

# An Analysis of the Choice of Compensation Structures in Korean Technology Licensing from Abroad

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## Summary

Studies on compensation structures of international technology licensing show that the level of intellectual property protection in the host market and the favorableness of the host country's economic environment are positively related to the use of running royalty-based compensation structure. Lump-sum fee or fixed royalty compensation is more likely to be used in the introduction and decline stages of the technology life cycle, and running royalty compensation in the growth stage. The international experience and the size of the licensor company are positively related to the use of running royalty. In this theoretical context, this paper analyzes the choice of compensation structures in Korean technology imports. The paper uses the officially reported data to analyze the compensation structures. It analyzes the characteristics of the compensation structures in terms of fixed royalty and running royalty by licensor country, group of licensor countries and size of licensee companies.

Key words : technology licensing, compensation structure, fixed royalty, running royalty, royalty rate

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## 1. Introduction

The evolution of borderless business environment, the need for quick entry into foreign markets, shorter technology life cycles, and high R&D requirements to develop new technologies have all increased international technology transactions.<sup>1)</sup> The rise of technology licensing as a part

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1) A recent survey reports that international technology licensing to non-affiliate firms has been rising at annual growth rates of 18%, compared to an increase of 10 percent in domestic technology licensing (Survey of Current Business, 1994; Kotabe, Sahay and Aulakh, 1996).

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of a company's international strategy emphasizes the need to examine issues related to appropriate structuring, and managing these licensing relationships from both managerial and theoretical perspectives.

Companies are increasingly using technology licensing not only as a source of additional benefits from R&D investments but also as a strategic tool to gain their competitive advantage in terms of setting industry standards, preempting competitors, gaining quick market access, building goodwill, accessing complementary skill, etc. While transferring technology to other companies allows the licensors to gain strategic goals, it has to balance the costs and risks involved with such transfers.

Existing research on international technology licensing has focused on three issues: predicting the choice between licensing and other entry modes (e.g., Agarwal and Ramaswani, 1992; Contractor, 1984; Davidson and McFetridge, 1985; Kim and Whang, 1992); identifying factors that motivate companies to license their technologies abroad (e.g., Hagedoorn, 1993; Kotabe, Sahay, and Aulakh, 1996; Kim, 2003; Telesio 1979); and examining costs and benefits of licensing for both licensor and licensee companies and their relative bargaining positions in negotiating compensation amounts (e.g., Cho, 1988; Contractor, 1981, 1985; Kim and Im, 1997).

Although these studies have considerably enhanced our understanding of international technology licensing, they do not directly address issues related to control considerations and risk preferences of companies in technology transactions between two companies. For instance, the entry mode literature implicitly assumes that technology licensing offers little control over a foreign licensee and is thus a low involvement and low return mode of entering foreign markets.

The negotiation literature emphasizes the bargaining leverage of companies in computing total compensation packages for the licensed technologies but does not relate different compensation structures to the larger context of foreign market involvement of the licensor company.

In this paper, we examine the underlying properties of fixed royalty and running royalty compensation structures and then empirically review basic models of the factors that affect the choice of a particular type of compensation.

In particular, we look into the trends of technology licensing from abroad in Korea and examine the theoretical model on compensation structures of technology licensing by analyzing empirically the patterns of compensation structures in terms of licensor countries, country groups and size of licensee companies. We investigate how compensation structures in international technology transactions are determined in Korea and draw implications from the process of discussion.

## **2. Basic Model of Compensation Structures**

The environment of host countries, the stage in the life cycle of the licensed technology, and the characteristics of licensor companies are identified as ones that are most likely to impact the choice of compensation structure in a given country. Other factors such as scale of licensor's plant, licensee's technology adoption capability, exclusivity of the licensee, etc. are also important in negotiating compensation amounts and may affect the choice of compensation type.<sup>3)</sup>

### *2.1 Environmental Factors of Host Country*

External uncertainty in foreign markets has been shown to be an important factor in determining the choice of entry mode.<sup>4)</sup> The political risk of host or licensee countries is generally considered to be a form of uncertainty that impacts investment decisions in foreign markets. Since interorganizational technology licensing does not involve any capital investment on the part of a licensor in a foreign country, the risk of expropriation of assets associated with political instability is not of primary concern to the licensor companies. However, the legal and economic environment of the host or licensee countries is likely to impact licensor's ability to protect intellectual property and repatriate licensing revenues.

In countries with tight enforcement of intellectual property rights, the legal system explicitly protects and enforces any infringements related to intellectual property. Technology transactions based on running royalties imply a long-term orientation on the part of the licensor companies, as they expect to receive revenues over the course of the licensing agreements. Thus, it is important to these companies that their proprietary know-how is adequately protected in the host country, since expropriation of the know-how by other companies (who are competitors of the licensee company) would adversely impact the licensors' revenue streams from their respective licensees.

Accordingly, running royalty-based compensation structures are likely in countries with strong legal protection. If a foreign market does not adequately protect intellectual property rights, the licensor can either refuse to license its technology or know-how in that market, or minimize uncertainty regarding intellectual property protection by opting for a lump-sum or fixed compensation to be paid up front. In fact, the licensor may demand a higher compensation given the weak legal protection in that market. Based on these facts, it is argued that the level of intellectual property protection in the host market is positively related to the use of running royalty compensation.

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3) Contractor (1981, 1985); Cho (1988).

4) Anderson and Gatignon (1986); Agarwal and Ramaswami (1992); Davidson and McFetridge (1985).

Besides the risk of intellectual property protection, the licensor also faces numerous economic uncertainties in foreign markets. These include changes in the economic and political ideologies of host country governments toward foreign companies and the related policy initiatives affecting currency controls and profit repatriation, among others. Thus, the economic environment is likely to influence the ability of foreign companies to repatriate profits from the licensee country.<sup>5)</sup>

In the context of technology licensing, favorable economic environments facilitate repatriation of licensing revenues to their home markets on an ongoing basis. However, countries with unfavorable or volatile environments will create extensive bureaucratic hassles and roadblocks to repatriate earnings. In such countries, a licensor company is likely to minimize its exposure to these uncertainties by using a fixed compensation structure that allows it to repatriate its fees at the onset of the licensing agreement. In fact, it may require an advance payment before a licensor transfers the technology. Accordingly, the favorableness of the host country's economic environment is positively related to the use of a running royalty compensation structure.

## *2.2 Stage in the Technology Life Cycle*

Although past research considered licensing as an appropriate strategy in foreign markets to extract remaining value from a mature technology,<sup>6)</sup> recent studies and industry practices suggest that companies also license out their newer technologies.<sup>7)</sup> It is assumed that both licensor and licensee companies' risk perceptions about the valuation of technology vary as it passes through different stages, which in turn influences their preferences for different compensation structures.

In the maturity and decline stages of its life cycle, the technology has already been out for a number of years and thus the marketplace, including the licensor and licensee companies, has a clear perception of its residual value. Due to this absence of information asymmetry, both the licensor and licensee will prefer a lump-sum or fixed compensation structure.

There is also a likelihood of convergence in compensation preference during the growth stage of the technology life cycle. During this stage, the technology is increasingly being adopted in the market and there are new possibilities of its use. Thus, although a licensor sees a long-term potential of revenue generation from its technology, it is also concerned with the risk of its

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5) Naya and Ramstetter (1988).

6) Telesio (1979).

7) Refer to Kotabe, Sahay and Aulakh (1996) for instance.

expropriation and shrinking that will impact revenue generation. It, therefore, prefers a running royalty compensation structure that will provide the licensor with more monitoring capability over the licensee to ensure that the latter makes appropriate use of the technology.

The licensee also wants to maximize its gains from the licensed technology. However, it needs marketing and technical support from the licensor to make full use of the technology. Therefore, in order to minimize licensor shrinking, the licensee is motivated to tie the licensor in, through a running royalty compensation structure. Based on the above discussion, it is proposed that the licensor will prefer a lump-sum fee structure in the mature and decline stages and a running royalty-based structure in the growth stages of the technology life cycle.

The choice of a compensation structure during the introduction stage of the technology life cycle is more complex. Two characteristics related to the technology impact the risk perceptions of both licensor and licensee companies. That is, given the newness of the technology, there are uncertainties about its market value and chance of success. In one scenario, it may be argued that a licensor risks undervaluing the technology under a fixed or lump-sum compensation structure, given uncertainty regarding the market value of the technology. To mitigate this risk of undervaluation, the licensor could use an industry norm royalty rate in licensing out the technology.

A running royalty compensation may also be preferred by the licensee because of two interrelated reasons. First, the licensee faces a risk of overvaluation of the technology since it does not have full information regarding its value, and second, given the high risk of failure of a new technology, it would like to make its payments contingent on the technology's success. Since the licensor wants to expand the usage base of its new technology in a race to set the dominant design, it may use a royalty structure to alleviate the risk of failure for the licensee. Thus, the licensor may be more willing to assume the risk as a way to attract licensee companies to adopt its technology. In the above scenario, both the licensor and licensee prefer a running royalty compensation during the introduction stage of the technology life cycle.

However, if a licensor chooses a running royalty in the introduction stage, it also assumes a higher risk of the new technology's failure. Thus, a risk-averse licensor would be more motivated to maximize realized value in the current time period and shift the risk of failure to the licensee by negotiating a lump-sum fee. Besides the risk aversion, licensors may also prefer to use a lump-sum fee compensation for strategic reasons.

Generally, fixed royalty compensation structures are more likely to be used in the introduction and decline stages of the technology life cycle, and running royalty compensation structures in the growth stage of the technology life cycle.

### *2.3 Characteristics of Licensor Company*

International experience and company size are related to the choice of a compensation structure. Past research has empirically shown that internationally experienced companies have better perceptions of risks and returns in foreign markets, and are therefore willing to take a long-term view of their foreign operations.<sup>8)</sup>

In the context of licensor-licensee relationships, this suggests that internationally experienced licensor companies will be less risk averse about the uncertainties attributable to host market conditions, and thus prefer running royalty compensation. Thus, it is argued that the international experience of the licensor company is positively related to the use of running royalty-based compensation structure.

Existing research on entry modes has also shown the risk-absorption capacity attributable to the size of companies. Accordingly, larger companies are more willing to enter foreign markets through entry modes involving investment.<sup>9)</sup> Although technology licensing agreements between companies do not involve investing assets in foreign markets, the licensor company has to put in place mechanisms to monitor the licensee behavior, especially in running royalty compensation structures. Thus, along with higher risk-absorption capacity, larger companies are more likely and willing to invest in financial and managerial resources needed to monitor licensee behavior and ensure its compliance in running royalty-based agreements. Accordingly, the size of the licensor company is positively related to the use of running royalty-based compensation structures.

## **3. Characteristics of Technology Licensing in Korea**

This chapter takes a general view on the trends and features of Korean technology licensing from abroad. Also, it points out that we need to pay attention in understanding and interpreting the statistical data on Korean technology transactions.

### *3.1 Characteristics and Interpretation of Analytical Data on Technology Transactions*

#### *3.1.1 Characteristics of Data*

Korea has built up a foundation of economic growth by licensing more than 10 thousand

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8) Gencturk and Aulakh (1995); Johanson and Vahlne (1977).

9) Agarwal and Ramaswami (1992).

advanced technologies from abroad since 1962. It is said that Korea has obtained excellent results by pursuing growth through an imitation strategy. The strategy has been effective in establishing a national technological foundation for Korea despite its small landmass and limited natural resources.

The Korean government has taken the lead in industrial policy and actively imported foreign technologies in the belief that securing technological power is a key factor of industrial development. The government has actively encouraged industry to introduce necessary technologies from abroad, while pushing large-scale projects through foreign investment. On the other hand, the Korean government has sought to protect domestic industry through various regulations related to technology import.

This protective policy of the government has been gradually diminished as the external environments of companies have been moving toward openness and liberalization. Relaxation or removal of regulations was inevitable because Korea had to heed advanced countries' demand to lift the government's regulations on international trade and technology transaction and expand the liberty of business activities. Therefore, regulations on technology import have been eased gradually since 1978 and now most government regulations on international technology licensing have been removed except only a few areas.

In February 1978, Ministry of Finance and Economy limited the mandatory registration or report of technology import to the technologies in space, aviation and defence industry, and the high technologies necessary to enhance international competitiveness, for which licensees would apply for the reduction of and exemption from taxes.

This paper analyzes the cases of international technology transactions in Korea from 1996 to 2002 because practical data on technology imports could be obtained for that period. Therefore, the data on technology imports are limited to technologies reported to a managing agency in 3 categories such as space and aviation industry, defence industry and high technologies applied for tax exemption in line with the Korean government's liberalization of technology import. In particular, imported technologies in the field of nuclear power industry were included only in the data of 1996, but excluded from 1997 because the industry was exempted from the subject of report.

Accordingly, data on Korean technology licensing-in, which is the subject of analysis in this paper, cannot reflect all the cases of actual technology imports of Korea, but can be useful in understanding the general trends of Korean technology imports because the data include most of the high technologies as the subject of report.

### 3.1.2 Interpretation of Data on Technology Transactions

The data used to analyze characteristics of international technology transaction can be divided into two groups that are the number of contract cases and the amount of royalty payments. First, the contract cases are the number of contracts concluded in a certain calendar year which is important data that reflects trends by year. Second, the amount of royalty payments are the money amounts payed at the point in time, which have limitation to show the state of technology transactions of a certain year because they do not only reflect certain year's transactions or contracts but also have relations with all the contracts belonging to the period of contracts.<sup>10)</sup> Nevertheless, the amounts of royalty payments are useful information to understand the late trends of technology transaction because they reflect mainly the latest contracts.

As mentioned above, statistics on the number of contracts reflecting exactly the trends of technology imports by year are being produced only limitedly. The statistics on the number of the technology contracts are produced based on the contracts reported to the government and the scope of the report to the government was confined within narrow limits. The main subject of the report is high technologies, which are useful in improving national competitiveness, so the major trends of the imports of advanced technologies can be figured out through the statistics on the number of reported contracts of technology imports.

### 3.2 Trends and Features of Technology Licensing

Table 1 shows the trends of technology licensing from abroad in Korea in terms of number of contracts by major licensor country. As seen in the Table, 4 countries including the US, Japan, the UK and Germany record the highest numbers of cases during the 7 years. These 4 countries account for 78.1% of the total cases of technology imports during the period.

To put it concretely, the US recorded 98 cases (51.8%) in 1996, 91 cases (52.6%) in 1997, 39 cases (42.4%), in 1998, 32 cases (38.6%) in 1999, 33 cases (41.3%) in 2000, 28 cases (37.8%) in 2001, and 29 cases (48.3%) in 2002, which means that one country commands an overwhelming weight with 350 cases (46.5%) during the period. Japan accounts for quite a high number with 135 cases (18.0%) during the same period. Accordingly, the US and Japan command almost two thirds of all the technology imports, which shows that Korea has been highly dependent on the two countries and, in particular, too dependent on the US which maintains

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10) For example, a contract concluded in 1990 with 10 year period gives rise to payments for 10 years, so it can be included in the statistics of 1997 for instance.



a large surplus in technology trade.

**Table 1 :** The Number of Technology Imports by Major Country

	1996		1997		1998		1999		2000		2001		2002		Total	
	Cases	%	Cases	%	Cases	%	Cases	%	Cases	%	Cases	%	Cases	%	Cases	%
U S	98	51.8	91	52.6	39	42.4	32	38.6	33	41.3	28	37.8	29	48.3	350	46.5
Japan	41	21.7	31	17.9	15	16.3	12	14.5	20	25.0	10	13.5	6	10.0	135	18.0
U K	6	3.2	7	4.0	10	10.9	7	8.4	6	7.5	10	13.5	9	15.0	55	7.3
Germany	13	6.9	7	4.0	6	6.5	4	4.8	5	6.3	7	9.4	5	8.3	47	6.3
Others	31	16.4	37	21.4	23	25.0	28	33.7	16	20.0	19	25.7	11	18.3	165	22.0
Total	189	100.0	173	100.0	92	100.0	83	100.0	80	100.0	74	100.0	60	100.0	752	100.0

Source : Korea Industrial Technology Association, *Technology Export and Import Statistics*, various issues.

#### 4. Analysis of Technology Licensing Compensation Structures

This chapter analyzes the compensation structures in terms of types and royalty rates by licensor country, group of licensor countries and size of licensee company. To do this, it examines the general features of the technology imports and executes the analysis of difference in the types of their compensation structures.

##### 4.1 Collection of Data and Method of Analysis

###### 4.1.1 Collection of Data

This study deals with the cases of technology licensing contracts concluded from 1996 to 2002 from which we can get the information on licensee companies, licensor countries, and types of compensation structures, among others. The period of time for analysis is limited to from 1996 because consistency of data should be kept.

According to the liberalization of technology import in April 1995, the government abolished the legal obligation to report the contracts of technology import in most industries except the aviation and space industry, nuclear power industry and defence industry and high technology industry applicable for tax exemption. Again, technology licensing in nuclear industry was further liberalized in 1997. The cases of technology imports in 1996 are included in the analysis, however, because the cases of technology imports in nuclear industry are few and the number of data of technology transactions decreases significantly if the cases of 1996 are excluded.

Sample data for analysis were obtained from the publications of Korea Industrial Technology Association (KITA) and the data included finally in the subject of analysis are summarized as in Table 2.

**Table 2 : Sample Data of Technology Import**

	1996	1997	1998	1999	2000	2001	2002	Total
Cases	183	168	82	66	65	59	60	683

Note : The numbers of data in this Table 2 have differences from those of Table 1 which is the data of cases reported to the government, because the analysis could not include some cases for which the companies concerned did not want to disclose the terms and conditions of their contracts.

#### *4.1.2 Method of Analysis*

In considering the compensation structures of technology imports in Korea, this study examines the trends and characteristics of technology licensing cases by frequency analysis, and tests the difference in types of compensation structures and royalty rates among licensor countries, between advanced and developing countries, and between large companies and small and medium companies (SMEs) by one-way ANOVA (analysis of variance) and uses Duncan test for multiple comparison.

The licensee companies are divided on the basis of the size of capital stock into large companies with 75 billion won or more and SMEs with less than 75 million won. The types of compensation structures are divided into fixed royalty and variable royalty.

#### *4.2 General Features of Compensation Structures*

##### *4.2.1 Choice of Compensation Structures*

The compensation structures of technology imports can be largely classified into 4 types of lump-sum royalty, initial payment, running royalty and others. A contract of technology import can take one out of 4 types or a combination of two or more types. The types of compensation structures of technology imports in Korea can be classified, based on the actual terms and conditions of contracts of technology imports, as follows.

- A. lump-sum royalty
- B. lump-sum royalty + initial payment
- C. lump-sum royalty + initial payment + running royalty

- D. initial payment + running royalty
- E. running royalty
- F. other payment

The types of compensation structures of Korean technology imports were shown as in Table 3 in terms of licensor country. In compensation structures by licensor country from which technologies are imported, A type (① lump-sum royalty) accounts for 201 cases (62.0%) from the US and 32 cases (71.1%) from the UK respectively, which shows that the type of lump-sum royalty accounts for about two thirds of the technology imports from the 2 countries. Japan and Germany have different trends from the US and the UK.

**Table 3 :** Types of Compensation Structures of Technology Imports by Licensor Country

(Unit : cases, %)

Country \ Type	A (①)	B (①+②)	C (①+②+③)	D (②+③)	E (③)	F (④)	Total
U S	201 (62.0)	7 (2.2)	1 (0.3)	66 (20.4)	46 (14.2)	3 (0.9)	324 (100.0)
Japan	55 (40.7)	0 (0.0)	1 (0.7)	43 (31.9)	36 (26.7)	0 (0.0)	135 (100.0)
U K	32 (71.1)	1 (2.2)	1 (2.2)	9 (20.0)	2 (4.4)	0 (0.0)	45 (100.0)
Germany	14 (35.0)	0 (0.0)	0 (0.0)	16 (40.0)	10 (25.0)	0 (0.0)	40 (100.0)
Others	101 (72.7)	2 (1.4)	0 (0.0)	20 (14.4)	13 (9.4)	3 (2.2)	139 (100.0)
Total	403 (59.0)	10 (1.5)	3 (0.4)	154 (22.5)	107 (15.7)	6 (0.9)	683 (100.0)

Notes : ① Lump-sum royalties, ② Initial payments, ③ Running royalties, ④ Other payments.

In Table 3, A and B can be categorized into the type of fixed royalties and D and E into the type of variable royalties. On the whole, the former type (A+B) with 413 cases (60.5%) are more common than the latter type (D+E) with 261 cases (38.2%) in the compensation structures of Korean technology imports. In other words, technology imports tend to have the fixed royalty payments more frequently.

Licensor countries from which technologies are imported can be grouped into OECD countries and non-OECD countries. Table 4 shows the cases of technology imports by country group. Technology imports from OECD countries or advanced countries account for more than 90%

of the total. For both of these two groups of licensor countries, lump-sum payments are the most commonly used compensation structure, with non-OECD countries' having even higher proportion (75.0%).

**Table 4 :** Types of Compensation Structures of Technology Imports by Licensor Country Group  
(Unit : cases, %)

Country \ Type	A (①)	B (①+②)	C (①+②+③)	D (②+③)	E (③)	F (④)	Total
OECD	364 (57.7)	9 (1.4)	3 (0.5)	148 (23.5)	103 (16.3)	4 (0.6)	631 (100.0)
Non-OECD	39 (75.0)	1 (0.2)	0 (0.0)	6 (11.5)	4 (7.7)	2 (3.8)	52 (100.0)

Notes : ① Lump-sum royalties, ② Initial payments, ③ Running royalties, ④ Other payments.

In terms of size of licensee companies, types of compensation structures are shown in Table 5. Small & medium-sized companies (421 cases) have imported more technologies than large companies (262 cases). In terms of company size, the trends come to the same, as in Table 5. In particular, large companies have higher proportion (69.5%) of lump-sum payments.

**Table 5 :** Types of Compensation Structures of Korean Technology Imports by Licensee Company Size  
(Unit : cases, %)

Country \ Type	A (①)	B (①+②)	C (①+②+③)	D (②+③)	E (③)	F (④)	Total
Large Companies	182 (69.5)	8 (3.0)	2 (0.8)	42 (16.0)	26 (9.9)	2 (0.8)	262 (100.0)
SMEs	221 (52.5)	2 (0.5)	1 (0.2)	112 (26.6)	81 (19.2)	4 (1.0)	421 (100.0)

Notes : ① Lump-sum royalties, ② Initial payments, ③ Running royalties, ④ Other payments.

#### 4.2.2 Level of Running Royalty

In order to analyze the general features of running royalty rate in technology imports, this paper classified the cases of contracts including running royalty as terms of payments from 1% or less to higher than 10%. 202 cases included the variable payment terms and 199 cases included running royalty payments, except 3 cases with ad valorem payments.

**Table 6 : Royalty Rates of Technology Imports in Korea by Licensor Country**

(Unit : cases)

	1% or Less	1-2%	2-3%	3-5%	5-8%	8-10%	Over 10%	Other	Total
U S	9	12	20	29	9	4	1	1	85
Japan	3	18	31	10	2	0	0	0	64
U K	0	1	4	3	0	0	0	0	8
Germany	1	1	5	12	1	0	0	1	21
Others	2	7	6	8	0	0	0	1	24
Total	15	39	66	62	12	4	1	3	202

Note : The subjects of analysis include only the cases transacted with running royalties as payment terms.

Table 6 shows the royalty rates of 202 cases of technology imports by licensor country. The most cases are distributed in the range of 2-3% (66 cases) and 3-5% (62 cases). The difference in royalty rates can be found among countries. The US and Germany have the most cases in 3-5% and Japan in 2-3%.

Difference in royalty rates can be found between OECD and non-OECD countries as in Table 7. We can see that 197 of 202 cases are technology imports from OECD countries, which shows Korean technology imports were concentrated on advanced countries. Royalty rates of technology imports from OECD countries are most common in the range of 2-3% and 3-5%, reflecting the general trends of all technology imports of Korea,

**Table 7 : Royalty Rates of Technology Imports in Korea by Licensor Country Group**

(Unit : cases)

	1% or Less	1-2%	2-3%	3-5%	5-8%	8-10%	Over 10%	Other	Total
OECD	13	39	65	60	12	4	1	3	197
Non-OECD	2	0	1	2	0	0	0	0	5

Note : The subjects of analysis include only the cases transacted with running royalties as payment terms.

Difference in royalty rates can also be identified by licensee company. Table 8 shows the royalty rates of large companies and SMEs. SMEs are dominant with more than 70% (147 cases) in the cases of contract with running royalty terms.

**Table 8 : Royalty Rates of Technology Imports in Korea by Licensee Company Size**

(Unit : cases)

	1% or Less	1-2%	2-3%	3-5%	5-8%	8-10%	Over 10%	Other	Total
Large Co.	2	9	21	18	3	0	0	2	55
SMEs	13	30	45	44	9	4	1	1	147

Note : The subjects of analysis include only the cases transacted with running royalties as payment terms.

### 4.3 Difference of Compensation Structures

#### 4.3.1 Difference Test of Choice of Compensation Structure

This study tested the difference in choice of compensation structures on the determination of compensation structures of technology imports in Korea by licensor country, group of licensor countries and size of licensee companies. The determination of compensation structure has significant differences by country and company size. However, it does not have a significant difference between country groups, OECD and non-OECD.

Table 9 summarizes the results of difference analysis on the determination of compensation structures of technology imports in Korea by licensor country. In terms of licensor country, fixed royalties are dominant in technology import from the US and the UK and running royalties are dominant from Japan and Germany. In view of the basic model of compensation structures, Korean economic environments could seem to be regarded as more favorable to Japan and Germany's licensors than to the US and the UK licensors. Furthermore, it is presumed that licensors from Germany and Japan are likely to be larger companies.

**Table 9 : Difference of Types of Compensation Structures by Licensor Country**

		N	A+B	D+E	F value (p-value)
Country	U S *	320	208	112	10.006 (0.000)
	Japan **	134	55	79	
	U K *	44	33	11	
	Germany **	40	14	26	
	Others *	136	103	33	

Notes : 1) A+B are the type of fixed royalties and D+E are the type of running royalties.

2) Duncan test was carried out for multiple comparison. It resulted in \* > \*\*.

Between groups of licensor countries, choice of compensation structures has difference, with technology imports from non-OECD countries adopting fixed royalty relatively more than from

OECD countries, as in Table 10. This difference between country groups seems to be resulted from the licensor country's perception on the environmental factors of licensee countries. Non-OECD countries could see Korean economic environments including intellectual property protection favorable, which could affect the choice of compensation structure. In addition, Korean companies tend to import technologies in the growth stage from OECD countries more than from non-OECD countries, considering that running royalty compensation structures are more likely to be used in the growth stage than the introduction and decline stages. Moreover, we could infer that licensors from OECD tend to be larger companies.

**Table 10 :** Difference of Types of Compensation Structures by Country Group

		N	A+B	D+E	F value (p-value)
Country Group	OECD	624	373	241	3.947 (0.047)
	Non-OECD	50	40	10	

Notes : A+B are the type of fixed royalties and D+E are the type of running royalties.

Korean technology imports have statistically significant difference in choice of compensation structures by company size, as in Table 11. Large companies are using fixed royalties relatively more, and small and medium companies are using running royalties relatively more. The difference can be thought about on the basis of what the basic model of determination of compensation structures suggest. According to the model, larger licensor companies with more international experience are positively related to the use of running royalty-based compensation structures since they are less risk averse than smaller licensor companies. In this analysis, however, the relationship the model suggests cannot be identified because the information on size of licensor companies is not available.

**Table 11 :** Difference of Types of Compensation Structures by Licensee Company Size

		N	A+B	D+E	F value (p-value)
Company Size	Large Company	258	190	68	21.814 (0.000)
	SMEs	416	223	193	

Notes : A+B are the type of fixed royalties and D+E are the type of running royalties.

#### 4.2.3 Difference in Running Royalty Rate

This section summarized the results of difference test on running royalty rates of Korean technology imports. The test on royalty rates was carried out in terms of licensor countries, groups of licensor countries, and size of licensee companies.

The results of the difference test by country on royalty rates of technology imports are shown in Table 12. The means of royalty rates show the difference among licensor countries. Korean technology licensees pay higher royalty rates to the US and Germany than Japan and the UK. However, the differences are not statistically significant.

**Table 12 :** Difference of Royalty Rate of Technology Imports by Licensor Country

		N	Mean	Standard Deviation	F value (p-value)
Country	U S	85	3.875	3.200	1.338 (0.257)
	Japan	64	2.756	1.167	
	U K	8	3.146	0.968	
	Germany	21	3.560	1.077	
	Others	24	5.168	11.729	

The test results by country group are shown in Table 13. The means of royalty rates show the difference among licensor countries. Korean technology licensees pay higher royalty rate to OECD countries (3.645%) than non-OECD countries (2.400%). From this difference, we could infer that Korean companies import advanced, high technologies or growth-stage technologies from OECD countries more than non-OECD countries. The inference is not supported by any proven evidence.

**Table 13 :** Difference of Royalty Rate of Technology Imports by Licensor Country Group

		N	Mean	Standard Deviation	F value (p-value)
Country Group	OECD	197	3.645	4.655	0.355 (0.552)
	Non-OECD	5	2.400	1.296	

The results of the difference test by licensee company are shown in Table 14. Small and medium companies (3.793%) pay higher royalty rates than large companies (3.137%). This results



could be presumed to be caused by the difference in bargaining power between large companies and small and medium companies. However, the difference in royalty rates by company size is not statistically significant.

**Table 14 :** Difference of Royalty Rate of Technology Imports by Licensee Company Size

		N	Mean	Standard Deviation	F value (p-value)
Company Size	Large Co.	55	3.137	1.514	0.812 (0.369)
	SMEs	147	3.793	5.313	

### 5. Conclusion

The purpose of this study was to examine how the compensation structures of international technology transactions were determined and analyze the difference in the types of compensation structures of technology imports in Korea by licensor country, group of licensor countries and size of licensee companies.

To begin with, this paper examined the trends of existing studies on international technology transfer and the fundamental background of the analysis of compensation structures in international technology transaction, and summarized the basic models of the choice of a compensation structure of technology transfer between licensor and licensee countries in terms of host or licensee countries' environmental factors, stages in the technology life cycle and licensors' characteristics.

Under the fundamental and theoretical background, the paper took the overview on the trends and characteristics of technology licensing in Korea and pointed out the need to be careful in understanding and interpreting the data related to international technology transactions of Korea. The data of cases officially reported and collected were used to analyze the compensation structures of Korean technology imports. Analysis was made on how the type of a compensation structure between fixed royalty and running royalty was different by licensor country, group of licensor countries and size of licensee companies.

The difference analysis was carried out for the trends of choice of a compensation structure. According to the analysis, the type of compensation structures is significantly influenced by the licensor country, group of licensor companies, and size of the licensee company. That is, the Korean licensee companies showed characteristic differences in the choice of compensation structures of technology imports among licensor countries, between advanced and developing

countries, and between large companies and SMEs.

In terms of royalty rates, Korean technology licensees have difference in royalty rates among licensor countries, between advanced and developing countries, and between large companies and SMEs, but the difference is not statistically significant.

In particular, Korean licensees have used running royalties more with Japan and Germany and fixed royalties more with the US and the UK. Licensors from Japan and Germany could see Korean economic environments more favorable, sell the technologies of growth stage in life cycle more, and be large companies with international experience.

Korean licensees have used running royalties relatively more with OECD and fixed royalties relatively more with non-OECD. This difference could be related with licensee countries' environmental factors and licensor companies size and international experience. Korean economic environments concerning technology licensing could be seen as unfavorable to OECD than to non-OECD countries. Licensor companies from non-OECD could have less international experience and smaller size. This could result in non-OECD countries' more frequent choice of fixed royalties in order to avert risks related to international technology transactions.

Large Korean licensee companies have used fixed royalties relatively more than SMEs. Larger licensor companies are presumed to choose fixed royalties more often since they fixed possible risks related to technology transaction in a short time using their stronger bargaining power. Here, the relationship the model suggests cannot be identified because the information on size of licensor companies is not available, however.

In summary in terms of choice of compensation structures, when Korean licensees import foreign technologies, large companies tend to use fixed royalties with licensors from non-OECD countries and SMEs tend to use running royalties with licensors from OECD countries, especially Japan and Germany.

This study analyzed the choice of compensation structures and royalty rates of Korean technology imports in terms of licensor countries, country groups and company size. The analysis was made with officially reported, limited data in the several fields, and therefore, the results of the study could have limitations in explaining the characteristics of Korean technology imports.

In addition, the analysis could have limitations in verifying systematically the theoretical models explaining the compensation structures of technology licensing because the available information from the cases of technology imports was limited. If more cases can be obtained and more information on terms and conditions of technology transactions can be identified, we are able to expect to conduct more theoretical analysis and empirical tests on determination of compensation structures of technology licensing.

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