings. However, innovation is equally important in other team settings. Our study provides empirical evidence of the impact of knowledge transfer on employees' innovative behavior in sales teams by measuring team innovation in a service setting.

### *Managerial Implications*

In addition to the theoretical contributions, this study provides some new insights for managing knowledge flows that would benefit innovation. First, the results of this study point to a refocus of knowledge outflows for encouraging innovative behavior in an organizational unit. This study found that balanced flows within a context of high knowledge flows are important for innovation. In an ideal world, organizational units would eagerly and freely exchange knowledge with the goal of tapping into knowledge residing in different parts of the organization. Unfortunately, managers typically tend to minimize knowledge flows to other units because outflows could lead to a loss of valuable assets and bargaining power, particularly between competing units (Husted and Michailova, 2002). Our results suggest that managers should actively disseminate knowledge to other units. Outflows provide an opportunity for self-learning and create a reciprocal knowledge sharing process with other units that would benefit innovation.

Second, our results call for managerial support provided to an isolated unit. The ability to leverage knowledge residing in different parts of a firm is increasingly becoming a source of competitive advantage for the firm (Kogut and Zander, 1992; Schulz, 2003; Yang, Mudambi, and Meyer, 2008). Our results indicate that isolated units are low in employee innovative behavior; thus, managers should re-create the link between isolated units and the rest of the firm. Socialization mechanisms should be set up (Lawson et al., 2009) and team structures should be redesigned (Sivasubramaniam et al., 2012) to bring isolated units back to the knowledge network of the firm.

### *Limitations and Further Research*

Several limitations are noted in this study. First, the survey of this study is conducted in sales units of a single firm in a single industry. Confining our study to one firm in one industry allows us to control for extraneous variation due to firm or industrial differences and to ensure similar respondent understanding of questionnaire items. However, this limits the generalizability of our results. The domestic multiunit setting also reduces the potential effect of cultural differences on the amount of knowledge flows, and on how knowledge is turned into innovative behavior. Future studies should extend the research to new service development teams, multinational firms, and other industrial contexts.

Second, the survey was cross-sectional, whereas our hypotheses are based on causal arguments. Exogeneity of knowledge transfer is implicitly assumed. However, knowledge inflows and outflows could be an iterative process. A subunit takes time to process knowledge with other units, and thus the intensity and relevance of knowledge inflows would affect subsequent knowledge outflows. Whether a particular leadership style (e.g., an adventurous shop manager) leads to both high innovative behavior and high levels of knowledge flows is also a concern. In this case, total flows would correlate with the error term in the regression. To address this concern, an extra set of regressions with total knowledge flows determined by two predictors was run: trust in other shops and trust in the headquarters. In the innovative behavior equation, the predicted values of total knowledge flows were used in lieu of the original values. Total knowledge flows remained significant at the .01 level.

Third, prior research has also shown that organizational units that are highly capable (Monteiro et al., 2008; Schulz, 2003) or have valuable and relevant knowledge for other units (Gupta and Govindarajan, 2000; Yang et al., 2008) have high knowledge outflows. Considering that innovative units will pass on more knowledge to other units, this study faces an endogeneity bias resulting from reverse causality from innovation to knowledge sharing (Phelps et al., 2012). Because of the cross-sectional data of this study, the possibility of reverse causality cannot be ruled out. Yet the likelihood of reverse causality is low for two reasons. Innovative units in our study may not be more inclined to share knowledge with others because the retail stores compete with each other for local optimization of sales (Gupta and Govindarajan, 2000). The stores, on their own, do not have much incentive to pass on knowledge to other stores for fear that other stores may opportunistically exploit the acquired knowledge (Mahnke et al., 2009). In addition, our results indicate that the most innovative units are those that have balanced knowledge flows, not those that have only high outflows. However, longitudinal research is necessary to directly test causal relationships.

Fourth, this study cannot empirically separate specific feedback on outflows discussed in H1 from general inflows received from other units in our study. This kind of feedback was lumped together with general inflows owing to the items used in the survey. Further research could disaggregate these two types of knowledge inflows to empirically strengthen the theoretical arguments underpinning the hypothesis.

## Conclusion

Prior studies on intrafirm knowledge flows have focused almost entirely on the effect of knowledge inflows on technological innovation. Conversely, this study examines the much neglected role of knowledge outflows in employee innovative behavior within a service setting by examining inflows and outflows simultaneously as total flows and balanced flows. This study found that both total knowledge and balanced flows are important ingredients of a knowledge sharing process that contributes to employees' innovative behavior. As such, this study helps lay the foundation for a more structured way to investigate the relationship between knowledge transfer and innovation.

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## Appendix. Questionnaire Items

### *Employee innovative behavior (alpha = .82)*

1. Our store employees as a group search out new technologies, processes, techniques, and/or product ideas
2. Our store employees as a group generate creative ideas
3. Our store employees as a group promote and champions ideas to others
4. Our store employees as a group investigate and secure funds needed to implement new ideas
5. Our store employees as a group develop adequate plans and schedules for the implementation of new ideas
6. Our store employees as a group are not innovative (reverse)

### *Knowledge outflows (alpha = .87)*

*Our store provides knowledge and skills to other stores in the following areas during the last six months:*

1. Marketing know-how
2. Merchandise stocking know-how
3. Merchandise display
4. Operations process design
5. Procurement know-how
6. Management systems and practices

*Knowledge inflows (alpha = .89)*

*Our store receives knowledge and skills from other stores in the following areas during the last six months:*

1. Marketing know-how
2. Merchandise stocking know-how
3. Merchandise display
4. Operations process design
5. Procurement know-how
6. Management systems and practices

All the items above were measured on a 5-point Likert scale ranging from fully disagree (1) to fully agree (5).