The Pathways of Knowledge Spillovers[*]

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Abstract

Knowledge spillovers are unintentional and costless transfers of knowledge from a leader firm to a follower firm. They can occur via three pathways: Observation, imitation, and managerial interaction; Labor mobility; and Value chain upgrading. Knowledge spillovers also affect the follower firm's performance via competitive pressure imposed by new entrant leader firms. Knowledge spillovers are important to firms because they are a means to gain competitive advantage. In this study we explore the pathways by which knowledge spillovers can occur and effects of competitive pressure on the firm's performance. We document the experiences of Vietnamese software companies to demonstrate the dynamics of knowledge spillovers.

The typical question asked about knowledge spillovers is, do they occur? The answer to this question in the empirical literature is mixed. The mixed findings may be the result of the multiple pathways by which knowledge spillovers can be realized, by the chances of negative as well as positive spillovers, and by imprecise measurement.

In this paper we ask a different question: How do knowledge spillover occur? Under what conditions do knowledge spillovers occur and when do they not occur? Here we take up cases in which company managers report giving or receiving knowledge. We analyze the pathways of knowledge spillovers, and illustrate them using experiences form Vietnamese software firms.

We define knowledge spillovers to be the unintentional and nearly costless transfers of knowledge from a leader to a follower. They are externalities (usually thought to be positive).[1] It is peer-to-peer learning. Knowledge spillovers may be horizontal (intra-industry) – between firms in the same business – in which case the firms are potential competitors. Or they may be vertical (inter-industry) – across stages of the value chain, upstream to suppliers or downstream to assemblers or distributors, in which case the firms may be customers. We can think of knowledge spillovers as a type of technology transfer or diffusion. The source, from whom knowledge flows is a particular firm, or a business unit in that firm, or a small set of people, or an individual actor devoted to a particular task. The source is the leader. The follower who receives the knowledge similarly may be any one of these units of analysis.

[*] I am indebted to Kshitij Yadav for research assistance, and to Vietnamese software company executives for sharing their experiences about knowledge spillovers.

[1] Because knowledge spillovers are externalities, too little knowledge may be produced. For example, technical knowledge spillovers may cause the recipient firm to reduce its own R&D spending. See Heggedal et. al. (2015) on the topic of externalities and spillovers from labor mobility.

Why do firms care about knowledge spillovers? The answer is that knowledge is the currency of competitive advantage. If we understand the pathways of knowledge spillovers, we understand the potential for gain or loss of knowledge. This applies especially to tacit or intangible knowledge that is difficult to obtain otherwise. Because it is nearly zero cost to obtain, it may be an underappreciated source of competitiveness.

The research questions in this study are:
(1) What exactly are the knowledge spillovers? What are the sources?
(2) What is the spillover transmission pathway? How does knowledge get from leader to follower?
(4) What is the cost, direct and indirect, perceived or measured, of the spillover to the recipient and to the leader companies?
(5) How much value does the knowledge spilled over have? How is that value assessed?

Types of Knowledge Spillover Pathways

We categorize the pathways or transmission mechanisms for knowledge spillovers into three types:

1a. Observation and imitation. Horizontal
1b. Managerial interaction. Horizontal

The follower firm observes the knowledge practices of the leader firm and adapts them to its own purposes (it is a demonstration effect). Employees attend organized conferences and training programs to gain knowledge intentionally. But spillovers may take place from informal sidelines conversations and professional relationships formed there. Company managers meet formally in business meetings and industry association events and exchange ideas, or they meet informally socially (at lunches or on the golf course). Here also informal conversations take place that my yield spillovers. Although we distinguish spillovers from intentional learning, such as training programs, both often occur simultaneously. They are complementary (Isaakson et al 2015).

2. Labor mobility. Horizontal and vertical

There are two pathways by which labor mobility can produce knowledge spillovers. First, the leader firm attracts more skilled labor to the geographic area, trains existing labor, and thereby enlarges the skilled labor pool. Follower firms can then find better employees more easily without incurring additional recruiting cost. Second, employees move from a leader firm to a follower firm and take with them the knowledge gained at the leader firm for use at the follower firm. If the follower firm seeks a particular employee with specialized knowledge that it needs but does not have from a leader firm, it is “poaching.” Employees from a leader firm may also shift to a follower firm on their own initiative.

For example, if a new small software services company lacks critical skills needed to complete its package of services to clients; it hires an expert experienced person from another larger firm to obtain the skills needed.

3. Value chain upgrading. Vertical

The leader firm that is a new entrant attracts new upstream suppliers or downstream distributors that have better quality and reliability, or it trains existing suppliers and distributors to be better performers. This pathway is typically associated with foreign direct investment. For example, a foreign firm begins operations in an emerging market economy and works with local suppliers to upgrade their quality and reliability; other local firms can utilize the same upgraded suppliers. In addition, the leader firm may

develop or import better capital equipment than was previously used, and follower firms develop or import similar capital equipment. This is an imitation pathway that does not depend on personal interaction.

Competitive Pressure

A fourth pathway is often mentioned, which is competitive pressure. However, we treat it differently. Competitive pressure differs from the three pathways described above insofar as it is an external force that serves as a motivator for follower firms to improve their performance; it is not a method by which knowledge moves from one firm to another.

The Role of Foreign Direct Investment

Much of the empirical research on knowledge spillovers is set in an emerging market or region or country. Foreign direct investment (FDI) is the explanatory variable. The availability and value of knowledge spillovers would appear to greatest in this setting. The basis for this approach is that foreign firms must have a firm-specific advantage in order to compete successfully in the local market. If that advantage is to some extent technological or managerial consisting of knowledge that can be transferred and learned by others, then FDI can be a source of knowledge spillovers through any of the pathways described. There is a substantial literature that shows that usually multinational corporations are more productive than domestic firms (for example, see Helpman, Melitz & Yeaple 2004).

This implies that foreign-invested operations are leaders and local firms are followers. Much of the literature adopts this posture. However, it need not be the case. Knowledge leadership in specific domains can be sourced from local firms also. The same firm can be both a leader and a follower. A single firm may be a follower for some technical or managerial knowledge but a leader in other areas.

The potential for knowledge spillovers from FDI is variable. It depends on the market-seeking or resource-seeking objective of the foreign investor, whether the FDI is greenfield or by merger & acquisition, and whether the operation is a joint venture with a local firm.

If the foreign invested operation is a resource-seeking export platform (and imports a substantial share of components), it is minimally engaged with the local host country economy. The scope for knowledge spillovers is limited (Meyer & Sinani 2009). On the other hand, FDI that is market seeking from services firms is very much engaged in the local economy with corresponding chances for knowledge spillovers.

Greenfield FDI is likely to offer more opportunities for knowledge spillovers to be realized than foreign investment by merger or acquisition (Perry & Peruffo 2016), at least in the short run. If a new operation is built with new employment opportunities and the introduction of new technologies, local people are more engaged. A local operation that is acquired will likely undergo change at the behest of the new foreign owner, but the scale of change and the time frame is surely longer.

International joint ventures, whether equity or non-equity, should be an especially promising source of knowledge spillovers because of the close relationship between the foreign and domestic partners. This affords accessible opportunities for knowledge spillovers via the channels of observation and imitation and informal managerial interaction.

A joint venture between by an MNC and a local company has multiple possible outcomes for knowledge spillovers. The local partner may find no more knowledge spillover opportunity than a free-standing local

firm if the MNC partner does not transfer its most valuable knowledge, particularly if the knowledge is proprietary intellectual property (Malik 2015) and the joint venture is minority foreign-owned. On the other hand, the fact that the joint venture is a partnership implies more opportunity for observation, imitation, and managerial interaction – the pathway is more available. The joint venture also implies a measure of trust.

Empirical evidence that links FDI and the performance of domestic firms is mixed, with positive, negative, and no relationships found (for example, Poole 2013, Caves 1974, Blomstrom & Persson 1983, Blomstrom 1986, Aitken & Harrison 1992, Haddad & Harrison 1993.) The mix of results may be in part due to the way in which measurements are taken along with the sample studied.

The Measurement of Spillovers

If knowledge spillovers take place, the performance of the follower or recipient firm should be improved: Greater productivity and efficiency, lower costs, improved product or service quality, higher sales revenue, or increased market share or profitability. Differences in knowledge spillovers are hypothesized to be associated with differences in total factor productivity (Jude 2016; Girma & Gorg 2004). As always, a set of control variables is required to attempt to find the partial effect on knowledge spillovers.

Empirically, most studies measure spillovers by the intensity of foreign presence or participation in the local market. For horizontal spillovers, that indicator is the ownership stakes of foreign firms and the sales revenue of foreign firms as a share of all firms in the market. For vertical spillovers, a more targeted indicator is the share of the foreign firm's output that is purchased from all firms in the market (backward) or sold to all firms in the market (forward). These data typically are not available; a surrogate measure is the share of the industry's output that is purchased from upstream industries or sold to downstream industries (Jude 2016). This measure reveals the volume of interindustry transactions within the market but does not pinpoint the activity of foreign firms.

In firm-level studies of knowledge spillovers in emerging market economies, horizontal spillovers tend to be negative (Mondal & Pant 2016) whereas in developed countries horizontal spillovers tend to be positive. It appears that the effect of spillovers depends to some extent on the size of the firm. Many local firms are small or medium-sized with limited absorptive capacity. They do not have the human or financial resources to absorb new knowledge sufficiently. They cannot compete with the typically larger foreign firms or advanced larger domestic firms and they lose market share. Their performance as measured is harmed and the effect of spillovers is negative. However, if local firms are heterogeneous (different sizes, ages, and productivities), then some will not fit the aggregate finding. Some small firms in developing countries will gain competitiveness due to knowledge spillovers.

Table 1. How knowledge spillovers depend on absorptive capacity and foreign firm presence

	Foreign Firm Presence via Direct Investment	
Absorptive Capacity	*High*	*Low*
High	Positive horizontal spillovers	Small positive spillovers
Low	Negative horizontal spillovers	No net spillovers

These measures of spillovers are quite macro. Even if the unit of analysis is the firm, they do not measure actual spillovers, but only the potential for spillovers. They do not tell us where the spillover-induced

performance change comes from and consequently do not help us to understand how spillovers do or do not contribute to the firm's performance. We need to open the "black box."

Knowledge Gap and Absorptive Capacity

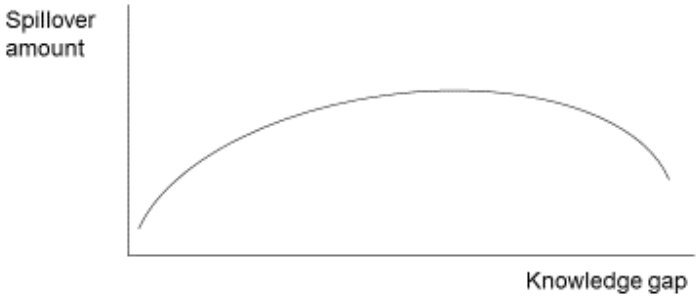
The greater the gap in the knowledge possessed by the leader firm compared to the follower firm, the greater the potential for knowledge spillover. There is more to be learned – spilled over (Girma & Gorg 2005, Iovanovic & Rob 1989). But for the spillover to occur, the follower firm must have the ability to learn it, to take it in and adapt it to its own uses. Does it have sufficient absorptive capacity? Firms are heterogeneous on this respect (Aitken & Harrison 1999, Javorcik 2004).

The firm's absorptive capacity depends in a micro sense on the ability of its employees to comprehend and take in the leader firm's knowledge. The employees' capability to absorb new knowledge in turn depends on their formal education, training on the job, and relevant experience. Surely one interacts with another, but is one more important than another? Empirical evidence suggests that experience is critical (e.g., Balsvik 2011). Absorptive capacity may also be aided by the technological similarity between the leader and the follower firm, although this effect was not found by Isaakson et all (2005).

In a macro sense, absorptive capacity depends on the setting in which the newfound knowledge might be implemented – inter-firm networks, organizational culture, financial resources – nor only the individual's capabilities.

The relationship between the size of the knowledge gap and the amount of knowledge spillover is curvilinear – an inverted U shape. A knowledge gap that is too great yields less, not more, spillovers (Girma & Gorg 2005).

The content of the knowledge possessed by the leader firm is also important. We can associate a low knowledge gap with adaptive spillovers – applying known methods to a local situation – and a high knowledge gap with innovative spillovers – knowledge that is new to the region, country, or world (not just to the follower firms). A high knowledge gap with innovative knowledge content is likely to have high intellectual property content, be proprietary, and be specialized. In this case, less is spilled over either because the intellectual property is protected or because it is less applicable to the range of uses that the recipient has for it.



As the knowledge gap increases, knowledge spillovers increase for a given level of absorptive capacity. However, as the limit of absorptive capacity is reached, the amount of knowledge received diminishes and may actually decrease as less of it becomes usable.

Figure 1. The Curvilinear Relationship Between Knowledge Gap and Spillovers.

A local firm with a high level of human capital in its workforce, and substantial absorptive capacity, may actually receive a small amount of knowledge spillovers if the high level of human capital implies a high beginning level of knowledge with less to learn – a small knowledge gap.

The Observation-Imitation-Interaction Pathway

To gain knowledge unintentionally would appear to be ubiquitous. Yet it is difficult to ascertain the extent to which is occurs and its value. If the spillover comes easily and informally, how much can it be worth? Furthermore, knowledge spillovers from observation at training programs, or in the course of doing normal business with customers, occur simultaneously. They are complementary with intentional learning.

Follower firms that are co-located or agglomerated with leader firms in clusters have greater opportunities to benefit from knowledge spillovers. The observation–imitation–interaction pathway is more available geophysically (Perry & Peruffo 2016). Events in which company people can meet informally are more frequent and the direct costs of travel are smaller

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Case 1. Domain Knowledge Spillovers from Observation and Interaction

LARION is a Vietnamese-owned software services company located in Ho Chi Minh City. Its business is developing software applications and managing data, focusing on the health care, banking, real estate, and education verticals. The company was founded in 2003 and now exports services to 15 countries with a staff of 150 people. The company has had a large US health care industry customer for the past eleven years. The relationship is close and collaborative. From knowledge spillovers from its customer contact, LARION has gained domain knowledge; it understands the health care business in the US.

The work that LARION does for the US company is "data normalization." It is software developed by LARION using artificial intelligence. The task that is accomplished is to identify items, products, people, locations, companies, codes, geographies – that are the same despite bearing two or more different names or numbers. For example, MMM and 3M are the same company. After the data are normalized, the next task is to classify the items into meaningful groups, such as companies. This work is used by the customer to improve its supply chain management.

At the outset of this business, the US client sent two or three of its people to Vietnam for 2-3 weeks; this occurred roughly 10 times. In turn, LARION sent 2-3 of its people to the US. In between times, online communication was continued. This type of training of a new supplier by the customer is intentional and standard practice. But LARION's management believes that the knowledge acquired by LARION people far exceeded the content of the formal training. LARION people gained domain knowledge above and beyond the intentional training – maybe 70% of the domain knowledge LARION people acquired came via the knowledge spillover pathway. The repeated onsite interactions enabled the tacit knowledge component of domain knowledge to be gained.

In the course of executing its contract with the US company, LARION made an additional discovery: the same software that it developed to be used in supply chain management could also be used in e-commerce marketing / sales. To gain this knowledge is not a direct knowledge spillover because its source was not the US customer directly; it was created by LARION people. However, this new knowledge was an indirect result of the customer contact and the associated knowledge spillover that yielded the domain knowledge.

If the knowledge spillover received by LARION is to be useful, LARION must have sufficient absorptive capacity comprehend it, and there must be an outlet for it. In this case, LARION reports sufficient absorptive capacity because all of its people engaged in the US firm's contract are engineering or business administration graduates; some have master's degrees (about 10-20%), with experience ranging between five and 20 years. They had both formal learning capabilities and the experience to apply the new knowledge.

The value or use to be made from the spilled-over domain knowledge is not to get another US health care company as a customer – this is barred by confidentiality and non-disclosure provisions. Instead it finds value in strengthening LARION's relationship to the US company. This results in more and bigger contracts. It makes the relationship with the US client "sticky."

In summary, knowledge spillovers occurred, consisting mainly of the tacit knowledge component of domain knowledge. They were complementary with intentional training. Their value consisted in strengthening LARION's relationship with its US customer that yields a long term future flow of new business.

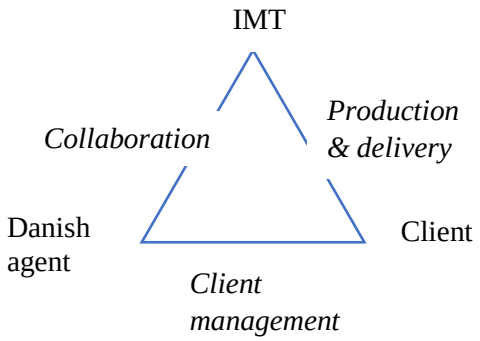
Case 2. Managerial Knowledge Spillovers from Observing a Partner Firm: Two Cases

IMT Solutions is a 9-year old Vietnamese-owned company with 150 employees. It has clients in the US, Europe, Japan, Australia, and Southeast Asia. It is a software services provider that does custom application development, engineering processes, and testing. It is a Microsoft partner.

Case 2a.
IMT has a partner firm in Denmark with whom it works. The Danish firm acts mainly as an agent to get customers for whom IMT does the work. The customers are mainly software products firms or platform makers in Denmark. IMT was connected to the Danish firm initially in a Denmark-Vietnam business-to-business event promoted by the Danish government.

The Danish agent manages the customer relationship. IMT uses its technology to produce and deliver the service to the customer. IMT interacts with the customer as part of its contract fulfillment. IMT is paid by the customer; the Danish agent takes a commission.

Frequently, IMT observes that its Danish agent offers to its customers an alternative business model: to establish operations in Vietnam in a captive cost center instead of outsourcing - to achieve greater control. The Danish agent offers assistance to the customer to set up its own operations; it means new business for the Danish agent but less business for IMT. However, IMT observes that this offer is seldom taken up and the Danish agent's customer does not follow through on the plan suggested.



What is the knowledge spillover to IMT from observing this business dynamic? It is a lesson in customer relations. It is that good customer relationships require that one speaks the customer's language (figurately as well as literally), know the customer's needs, and is flexible to meet them. By observing the agent's (ineffective) practices, IMT gains knowledge about how to manage other customers.

Case 2b.
IMT is a partner and supplier to a US-owned software platform maker. Observing the way in which a business crisis in this relationship was handled was another spillover of value to IMT. The US platform maker's client was a Japanese telecom company. IMT supplies software to the US platform maker that is in turn sold to the client.

In the case at hand, the completed software package created by IMT for its US platform maker partner and supplied to its Japanese client did not run correctly on the client's server. This was a surprise because the Java-based software had been used routinely for this type of job by IMT and many others.

How was the crisis resolved? The US platform maker sent its Japan team including the country manager to its Japanese telecom client immediately. Its US team was also engaged. Oracle, the producer of Java, was engaged. Work continued for 24 hours around the clock. IMT suspected the problem was in the server hardware and ran laboratory-type experiments. All the players took responsibility for solving the problem. It was proactive. No one was blamed and charged with finding the answer. Each company's team collaborated continuously. It was not acceptable to devise a temporary work-around; the solution had to be whole and permanent. In the end, the source of the problem was the Japanese client's server. It was a hardware fault. It was an unusual combination of Java, the US platform maker's software supplied by IMT, and the hardware itself. The solution was the system.

The knowledge spillover gained by IMT was the way in which the crisis was handled and resolved. It was a lesson in crisis management that could be used again for future crises.

The Labor Mobility Pathway

Labor mobility is a main channel for knowledge spillovers (Jude 2016). It arises both when the employee moves by his or her own initiative from one firm to another, and when the employee is specifically sought by the receiving firm and hired away from the firm to which he or she goes. Most labor mobility yields horizontal spillovers, although mobility from supplier to assembler or conversely can also take place.

The extent to which spillovers from labor mobility take place depends on an array of conditions.

- Typically skilled and experienced labor moves from large to small companies. The small companies are less able to train workers both due to lack of money and time spent away from work.
- Labor mobility is likely to be greater among firms in a cluster compared to firms separated by geographic distance because of the relative ease of moving short distances.
- Labor mobility should be especially important in emerging market economies in which absorptive capacity is limited and therefore the imitation channel is limited.
- If knowledge is tacit, labor mobility can be an effective pathway for knowledge spillovers, whether horizontal or vertical.
- The short term value of knowledge spillovers is likely to be greatest when the mobile employees possesses specific technical or managerial skill that matches the immediate needs of the recipient firm.

If a firm purposefully seeks the mobile employee, it is poaching. Firms that are head-to-head competitors in a cluster may tacitly agree to minimize or ban poaching. On the other hand, the risk of losing competitive advantage is small in the short run if the exiting employee's specific knowledge is too partial to be a threat unless it is combined with other pieces of knowledge that the recipient firm has yet to develop. The leader firm that loses an employee via poaching may regard the loss as an affirmation of its strength. In any event, a roughly equal poaching trade balance minimizes concern about poaching, especially if the specific knowledge becomes quickly obsolete.

Poaching is a term that is infrequently used by Vietnamese software executives. This may be due to the fact that the industry in young and fast growing, and that the firms in it are usually not head-to-head competitors.

Empirically, greater labor mobility is associated with greater employment by foreign-invested firms in the market, and intra-industry horizontal labor mobility is associated with higher productivity (Jude 2016). The experience of the employee who moves is more important that his or her formal education in explaining the productivity gain in the follower firm from the labor mobility channel (Balsvik 2011).

Case 3. Knowledge Spillovers from Labor Mobility: Disappointing Outcomes for Savvycom

Savvycom is owned and located in Vietnam. It develops software applications for mobile devices and websites, and it provides software testing services. Most of its revenue is earned from exports. It is a small company (less than 100 employees) and it is young (less than 10 years since founding).

In 2014, the company hired a person with testing experience and expertise away from a much larger and well-known Vietnamese software firm. The new employee made the shift of employers because of a belief that promotion opportunities were limited in the current large company, and because a salary was offered by Savvycom that was about 10% above the market rate. The shift was within the same geographic cluster so that the costs to make the shift were low.

The need for Savvycom was to find a testing team leader who could revise and improve the firm's testing process, including shifting it from manual to automated. This included adjusting employees' job descriptions, creating internships, and organizing events that would showcase the company's capabilities and establish its brand. The target new employee was well acquainted with organizations that conferred certifications that the company sought to achieve.

Some of the performance that the company expected the new employee to achieve consisted largely of tangible or explicit knowledge. Job descriptions are written. Internships are defined and concrete. Showcase events are literal. Certifications follow specific and well-known procedures. On the other hand, conversion from manual to automated testing includes an element of tacit knowledge. Nevertheless, the success of transferring the knowledge to the incumbent employees depended in part on tacit knowledge – observation and interaction between new team leader and existing team members. In fact, it was this element of absorptive capacity that stood in the way of full success of the labor mobility.

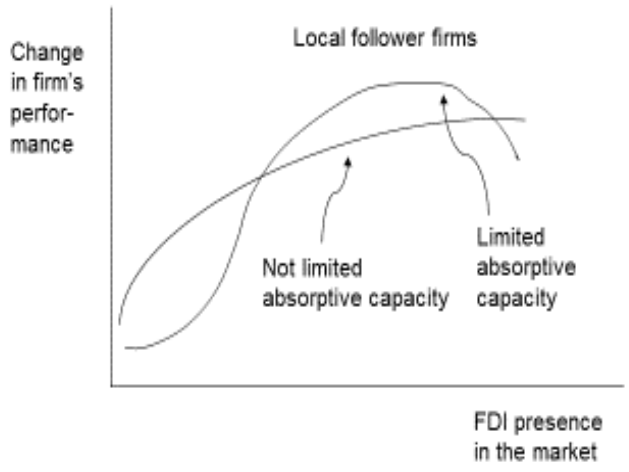
The expectations that Savvycom had for upgrading its testing services business were not completely fulfilled. It was not from lack of education among its employees. It could be seen as lack of experience – attributed to an age gap between the new employee and the no-experience young incumbent workers. A knowledge gap was present, and could not be overcome.

In summary, knowledge spillovers were limited because there was a sizable knowledge gap and absorptive capacity limited by an experience gap between new team leader and existing eimployees. Knowledge spillovers due to labor mobility in this case were positive but small.

The Double Effect of Competitive Pressure: Positive and Negative Spillovers

Among the knowledge spillover channels described above, competitive pressure is qualitatively different. It is not a transmission mechanism that connects or runs from leader to follower. Instead it is an external force to the follower firm.

Figure 2. How Absorptive Capacity Moderates the Effect of FDI on Local Firm Performance



The performance of the local follower firm increases rapidly due to a sizable knowledge gap with the foreign leader firm. But the follower firm has limited absorptive capacity and as FDI presence and competitive pressure increase it loses market share. The effect of greater knowledge spillovers is negative. If absorptive capacity is not limited, and the knowledge gap is less, the effect of greater spillovers remains positive. If absorptive capacity increases, the curvilinear relationship shifts.

Competitive pressure comes from foreign-invested firms or from leading domestic firms. The presence of these leader firms affects the performance of follower firms in two ways. The first way is potentially positive: the presence of foreign or leading domestic firms compels the follower firm to raise its game – to improve the quality of its goods or services or expand its offerings, or reduce its costs and prices to customers. It is motivated to become more competitive due to the stimulus of the foreign or domestic leading firm. This positive response to competitive pressure is likely to come from firms with sufficient managerial, technical, and financial resources – larger rather than smaller local firms. A positive response to horizontal spillovers is also likely if the domestic firm is similar technologically to the foreign firm, which implies it has greater absorptive capacity (Fonz-Rozen et al 2017). The greater the presence of foreign firms, the greater the competitive pressure and the greater the improvement in local firm performance.

However, this positive relationship between foreign firm presence and local firm response may turn around after a critical foreign firm presence is reached. The initial positive performance effect may turn to a negative effect if the local firm has insufficient absorptive capacity to match the competitiveness of the foreign firms. These firms are likely to be small in size and lack the human capital and financial resources to utilize the advanced knowledge. As FDI presence in the market increases, these local firms lose market share. By this measure of performance, the relationship between FDI presence and performance becomes negative (see Fons-Rosen et al 2017).

However, if the local firm has sufficient absorptive capacity (resources proxied by size), increasing competitive pressure may slow down its growth in performance due to increasing competitive pressure but not turn it negative.

If absorptive capacity increases, the curvilinear relationship may shift and the slowing down of local firm positive response to competitive pressure staved off – the curves in the figure shift upward.

We represent the spillover potential by the knowledge gap between leader and follower. The spillover realized depends on the absorptive capacity of the follower in a curvilinear relationship.

Table 2. Effects on Local Follower Firm Performance with Competitive Pressure

	Knowledge gap	
Absorptive capacity	*High*	*Low*
High	Potential is high Realized is high Effect is positive, maximum	Potential is high Realized is low Effect is negative, maximum
Low	Potential is low Realized is low Effect is positive, minimum	Potential is low Realized is low Effect is negative

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Case 4. How Competitive Pressure Affects Knowledge Spillovers: Hanel Software Solution's Actions to Prevent Loss of Market Share

Hanel Software Solutions is a Vietnamese company with 200 employees and a decade of experience in the market. It is one of several companies in the Hanel Group of companies. Hanel Software produces both products and ITO services for the enterprise, transportation, government, and banking sectors. It has ISO 27001 and CMMI-3 certifications. It occupies several stages of the value chain with its own people: design, engineering, code writing/production, testing, implementation, and maintenance. Hanel Software's services apply both to its software products and those of other companies

Hanel Software has a client in Vietnam that is a Japanese firm. It is domestic business for Hanel with a foreign-owned client. The Japanese client produces electronic appliances such as printers, multifunctional machines, fax machines, labelers, and sewing machines for household and industry. Hanel supplies software for human resource management and administrative documents processing and transmission.

Recently a Japanese multinational competitor entered the market by starting operations in Vietnam. The new entrant provides similar software services as does Hanel; they are potentially direct competitors. The competitive threat posed by the Japanese firm arose from two factors. The first was that the new entrant's management people all used the Japanese language, and probably Hanel's client prefered this compared to its people, only some of whom were able use the Japanese language sparingly. The second was an apprehension: Hanel did not fully understand the client's requirements to due to the language difference and was therefore hampered in customizing its product to suit its business. Hanel was not fully adapted to Japanese styles of negotiation. Did the Japanese entrant have superior quality or reliability or both? Was Hanel likely to lose its Japanese client?

An expected reaction from the Vietnamese is to observe and imitate the entrant's capabilities, and to interact with its managers in informal events – these are standard knowledge spillover pathways. But direct observation was not possible, and informal managerial interaction, if possible, would take time. The two firms were competitors. If the Japanese competitor had proprietary intellectual property, it would not be directly observable. However, Hanel was able to gather competitive intelligence from its client's employees who were acquainted with the Japanese entrant's business and its strengths. The service quality and reliability apprehensions were confirmed.

Hanel's reaction was the one that the competitive pressure pathway suggests: "We must get better." But how? Could Hanel close the knowledge gap? Four actions were taken:

1. Engaged all of its top managers to determine a strategic response, the tactics to implement it, and the resources required to do so.
2. To the extent there was lack of confidence about the planned response, considered hiring an external consultant to evaluate and improve the internally designed strategic response.
3. Hired new people who had the skills and experience to match the advantages that the entrant had.
4. Assessed the firm's financial capacity to implement the planned response to be implemented.

Keep the traditional market with Vietnamese clients by customer care and support; cooperate with the new entrant, if possible, to promote their products that Hanel does not have to Vietnamese clients so that Hanel has a chance to assess their knowledge and expertise.

In the end, Hanel's retained the Japanese client in Vietnam; Hanel's response to competitive pressure was partly successful – but the story did not end there. The Japanese client continued to use Hanel's software services but switched to the Japanese MNC's software product. And other clients of Hanel who might have switched to the Japanese entrant were also retained, but not the biggest firms in Vietnam who preferred the Japanese entrant. To compensate for the loss of some clients, Hanel developed other ITO services and now has business with new clients, such as Vietnamese contractors to Japanese firms.

"We also keep in mind that the issue / problem always happens. In many cases, we can not fully resolve it but we need to minimize its effect and develop other business to keep growing."

The Value Chain Upgrading Pathway

A foreign multinational corporation or a leading domestic firm that enters the local market is likely to be the source of vertical spillovers – backward to its upstream local suppliers or forward to its downstream assemblers or distributors. The original flow of knowledge from the MNC to its local suppliers is largely intentional and therefore not strictly a knowledge spillover. The spillover is received by other local firms that can utilize the upgraded performance of the MNC's supplier. (See Figure 3.)

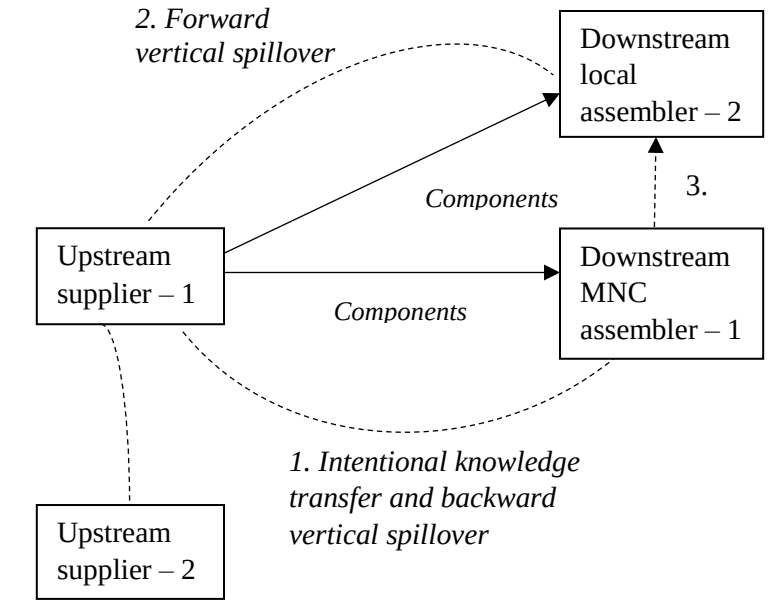
Knowledge spillovers can be multiplied via second order effects spillovers. The knowledge initially transferred can travel up and down the value chain; the spillover effect is magnified.
Empricially, backward or upstream vertical spillovers from a multinational firm in an emerging market economy to its suppliers do occur and are positive via increased quality of inputs from upgraded suppliers (Jude 2016, Malik 2015 Isaakson et al 2015). However, in one study, vertical knowledge spillovers were judged to have a lesser effect than horizontal spillovers (Perry & Perullo 2013).

Conclusions

Knowledge spillovers occur via three pathways: Imitation-observation-interaction, labor mobility, and value chain upgrading. Each of the pathways has the potential to increase the performance of follower firms that can benefit from the superior knowledge of leader firms. Competitive pressure is a further force that affects the performance of follower firms, either positively or negatively. The extent of the knowledge spillover depends on the size of the knowledge gap, the absorptive capacity of the follower firm, and the presence of foreign firms in the market. We illustrate the ways in which knowledge

spillovers take place using the experiences of Vietnamese software firms as reported by their top executives. We show how informal observation of a customer's business strengthened the supplier's long terms business with its customer, and how a supplier's relationship with its foreign partner imparted new tacit knowledge of customer relations. We see that a spillover that might have occurred from labor mobility did not happen satisfactorily. We learn how a local firm responded to competitive pressure and how its business was affected with both wins and losses.

Figure 3. Vertical Knowledge Spillovers from Upstream Supplier to Downstream Assembler



1. Upstream supplier – 1 receives training from Downstream MNC assembler – 1 and knowledge spillovers

2. Downstream local assembler – 2 utilizes components from Upstream supplier and becomes a stronger competitor to Downstream assembler – 1

3. Horizontal spillovers may occur between Downstream assemblers 1 and 2

4. Upstream supplier – 2 receives horizontal spillovers from Upstream supplier – 1

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