

International knowledge spillovers and capital structure of multinational affiliates

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Abstract

This paper investigates how knowledge transferred within multinational enterprises affects capital structure decisions of foreign affiliates. Employing the unique dataset on Korean multinationals and their employment structure of foreign affiliates, we measure the knowledge transfer through human interactions using the ratio of expatriate managers out of total employees. We document that affiliates with more expatriate managers tend to maintain lower leverage, suggesting the high level of intangible assets passed on through expatriate managers discourage debt financing. We further show that the negative effect on leverage is more pronounced when parents/affiliates are involved with greater intangible assets and the host countries have less knowledge assets in place. Our two stage least square estimation also confirms the negative effect.

JEL Classification: F23; G32; O33

Keywords: Multinational corporations, Knowledge transfer, Intangible assets, Capital structure

1. Introduction

In the last decades, the knowledge economy has come to represent a large component of core economic activities. Although several developed countries take a majority of the worlds' creation of new knowledge, international knowledge diffusion makes most of knowledge global over time (Keller, 2002; 2004). The international knowledge diffusion has made intangible assets increasingly important around the world, which has made researchers question whether traditional finance models may still work (Peters and Taylor, 2017). As the intangible assets that largely include knowledge are created through innovation activities, many studies investigate how the innovation is financed and attempt to establish the link between finance and economic growth (see Kerr and Nanda, 2015 for a review). However, little is known about how knowledge spillover across firms may influence corporate financial policies. This paper attempts to fill the gap in the literature.

In this paper, we focus on multinational corporations and examine how knowledge transferred from parents to foreign affiliates affect affiliate capital structure for two reasons. First, multinational corporations have a greater motivation to create knowledge than local and exporting firms because knowledge can be considered as public goods within a corporation including foreign affiliates (Markusen, 1984) and multinational corporations serve larger markets compared to other types of firms (Helpman, Melitz and Yeaple, 2004). Second, this knowledge created in the parents can easily spill over foreign affiliates through moving workers

in the boundary of a multinational firm. Human interactions are often essential to pass the knowledge (Keller, 2004). Singh (2007) documents that knowledge transfer within a multinational corporation is closely related to movement of inventors within the corporation. Several studies assume that knowledge is transferred through expatriate managers sent from parents and show the expatriate managers can alter affiliate productivity and performance (Gong, 2003; Chang, Gong, and Peng, 2012; Cho, 2018). The knowledge transferred from parents again diffuses to local markets, which has been a main reason that many host country governments use a variety of investment incentives to attract prospective multinational corporate investors (Oman, 2000).

We argue that knowledge transferred through expatriate managers lowers affiliate leverage because the knowledge represent the valuable intangible assets that is often associated with high growth potential. The intangible assets transferred through expatriate managers include technological knowledge as well as organization capital including corporate culture. The intangible assets are known to discourage debt financing as they tend to have high valuation risk and low collateralizability. Large prior literature on capital structure also suggests that high growth opportunities discourage debt financing mainly due to the high bankruptcy cost of debt. Along the similar arguments, innovation and R&D investments that generate technological knowledge are shown to be associated with low debt financing.

We exploit the unique dataset on Korean multinational corporations and their employment

structure in foreign affiliates, which is obtained from Export-Import (EXIM) bank of Korea. To measure the knowledge transferred from the parents, we calculate the ratio of Korean managers to the total number of employees for each foreign subsidiary. Our sample includes the unbalanced panel of 13,540 affiliate-year observations for the period of 2006-2013. A matched parent-affiliate dataset allows us to quantify the extent to which knowledge transfer via expatriates is associated with affiliate leverage after controlling corporate-wide capital structure policy. We find that foreign affiliates with higher ratio of expatriate managers tend to maintain lower leverage in their capital structure and the negative association is robust after controlling for various affiliate characteristics as well as host country characteristics.

To bolster our argument that the expatriate managers represent transfer of intangible assets, we exploit the setting where the expatriates are more likely to be essential in delivering knowledge to affiliates. First, we conjecture expatriate managers are more likely to pass on valuable knowledge when parents invest heavily in research and developments to create technological knowledge or when affiliates spend heavily in selling, general, and administrative expenses to create organization capital. We show that the negative effect of expatriate managers is more pronounced when the multinational parents or affiliates are more likely to be involved with the high level of intangible assets. Second, we conjecture expatriate manager should be more important in intangible transfer when foreign affiliates are located in countries with the low level of knowledge endowment. Our analyses reveal that the expatriate managers lower

leverage further when the host countries of foreign affiliates have low level of patent application, R&D investments, and schooling.

We attempt to ensure the robustness of our findings to alternative definitions of leverage and expatriate ratio. We run the baseline regression using three alternative definition of leverage: nontrade account leverage (using liabilities excluding trade related accounts), long-term leverage (using only long-term liabilities), and net leverage (treating cash as negative debt).

The estimation results still show the statistically and economically significant effect of the expatriate managers on affiliate leverage. Finally, we attempt to measure the intangible transfer using all expatriates that are not limited to managers and the analysis confirms again the intangible transfer through expatriates discourage debt financing in affiliates.

The decision to send expatriates to a certain affiliate is a part of corporate strategies, which is endogenous as the financial policies. Many factors can affect both the expatriate ratio and leverage of an affiliate and the two may seem to be associated when they do not directly affect each other. To tackle this problem, we adopt the two stage least squares. The detailed data on foreign affiliates allows us to employ good instruments for the ratio of expatriates. We use local sales and purchases as two instruments for the expatriate ratio. The 2SLS estimation again confirm that foreign affiliates tend to maintain low leverage when the share of expatriates in the affiliates are high.

The paper echoes an extensive literature on international knowledge transfer. Many studies

document empirical evidence on knowledge transfer within multinational corporations (Branstetter (2006); Singh (2007), Noorderhaven and Harzing, 2009). While several papers examine whether knowledge spillover through transferred employees from the parents affect affiliate performance (Gong, 2003; Chang, Gong, and Peng, 2012; Cho, 2018), this paper documents the first empirical evidence that the knowledge spillover through expatriate managers can significantly affect capital structure of multinational affiliates. Moreover, this paper addresses the potential endogeneity problem of worker mobility by providing valid instruments.

The paper contributes to the literature on multinational corporations' capital structure by suggesting expatriate managers, which represent transferred knowledge from the parents, can be a new determinant of affiliate capital structure. While multinationals' capital structure follows traditional capital structure theories, several studies uncover some determinants specific to multinationals such as political risk and a host country's creditor rights (Desai et al, 2004; 2008; Kesternich and Schnitzer, 2010). Finally, as the transferred employees from the multinational parents represent the transfer of intangible assets, the paper is also closely related to studies on the effect of intangibles on corporate capital structure. Due to absence of appropriate proxy of intangible assets, direct empirical evidence on the effect of intangible assets on capital structure has been limited. This paper suggests that knowledge transferred through personnel movements can be a proxy of importance of intangible assets. The negative

effect of transferred knowledge on affiliate leverage is consistent with previous finding that intangible assets are associated with low debt financing (Frank and Goyal 2008; Parsons and Titman 2009).

The remainder of the paper is organized as follows. Section 2 discuss related literature and generate the paper's hypothesis. Section 3 explains data and empirical methodology. Section 4 presents empirical evidence on the effect of expatriate managers on leverage of foreign affiliates. Section 5 concludes

2. Related literature and hypothesis development

2.1. International knowledge spillovers

A considerable body of theoretical and empirical work has focused on technological knowledge flows across national borders. Many studies have explored whether imports of manufactured goods could serve as channels of knowledge spillovers. Literature also suggests the possibility of a knowledge transfer when firms learn to improve the quality of their products and production processes through contact with more advanced foreign competitors in global export markets. Another very important channel of knowledge spillover is known to be foreign direct investment. Multinational corporations or multi-plant firms that share the same ownership transfer knowledge to their foreign affiliates. Burstein and Monge–Naranjo (2009),

Ramondo (2014) and Ramondo and Rodríguez-Clare (2013) show that such knowledge transfers through multinationals are an important source of welfare gains to the host countries.

To empirically find the existence of knowledge spillover through multinational enterprises, many empirical works use the amount of foreign direct investment and infer the existence of knowledge spillover by seeking productivity growth observed in the host countries (e.g., Haskel et al (2007) and Wei and Liu (2006)). Alternatively, many believe that the flow of physical goods along the parent to foreign affiliates is a channel of technological knowledge spillover through foreign direct investments because multinational corporations account for the vast majority of trade across countries. Surprisingly, physical transactions between affiliates sharing the ownership are not widely observed. Atalay et al. (2014) and Ramondo et al. (2016) show that physical trades are concentrated within a very small number of firms and suggest that the knowledge transfer may occur through intangible forms.

Other studies utilize patent citations to uncover knowledge transfer because if one patent application cites another patent, this generally indicates that the patent has benefited from the cited patent. Branstetter (2006) and Singh (2007) show that knowledge transfer is observed through patent citation between parents and foreign affiliates. Similarly, Branstetter (2000) documents the comovement between the R&D spending of U.S. firms and the patent output of Japanese firms within a multinational corporation as evidence of knowledge transfer. Singh (2007) notes that the cross citation between the parents and affiliates follows the

movements of inventors, which indicates that the knowledge flow is closely associated with personnel flows.

As knowledge is to some extent tacit, knowledge can be transferred most effectively through face-to-face interactions in many cases (David, 1992; Keller, 2004). This means knowledge spillover (diffusion) would need moving employees into the same geographical location. The models set forth by Dasgupta (2011) and Beaudy and Francois (2010) assume that first, transferred managers from the parents pass knowledge to local hires and second, local hires pass on the knowledge to other local people when they move from a multinational affiliate to local firms. Several empirical studies such as Balsvik (2011) and Poole (2013) focus on the second step of knowledge diffusion and show that worker moving from a multinational to a local firm increase productivity of the local firm.

A few studies attempt to use the proportion of expatriates in the foreign subsidiary as a measure of knowledge transfer. The expatriates are considered agents to transfer corporate culture to foreign affiliates and to develop subsidiary employees' perceptions about and attitudes toward headquarters (Kostova and Roth, 2002; Peng, 2011). More importantly, expatriates understand and have experience in utilizing their parent firm's knowledge base, especially technological knowledge. For these reasons, the transferred knowledge may affect subsidiary performance (Chang, Gong, and Peng, 2013; Gong, 2003). Specifically, the nationality of a subsidiary's general manager or the number/proportion of expatriates in the

subsidiary is shown to affect subsidiary performance (Colakoglu and Caligiuri, 2008; Fang, Jiang, Makino, & Beamish, 2010; Gaur, Delios, and Singh, 2007). Markusen and Trofimenko (2009) and Cho (2018) shows that there is a positive association between expatriates and labor productivity in foreign affiliates and argue that this correlation is as evidence that expatriates are not just more productive than foreign workers, but also transfer knowledge to foreign affiliates.

2.2. Intangible assets and capital structure

The knowledge transferred from the parents represents valuable, but intangible assets to foreign affiliates. Theories imply that intangible assets would discourage debt financing as they tend to have high valuation risk and low collateralizability. However, direct empirical evidence on the effect of intangible assets on corporate capital structure is limited because it is hard to find an objective proxy of intangible assets. On the other hand, tangible assets are shown to support high debt financing (Harris and Raviv 1991; Frank and Goyal 2008; Parsons and Titman 2009) because they can be used as collaterals and have low bankruptcy costs.

Major part of intangible assets transferred from parents to foreign affiliates include technological knowledge. The technological knowledge is generated from the patents and R&D investments (Branstetter, 2000 & 2006; Singh, 2007), which are a critical input to growth. Myers (1977) argue that the firms with high growth options should be associated with low

leverage compared to firms with greater assets-in-place because they are more likely to have underinvestment problems caused by debt overhang. Several studies (Titman and Wessels (1988), Rajan and Zingales (1995), Hovakimian, Opler, and Titman (2001), Fama and French (2002), Barclay, Smith, and Morellec (2006)) find a significantly negative relation between book leverage and proxies for growth options. More direct evidence that innovation is associated with low leverage is documented by Brown, Fazzari, and Petersen (2009) that show that R&D investment is mainly financed by internal funds and equity. The R&D investments are hard to be financed by debt because of highly uncertain cash flows and high bankruptcy costs of firms investing intensively in R&D.

Transferred intangible assets not only include technological knowledge, but also include organization capital that largely include corporate culture (Bloom, Sadun, and Van Reenen, 2012; Kodama, Javorcik, and Abe, 2018). Literature does not predict whether certain corporate culture in general would encourage or discourage debt financing, but culture factors are shown to affect capital structure decisions significantly. Chui et al. (2002), who demonstrate that domestic firms in countries with high scores on the cultural values of mastery and embeddedness have lower corporate debt ratios. Li, Griffin, Yue and Zhao (2011) show that leverage of foreign joint ventures in China is greatly affected by the cultural values from their countries of origin. When preserving corporate culture, which is a valuable organization capital is important, the involved firms would avoid high debt financing.

Summarizing, expatriates represent valuation intangible assets including technological knowledge as well as cultural assets. Therefore, we derive the following hypothesis:

Hypothesis: When a foreign affiliate involves a high level of intangible asset transfers through expatriates from the parent, the affiliate will maintain low financial leverage in its capital structure.

3. Estimation Strategy

3.1 Data

We obtain data on employment of foreign affiliates from the unpublished firm-level data set collected by the Export-Import (EXIM) bank of Korea to obtain information about foreign affiliates. The big advantage of the data set is that it provides detailed information of not only employment status, but also financial status of foreign affiliates regardless whether they are public or private. Moreover, the data also provides some financial information of parent firms. Since 2000, the EXIM bank has conducted annually a benchmark survey of Korean Multinational affiliates abroad. For this, the EXIM bank draw the sample from foreign affiliates that had total accumulated investments of more than 1 million USD and were required by law to submit annual business reports. In 2013, for example, the survey reported that there

were 42,596 Korean foreign affiliates operating outside Korea. Then the 2013 sample from the EXIM bank covers 13.4 percent of the total number of Korean foreign affiliates, but accounts for 67.2 percent of the total accumulated investments of Korean foreign affiliates. Since the number of firms and affiliates included in the EXIM survey each year varies much until 2006, it is hard to conduct a meaningful panel analysis using the data before 2006. We focus on the sample period between 2006 and 2013.

The EXIM survey data set provides the number of affiliate employees categorized by whether the employees are Korean or foreign, and which one of four positions they hold in the affiliate: Executive, Manager, Sales, or Production. As reported in Table 1, most of Korean expatriates hold upper level positions such as executives and manager while local hires take a majority part of lower level positions such as production. We focus on upper level managerial knowledge because key knowledge is passed on through executives and managers. As a measure of transferred knowledge to an affiliate, we calculate the Korean manager ratio, the ratio of Korean executives and managers to total employees.

For the information of the affiliates' parent that we need, we link the EXIM data with the Korean Information System (KIS) database. The KIS data contains extensive information on accounting statements of Korean firms that are subject to external audits. Most of these firms are public firms. Foreign affiliates without information of parent firms were excluded. We keep foreign affiliates that operate in manufacturing industries. Finally, observations with

missing values of key variables discussed below are dropped. The final sample has 2,349 parents investing in 3,908 affiliates. In 2010, the average parent had 1.9 affiliates, and the median parent had one affiliate. A parent had, at most, 55 affiliates throughout the world. In addition, the data set provides information regarding the country and industry in which each affiliate operates.

Table 2 reports the distribution of our sample of foreign affiliates by country and industry in year of 2013. Foreign affiliates operate in 60 host countries and about 80% of foreign affiliates is concentrated in 5 countries. The top 5 countries are China, Vietnam, U.S.A., Indonesia, and India in the order of the number of affiliates in the country. As Table 2 shows, China hosted the most 1,374 Korean affiliates out of 2,679 with 51.3% in 2013. Vietnam hosted the second-most Korean MNCs with 313 affiliates. Since these affiliates operate in countries that differ significantly by market size or endowment, the sectors where these affiliates operate are quite different. For example, although China and Vietnam are developing countries, the most sectors that Korean affiliates operate are different. Interestingly, China and U.S. hosted Korean affiliates operating in the similar sector.

3.2 Model specification and variables

To explore how knowledge transfer through expatriates affect the capital structure of foreign affiliates, we consider the affiliate-level panel equation in order to control for

unobserved time-invariant affiliate characteristics.

$$AffLev_{i,t} = \beta_1 Expatriate\ ratio_{i,t} + \beta_2 X_{i,t}^a + \beta_3 X_{c,t}^c + \delta_i + \tau_t + \varepsilon_{i,t} \quad (1)$$

where δ_i , τ_t , and $\varepsilon_{i,t}$ denote the i affiliate-specific effect, the t time-specific effect, and the error-term, respectively. The dependent variable is financial leverage of foreign affiliate, which is defined as total liabilities over total assets. Our main variable of interest is Expatriate ratio, which is the ratio of Korean managers to total employees in an affiliate i . $X_{i,t}^a$ denotes affiliate-level control variables including and $X_{i,t}^c$ denotes country-level control variables. To control time-invariant omitted variables, we include affiliate-fixed effect. We also include year-fixed effects. All standard errors are clustered at the affiliate level and robust to heteroscedasticity. Our hypothesis predicts the coefficient β_1 to be negative.

To exclude alternative explanation on the association between expatriates and affiliate leverage, we include various control variables. We include parent leverage as a foreign affiliate would follow its parent's capital structure policy. Parent leverage is defined as parents' total liabilities over total assets. Following the literature (Frank and Goyal, 2009), we include a set of affiliate-level control variables. Size is the natural logarithm of total assets, and Profitability is operating income divided by total assets. Tangibility is Net Property Plant divided by total assets. We additionally include Age, the natural logarithm of affiliate age because firm age

seems to affect both affiliate leverage and the number of expatriates. Literature suggests that expatriates are highly favored in the early stages of internationalization and their number tend to decrease as the affiliate ages. Firms tend to use more debt financing as they mature (Kieschnick and Moussawi, 2018). It is important to control for the degree of competition with local rivalries because establishment of an affiliate not only transfer knowledge but also increase the competition that local firms face (Aitken and Harrison, 1999). We use a dummy variable indicating high competition, Competition. The EXIM survey includes a five-point Likert-type scale question and the surveyed ticks one of five choices based on the subjective judgement on the degree of competition with local rivalries. The dummy variable gets one when the surveyed ticks “tough” and “very tough”.

We also consider country-level control variables. Following Desai et al. (2004), we include the host country’s tax rate, private credit, GDP growth rate, and inflation rate. Statutory tax rates are taken from the Corporate Tax Guides of Ernst & Young and KPMG. Private credit is the ratio of private credit lent by deposit money banks to GDP and captures the degree of financial development across host countries. We measure the opportunity of growth in a host country as GDP growth rate. The rate of inflation is the contemporaneous percentage change in a host country’s GDP deflator. We obtain information on private credit, GDP growth rate and inflation rate from World Development Indicator (WDI). We additionally control for county-specific and time-varying political risk (Desai et al, 2008; Kesternich and Schnitzer,

2010), which we obtain from the International Country Risk Guide (ICRG). This guide assigns numbers between zero and 100 to countries that represent aggregations of various components of political stability. The political risk variable used in the analysis is the ratio of the corresponding ICRG measure to 100, thereby imposing that measures of political risk lie between zero and one, with higher numbers corresponding to greater political stability.

Our final sample include affiliate-year observations for foreign affiliates and the sample period is 2006-2011. Table 3 presents the summary statistics of main variables. All variables are winsorized at their 1% and 99% percentiles. On average, about 7% of subsidiary employees are expatriate managers while 8% is taken by expatriate employees. The expatriate manager ratio ranges from 0 (no expatriate) to 1 (no local hires). The ratio of expatriate managers shows enough variations in the sample. Affiliate leverage and parent leverage have a similar mean, about 0.54 and 0.50, respectively. The average values of leverage are similar to what is reported for American multinational corporations in Desai et al. (2004).

Before focusing on regression methodology and results, we present a scatter plot showing the relationship between the expatriation ratio and affiliate leverage. Figure 1 shows the negative relationship between the change of affiliate leverage and that of Korean manager ratio between 2006 and 2013. While the scatter plot is suggestive, we attempt to find a robust relation between the expatriate managers and subsidiary capital structure after considering various other factors in the next section.

4. Estimation Results

4.1. The effect of knowledge transfer through expatriates on foreign affiliate leverage

Table 4 presents the main results obtained from the baseline regressions where we examine how the proportion of expatriate managers affects affiliate leverage. Before we add control variables, we first look into a relationship between the expatriate managers and affiliate leverage. The first column in Table 4 indicates that Korean manager ratio (that is, the share of Korean managers in foreign affiliates) is negatively associated with affiliate leverage. In Column 2, we introduce parent leverage and affiliate-level control variables. The negative effect of Korean manager ratio on affiliate leverage is still statistically significant after including additional controls. As expected, parent leverage largely explains affiliate leverage and the effect is positive, indicating that affiliates closely follow parent leverage policy. Affiliate size is positively associated with affiliate leverage and affiliate profitability is negatively associated with affiliate. The coefficient estimates for Tangibility, and firm age are not statistically significant at conventional levels, but their effects are consistent with literature. The affiliates' degree of competition with local rivalries increases their financial leverage.

In Column 3 of Table 4, we additionally include country-level control variables. The estimated coefficients of Korean manager ratio is -0.152 and is statistically significant at 1 % level. The coefficient is economically significant because it indicates that leverage would

decrease by about 2.5% when there is one standard deviation increase in the expatriate ratio. The tax rate positively affect the affiliate leverage, consistent with tax incentive of the tradeoff theory. The GDP growth of the host country also leads to an increase in affiliate leverage. Inflation rate positively affect affiliate leverage, but the coefficient is not significant. The positive effect of political risk on the affiliate leverage is consistent with prior studies (Desai et al., 2008).¹ Overall, the results suggest that transfer of intangible assets through expatriate managers tends to discourage debt financing, which results in the lower financial leverage of foreign affiliates.

To bolster our argument on the knowledge transfer, we exploit the setting where the expatriate are more likely to act as an agent passing on knowledge to affiliates. First, we examine whether the negative relationship between Korean manager ratio and affiliate leverage is more pronounced when the parent or a subsidiary is more likely to be involved with valuable intangible assets. We conjecture that the knowledge spillover from a parent to foreign affiliates tends to increase when the parent invests intensively in the Research and Development (R&D). We use the parent R&D intensity, the R&D expenses over total assets and interact it with the ratio of expatriates to test the heterogeneous impact of Korean manager on affiliate leverage depending on the R&D intensity of parent firms. Additionally, we calculate the ratio of selling and general administrative expenses (SG&A) to total sales of a subsidiary to measure whether

¹ Unlike Desai et al. (2008), our result shows that the effect of political risk is not statistically significant at the conventional level.

a subsidiary's product is more likely to be involved with high knowledge/technology². The SG&A is used as an investment in organization capital that is a part of intangible assets (Peters and Taylor, 2017).

Table 5 reports the results from the regression model including the interaction between expatriates and the High_RD and High_SGA, in column 1 and 2, respectively. The High_RD is a dummy variable that takes the value of one if parents are in the top 25 percent of R&D intensity within the industry. As in Table 5, the coefficient of interaction terms is negative at the conventional level of significance, which implies that the R&D intensity of a parent firm strengthens the negative association between Korean manager ratio and affiliate leverage. To be more specific, the affiliate leverage tends to be reduced as Korean manager ratio increases, and its impact is stronger for affiliates with the relatively high R&D intensity of their parent firms. Based on the estimated coefficients in Table 5, the increase in Korean manager ratio by 0.1 unit leads to a decrease in the leverage of affiliates, whose R&D intensity is the top 25 percent or more, by 0.022. Whereas the leverage of affiliates whose R&D intensity is the top 25 percent or below decreases by about 0.013. Similarly, the second column shows the significantly negative coefficient of the interaction between High_SGA and Expatriate ratio. The affiliates with the greater SG&A intensity are more likely to be involved with more organizational knowledge and hence, they tend to maintain lower leverage ratio.

² We employ SG&A because affiliate-level R&D information is not available.

Second, we test whether the effect of expatriates on affiliate leverage varies in the host country characteristics. We expect that the affiliates would need more knowledge in their operation when the host country is likely to have the low level of knowledge endowment. We measure the level of knowledge endowment in three ways: the R&D ratio (the share of country-level R&D expenses in GDP), patent stock (patent applications of residents) and education level (percentage of population completing the secondary school). The three variables are obtained from World Development Indicator (WDI). We estimate the heterogeneous effects of Korean manager ratio on affiliate leverage depending on the level of knowledge endowment in a host country using interaction terms.

Table 6 reports the results from the regression model including the interaction between the expatriate ratio and `Low_RD_country`, `Low_Patent_country`, and `Low_Education_country`, respectively. `Low_RD_country` is a dummy variable that takes the value of one if the R&D ratio of host country is below the median. The `Low_Patent_country` and `Low_Education_country` are defined similarly based on the parent stock and the level of education of the host country, respectively. Across all columns, the coefficient of expatriate manager ratio is negative and statistically significant, confirming our earlier finding that affiliates with high expatriate managers tend to maintain low leverage. The column 1 shows that $\text{Expatriate ratio} \times \text{Low_RD_country}$ is significantly negative, which indicates that the negative effect of expatriates on affiliate leverage is more pronounced in host countries with

low R&D investments. As shown in the last two columns of Table 6, the patent stock and education level of host country with affiliates play a similar role in shaping a relationship between Korea manager ratio and affiliate leverage. Note that the coefficient of dummy variables indicating the low level of knowledge endowment is positive, indicating that affiliates operating in countries with less innovation and education tend to choose high debt financing. However, the negative interaction indicates that even in countries with less innovation, the affiliate would lower leverage when it has a lot of intangible assets transferred from the parents.

Overall, the results reported in Table 5 and 6 confirm that the foreign affiliates tend to use less debt financing when knowledge is transferred to the affiliates through expatriates and the effect is more pronounced when the parents or affiliates are involved with higher level of knowledge and the affiliates are more in demand for the knowledge due to the low level of host country knowledge endowment.

4.2. Robustness checks: Alternative definitions of leverage and knowledge transfer through expatriates

Many studies on corporate leverage in cross-country settings commonly uses both long-term debt and total debt (e.g, Booth, et al, 2001; Fan et al. 2012; Cho et al. 2014, Desai et al., 2004). One explanation for using total debt as a measure of leverage is that many developing economies rely primarily on short-term loans, especially in bank-dominated

economies (Rajan and Zingales, 1995). However, it is possible the results discussed above may be driven by trade-related factors because our measure of affiliate leverage includes trade credits as a part of total liabilities. To confirm that our main results are not affected by different definitions of leverage, we conduct similar analysis using three alternative measures of leverage. First, we employ nontrade-account leverage, which is the ratio of total liabilities less trade account and trade notes payable to total assets. Second, we employ the long-term leverage, which is the long-term liabilities divided by total assets. Third, we employ the net leverage, which is total liabilities minus current assets excluding inventory. We attempt to measure leverage when we treat cash as negative debt, but the cash information for affiliates is not available.

Column 1, 2 and 3 in Table 7 report the regression results based on the alternative measures of leverage. The coefficient estimate of the expatriate manager ratio is -0.065 and -0.030 in the regression of nontrade account leverage and long-term leverage, respectively. The estimates are smaller in magnitude compared to the estimate obtained in the baseline regression using total liabilities, but the effect is still both statistically and economically significant. The coefficient estimate of the expatriate ratio is -0.171 in the regression of net leverage and the estimate is larger in magnitude compared to the baseline regression. The results again confirm that high knowledge transfer through expatriate managers lead to lower leverage of foreign affiliates.

Additionally, we use an alternative measure of knowledge transfer through expatriates.

It is true that managers play a significant role in passing knowledge to foreign affiliates, but we may be able to capture more comprehensive knowledge transfer when we include expatriate employees at all levels. The Column 3 in Table 7 uses Total expatriate ratio (that is, the share of Korean employees at all levels out of the number of all employees) instead of Expatriate ratio that accounts only Korean managers. The result suggests that the alternative definition of knowledge transfer through expatriates does not affect our main argument. The increase in Total expatriate ratio also relates to more knowledge transfer and increase in intangible assets, which results in the lower affiliate leverage.

4.3. Addressing endogeneity

Both affiliate leverage and the ratio of transferred managers are endogenously determined and the association between the two may be affected by some omitted factors that simultaneously affect both of them. We tackle the endogeneity issue using the two stage least squares (2SLS).

As the instrumental variables for the ratio of expatriate managers, we employ the local sales and purchases (the ratio of local sales out of total sales and the ratio of local purchases out of total purchases). We find the two variables to be valid instruments because local sales and purchases are closely related to the expatriate manager ratio, but are not associated with affiliate leverage. Tan and Manohey (2006) argue that a multinational is more likely to hire locals as

managers when the affiliate needs more local knowledge. They also show that less expatriates are placed in an affiliate when the MNE acquires an existing firm to set up the affiliate. High local sales and purchases means that the affiliate would need more frequent communication with local customers and suppliers. Local nationals should have much greater local knowledge and local business connections, which allow the multinational firm to obtain economically valuable local resources and to serve local customers. However, there is no reason to believe that local hires increase or decrease the optimal capital structure of the affiliate. One may argue that local sales and purchases may be associated with greater local financing, but they will not affect the total borrowing which can come from various sources.

Table 8 reports results obtained from the 2SLS regressions using both local sales and purchases as the instrument variables. As shown in the second column of Table 8, the first stage coefficients of local sales and local purchases ratio are both negative and statistically significant at the 10% level. The F-statistics from the first-stage regression is around 20, well over the critical value of 10 (Staiger and Stock, 1997), which implies they are not weak instruments. The Hansen J test of over-identifying restrictions does not reject the null hypothesis of the instruments' validity at the 10% significance level. As shown in Column 1 of Table 8, the IV estimate of Korean manager ratio is significantly negative and considerably higher than the OLS estimate with fixed effects. The IV estimates strongly confirm that intangible asset transfer through expatriate managers discourages affiliates' debt financing.

5. Conclusions

Given the increasing importance of intangible assets within modern corporations around the world, understanding the effect of knowledge transfer on corporate financial policies is very important. Multinational corporations play a significant role in diffusing knowledge across borders and it is important to understand how the knowledge is transferred from parent to foreign affiliates in the first place. Technological and organization knowledge represent valuable intangible assets passed on to affiliates often through expatriate managers sent from parent firms. The empirical challenge in examining the effect of personnel movement is limited availability of the data on the international employee transfer. Exploiting the unique dataset on Korean multinationals and their employment structure of foreign affiliates enable us to measure how many expatriate managers are employed in each affiliate and to define the expatriate manager ratio as the number of expatriate managers out of total employees for each affiliate. Using the expatriate manager ratio, we examine how the transfer of intangible assets through expatriates may influence foreign affiliates.

This paper documents empirical evidence on a linkage between the expatriate manager ratio and capital structure of the foreign affiliates. We argue that the knowledge transferred through expatriate managers would decrease affiliate leverage, which result from an increase in intangible assets of foreign subsidiaries. We exploit a matched parent-affiliate dataset from

Korea multinationals, which allows us to quantify the extent to which knowledge transfer via expatriates from parent to its affiliates is associated with affiliate leverage after controlling corporate-wide capital structure policy. The estimation results confirm the negative relationship between the expatriate manager ratio and affiliate leverage. The results indicate that intangible assets transferred through managers sent to foreign affiliates play a significant role in determining the financial leverage of affiliates.

Further analyses reveal that the negative relationship between the expatriate ratio and affiliate leverage is more pronounced when parents' R&D intensity is higher or affiliates SG&A intensity is higher. This finding supports the argument that expatriates have an essential role in delivering intangible assets (technological knowledge and organizational knowledge) to affiliates. Additionally, the negative effect on affiliate leverage is greater when the host country has lower endowment of knowledge, which is measured by the lower level of patent applications, R&D investments, and schooling. Finally, we address the potential endogeneity problem involved with the decision of sending expatriate managers to foreign affiliates by employing the two stage least squares instrumental variables estimator. We use local sales and purchases as instruments for the expatriate manager ratio and our analysis confirms that the high ratio of expatriate managers in a foreign affiliate tends to discourage debt financing of the affiliate.

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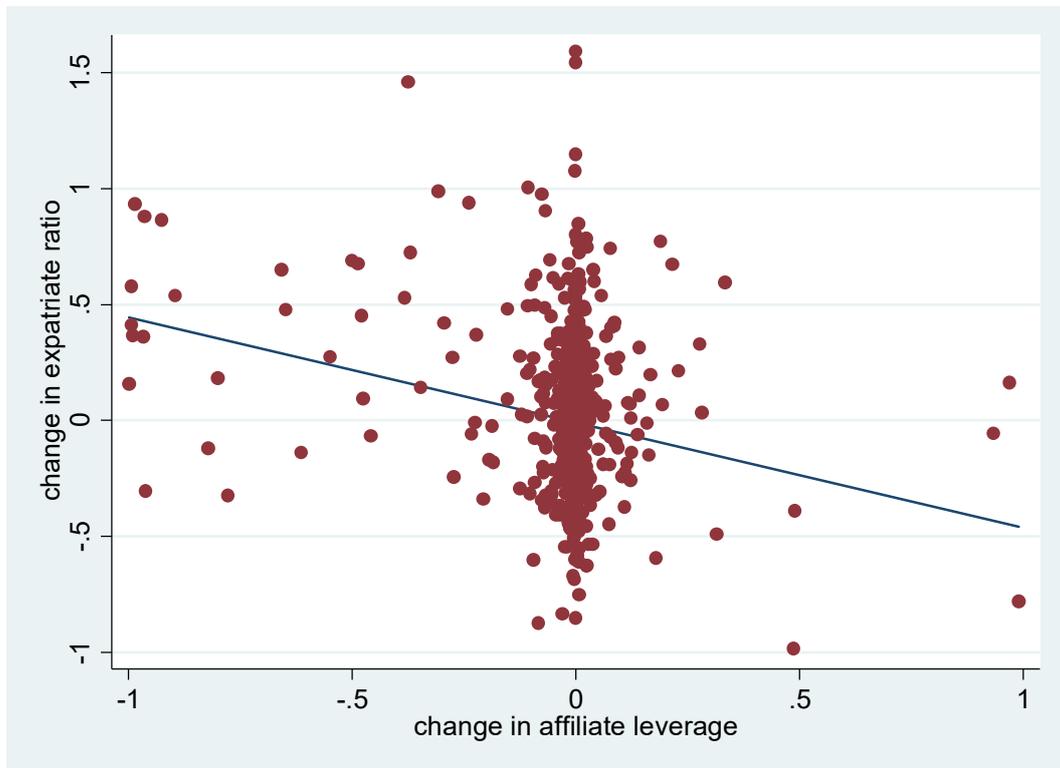
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Figure 1. Change in expatriate ratio vs. change in affiliate leverage



This figure plots the relationship between the change in expatriate ratio and the change in affiliate leverage. Change in expatriate ratio is the difference of Expatriate ratio between 2006 and 2013. Change in affiliate leverage is the difference of affiliate leverage between 2006 and 2013. The line is to plot the fitted values from a linear regression of change in affiliate leverage on change in expatriate ratio.

Table 1 Composition of employees in foreign affiliates in 2013

This table reports distribution of expatriates (Korean) and local employees in foreign affiliates in the sample by job positions. The data is obtained from survey by Export-Import bank of Korea and the reported job positions in foreign affiliates are Executive, Manager, Sales, and Production. The number in each cell represents the share of employee in corresponding job position out of total employees classified by their origin. The last column reports the total number of employees classified by their origin and the numbers are used to calculate the shares.

	Executive	Manger	Sales	Production	Total
Expatriates (Korean)	15.2%	57.5%	7.7%	19.6%	20,546
Local	0.3%	9.1%	3.1%	87.5%	1,581,615

Table 2 Foreign affiliates of Korean MNCs in 2013, by country and sector

This table reports the distribution of foreign affiliates of Korean multinational corporations by host country and industrial sector. The data is obtained from survey by Export-Import bank of Korea. The table reports the only 5 countries that host the most affiliates of Korean multinational corporations. The numbers in the first column and the third column represent the number of affiliates and the percentage of the number out of total 2,679 affiliates in the sample is reported each parenthesis. The fourth and fifth columns report sales in million dollars and the number of total employees of affiliates operating corresponding host country and industry sector, respectively.

Host country	Industrial sectors	No. of affiliates	Sales (\$millions)	No. of Employees
China 1,374 (51.3%)	Electronic Components, Computer, Radio, Television and Communication	329 (12.3%)	97,012	262,808
	Equipment and Apparatuses			
	Motor Vehicles, Trailers and Semitrailers	261 (9.7%)	53,516	112,246
	Chemicals and chemical products except pharmaceuticals, medicinal chemicals	120 (4.5%)	6,900	15,508
Vietnam 313 (11.7%)	Wearing apparel, Clothing Accessories and Fur Articles	62 (2.3%)	1,138	154,186
	Electronic Components, Computer, Radio, Television and Communication	43 (1.6%)	2,714	39,085
	Equipment and Apparatuses			
	Tanning and Dressing of Leather, Luggage and Footwear	27 (1.0%)	1,658	125,903
U.S. 200 (7.5%)	Electronic Components, Computer, Radio, Television and Communication	32 (1.2%)	11,023	12,521
	Equipment and Apparatuses			
	Motor Vehicles, Trailers and Semitrailers	32 (1.2%)	5,588	3,440
	Medical, Precision and Optical Instruments, Watches and Clocks	20 (0.7%)	156	523
Indonesia 131 (4.9%)	Wearing apparel, Clothing Accessories and Fur Articles	36 (1.3%)	729	82,390
	Tanning and Dressing of Leather, Luggage and Footwear	13 (0.5%)	540	16,095
	Electronic Components, Computer, Radio, Television and Communication	13 (0.5%)	501	46,131
	Equipment and Apparatuses			

India	Motor Vehicles, Trailers and Semitrailers	38 (1.4%)	7,093	25,983
86	Basic Metal Products	13 (0.5%)	1,187	5,539
(3.2%)	Fabricated Metal Products, Except Machinery and Furniture	10 (0.4%)	2,041	4,984

Table 3. Descriptive statistics of variables

The table reports descriptive statistics of variables used in the analyses. All variables are winsorized at their 1% and 99% percentiles. Affiliate leverage is the ratio of total liabilities to total assets of affiliates. Affiliate nontrade account leverage is the ratio of short-term borrowings and longterm liabilities in current account, to total affiliate assets. Affiliate long-term leverage is longterm liabilities over total assets. Affiliate net leverage is total liabilities minus current assets excluding inventories divided by total assets. Expatriate ratio is the ratio of Korean manager including executive and manager to total employees in foreign affiliate. Total expatriate ratio is the ratio of Korean employees to total employees in foreign affiliate. Parent leverage is the ratio of total liabilities over total assets of parent firms. Size is the natural logarithm of affiliate total assets. Profitability is affiliate operating income divided by total assets. Tangibility is affiliate net property plant divided by total assets. Age is the natural logarithm of affiliate age. Competition is a dummy variable indicating high competition with local rivals in a host country. Country tax rate is the highest corporate marginal tax rate of a host country. Private credit is the ratio of private credit lent by deposit money banks to GDP and captures the degree of financial development across host countries. GDP growth rate is the annual GDP growth rate of a host country. Inflation is the contemporaneous percentage change in a host country's GDP deflator. Political risk is the ratio of corresponding International Country Risk Guide (ICRG) scores to 100 so that it ranges between zero and one, with higher numbers corresponding to greater political stability. Local sales is sales within the host country divided by total sales of an affiliate. Local purchases is purchases within the host country divided by total purchases of an affiliate.

	Mean	Std. Dev.	min	max
Affiliate leverage	0.538	0.340	0	1.890
Affiliate non trade account leverage	0.207	0.237	0	1.101
Affiliate long-term leverage	0.085	0.166	0	0.854
Affiliate net leverage	0.010	0.386	-0.943	1.395
Expatriate ratio	0.069	0.169	0	1
Total expatriate ratio	0.084	0.189	0	1
Parent leverage	0.501	0.219	0.067	1.227
Size	16.612	1.492	13.375	20.787
Profitability	-0.011	0.161	-0.928	0.319
Tangibility	0.386	0.242	0	0.909
Age	6.876	5.106	0	22
Competition	0.110	0.312	0	1
Local sales	0.571	0.438	0	1
Local purchases	0.056	0.158	0	0.854
Country tax rate	27.560	5.278	16.5	40

Private credit	98.490	35.612	16.016	204.095
GDP growth rate	7.401	3.814	-7.800	14.526
Inflation	4.426	3.776	-4.478	23.116
Political risk	0.663	0.072	0.45	0.93

Table 4. Baseline results: fixed effects model

All variables are defined in Table 3. Standard errors that are clustered at the affiliate level are reported in parentheses; ***, **, and * denote significance at the 1%, 5%, and 10% confidence levels.

Dependent variable	Affiliate leverage		
	(1)	(2)	(3)
Expatriate ratio	-0.212*** (0.024)	-0.154*** (0.021)	-0.152*** (0.021)
Parent leverage		0.138*** (0.025)	0.137*** (0.025)
Size		0.094*** (0.009)	0.095*** (0.009)
Profitability		-0.444*** (0.034)	-0.445*** (0.034)
Tangibility		0.027 (0.021)	0.028 (0.020)
Age		0.009 (0.019)	0.010 (0.019)
Competition		0.037*** (0.009)	0.037*** (0.009)
Country tax rate			0.0032** (0.0014)
Private credit			0.0006 (0.0004)
GDP growth rate			0.003** (0.0014)
Inflation			0.001 (0.001)
Political risk			0.102 (0.156)
Year fixed effects	YES	YES	YES
Affiliate fixed effects	YES	YES	YES
R ²	0.027	0.139	0.141
No. of observations	13,540	13,540	13,540

Table 5. Cross-section test: interacting with parent firm's R&D intensity

All control variables in Table 4 are included in all specifications. High_RD and High_SGA are dummy variables that takes the value of 1 if parent firms and affiliates are in the top 25% of R&D intensity and SGA intensity within an industry, respectively. Standard errors that are clustered at the affiliate level are reported in parentheses; ***, **, and * denote significance at the 1%, 5%, and 10% confidence levels.

Dependent variable	Affiliate leverage	
	(1)	(2)
Expatriate ratio	-0.128*** (0.022)	-0.034 (0.025)
Expatriate ratio× High_RD	-0.093** (0.046)	
High_RD	0.019** (0.009)	
Expatriate ratio× High_SGA		-0.157*** (0.033)
High_SGA		-0.082*** (0.008)
Year fixed effects	YES	YES
Affiliate fixed effects	YES	YES
R ²	0.142	0.165
No. of observations	13,540	13,540

Table 6. Cross-section test: interacting with country-level characteristics

All control variables in Table 4 are included in all specifications. *Low_rd_country* is a dummy variable that gets 1 when the affiliate host country has national R&D investments less than the sample median. *Low_patent_country* is a dummy variable that gets 1 when the affiliate host country has national patent applications lower than the sample median.

Low_education_country is a dummy variable that gets 1 when the affiliate host country has the percentage of citizens finishing secondary school lower than the sample median. Standard errors that are clustered at the affiliate level are reported in parentheses; ***, **, and * denote significance at the 1%, 5%, and 10% confidence levels.

Dependent variable	Affiliate leverage		
	(1)	(2)	(3)
Expatriate ratio	-0.114*** (0.022)	-0.104*** (0.025)	-0.124*** (0.025)
Expatriate ratio× <i>Low_rd_country</i>	-0.096*** (0.033)		
<i>Low_rd_country</i>	0.019*** (0.007)		
Expatriate ratio× <i>Low_patent_country</i>		-0.092*** (0.034)	
<i>Low_patent_country</i>		0.050*** (0.018)	
Expatriate ratio× <i>Low_education_country</i>			-0.063* (0.036)
<i>Low_education_country</i>			0.032*** (0.010)
Year fixed effects	YES	YES	YES
Affiliate fixed effects	YES	YES	YES
R ²	0.143	0.143	0.142
No. of observations	13,540	13,540	13,540

Table 7. Robustness checks using alternative variables

Nontrade-account leverage is the ratio of total liabilities less trade account and trade notes payable to total assets. Affiliate long-term leverag is the long-term liabilities divided by total assets. Affiliate net leverage is total liabilities minus current assets excluding inventory. Expatriate ratio is the ratio of Korean manager including executive and manager to total employees in foreign affiliate. Total expatriate ratio is the ratio of Korean employees to total employees in foreign affiliate. All control variables in Table 4 are included in all specifications. Standard errors that are clustered at the affiliate level are reported in parentheses; ***, **, and * denote significance at the 1%, 5%, and 10% confidence levels.

Dependent variables	Affiliate nontrade account leverage	Affiliate long- term leverage	Affiliate net leverage	Affiliate leverage
	(1)	(2)	(3)	(4)
Expatriate ratio	-0.065*** (0.016)	-0.030** (0.012)	-0.171*** (0.027)	
Total expatriate ratio				-0.115*** (0.017)
Year fixed effect	Yes	Yes	Yes	Yes
Affiliate fixed effects	Yes	Yes	Yes	Yes
R ²	0.094	0.060	0.300	0.139
No. of observations	13,540	13,540	13,540	13,540

Table 8. 2SLS instrumental regression

Local sales and Local purchases are sales and purchased within the host country divided by total sales and purchases, respectively, of an affiliate. All other variables are defined in Table 3. Standard errors that are clustered at the affiliate level are reported in parentheses; ***, **, and * denote significance at the 1%, 5%, and 10% confidence levels.

	2nd stage regression	1st stage regression
<i>Expatriate ratio</i>	-1.540*** (0.300)	
Parent leverage	0.156*** (0.032)	0.015 (0.014)
Size	0.017 (0.019)	-0.051*** (0.005)
Profitability	-0.460*** (0.039)	-0.015 (0.014)
Tangibility	-0.101** (0.039)	-0.088*** (0.014)
Age	0.005 (0.017)	-0.003 (0.006)
Competition	0.038*** (0.012)	0.001 (0.005)
Country tax rate	0.0019 (0.0019)	-0.001 (0.001)
Private credit	0.0005 (0.0006)	0.00005 (0.0003)
GDP growth rate	0.001 (0.002)	-0.001 (0.001)
Inflation	0.001 (0.001)	0.0002 (0.0006)
Political risk	-0.132 (0.227)	-0.168 (0.119)
Local sales		-0.051*** (0.008)
Local purchases		-0.018* (0.010)
Year fixed effects	Yes	Yes
Affiliate fixed effects	Yes	Yes

Kleibergen-Paap F-statistic [p-value]		22.38 [0.00]
Hansen J statistic [p-value]	0.365 [0.546]	
No. of observations	13,540	
