Intra-Group Business Transactions with Foreign Subsidiaries and Firm Value: Evidence from Foreign Direct Investments of Korean Firms

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September 2014

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The authors acknowledge helpful comments from Woojin Kim, Daniel P. Klein and Mingsheng Li on the earlier version of this paper. The usual disclaimer applies.

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Abstract

We investigate the resource transfer through intra-group transactions of foreign direct investment (FDI) firms with their foreign subsidiaries and its effect on firm value. Employing extensive intra-group transaction data of Korean FDI firms constructed by the matching sample approach, our results uncover strong evidence of resource transfer by FDI firms to their foreign subsidiaries. We find that an FDI firm with a larger size, a higher debt ratio, a higher R&D ratio, a higher export ratio, and/or a lower import ratio is likely to engage in more intra-group transactions with its foreign subsidiaries. More importantly, we show that intra-group transactions with foreign subsidiaries reduces firm value, and this association is significantly related with the size and technology level of the investing firm and the economic nature of the host country of foreign subsidiaries, but insignificantly to the ownership structure of the foreign subsidiary. The overall results of our paper offer evidence that Korean FDI firms use the intra-group transactions primarily as a means of propping their poor-performing foreign subsidiaries.

JEL Classification: G34, G31
Keywords: intra-group transactions with foreign subsidiaries; FDIs, firm value, determinants

I. Introduction

Firms engage in foreign direct investments (hereafter, FDI) to actively take advantage of good investment opportunities in foreign countries or to supplement domestic business activities. Whatever motives, the ultimate purpose of a firm's FDI is to increase firm value by enhancing the firm's profitability. One of the rationales explaining the motive of a firm's FDI is that the firm internalizes its resources overseas, as advanced by the Internalization and Eclectic paradigm (see, e.g., Buckley and Casson, 1976; Dunning, 1977; Rugman, 1981; Buckley, 1989).[1] That is, when a firm's transactions are performed ineffectively due to the imperfect market in utilizing the firm's resources, the firm internalizes its resources. When this internalization of a firm's resources is done abroad, this is called an FDI, through which the firm may benefit by reducing the transaction costs. A firm's FDI can also be understood as a decision to diversify the firm's business operations globally (Denis, Denis and Yost, 2002). Hence, if the FDI is viewed from the perspective of corporate diversification, then the benefits and costs of corporate diversification can equally apply to FDIs. [2]

If the outcome of a firm's FDI comes either from savings of transaction costs or from the diversification benefit, the intra-group or related-party transactions between the investing firm and its foreign subsidiary will be an important mechanism to generate investment outcome. Regardless of whether to approach FDI from the perspective of transaction costs or diversification, the outcome of FDIs through the intra-group transactions will be reflected into the firm's business performance, which will in turn bring in a change in firm value.

In essence, when a firm engages in intra-group transactions with other related firms or with other shareholders, the purpose of these transactions could be different from that of common market transactions. In the international transactions, the terms of transactions could also be different from arm's-length transactions. Hence, the outcome of these transactions may bring in distorted effects on the

[1] The Internalization and Eclectic paradigm provides a theoretical base for firms' international operations that a firm's operations become internationalized whenever markets are internalized across national boundaries, providing a firm with firm specific advantages in knowledge and proprietary information.

[2] See Lewellen (1971), Jensen (1986), Stulz (1990), Meyer et al. (1992), and Chandler (1997) for detailed discussions of benefits and costs of corporate diversification.

value of firms and interests of parties involved in these transactions. Furthermore, intra-group transactions may discourage fair competitions in the market and thus cause social costs. Because of these reasons, researchers have focused on the motives and effects of intra-group business transactions.[3] If an intra-group business transaction intends to improve efficiency by utilizing a firm's business networks, the firm would be able to increase its value through such a transaction. On the other hand, if an intra-group transaction is done for purposes other than the economic efficiency of a firm's affiliate, such an intra-group transaction will reduce the total value of firms involved in the transaction.

The outcome of business operations of a foreign subsidiary set up through FDIs is either distributed to the investing firm in the form of cash dividends or kept as retained earnings for reinvestment in the local country. Hence, the intra-group transactions with foreign subsidiaries play an important role of transferring the generated outcome as well as the generating the investment outcome. In this regard, the intra-group transactions with foreign subsidiaries in FDIs would affect firm value not only through the generation of investment outcome but also through the transferring function of the generated outcome to the investing firm.

In this paper, we investigate the effect of the intra-group transactions between investing firms and their foreign subsidiaries on the value of the investing firms. In doing so, we develop testable hypotheses drawing from the existing literature and test them using extensive firm-level data. We focus on Korean manufacturing firms. Over the past decade, Korean firms' outward FDIs have significantly increased, largely propelled by the firms' desire to reduce production costs. For example, Korean FDIs amounted $24.054 billion in 2013, with the largest amount of $27.591 billion in 2011, compared to $4.754 billion in 2003, and set up 2,776 new overseas enterprises in 2013 alone.[4] Furthermore, Korean firms' FDIs have been directed toward to both developed and developing countries. Hence, FDI activities of Korean firms

[3] Allen, Gu and Kowalewski (2011) examine the intra-group transactions between the parent bank and its foreign subsidiaries in European Union countries during the global financial crisis and document that such transactions create a serious threat to the financial system stability of the host countries.
[4] Source: Korea Exim Bank, FDI Statistics; http://keri.koreaexim.go.kr/

provide a rich and excellent experimental laboratory to investigate the potentially different valuation effects of intra-group transactions with foreign subsidiaries located in developed vs. developing countries.

Employing extensive firm-level data constructed using the matching sample approach, we find that the intra-group transactions of FDI firms with their foreign subsidiaries are associated with a decline in firm value, and that this association is closely related to the size of the investing firm, the economic nature of the host country where the foreign subsidiary is located, and the technology level of the investing firm. More specifically, the intra-group transactions of KSE-listed investing firms are negatively related to firm value when the investing firm is large and/or in a high-tech industry. In contrast, the intra-group transactions of KOSDAQ-listed investing firms are negatively related to firm value when the investing firm is large and/or in a low-tech industry or the host country of foreign subsidiary is in a developing country. However, the ownership structure of the foreign subsidiary plays little role in this association.

Our results also show that an FDI firm's level of intra-group transactions with its foreign subsidiary is significantly influenced by factors including firm size, financial leverage, R&D expense, export activities, and import ratio of the investing firm. A larger Korean FDI firm with a higher R&D ratio, a higher export ratio, and/or a lower import ratio are likely to engage in more intra-group transactions with their foreign subsidiaries. Interestingly, the FDI firm's debt ratio affects its intra-group transactions in an opposite way based on the listed exchange of the investing firm. While a KSE-listed firm with a higher debt ratio tends to engage in less buy-intra-group transactions involving cash inflows of sales and profits, a KOSDAQ-listed firm with a higher debt ratio tends to engage in more buy-intra-group transactions involving cash outflows of purchases and costs.

Overall, the empirical results of our paper offer strong evidence of the possibility of resource transfer through intra-group transactions of Korean FDI firms with their foreign subsidiaries. Our results suggest that Korean FDI firms utilize the intra-group business transactions as a way to move their resources to help poor-performing or financially-distressed foreign subsidiaries, which results in the decline in the overall values of investing firms, evidence consistent with the propping hypothesis in the

existing literature.

Our paper is organized as follows. In Section 2, we review related studies and develop testing hypotheses on the determinants and the effect of intra-group transactions with foreign subsidiaries. Section 3 presents data and empirical designs, and Section 4 reports empirical results, with summary and conclusion in Section 5.

2. Related Studies and Development of Hypotheses

2.1. Related studies

Previous studies have examined the effect of FDI on the value of the investing firm by analyzing the responses of investors (or the market) to the firm's FDI decision. These studies investigate the changes in stock prices before and after the announcements of FDI decisions by employing an event study approach (see, e.g., Doukas and Travlos, 1988; Chen, Hu and Shieh, 1991). However, these studies focus primarily on the effect of a firm's FDI decision on its value but do not examine how the operating performance of foreign subsidiaries after FDI is made affects the value of the investing firm or how (e.g., through what channels) this valuation effect occurs.

The effect of FDI on the value of the investing firm can also be examined from the perspective of the benefits and costs associated with a firm's diversification. Considering the low correlation between the operating performance of an investing firm and that of its foreign subsidiary even in the investment in the same industry, the results from the analyses of the benefits and costs associated with industrial diversification can be adopted to explain the benefits and costs of the global diversification through FDIs. Denis et al. (2002) define FDI as a firm's global diversification and compare the effect of the global diversification on firm value with that of the domestic industrial diversification on firm value. They show that the costs of global diversification exceed its benefits, leading a firm's global diversification to reduce firm value by the same magnitude as the industrial diversification does.

One of the key issues on the diversifying firm's intra-group transactions examined in the existing studies is whether the intra-group transactions of the investing firm with its related firms that are formed through the

diversification are used to transfer the wealth of the related firms and thus transfer the shareholders' wealth illegally. The existing literature has advanced two theoretical hypotheses to explain the resource transfer through intra-group transactions, the tunneling hypothesis and the propping hypothesis. The tunneling hypothesis posits that the majority shareholder of the investing firm engages in intra-group transactions to tunnel or exploit the wealth of minority shareholders and debtholders, whereas the propping hypothesis posits that the majority shareholder does so to prop or support its financially-distressed affiliated or related firm.[5] In their analysis of large business groups in Belgium, Buysschaert, Deloof and Jergers (2002) report no evidence of wealth transfer or tunneling. In contrast, Cheung, Rau and Stouraitis (2004) provide evidence supporting the tunneling hypothesis for listed firms in Hong Kong. Bae, Kang and Kim (2002) also report evidence in supportive of the tunneling hypothesis from their analysis of the M&A cases of large business groups in Korea. On the other hand, Baek, Kang and Lee (2006) document evidence in supportive of both the tunneling and propping hypotheses for Korean large business groups. They show that rights offerings are associated with both tunneling and propping activities, though the privately-placed equity offerings are with tunneling activities. In sum, the empirical results of the existing literature indicate that a firm's intra-group transactions with its domestic related or affiliated firms are used as a means of transferring firm resources, and that the characteristics of the resource transfer can be explained to some extent by the tunneling and propping hypotheses.

Although the tunneling and propping hypotheses on the motives of a firm's intra-group transactions with its domestic affiliated firms are not directly applicable to the explanation of the characteristics of intra-group transactions of FDI firms with their foreign subsidiaries, this theoretical framework at least provides the starting point of analyzing the motives of FDI firms' intra-group transactions with their foreign subsidiaries. Drawing from the theoretical framework of the existing literature, we develop our testing hypotheses in the next section.

2.2. Development of hypotheses

[5] According to Korean business laws, affiliated firms are firms formed through share ownership of more than 20%, and related firms are firms formed through special interests other than share ownership (e.g., a firm owned by a person's son but no share ownership in the firm by the person). The related firms are also often called special affiliated firms.

If an FDI firm pursues long-term profit maximization through the expansion of its business operation in a foreign country by regarding the foreign subsidiary as an independent identity, the investing firm may reinvest the profits from the foreign subsidiary locally. However, if the investing firm cannot find better investment opportunities than current business operations in the foreign subsidiary or has the goal of withdrawing short-term profits, then the investing firm will attempt to transfer investment profits through dividends or intra-group transactions. While the reinvestment of profits in local projects of the foreign subsidiary may also generate short-term profits, the shareholders of the investing firm may still prefer to withdraw the local subsidiary's short-term profits to the investing firm mainly due to the uncertainty associated with the reinvestment in local projects.

From this perspective, it is possible that the reinvestment of the local subsidiary's profits would lead to a lower value of the investing firm than the withdrawal of local profits. Accordingly, the investing firm may have a motive to withdraw any possible foreign subsidiary's profits to the home country. In this case, if the investing firm judges it inappropriate to withdraw local profits through dividends, then the investment firm will attempt to do so by adjusting the terms (mainly transfer price) of the intra-group transactions with the foreign subsidiary. The observation that firms continue to make FDIs even when the outcome of FDI firms is on average substantially lower than that of domestic firms may support the proposition that investing firms withdraw local subsidiaries' profits mainly through adjusting transfer prices of individual transactions.

FDI firms do not use the intra-group transactions solely for transferring local subsidiary's profits. The intra-group transactions can also be used for the purpose of propping (Friedman, Johnson and Mitton, 2003). If the investing firm uses the intra-group transactions to make up for the foreign subsidiary's operating loss, then such transactions may lead to a decrease in firm value. If the foreign subsidiary's operating problem is temporary, then the investing firm's value may not suffer, but if it is more of a structural problem, then the intra-group transactions would result in a decline in firm value.

Because the transfer of a foreign subsidiary's profits through intra-group transactions, however, would also lead to a decrease in tax revenue for the local country, the local tax authority would closely monitor the transfer price applied in the intra-group transactions. Hence, the transfer price that investing firms apply would not be significantly different from the normal price. Accordingly, , the size of intra-group transactions will get larger

as the operating loss of the foreign subsidiary that the investing firm attempts to make up for becomes larger. Therefore, it is expected that the larger the size of resources to transfer through intra-group transactions, the larger the decline in the value of the investing firm. Based on this discussion, we develop our first hypothesis as follows:

Hypothesis I: The size of the intra-group transactions between an investing firm and its foreign subsidiary is positively related to the investing firm's value.

The effect of the intra-group transactions on the value of the investing firm may also be closely related to the degree of ownership that the investing firm owns in the foreign subsidiary. While the internal constraints on the transfer of operating outcome through intra-group transactions are not substantial for the wholly-owned FDI, such constraints would be relatively high for joint ventures because the investing firm needs to consider its relationship with local investment partners. For local partners of joint ventures, the intra-group transactions may be viewed as a mechanism of tunneling local subsidiary's wealth and thus would not be easy to perform.

Intra-group transactions are not only employed to transfer or tunnel a foreign subsidiary's business outcome to the investing firm, but can also be used for the investing firm to support or prop the foreign subsidiary. However, it is highly unlikely that the investing firm would transfer its resources to the jointly-owned foreign subsidiary, that is the joint venture. Accordingly, the propping activity through intra-group transactions are more likely to be done for the wholly-owned foreign subsidiary. If the intra-group transactions are used for the purpose of propping, then a higher level of the intra-group transactions would lead to a lower value of the investing firm. Similarly, if the controlling shareholders of the investing firm transfer firm wealth to a foreign subsidiary that they own for the purpose of a flight of the firm's resources, such activity would affect the firm value negatively. Hence, it is reasonably expected that the relationship between intra-group transactions and the value of the investing firm will be more apparent in the wholly-owned foreign subsidiary. This discussion leads to our second hypothesis as follows:

Hypothesis II: The effect of the intra-group transactions between the investing firm and the foreign subsidiary on the value of the investing firm is more significant for a wholly-owned foreign subsidiary.

The effects of transferring profits through the intra-group transactions with a foreign subsidiary can vary

depending on the purpose of the FDI, which is in turn closely related to the location of the foreign subsidiary. In case of investing in developing countries for the cost saving purpose, the investing firm is likely to adopt the strategy of withdrawing operating profits through intra-group transactions, instead of expanding the operation locally. In this situation, the intra-group transactions may boost the value of the investing firm. However, if the investing firm entered the foreign country for the purpose of securing a local market, it may command a strategy of expanding business operations in the foreign country, instead of securing short-term profits through transferring of profits. Hence, if the investing firm follows this strategy and engages in propping the foreign subsidiary through intra-group transactions, then the intra-group transactions may lower the value of the investing firm.

On the one hand, FDIs by Korean firms in developing countries are mainly for cost savings by taking advantage of cheaper labor or raw materials. On the other hand, their FDIs into developed countries are primarily for securing markets and acquisition of technology. From this perspective, the valuation effect of the intra-group transactions can vary by the target country of FDIs. The establishment of a hypothesis on this variation can be understood in line with the discussion on the site factors of investment target countries in FDIs (Dunning, 1979). The difference in the relationship between intra-group transactions and firm value based on the location of the foreign subsidiary can be stated in the hypothesis as follows:

> *Hypothesis III: The effect of the intra-group transactions between an investing firm and the foreign subsidiary on the value of the investing firm varies by the economic nature of the local country where the foreign subsidiary is located.*

The investment firm's decision on whether to use the foreign subsidiary as a base to expand business operations locally or to enhance the investing firm's business performance and maximize near-term profits by transferring profits would be related to the investing firm's size. A small firm is likely to use FDI as a way to enhance the operating performance of the head office. On the contrary, a large firm is likely to use the FDI for the long-term profit maximization. In this case, the investing firm would transfer its resources to the foreign subsidiary through intra-group transactions. In addition, when the operating performance of the foreign subsidiary is poor, a large firm may be motivated to prop the foreign subsidiary through intra-group transactions to improve

its global reputation, which may in turn affect the investing firm's value negatively. In this regard, we can posit that the valuation effect of the intra-group transactions would vary by the size of the investing firm. This hypothesized relationship is indeed in line with the evidence that the performance of FDI is related to the size of the investing firm (Wolf, 1977). This relationship can be summarized in the hypothesis as follows:

Hypothesis IV: The effect of the intra-group transactions between the investing firm and the foreign subsidiary on the value of the investing firm varies by the size of the investing firm.

The valuation effect of intra-group transactions of the investing firm with its foreign subsidiary may also be related to the level of technology in the industry where the investing firm belongs. It is reasonably expected that the intra-group transactions of an investing firm producing high-tech goods have greater effects on firm value than those of an investing firm producing low-tech goods because of a greater value addition of high-tech goods. The relationship between the level of technology and the performance of the FDI firm is consistent with the proposition on the ability of product differentiation as an underlying motive of a firm's FDI (Caves, 1974). Based on this discussion, we develop our last hypothesis:

Hypothesis V: The effect of the intra-group transactions between an investing firm and its foreign subsidiary on the value of the investing firm varies by the technology level of the investing firm.

However, it is worth noting that if the investing firm aims to secure the financial health of its foreign subsidiary or expand the market instead of maximizing its short-term profits by withdrawing operating profits from the foreign subsidiary, then the valuation effect of intra-group transactions may not be clearly observable. This result is likely to appear when the investing firm approaches the FDI from the perspective of maximizing long-term, rather than short-term, profits. Furthermore, when there are no operating profits to transfer through intra-group transactions due to the poor performance of the foreign subsidiary, it is equally possible that the relationship between intra-group transactions and firm value may be shown insignificant, regardless of the ownership structure of the foreign subsidiary, the economic

nature of the local country, the size of the investing firm, and the technology level of the investing firm.

3. Empirical Design

3.1. Regression models

We test the five hypotheses by examining the determinants of the intra-group transactions of FDI firms with their foreign subsidiaries and the effects of intra-group transactions on the values of investing firms using regression models.

First, we analyze the determinants of investing firms' intra-group transactions with foreign subsidiaries. Considering that the primary motive of Korean firms' FDIs is closely related to their exporting activities, it is expected that as their exporting activities (*EXPORT*) increase, investing firms engage in more intra-group transactions. If the investing firm makes FDI in order to import raw or intermediary materials or finished goods from the foreign subsidiary, it is expected that as the proportion of imported materials in produced goods (*IMPORT*) increases, firms engage in more intra-group transactions. If the investing firm has accumulated greater technology in produced goods, the investing firm may also engage in more intra-group transactions in order to make use of such technology. This suggests that an FDI firm's R&D activity (*RND*) may also increase its intra-group transactions. Although unclear about the direction, the size (*FSIZE*) and the debt ratio (*DEBT*) of the investing firm are also expected to be related to the firm's intra-group transactions. While a large firm is likely to engage in more intra-group transactions with its foreign subsidiaries, a firm's debt ratio would affect the intra-group transactions in such a way that when a firm's intra-group transactions play a role of an intra-group capital market, a firm with a higher debt ratio may have a greater need for the intra-group capital market and thus engage in more intra-group transactions.

In order to examine the relationships of these variables to the investing firm's intra-group transactions, we estimated regression equation (1) as given below.

$$INTTR_{i,t} = \alpha_0 + \alpha_1 FSIZE_{i,t} + \alpha_2 DEBT_{i,t} + \alpha_3 RND_{i,t} + \alpha_4 EXPORT_{i,t} + \alpha_5 IMPORT_{i,t} + \sum_{j=1}^{J} \alpha_{5+j} INDDY_{i,t} + \sum_{v=1}^{3} \alpha_{5+J+v} YEARDY_{i,t} + \pi_{i,t} \quad (1)$$

In regression model (1), the dependent variable of *INTTR* is the intra-group transaction index of an investing firm with its foreign subsidiaries. Because the value of *INTTR* is bounded between 0 and 1, we estimate regression equation (1) using Tobit model. *INTTR* is measured by the total transaction amount involved in the intra-group transactions of an investing firm with its foreign subsidiaries divided by the investing firm's sales. *FSIZE* is firm size, measured by the sum of the book value of total debt and the market values of preferred stock and common stock, and enters the regression model as the natural logarithm form. *DEBT* is debt ratio, measured by the book value of total debt divided by total assets. *RND* is R&D ratio, measured by R&D expenses, relative to sales. *EXPORT* is export ratio, measured by exporting amount divided by sales. We also add industry dummies (*INDDY)* and year dummies (YEARDY) to control for the industry characteristics and yearly differences, respectively.

Unlike other variables in regression equation (1), a firm's import ratio, *IMPORT*, cannot be directly observable nor measurable. Because data on a firm's import ratio are regarded as the firm's trade secrets and thus are not publicly available, a firm's import ratio is proxied by relating the firm's sales composition to the imported input shares of sales in the sector where the firm's produced goods belong (see Bae et al., 2012). The imported input shares of sector sales are collected from the input-output tables reported by the Bank of Korea.[6]

Second, we examine the valuation effect of an investing firm's intra-group transactions with its foreign subsidiary firm using regression equation (2).

$$FV_{i,t} = \beta_0 + \beta_1 INTTR_{i,t} + \beta_2 FSIZE_{i,t} + \beta_3 DEBT_{i,t} + \beta_4 RND_{i,t} + \beta_5 EXPORT_{i,t}$$
$$+\beta_6 IMPORT_{i,t} + \sum_{j=1}^{J} \beta_{6+j} INDDY_{i,t} + \sum_{v=1}^{3} \beta_{6+J+v} YEARDY_{i,t} + \mu_{i,t} \quad (2)$$

In regression model (2), the dependent variable of *FV* is the value of the investing firm, measured by a

[6] The input-output tables are widely used by economists as a basis to determine whether goods are capital- or labor-intensive. For example, if a firm produces goods belonging to the manufacturer of pulp, paper, and paperboard (KSIC 17), we use the corresponding sector's imported input share of 24.28% (2008 year basis) as a proxy for the firm's import ratio. If a firm produces multiple goods, the weighted average of the imported input shares of sector sales for the multiple goods is used as the firm's import ratio. For instance, a firm's sales consist of $60 million in sector A and $40 million in sector B. Then the percentages of sectors A and B of total sales are 60% and 40%, respectively. If the imported input shares of sector sales in sectors A and B are 0.1 and 0.2, respectively, as reported in the Input-Output Table, then the firm's imported ratio is measured as 14% (= 60% * 0.1 + 40% * 0.2).

firm's Tobin's q, and the key test variable of *INTTR* is the intra-group transaction index. Following the exiting literature, we employ several control variables that may affect the value of the investing firm (Lang and Stulz, 1995, Bhagat and Ivo, 1995, Chauvin and Hirschey, 1993, Bae, Kwon and Lee, 2011). *FSIZE* is firm size used to control for the possible size effect on firm value. *DEBT* is debt ratio and used to control for the possible effect of a firm's financial leverage on firm value. *RND* is R&D ratio, and *EXPORT* is export ratio. *IMPORT* is import ratio employed to control for the possible effects of price changes in imported materials on firm value. Industry dummies (*INDDY*) and year dummies (*YEARDY*) are used to control for differences in industry and year, respectively.

On the one hand, if the investing firm is withdrawing the foreign subsidiary's operating profits through intra-group transactions, then the estimated coefficient of *INTTR*, β_1, should be positive and statistically significant. On the other hand, if the investing firm transfers its resources to the foreign subsidiary through intra-group transactions primarily to prop the foreign subsidiary due to its poor operating performance, then *INTTR* will carry a negative and significant regression coefficient. If the intra-group transactions of the investing firm with its foreign subsidiary has nothing to do with the transferring of operating outcome, the estimated coefficient of *INTTR* would not be different from zero.

We divide our sample firms into several subgroups classified by several firm characteristics to directly test Hypotheses II through V. First, we examine the valuation effects of intra-group transactions for sample firms classified based on the ownership structure of the foreign subsidiary. The four classifications of ownership structure include wholly-owned foreign subsidiary, majority-owned foreign subsidiary (50%<= ownership <100%); minority-owned foreign subsidiary (0%< ownership <50%); and zero-owned foreign subsidiary, which is a related firm but where the investing firm does not have a direct ownership. In addition, our sample firms are classified into several groups based on the host country of the foreign subsidiary (developed vs. developing country), the size of the investing firm (large vs. small), and the technology level of the investing firm (high-tech vs. low-tech).

When classifying firms based on these criteria, a particular group includes firms that satisfy the corresponding criteria only. For example, if an investing firm A engages in intra-group transactions with both a

wholly-owned foreign subsidiary and a minority-owned foreign subsidiary, then firm A will still be included to the measurement of the intra-group transaction index that is based on the total transaction amount of the intra-group transactions. However, firm A's intra-group transactions will not belong to either a group of wholly-owned foreign subsidiary or a group of minority-owned foreign subsidiary. This selection process will ensure clean samples for our analyses by not double-dipping a firm's intra-group transactions into more than one group under the same classification criteria.

For the classification of firms based on the host country of the foreign subsidiary, a country with a higher (lower) per capita GDP than Korea is classified as developed (developing) country. For the classification based on the size of the investing firm, a firm whose size is larger (smaller) than the median size of the whole sample firms is classified as a large (small) firm. For the classification based on the technology level, an investing firm whose primary business (based on sales) is in a high-tech (low-tech) industry is classified as a high-tech (low-tech) firm. We employ the technology classifications developed by OECD based on aggregate industry R&D expenses.

3.2. Construction of test and matching control samples

The regression models presented in the earlier section are to investigate the determinants and the valuation effects of the investing firms' intra-group transactions. While the models employ several control variables including firm size, debt ratio, R&D ratio, export ratio, import ratio, and year and industry dummies, the regression results may be affected by the potential endogeneity problem, which may arise because poor-performing firms may engage in FDIs and thus more intra-group transactions with their foreign subsidiaries. Furthermore, when employing all firms in the sample, the analysis would focus on the comparison of firms engaging in intra-group transactions and those not engaging in such transactions at all, whose results may reflect the effects of other factors not included in the regression models. In order to overcome these issues and ensure the reliability of empirical results, we employ a matching sample approach by constructing a control sample of firms not engaging in intra-group transactions matched with the test sample of firms engaging in intra-group transactions based on several firm characteristics. The matching sample approach will ensure the comparability of our test sample

against the matched control sample with similar firm characteristics.

Following the selection process similar to that used in Harris (1989) and Bae, Kwon, and Park (2004, 2009) for their analyses of stock return volatility, we pair each firm engaging in intra-group transactions with a firm not engaging in intra-group transactions in the same industry that possesses the closest profile with respect to several firm-specific attributes, whose variables are widely used in the existing literature as being closely related to firm value (see, e.g., Chauvin and Hirschey, 1993; Bhagat and Ivo, 1995; Lang and Stulz, 1995; Bae, Kwon and Lee, 2011).

The procedure for constructing the matching sample is as follows: (i) Sample firms in each industry (within the same two-digit KSIC) are divided into two groups, a group of FDI firms that engaged in intra-group transactions with foreign subsidiaries and another group of FDI firms that did not engage in intra-group transactions; (ii) Regression coefficients of all sample firms are estimated by regressing each firm's firm value (measured by Tobin's q) against five firm variables of firm size, debt ratio, R&D ratio, export ratio, and import ratio; (iii) The weighted-sum of distance of the five variables on the vector space between a firm engaging in intra-group transactions and a firm not engaging in the transactions in the same industry is calculated. The regression coefficient is then weighted in the calculation of distance; (iv) A firm not engaging in intra-group transactions with the shortest weighted-sum of distance is selected as a matching firm to a firm engaging in intra-group transactions in the same industry; and (v) Both the firm engaging in intra-group transactions and the selected matching firm not engaging in the transactions are removed from consideration, and the processes of (iii) through (v) are repeated until all firms engaging in intra-group transactions are matched. Hence, the matching firms not engaging in intra-group transactions selected through this procedure have similar firm characteristics to firms engaging in intra-group transactions in the same industry.

3.3. Data

Our preliminary sample consists of all non-financial firms listed on the Korea Stock Exchange (KSE) and the KOSDAQ market during the period of 2005-2008. Through the initial reviews of intra-

group transactions as reported in business statements and audit reports of all listed companies from the Korea Company Information TS2000 database, we limit our sample firms to those that engage in intra-group transactions only with their foreign subsidiaries.

We collect detailed information on the intra-group transactions of listed firms by searching 'transactional information on assets and liabilities transactions with affiliated and/or related firms' to measure the intra-group transaction index. While the transactional data on assets and liabilities show the size of a firm's intra-group capital market well, they exhibit only the status of the assets and liabilities at the closing date. Hence, we employ each firm's transactional and operational data on sales, purchases, profits, and costs to measure the (total) intra-group transaction index; we first add all transaction items by each foreign subsidiary and standardize the sum by total sales of the investing firm (= (sales + purchases + profits + costs)/total sales) in order to remove the size effect since total sales are used as a proxy for firm size.

From the aspect of cash flows, a firm's intra-group transactions can be classified into two types of transactions, one involving cash inflows and another involving cash outflows. In order to take into account this aspect, we divide intra-group transactions into sell-intra-group transactions representing the sum of sales and profit transactions related to cash inflows and buy-intra-group transactions representing the sum of purchases and costs transactions related to cash outflows and compute the intra-group transaction index for each of sell- and buy-intra-group transactions.

We collect information on the ownership percentages of foreign subsidiaries from the 'Status of Investments in Other Corporations' section of the TS2000 database.[7] Because the ownership information on the foreign subsidiaries is available from the TS2000 database starting 2005 year, our analysis period begins from 2005 year. Data on assets, liabilities, sales, R&D expenses, and exporting amount of investing firms are collected from TS2000. The market values of common stock and preferred stock of investing firms are obtained from KIS Value database.

[7] When the ownership information cannot be identified, the transaction is classified as zero-owned foreign subsidiary. Most of these local subsidiaries are those where the major shareholders of the investing firm invest or a subsidiary of the investing firm invests.

Considering notable differences in the characteristics of firms listed on the two exchanges, we examine our sample firms separately by the listing stock market. Industry dummies are constructed based on sales of each firm's main business classified up to two-digit KSIC. Year dummies use 2005 year as basis year and represent the remaining 2006, 2007, and 2008 years.

4. Empirical Results

4.1. Summary statistics

Table 1 reports the summary statistics of variables used in the regression models by the market for firms listed on the KSE in Panel 1 and firms listed on the KOSDAQ in Panel B. In each panel, summary statistics are reported separately for firms engaging in intra-group transactions (test sample) and for firms not engaging in intra-group transactions constructed by the one-to-one matching sample approach (control sample). Firm value is the natural logarithm of Tobin's q ratio, and all other variables as defined and measured in the earlier section.

Among KSE-listed firms, as shown in Panel A, firms engaging in intra-group transactions have on average smaller firm value, a higher operating margin, a larger firm size, a higher debt ratio, a higher R&D ratio, and a higher export ratio, and a lower import ratio than firms not engaging in intra-group transactions. For KOSDAQ-listed firms reported in Panel B, the results are qualitatively identical to those for the KSE-listed firms, except that firms engaging in intra-group transactions have on average a higher import ratio.

4.2. Measures of intra-group transaction index

Table 2 shows the intra-group transaction index measured by adding up all intra-group transaction amounts (sales, purchases, profits, and costs) of each investing firm with its foreign subsidiaries and dividing it by the firm's total sales. Panels A and B report results of firms listed on KSE and KOSDAQ, respectively. In each panel, the intra-group transaction index is presented for firms classified by several criteria including ownership structure of foreign subsidiary, host country of foreign subsidiary, size of investing firm, and the technology level of products of the investing firm as well as by

year.

Looking first at KSE-listed firms in Panel A, the intra-group transaction index ranges between 15.2% and 16.2% for firms engaging in intra-group transactions (test sample), indicating that about 15% to 16% of total sales of investing firms are on average involved in intra-group transactions with their foreign subsidiaries. It is also shown that the number of firms engaging in intra-group transactions with foreign subsidiaries increases over our sample period from 283 in 2005 to 332 in 2008. When firms are classified by the ownership structure of their foreign subsidiaries, wholly-owned foreign subsidiaries are the most common type of foreign subsidiaries with about 30% (=90/296) to 33% (= 106/322) of all sample firms engaging in intra-group transactions and also carry the largest transaction amounts among the four ownership-type subsidiaries, evidenced by the substantially higher transaction ratios of 0.103 in 2005 and 0.127 in 2008, relative to total sales.

For sample firms classified by the host country of foreign subsidiaries, the number of firms engaging in intra-group transactions with foreign subsidiaries located in developing countries are more than twice those engaging in transactions with foreign subsidiaries located in developed countries. Hence, more Korean firms make their FDIs to developing countries than to developed countries. However, the transaction amounts measured by the intra-group transaction index of these firms are similar in the range of 10.3% for the group of developed country to 11.7% for the group of developing country. According to firm size, more large firms engage in intra-group transactions with their foreign subsidiaries than small firms, but the transaction amounts (relative to total sales) of large firms are substantially smaller than those of small firms, as evidenced by the intra-group transaction indexes of 12.7% to 13.7% for large firms and 18.1% to 19.4% for small firms. For firms based on the technology level, a smaller number of high-tech firms engage in intra-group transactions than low-tech firms, but the transaction amounts of high-tech firms are larger than those of low-tech firms.

Panel B reports results for KOSDAQ firms. The number of sample firms listed on the KOSDAQ market is larger than that listed on the KSE. Similarly to the KSE-listed firms, however, an increasing number of KOSDAQ-listed firms engage in intra-group transactions with their foreign subsidiaries, as evidenced by 253 in

2005 and 355 in 2008. The intra-group transaction index remains stable in the range of 14.1% - 15.3% from 2005 to 2007, but increases sharply to 32.0% in 2008. Among the foreign subsidiaries engaged in intra-group transactions, wholly-owned foreign subsidiaries of KOSDAQ-listed firms are the most common type with the largest transaction amounts, whose findings are similar to those for KSE-listed firms. When classified by the host country of foreign subsidiaries, intra-group transactions with foreign subsidiaries located in developing countries (13.2% - 34.3%) are far larger than those with foreign subsidiaries located in developed countries (8.5% - 15.8%), as well as those for KSE-listed counterparts. According to firm size, intra-group transactions of large firms are in the range of 13.5% to 35.6%, larger than 13.2% to 27.3% for those of small firms. This evidence is again different from that for KSE-listed firms. By the technology level, a substantially larger number of high-tech firms engage in intra-group transactions than low-tech firms. Interestingly, the intra-group transaction index is higher for low-tech firms until 2006, but higher for high-tech firms after 2007.

The main results reported in Table 2 can be summarized as follows. First, a larger proportion of KSE-listed firms (50% - 52%) engage in intra-group transactions with their foreign subsidiaries than KOSDAQ-listed firms (28% - 32%). Second, the intra-group transactions of firms listed on both the KSE and the KOSDAQ follow an increasing trend over the sample period, with a higher growth rate for KOSDAQ-listed firms. Third, KOSDAQ-listed firms engage in more intra-group transactions with foreign subsidiaries located in developing countries than with those located in developed countries, whereas there is little difference in the host country of foreign subsidiaries for KSE-listed firms. Fourth, small firms listed on the KSE and large firms listed on the KOSDAQ tend to engage in more intra-group transactions (in terms of amount) than their counterparts listed in each exchange. Fifth, regardless of the exchange, high-tech firms tend to engage in more intra-group transactions (in terms of amount) than low-tech firms. These findings suggest that the two exchanges have different characteristics with respect to the intra-group transactions of investing firms.

4.3. Regression results

4.3.1. Determinants of intra-group transactions with foreign subsidiaries

Table 3 reports results of regression equation (1) estimated from Tobit model by listed market (KSE vs.

KOSDAQ) to examine the determinants of FDI firms' intra-group transactions with their foreign subsidiaries. The sample firms consist of both test sample firms that engage in intra-group transactions with foreign subsidiaries and matching control sample firms that are selected based on several criteria from firms not engaging in intra-group transactions. We employ three dependent variables: total intra-group transaction index, sell-intra-group transaction index, and buy-intra-group transaction index. The total intra-group transaction index is measured by including transaction amounts of all intra-group transactions with foreign subsidiaries, and sell- and buy-intra-group transaction indexes include the transaction amounts of sales and profits and those of purchases and costs, respectively.

Looking first at the regression results for KSE-listed firms, the total intra-group transaction index (*INTTR*) is positively and significantly (at least at the 1% level) related to *FSIZE* (firm size), *RND* (R&D ratio), *EXPORT* (export ratio) but negatively and significantly (at the 1% level) to *DEBT* (debt ratio) and *IMPORT* (import ratio) of the investing firm. When two alternative indexes of sell- and buy-intra-group transaction indexes based on the direction of cash flows are used as dependent variables, the regression results exhibit similar estimates for most explanatory variables with a few noticeable differences. While the sell-intra-group transaction index is not significantly related to debt ratio of an investing firm, the buy-intra-group transaction index is not significantly related to firm size.

For firms listed on the KOSDAQ, when the total *INTTR* is used as dependent variable, the regression coefficients of *FSIZE*, *EXPORT*, and *IMPORT* carry the same signs and significance levels as those for KSE-listed firms, but neither *DEBT* nor *RND* carry a significant negative regression coefficient. While the regression estimates using the sell-*INTTR* as dependent variable are similar to those using the total *INTTR*, with respect to signs and significance levels, buy-*INTTR* is significantly related to *DEBT*, *EXPORT*, and *IMPORT*. In particular, *DEBT* carries a negative and significant (at the 5% level) regression coefficient, a different sign than for KSE-listed firms, indicating that a KOSDAQ-listed firm with a higher debt ratio tends to engage in more buy-intra-group transactions (purchases and costs) with its foreign subsidiaries.

The overall regression results shown in Table 3 indicate that an investing firm with a higher export ratio is likely to engage in more intra-group transactions with foreign subsidiaries but a firm with a higher import ratio of

input (raw or intermediate) materials for its produced goods is likely to engage in less intra-group transactions. These findings suggest that the intra-group transactions of an investing firm with its foreign subsidiaries are mainly associated with transfers of its sales and profits. A large firm is more likely to engage in sell-intra-group transactions that involve cash inflows of sales and profits rather than buy-intra-group transactions involving cash outflows of purchases and costs. Interestingly, the investing firm's debt ratio affects its intra-group transaction index in an opposite way that a KSE-listed firm with a higher debt ratio tends to engage in less buy-intra-group transactions, but a KOSDAQ-listed firm with a higher debt ratio tends to engage in more buy-intra-group transactions. The investing firm's R&D ratio affects the intra-group transaction index of KSE-listed firms only. It is also shown that the Tobit regression model has greater explanatory power for the variations of KSE-listed firms than of KOSDAQ-listed firms, as evidenced by substantially larger Pseudo R^2 values for KSE-listed firms. The overall results confirm our earlier findings that the determinants of the level of a firm's intra-group transactions vary depending on the exchange where the investing firm is listed.

4.3.2. Effect of intra-group transactions on firm value

We now turn to the regression results on the effect of the investing firm's intra-group transactions on its firm value. The key issue exploring here is whether the intra-group transactions of investing firms with their foreign subsidiaries have positive or negative effects on the values of the investing firms, whose results would offer important implications on the valuation role of intra-group transactions. Table 4 reports the regression results from regression equation (2) for KSE-listed firms classified by several criteria such as ownership structure and host country of foreign subsidiary, size and technology level of the investing firm.

The regression coefficient of the total *INTTR*, the key testing variable, carries a negative and significant (at the 10% level) regression coefficient, indicating that intra-group transactions of an FDI firm with its foreign subsidiaries reduce firm value, whose result is not in supportive of Hypothesis I. Contrary to Hypotheses II and III, the investing firm's ownership in the foreign subsidiary and the economic nature of the host country play little role in the relationship of the firm's intra-group transactions with firm value. On the contrary, more intra-group transactions of an investing firm in large size and/or in a high-tech industry are negatively and significantly (at

least at the 10% level) related to a decrease in the value of the investing firm. These findings support Hypotheses IV and V that the valuation effect of intra-group transactions varies by the size and technology level of the investing firm. Regarding the regression estimates of control variables, firm value is positively related to firm size (*FSIZE*), R&D ratio (*RND*), and import ratio (*IMPORT*) but is negatively to debt ratio (*DEBT*) and export ratio (*EXPORT*).

The regression results in Table 4 indicate that for KSE-listed firms, the intra-group transactions with their foreign subsidiaries set up through FDIs are negatively and significantly related to firm value. This relationship between intra-group transactions and firm value is affected by the size and technology level of the investing firm, but not affected by the ownership structure nor the host country of the firm's foreign subsidiary.

While there is a negative and significant relationship between the intra-group transactions (measured by the total *INTTR*), no such a significant relationship is observed for firms classified based on the ownership structure of the foreign subsidiary. These results can be partly explained by the observation that investing firms often possess both majority-owned subsidiaries and minority-owned subsidiaries and engage in intra-group transactions with both types of foreign subsidiaries, whose case is not examined in our analyses because such a type of foreign subsidiary does not belong to any of the four ownership classifications of foreign subsidiary.

We now review the regression results for KOSDAQ-listed firms, whose results are presented in Table 5. Similarly to Table 4, the regression estimates are reported by several criteria such as ownership structure and host country of foreign subsidiary and size and technology level of the investing firm. The intra-group transactions of KOSDAQ-listed investing firms, measured by the total *INTTR*, are negatively and significantly (at the 5% level) related to firm value. However, this negative relationship is not affected by the different ownership structure of the foreign subsidiary. These findings are similar to those for KSE-listed firms.

The results further show that the intra-group transactions with a foreign subsidiary located in the developing country are significantly related to a lower firm value. Similar to the results for KSE-listed firms, the intra-group transactions of large investing firms listed on the KOSDAQ are negatively related to firm value. The intra-group transactions of KOSDAQ-listed firms in the low-tech industry are also negatively and significantly (at

the 1% level) related to the firm value. This evidence is contradictory to that for KSE-listed firms. Examining the regression results for the whole sample, the regression estimates of control variables for KOSDAQ-listed firms exhibit similar signs and significance levels to those for KSE-listed firms, except for *IMPORT*, which carries a negative and insignificant regression coefficient.

The main results from our regression analyses reported in Tables 4 and 5 are that the intra-group transactions of FDI firms with their foreign subsidiaries reduce firm value. The decrease in firm value associated with intra-group transactions is not directly related to the ownership structure of the foreign subsidiaries. The result of a strong negative relationship between intra-group transactions and firm value for large firms is a plausible outcome when large firms attempt to support or prop their foreign subsidiaries with focuses on long-term wealth maximization. The result of a negative, though insignificant, effect of the intra-group transactions of large KOSDAQ-listed firms on the firm value seems to support this interpretation. Similarly, the result of a negative and significant relationship between intra-group transactions of KSE-listed firms in the high-tech industry and their values suggests that FDIs in the high-tech industry are primarily made with a goal of obtaining high technology for long-term profit maximization rather than for short-term profit maximization. However, our results also show that the intra-group transactions of KOSDAQ-listed firms in the low-tech industry lead to a significant decline in firm value. This result seems to reflect the low investment performances of FDIs made by relatively small KOSDAQ-listed firms mainly to achieve production cost savings in the low-tech products.

The overall results of our paper indicate that Korean FDI firms use the intra-group transactions primarily as a means of propping their poor-performing foreign subsidiaries. The evidence on the reduction in firm value associated with Korean firms' FDIs, especially by large firms and/or firms in the high-tech industry, may be partly attributable to the firms' focuses on the long-term profit maximization, not on the short-term profit maximization. Nevertheless, even if firms make their FDIs from the long term perspective, firms will need to pay attention to the fact that investors may not necessarily evaluate the firms' efforts positively. Furthermore, the market seems to have a strong negative view on the intra-group transactions of KOSDAQ-listed firms with their foreign subsidiaries involving low-tech products.

5. Summary and Conclusion

In this paper, we have examined two major issues pertinent to the intra-group transactions of FDI firms with their foreign subsidiaries: the determinants and the valuation effect of such transactions. Employing extensive firm-level data of Korean manufacturing firms over the 2005-2008 period, we find that a larger Korean FDI firm with a higher R&D ratio, a higher export ratio, and/or a lower import ratio are likely to engage more intra-group transactions with their foreign subsidiaries. Interestingly, the FDI firm's debt ratio affects its intra-group transactions in an opposite way that while a KSE-listed firm with a higher debt ratio tends to engage in less buy-intra-group transactions involving cash inflows of sales and profits, a KOSDAQ-listed firm with a higher debt ratio tends to engage in more buy-intra-group transactions involving cash outflows of purchases and costs.

More importantly, our results show that the intra-group transactions of FDI firms with their foreign subsidiaries are associated with a decline in firm value, and that this association is significantly related to the size of the investing firm, the economic nature of the host country of foreign subsidiary, and the technology level of the investing firm, but insignificantly to the ownership structure of foreign subsidiaries. To be more specific, the intra-group transactions of KSE-listed investing firms are negatively related to firm value when the investing firm is large and/or in a high-tech industry. In contrast, the intra-group transactions of KOSDAQ-listed investing firms are negatively related to firm value when the investing firm is large and/or in a low-tech industry or the host country of foreign subsidiary is in a developing country. These results reflect the poor performances of Korean firms' FDIs, especially of the FDIs made by KOSDAQ-listed firms in the high-tech industry.

The empirical results of our paper confirm the possibility of resource transfer and the poor performance of Korean firms' FDIs through the examination of the intra-group transactions of these firms with their foreign subsidiaries. Although firms may transfer their resources through intra-group transactions for the maximization of long-term profits, investor may view the firm's efforts negatively and thus reduce firm value.

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Table 1. Descriptive statistics of variables of interest

Panel A. Korea Stock Exchange-listed firms						
Variables	Mean	Maximum	Upper 75%	Median	Lower 25%	Minimum
A.1. Firms engaging in intra-group transactions (test sample)						
Firm value	0.989	8.811	1.223	1.126	0.7702	0.243
Profit margin	0.009	6.620	0.073	0.012	0.005	-5.664
Firm size ($b)	22.200	1,180.00	11.200	2.030	0.938	0.125
Debt ratio	0.461	0.947	0.628	0.006	0.296	0.017
R&D ratio	0.017	0.509	0.022	0.001	0.001	0.000
Export ratio	0.424	1.000	0.680	0.009	0.103	0.000
Import ratio	0.166	0.751	0.201	0.004	0.081	0.001
INTTR index	0.159	1.344	0.194	0.007	0.013	0.001
Sell-INTTR	0.089	0.989	0.109	0.004	0.004	0.000
Buy-INTTR	0.070	1.046	0.069	0.004	0.000	0.000
A.2. Firms not engaging in intra-group transactions (control sample)						
Firm value	0.994	5.129	1.220	1.011	0.772	0.292
Profit margin	-0.130	2.385	0.068	0.028	-0.005	-13.570
Firm size ($b)	9.86	478.00	4.39	1.55	0.711	0.128
Debt ratio	0.460	0.922	0.629	0.006	0.281	0.015
R&D ratio	0.128	0.374	0.013	0.001	0.000	0.000
Export ratio	0.120	1.000	0.362	0.007	0.001	0.000
Import ratio	0.170	0.751	0.208	0.004	0.077	0.004
Panel B. KOSDAQ-listed firms						
Variables	Mean	Maximum	Upper 75%	Median	Lower 25%	Minimum
B.1. Firms engaging in intra-group transactions (test sample)						
Firm value	1.196	19.240	1.478	1.012	0.915	0.249
Profit margin	-0.230	1.157	0.070	0.034	-0.097	-12.987
Firm size ($b)	1.14	13.60	1.28	0.674	0.043	0.032
Debt ratio	0.370	1.000	0.531	0.006	0.195	0.005
R&D ratio	0.050	1.599	0.054	0.003	0.007	0.000
Export ratio	0.424	1.000	0.750	0.010	0.101	0.000
Import ratio	0.190	0.573	0.319	0.004	0.092	0.002
INTTR index	0.197	10.209	0.213	0.125	0.016	0.006
Sell-INTTR	0.122	10.025	0.119	0.010	0.003	0.000
Buy-INTTR	0.075	4.102	0.060	0.006	0.000	0.000
B.2. Firms not engaging in intra-group transactions (control sample)						
Firm value	1.289	9.189	1.633	1.013	0.941	0.213
Profit margin	-0.448	2.754	0.078	0.054	-0.187	-20.038
Firm size ($b)	0.795	18.00	0.883	0.557	0.036	0.022
Debt ratio	0.343	1.000	0.493	0.006	0.175	0.0004
R&D ratio	0.049	1.09	0.060	0.003	0.002	0.000
Export ratio	0.239	1.000	0.427	0.009	0.000	0.000
Import ratio	0.190	0.549	0.317	0.004	0.092	0.003

Notes: The sample consists of 2,430 firm-year observations for KSE-listed firms and 2,452 firm-year observations for KOSDAQ-listed firms during 2005-2008 period. INTTR is intra-group transaction index. Firm value is measured as the sum of market value of common stock, book value of preferred stock and book value of debt, standardized by total assets.

Table 2. Intra-group transaction index for investing firms by year and several classifications

	2005		2006		2007		2008	
	No. of firms	INTTR Index	No. of firms	INTTR index	No. of firms	INTTR index	No. of firms	INTTR index
Panel A. Korea Stock Exchange-listed firms								
Whole sample firms	569	0.080	585	0.081	603	0.079	619	0.084
Test sample firms	283	0.161	296	0.160	314	0.152	322	0.162
By ownership %								
Wholly-owned	94	0.104	90	0.114	102	0.117	106	0.127
Majority-owned	19	0.054	26	0.062	22	0.084	19	0.051
Minority-owned	15	0.097	16	0.061	16	0.072	25	0.067
Zero-owned	34	0.087	29	0.103	32	0.099	25	0.119
By host country								
Developed country	56	0.117	53	0.103	57	0.106	55	0.108
Developing country	116	0.109	126	0.118	129	0.106	136	0.116
By firm size								
Large firms	158	0.137	156	0.130	168	0.127	169	0.135
Small firms	125	0.190	140	0.194	146	0.181	153	0.192
By technology level								
High-tech firms	125	0.185	127	0.191	136	0.156	141	0.168
Low-tech firms	158	0.142	169	0.137	178	0.149	181	0.157
Panel B. KOSDAQ-listed firms								
Whole sample firms	800	0.048	848	0.047	908	0.055	941	0.121
Test sample firms	253	0.153	283	0.141	335	0.147	355	0.320
By ownership %								
Wholly-owned	134	0.164	153	0.162	184	0.149	164	0.330
Majority-owned	27	0.073	32	0.055	31	0.069	39	0.156
Minority-owned	23	0.062	23	0.050	33	0.070	28	0.093
Zero-owned	20	0.140	21	0.137	27	0.099	17	0.071
By host country								
Developed country	70	0.127	75	0.097	98	0.085	96	0.158
Developing country	145	0.143	155	0.132	178	0.154	184	0.343
By firm size								
Large firms	148	0.135	166	0.148	189	0.152	202	0.356
Small firms	105	0.179	117	0.132	146	0.142	153	0.273
By technology level								
High-tech firms	188	0.148	205	0.139	242	0.162	253	0.328
Low-tech firms	65	0.169	78	0.147	93	0.111	102	0.300

Notes: The sample consists of 2,430 firm-year observations for KSE-listed firms and 2,452 firm-year observations for KOSDAQ-listed firms during 2005-2008 period. INTTR is intra-group transaction index.

Table 3. Determinants of intra-group transactions with foreign subsidiaries

	KSE-listed firms Dependent variable			KOSDAQ-listed firms Dependent variable		
Variables	Total-INTTR index	Sell-INTTR index	Buy-INTTR index	Total INTTR index	Sell-INTTR index	Buy-INTTR index
Constant	-0.283***	-0.332***	-0.098	-1.115***	-1.150***	-0.487***
	(-3.37)	(-5.56)	(-1.62)	(-3.67)	(-3.38)	(-2.90)
FSIZE	0.009**	0.012***	-0.001	0.046***	0.048***	0.012
	(2.23)	(4.23)	(-0.25)	(3.12)	(3.11)	(1.48)
DEBT	-0.105***	-0.028	-0.108***	0.020	0.028	0.068**
	(-3.61)	(-1.53)	(-4.89)	(0.41)	(0.72)	(2.10)
RND	0.764***	0.628***	0.307**	-0.073	-0.042	-0.051
	(3.99)	(4.96)	(2.33)	(-0.76)	(-0.41)	(-0.78)
EXPORT	0.488***	0.323***	0.280***	0.647***	0.523***	0.338***
	(17.83)	(15.96)	(14.27)	(5.83)	(3.99)	(6.85)
IMPORT	-0.261***	-0.246***	-0.085*	-0.507***	-0.424**	-0.235***
	(-4.41)	(-6.49)	(-1.94)	(-2.73)	(-2.07)	(-3.30)
INDDY	Yes	Yes	Yes	Yes	Yes	Yes
YEARDY	Yes	Yes	Yes	Yes	Yes	Yes
Pseudo R^2	0.335	0.689	0.368	0.118	0.121	0.144
No. of obs.	2,430	2,430	2,430	2,452	2,452	2,452

Notes: The sample consists of 2,430 firm-year observations for KSE-listed firms and 2,452 firm-year observations for KOSDAQ-listed firms during 2005-2008 period. INTTR is intra-group transaction index; FSIZE is firm size; DEBT is debt ratio; RND is R&D ratio; EXPORT is export ratio; IMPORT is import ratio; INDDY is industry dummies; and YEARDY is year dummies. z-statistics are in parentheses. ***, **, and * denote significance at the 1%, 5%, and 10% level, respectively.

Table 4. Effects of intra-group transactions (INTTR) with foreign subsidiaries on the values of KSE-listed investing firms

		By ownership percentage				By host country		By firm size		By technology level	
Variables	Whole sample	Wholly-owned	Majority-owned	Minority-owned	Zero-owned	Developed country	Developing country	Large	Small	High	Low
Constant	-1.066***	-1.252***	-2.683***	-0.754	-1.260***	-1.738***	-1.350***	-1.244***	-0.986***	-1.265***	-1.131***
	(-10.78)	(-6.07)	(-4.63)	(-0.84)	(-2.87)	(-5.41)	(-7.27)	(-6.80)	(-3.13)	(-7.18)	(-8.70)
INTTR	-0.092*	-0.006	0.739	-0.164	0.231	-0.071	0.064	-0.230***	-0.049	-0.105*	0.091
	(-1.89)	(-0.05)	(1.54)	(-0.32)	(1.33)	(-0.63)	(0.58)	(-3.17)	(-0.69)	(-1.82)	(1.11)
FSIZE	0.075***	0.086***	0.128***	0.062	0.069***	0.090***	0.089***	0.069***	0.067***	0.081***	0.078***
	(14.67)	(7.92)	(5.70)	(1.28)	(3.29)	(7.68)	(9.08)	(9.66)	(4.00)	(10.81)	(11.72)
DEBT	-0.505***	-0.509***	-0.448**	-0.450**	-0.508***	-0.469***	-0.378***	-0.636***	-0.380***	-0.545***	-0.451***
	(-11.95)	(-6.10)	(-2.06)	(-2.25)	(-4.31)	(-8.64)	(-5.57)	(-11.15)	(-5.91)	(-8.34)	(-8.35)
RND	1.103***	1.223***	0.956	4.244*	-0.331	1.094**	0.797**	1.233***	0.942*	1.240***	1.580***
	(3.57)	(3.04)	(1.23)	(1.74)	(-0.15)	(2.00)	(2.03)	(4.38)	(1.79)	(3.06)	(2.73)
EXPORT	-0.120***	-0.174***	-0.190	-0.392**	-0.082	-1.406**	-0.171***	-0.101**	-0.188***	-0.148***	-0.082*
	(-3.70)	(-3.03)	(-1.43)	(-2.39)	(-0.79)	(-2.04)	(-3.34)	(-2.41)	(-4.15)	(-2.89)	(-1.79)
IMPORT	0.477***	0.197	0.120	0.949**	0.832***	0.863***	0.354**	0.345**	0.660***	0.237	0.264**
	(4.75)	(0.90)	(0.25)	(2.60)	(2.88)	(4.28)	(2.02)	(2.55)	(4.01)	(1.65)	(1.96)
INDDY	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
YEARDY	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adj. R^2	0.349	0.353	0.530	0.266	0.436	0.368	0.312	0.461	0.231	0.356	0.344
No. Obs.	2,430	784	172	144	240	442	1,014	1,302	1,128	1,058	1,372

Notes: The sample consists of 2,430 firm-year observations for KSE-listed firms during 2005-2008 period. The dependent variable is firm value measured as the sum of market value of common stock, book value of preferred stock and book value of debt, standardized by total assets. INTTR is intra-group transaction index; FSIZE is firm size; DEBT is debt ratio; RND is R&D ratio; EXPORT is export ratio; IMPORT is import ratio; INDDY is industry dummies; and YEARDY is year dummies. t-statistics are in parentheses. t-statistics are in parentheses. ***, **, and * denote significance at the 1%, 5%, and 10% level, respectively.

Table 5. Effects of intra-group transactions (INTTR) with foreign subsidiaries on the values of KOSDAQ-listed investing firms

	Total	By ownership percentage				By host country		By firm size		By technology level	
Variables	INTTR index	Wholly-owned	Majority-owned	Minority-owned	Zero-owned	Developed country	Developing country	Large	Small	High	Low
Constant	-2.941***	-3.009***	-4.618***	-3.163***	-2.553***	-3.673***	-2.670***	-2.468***	-4.018***	-3.311***	-3.022***
	(-14.35)	(-11.23)	(-7.37)	(-5.04)	(3.36)	(-9.65)	(-8.35)	(-8.18)	(-9.44)	(14.36)	(-8.33)
INTTR	-0.043**	-0.020	-0.151	0.223	-0.195	0.185	-0.044*	-0.032*	-0.083	0.001	-0.051***
	(-2.10)	(0.37)	(0.69)	(0.79)	(-0.89)	(1.62)	(-1.83)	(-1.90)	(-1.14)	(0.01)	(-2.67)
FSIZE	0.192***	0.192***	0.281***	0.206***	0.180***	0.243***	0.175***	0.166***	0.256***	0.216***	0.203***
	(17.81)	(3.26)	(8.65)	(5.69)	(4.44)	(11.73)	(10.53)	(10.61)	(10.88)	(17.04)	(10.16)
DEBT	-0.977***	-0.955***	-0.851***	-1.100***	-1.104***	-1.051***	-0.925***	-1.047***	-0.874***	-0.947***	-1.298***
	(-25.44)	(-18.77)	(-7.40)	(-9.45)	(-7.04)	(-15.91)	(-16.62)	(-20.33)	(-14.73)	(-21.26)	(-16.08)
RND	0.327***	0.504***	0.050	0.240	-0.100	0.089	0.395*	0.175	0.360***	0.382***	0.166
	(3.32)	(3.01)	(0.22)	(1.14)	(-0.20)	(0.86)	(1.92)	(1.28)	(2.67)	(3.95)	(0.62)
EXPORT	-0.106***	-0.098***	0.012	-0.091	-0.056	-0.124***	-0.085***	-0.088***	-0.070*	-0.049*	-0.006
	(-4.46)	(-2.88)	(0.16)	(-1.05)	(-0.45)	(-2.84)	(-2.62)	(-2.85)	(-1.69)	(-1.66)	(-0.11)
IMPORT	-0.167	-3.009***	-0.913***	-0.548	0.782	-0.307	-0.284*	-0.064	-0.561***	-0.192**	-0.049
	(-1.51)	(-11.23)	(-2.26)	(-1.43)	(1.38)	(-1.60)	(-1.75)	(-0.46)	(-3.26)	(-2.34)	(-0.20)
INDDY	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
YEARDY	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adj. R^2	0.421	0.421	0.461	0.618	0.374	0.561	0.377	0.474	0.324	0.446	0.518
No. Obs.	2,452	1,270	258	214	170	678	1,324	1,410	1,042	1,776	676

Notes: The sample consists of 2,452 firm-year observations for KOSDAQ-listed firms during 2005-2008 period. The dependent variable is firm value measured as the sum of market value of common stock, book value of preferred stock and book value of debt, standardized by total assets. INTTR is intra-group transaction index; FSIZE is firm size; DEBT is debt ratio; RND is R&D ratio; EXPORT is export ratio; IMPORT is import ratio; INDDY is industry dummies; and YEARDY is year dummies. t-statistics are in parentheses. t-statistics are in parentheses. ***, **, and * denote significance at the 1%, 5%, and 10% level, respectively.

Appendix
Korea Standard Industrial Classification (KSIC) Code and Industry

KSIC Code	Definition of Industry
15	Manufacture of Food Products and Beverages
16	Manufacture of Tobacco Products
17	Manufacture of Textiles, Except Sewn Wearing apparel
18	Manufacture of Sewn Wearing Apparel and Fur Articles
19	Tanning and Dressing of Leather, Manufacture of Luggage and Footwear
20	Manufacture of Wood and of Products of Wood and Cork, Except Furniture; Manufacture of Articles of Straw and Plaiting Materials
21	Manufacture of Pulp, Paper and Paper Products
22	Publishing, Printing and Reproduction of Recorded Media
23	Manufacture of Coke, Refined Petroleum Products and Nuclear Fuel
24	Manufacture of Chemicals and Chemical Products
25	Manufacture of Rubber and Plastic Products
26	Manufacture of Other Non-metallic Mineral Products
27	Manufacture of Basic Metals
28	Manufacture of Fabricated Metal Products, Except Machinery and Furniture
29	Manufacture of Other Machinery and Equipment
30	Manufacture of Computers and Office Machinery
31	Manufacture of Electrical Machinery and Apparatuses n.e.c.
32	Manufacture of Electronic Components, Radio, Television and Communication Equipment and Apparatuses
33	Manufacture of Medical, Precision and Optical Instruments, Watches and Clocks
34	Manufacture of Motor Vehicles, Trailers and Semitrailers
35	Manufacture of Other Transport Equipment
36	Manufacture of Furniture; Manufacturing of Articles n.e.c.