A Study on the Prediction Model for International Trade Payment Using Logistic Regression[*]

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Abstract

Purpose – Although remittance payment in international trade settlements has played a bigger role in recent years, scant research is being done. This study is to zero in on analyzing determinants of international trade payments focused on remittance by constructing a payment prediction model.
Design/methodology – This study categorizes the types of trade payments into advance remittance, post remittance, linked remittance, letter of credit, and mixed payment, and analyzes these after constructing a logit model. For empirical analysis, 147 survey data were collected for export manufacturers in Korea, and binominal logistic regression analysis was used to analyze the type of payment method the exporter chooses for trade transactions.
Findings – The likelihood of choosing advance remittance increased as the exporters had non-recovery experiences with payments, and decreased as the market power of importers increased. The possibility of post remittance increased when the export amount was large and the character of the buyer was reliable. In the case of linked remittance, it was highly likely to be selected when payment efficiency was important in trade settlement. In addition, when competition among companies in the global market is intense and market uncertainty is high, the possibility of using a letter of credit decreases. It was also found that the greater the export amount, the greater the possibility of choosing advance remittance, and even if the transaction period was longer, exporters using a letter of credit continued to use it.
Originality/value – Despite the high proportion of remittances in international trade settlements, it has been hard to find studies that reflect the practical characteristics of remittances. This study classified the types of remittance into advance remittance, post remittance, and linked remittance, and built a trade payment prediction model by adding a letter of credit and mixed payment. In addition, the originality of this study is recognized in that a logistic model was constructed and meaningful results were derived.

1. Introduction

As the points of selection of trade settlement methods between traders shift from traditional risk aversion to a focus on efficiency, the use of remittance settlement is increasing. Trade payment is a field with a conflict between an exporter that prefers pre-payment and an

importer that prefers post-payment to avoid the burden of capital.

It can be said that striking a balance between these two is the letter of credit (hereinafter referred to as L/C) method, but the usage rate is falling considerably due to a variety of reasons.

Accordingly, a new perspective is needed to embrace the changes in trade settlement mechanisms. However, discussions about what payment factors exporters and importers choose for international trade transactions have been conducted based on empirical studies confined to a few researchers (Kim Sung-Soo, 2016; Lee Oun-Yeong and Steve Ha, 2012; Choi Kwang-Ho, 2018; Han Woo-Jung and Cho Hyuk-Soo, 2019). In the case of Korea, remittance and L/C portions were reversed in terms of export payments in 1999, and this trend continued until the end of 2018.

Fig. 1. Changes in Export Payment Methods (1997-2018)   (Unit: %)
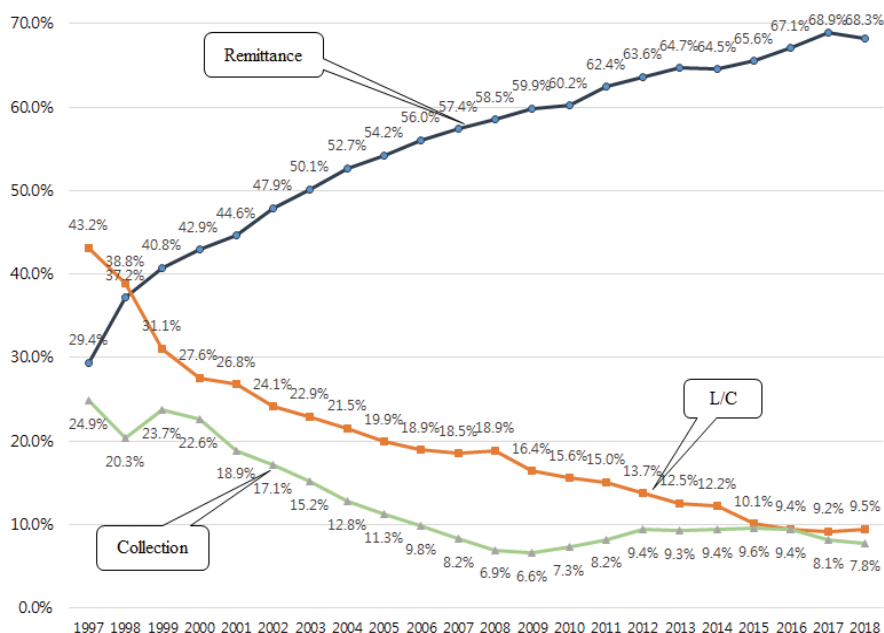
Source: Korea International Trade Association, Trade Statistics (http://stat.kita.net/stat).

Looking at remittances, which account for a large part of export payments in Korea, pre- and post-remittance have opposite interests between the exporter and importer, so the mechanism for selecting a payment method is very different. However, it is difficult to find studies that have analyzed these characteristics separately. From this point of view, so as to simplify the discussion and clarify the points of the study, this study attempted to analyze the determinants by dividing the types of remittances in which exporters receive payment from buyers into pre- and post-remittance.

In addition, we tried to analyze the difference in determinants between the single remittance method consisting of 100% advance remittance, 100% post remittance, and the linked remittance, consisting of some pre-remittance and the remainder post remittance.

Furthermore, the L/C payment method was added to the model, and a mixed settlement with remittance and L/C was also analyzed.

Therefore, this study aims to contribute to the creation of new knowledge and academic development in the international trade payment field by demonstrating the difference between the pre-remittance method and post-remittance method, or the difference between the linked remittance method and mixed payment, which has not been demonstrated in the field of trade settlement.

More specifically, the academic contributions of this study are as follows. First, although the linked remittance method and mixed payment are widely used in practice, they have not been considered in trade payment research.

Therefore, by constructing a research model that includes all, the perspective of international trade payment research is expanding.

Second, by constructing a logistic regression model that realistically reflects the selective situation of exporters and deriving meaningful research results, the study provides an empirical foundation that is helpful for subsequent research.

In general, it is said that export companies frequently use an L/C when conducting trade transactions for the first time, and then switch to a remittance method in consideration of efficiency. However, it seems that these facts, which have been solidified, have not been proved through empirical study. With respect to this, the study empirically verifies whether an exporter prefers an L/C payment to avoid risk when the export amount is large, and whether it is naturally converted to a method that emphasizes efficiency such as remittance when the trade transaction period is prolonged. Some research topics related to international trade payment will be scientifically examined through this empirical research.

2. Literature Review

When studies related to international trade settlements are divided into literature studies and empirical studies, literature studies centering on the legal principle of the L/C occupy a majority in trade settlements (Kim Sang-Man, 2018; Kim Sun-Ok, 2018; Song Kyung-Sook and Chae Hun, 2016; Chung Yong-Kyun and Jeong Jae-Yeon, 2015; Lee Dae-Woo, 2008).

However, in recent years, as payment methods have changed and the proportion of remittances increases, studies to manage the risk of remittances are emerging (Han Woo-Jung and Cho Hyuk-Soo, 2019). In addition, it was found that a number of studies on TSU/BPO are being conducted as an alternative to overcome the limitations of the L/C (Park Suk-Jae and Chun Hong-Chul, 2017; Yu Kwang-Hyun and Sim Sang-Mok, 2017; Joo Hye-Young and Yoo Byoung-Boo, 2018; Chae Jin-Ik, 2011).

In addition, in the case of empirical analysis, most of the three representative payment methods, such as L/C, collection, and remittance, are mainly used to analyze determinants. Kim Sung-Soo (2016) investigated eight determinants that influenced the choice of international trade settlement after dividing international trade payments into remittances and L/Cs in a study of small and medium-sized importers in Korea. Here, eight determinants include commodities, organizational factors, trade amounts, trade contracts, internal company factor, trade term factor, transaction type factor, and partner company factors.

Lee Oun-Yeong and Steve Ha (2012) analyzed the settlement risk management practices of export companies with post-remittance conditions. In other words, by assuming variables such as export orientation and settlement risk management level, the relationship with risk management performance was found through structural equation modeling. Han Woo-Jung and Cho Hyuk-Soo (2019) also found that company payment risks were also increasing as

the proportion of remittance payment methods has recently increased. Their research analyzed how settlement risk was affected by corporate factors, contract factors, and external factors.

When reviewing prior studies, they can be largely divided into the following characteristics: exporters, transaction characteristics, market characteristics, and the characteristics of importers as the preceding factors that affect the settlement of trade payments. Here, the characteristics of exporters refer to size, type of business, export experience, and so on that affect the settlement of trade payments (Shin Seung-Kwan, 2001; Lee Yong-Keun and Park Chong-Suk, 2003; Choi Kwang-Ho, 2018). Transaction characteristics mean the specificity of the transaction between the exporter and the importer, and can be classified into the export amount , settlement efficiency, reliability of buyers, and experience with non-recovery (Choi Seok-Beom, et al., 2007; Choi Kwang-Ho, 2018).

Market characteristics are the competitive characteristics and uncertainties of the market, which can influence exporter choices of trade settlement (Cho Young-Chul, 2010; Choi Kwang-Ho 2018). Also, trade payment is greatly affected by the characteristics of the importer (Lee Yong-Keun and Park Chong-Suk, 2003).

Therefore, these were assumed as determinants influencing the selection of trade settlement. In addition, when looking at the type of trade settlement, a dependent variable, in the remittance sector, if the importer makes a trade settlement, the payment can be made either by 100% pre-remittance or 100% post-remittance. In practice, there are many cases in which pre- and post-remittance are linked in a way that the remainder is post-remittance.

As such, research that reflects this practice is needed. Furthermore, except for a study by Kim Sung-Soo (2016), there is a need to escape from the perspective of research conducted somewhat uniformly based on a linear model in regression analysis. In the meantime, studies approaching from this perspective through empirical studies in the field of trade settlement are very hard to find.

This study subdivides international trade payment type, dependent variable, focused on remittance type, and categorizes it into advance remittance, post remittance, linked remittance, L/C, and mixed payment, and applies a binominal logit model as a realistic analysis method for analysis.

The goal of the study is differentiated from the prior studies in that it not only deepens the viewpoint of existing studies, it also expands the methodological viewpoint of related research fields.

Moreover, given that the common mixed payment is a combination of a L/C and remittance (T/T) (Lee Jung-Sun and Kim Cheol-Ho, 2016), this study intends to refer to the case where pre- and post-remittance occur together as a linked remittance method.

From an academic point of view, this study also tried to provide implications by empirically investigating whether the terms of credit are generally used when the export amount is large, and whether such terms of credit decrease as the transaction period with the importer increases. As discussed above, so as to overcome the limitations of previous research and propose a new research perspective, the following research topics are set.

Research Topic 1: What variables affect the exporter's selection of trade payment method of pre-remittance, post-remittance, linked remittance, L/C, and mixed payment method?

Research Topic 2: In selecting a payment method, will an exporter prefer a safer transaction, such as an L/C when the export amount is large, and avoid an L/C as the transaction period increases?

3. Methodology

3.1. Logistic Regression

The relationship between variables occurring in social phenomena is preferably expressed as a linear relationship: that is, a linear equation. This is because it is desirable in terms of ensuring the simplicity of the model (parsimony) and allows intuitive understanding. Here, when the independent variable and the dependent variable are continuous variables, there is no particular problem in setting up the model with this linear equation, but when the dependent variable is a binominal variable, the problem becomes somewhat complicated. Namely, when considering the dependent variable of home ownership, it is difficult to estimate the interval here because it exists only as a binary variable of having a house or not. Accordingly, it becomes impossible to solve with a linear equation whether or not such a house is owned by any preceding variables. Therefore, it is possible to convert the dependent variable into a probability for use, but this also has a problem as it may result in the possibility that the estimated probability in the linear equation exceeds 100%. That is to say, when calculated using a linear equation, the probability of owning a house can be 120%. Therefore, in order to solve this problem, a data conversion process called odd is needed. While probability is the chance of occurrence of an event compared to the total (p/1), odds represent the number of occurrences versus the number of non-occurrences (p/1-p).

The ratio of the probability of occurrence between different groups is also calculated through the odds ratio (Peng et al., 2002). As such, in logistic regression analysis, the odds ratio is calculated rather than the commonly calculated probability. This is because probability exists only between 0 and 1, whereas when the odds ratio is calculated, the range of the dependent variable becomes a value from 0 to infinity, and the range of the dependent variable expands to the entire real interval, and this enables us to estimate the regression model. The odds ratio, which is a value compared to other groups, has a more realistic meaning. In other words, in order to understand which variables have an important influence on the remittance payment method, it becomes clear by comparing the influence of these variables on payment methods other than remittance. In statistics, log transformation is performed to apply the dependent variable obtained by odds to regression analysis (Hair et al., 2006) because the interval converted to odds appears as 0 and infinity ($0 \leq odds \leq \infty$). Therefore, regression analysis becomes possible only when there is no negative number in the interval converted to odds, and the problems that appear in a nonlinear form are solved. For instance,

$$Logit_i = \ln\left(\frac{prob_{event}}{1 - prob_{event}}\right) = b_0 + b_1 x_1 + \cdots + b_n x_n.$$

This logit transformation enables data to stabilize linearly, and the range of the dependent variable exists from negative infinity to positive infinity. Thus, when the probability is 0, the log odds value becomes -∞, and when the probability becomes 1, the log odds value is+∞ (see Fig. 2).

Meanwhile, the fit of the logistic regression model is analyzed through a log likelihood ratio test. That is, the difference in the likelihood ratio of the model when there is no independent variable, the likelihood ratio when the independent variable is input is used as the test statistic, and a hypothesis test is performed based on the χ^2 distribution (Hair et al., 1998). Also, the -2LL value of the test statistic always has a positive (+) value and follows a χ^2 distribution with the number of independent variables as degrees of freedom. -2LL becomes a better model as it approaches '0'.

Fig. 2. Relationship between Probability and Log Odds
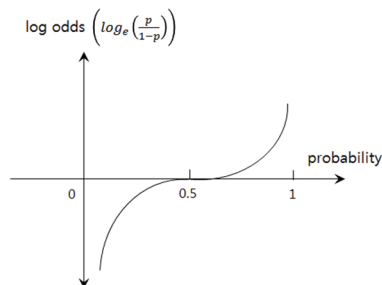
Source: Lee, Hun-Young (2019), Research Methodology, p. 701.

The fitness of logistic regression analysis can also be tested through the Hosmer & Lemeshow test (Peng et al., 2002), and it tests whether there is a difference between the actual value and the predicted value. Therefore, the goodness of fit can be judged only when the model shows no difference between the predicted result of the dependent variable and the actual category of the dependent variable.

However, since the value of the H-L index is very unstable depending on the number of samples, it is problematic to judge the model fit with only the H-L index. The method of interpreting the effect of logistic regression coefficient and odds ratio is shown in Table 1.

Table 1. Interpretation of Effects

Logistic Regression Coefficient	Exp(b)	Effect on Odds
b > 0	Exp(b) > 1	Positive effect
b = 0	Exp(b) = 1	No effect
b < 0	0 < Exp(b) < 1	Negative effect

3.2. Study Model

This study extracted antecedents that influenced the exporter's choice of payment through a literature review. In addition, we tried to find how these antecedents affected the exporters' choice of payment method of remittance, linked remittance, L/C, and mixed payment through logistic regression analysis. For this, a binominal logistic model was constructed, and its contents are shown in Fig. 3.

Fig. 3. Prediction Model

$$log_e \left(\frac{p_i(y_i=1)}{1-p_i(y_i=1)} \right) = \beta_0 + \beta_1 (Size_i) + \beta_2(Category_i) + \beta_3(Experience_i) +$$
$$\beta_4(Standard\ of\ Payment_i) + \beta_5(Payment\ Efficienty_i) +$$
$$\beta_6(Buyer\ Trust_i) + \beta_7(Unrecovered\ Experience_i) +$$
$$\beta_8(Technlogical\ Capabilities_i) + \beta_9(Competitive\ Environment_i) +$$
$$\beta_{10}(Buyer\ Character_i) + \beta_{11}(Market\ Power_i)\ .$$

In addition, through this logit model, the probability of occurrence of an event can be estimated as follows. In other words, when

$z_i = \sum_{m=0}^{M} \beta_m x_{im} = \beta_0 + \beta_1 x_{i1} + \cdots + \beta_M x_{iM}$, $\frac{p_i(y_i=1)}{1-p_i(y_i=1)} = e^{z_i}$, $p_i(y_i = 1) = e^{z_i} - e^{z_i} \cdot p_i(y_i = 1)$, it becomes $p_i(y_i = 1) = \frac{e^{z_i}}{1+e^{z_i}} = \frac{1}{1+e^{-z_i}}$.

As such, through equation, $p_i(y_i = 1) = \frac{1}{1+e^{-(\beta_0+\beta_1+\beta_2+\beta_3+\beta_4+\beta_5+\beta_6+\beta_7+\beta_8+\beta_9+\beta_{10}+\beta_{11})}}$, we can estimate the probability of the occurrence of an event.

3.3. Measurement of Variables

In this study, on the basis of prior studies, factors that can influence export company selection of trade payments are classified into exporter characteristics, transaction characteristics, market characteristics, and importer characteristics.

Measurement items that constitute these antecedents and sources are presented as follows.

3.3.1. Export Characteristics

In this study, characteristics of exporters were measured in terms of company size, industry type, and export experience. According to Lee Yong-Keun and Park Chong-Suk (2003), in international trade settlements, a company's industry type or export experience is an important factor affecting settlement method. Here, industry was divided into ① raw materials and processed goods and ② semi-finished products and finished products, and export experience was classified into ① 5 years or less, ② 6-15 years, and ③ 16 years or more. In addition, size of a company is highly likely to affect payment method as it affects the funding capacity of the exporting company and bargaining power (Huh Eun-Soog, 1996; Shin Seung-Kwan, 2001; Choi Kwang-Ho, 2018).

Company size was divided into ① small enterprise and ② medium enterprise and above. In general, employees know the size of their company, so they asked whether their company was small or large. The characteristics of exporters consist of a nominal scale, and dummy variables were processed for later analysis.

3.3.2. Transaction Characteristics

The characteristics of trade transactions are known as a major determinant influencing international trade payment (Eom Kwang-Yeol and Shin Seung-Man, 2003; Choi Seok-Beom et al., 2007; Choi Kwang-Ho, 2013). In this study, ① export amount and settlement criteria, ② payment efficiency, ③ reliability for buyers, and ④ unrecoverable experience were assumed as items of transaction characteristics.

The scale for measuring the above is a Likert-type 5-point scale (1 point = Not at all, 3 points = Moderately, 5 points = Extremely).

3.3.3. Market Characteristics

The characteristics of the global market are also a major variable affecting trade settlement (Chang Dong-Han and Kim Byung-Sun, 2001; Cho Young-Chul, 2010; Choi Kwang-Ho, 2018). In this study, ① the technological capabilities of export companies and ② the competitive environment of the global market were selected as sub-factors of market characteristics. For example, the better the technological competency of the exporter, the more favorable the payment terms for the exporter. Also, the scale for measuring is a Likert-type 5-point scale (1 point = Not at all, 3 points = Moderately, 5 points = Extremely).

3.3.4. Import Characteristics

The characteristics of the importer also have a major influence on an international trade payment (Lee Yong-Keun and Park Chong-Suk, 2003). In this study, ① the characteristics of the importer and ② market power of the importer were organized into the sub-dimensions of the characteristics of the importer. For example, the stronger the market power of the importer, the more likely it is that post-payment conditions that are favorable to the importer will be presented.

The scale for measuring the above is a Likert-type 5-point scale (1 point = Not at all, 3 points = Moderately, 5 points = Extremely).

3.3.5. Payment Type

In this study, we categorized payment type, a dependent variable, into 5 payment terms: ① 100% pre-remittance before shipment, ② 100% post-remittance after shipment, ③ linked remittance between pre- and post-remittance, ④ L/C, and ⑤ mixed payment of pre-remittance and L/C. Recently, remittance payments account for 60-70% of export payments, but there are few prior studies that have studied payment methods by specifically categorizing remittance payment methods in international trade payments. Therefore, from the results of this study, it is believed that the results will provide specific implications for trade settlement, focusing on the remittance settlement method.

For this measurement, when exporting companies received export payments for the past two years, the most used payment methods were answered in first and second order, and both single response or multiple responses were made possible.

4. Research Method

4.1. Pilot Study

Before conducting this survey, a pilot test was conducted by selecting 10 exporters located in Seoul. We visited the relevant companies in person or called to explain the purpose of the study, and asked for comments on questionnaires that were not understood or uncertain.

Through this process, it was checked whether a problem occurred in the content validity of the questionnaire, and the final questionnaire was prepared by supplementing the problem. In addition, companies that had undergone pilot tests were excluded in the final survey .

4.2. Data Collection

In this study, to collect the payment data of export companies, we used the 2013 Korean Business Directory CD Ver 1.0 published by the Korea Chamber of Commerce and Industry. This data not only can extract various occupational groups but also includes addresses, phone numbers, homepages, and major industries of export companies. In addition, this study used stratified sampling to extract samples.

Stratified sampling is a method of dividing a population into two or more homogeneous layers according to a certain criterion, and extracting samples using simple randomization or accounting extraction for each layer (Kim Gu, 2011). This method of extraction, for example, can select a sample by the random selection proportional to the size of Industry A in extracting the type of business of an exporter, and the sample can also be randomly extracted in proportion to the size of Industry B. It was considered that the subjectivity of a researcher

can be excluded, and that important groups can be included in the sample without omission. From this point of view, the study extracted samples mainly from export companies located in Seoul.

The data collection period lasted about 3 months from April 1 to June 30, 2020.

During the period, a total of 300 surveys were distributed through e-mail, and direct visits were also made. Thereafter, 159 copies were recovered (a recovery rate of 53.0%), of which 12 copies with poor responses or errors were excluded, resulting in a total of 147 valid samples.

4.3. Analysis Tools

In this study, frequency analysis, reliability analysis, and exploratory factor analysis were performed using the SPSS 26.0 statistical program. In addition, the type of trade settlement, a dependent variable, was classified into advance remittance, post-remittance, linked remittance, L/C, and mixed payment, which have been recently highly utilized. Here, since the dependent variable becomes a dichotomous variable, logistic regression analysis was used. As an example of advance remittance, the probability of occurrence of pre-remittance and the probability of it not occurring were calculated according to the characteristics of transaction, market, exporter, and importer.

5. Results

5.1. Sample Characteristics

As for the size of the companies, small businesses were the largest at 113 (76.9%), and annual sales of less than 100 million to KRW 100 million were found for 59 companies (40.1%). In addition, as for industry, 66 companies in electronics and machinery account for 44.8%. As for export type, direct export was the largest with 79 companies (53.7%), and overseas export experience was found to be largest at 6-10 years (52 companies, 35.4%). See Table 2 for more specific details.

Table 2. Sample Characteristics

Criteria	Frequency (n=147)	Percentage (%)
Size of Firm		
Small businesses	113	76.9
Medium-sized enterprises	25	17.0
Large companies	9	6.1
Annual Sales (₩)		
Less than 100 million won	46	31.3
100 million won to 1 billion won	59	40.1
1 billion won to less than 5 billion won	28	19.0
5 billion won to less than 10 billion won	5	3.5
More than 10 billion won	9	6.1
Industry Classification		
Consumer goods industry	43	29.3
Basic industrial goods industry	38	25.9
Electronic and machinery industry	66	44.8

Table 2. (Continued)

Criteria	Frequency (n=147)	Percentage (%)
Form of Export Contract		
Direct export	79	53.7
Inter-branch transaction	18	12.2
Processing deal (OEM)	5	3.4
Consignment export trade	6	4.1
Agency	8	5.4
Rental export	3	2.0
Intermediate trade	5	3.4
Etc.	23	15.6
Overseas Experience		
Less than 5 years	28	19.0
6 to 10 years	52	35.4
11 to 15 years	35	23.8
More than 15 years	32	21.8
Form of Export Goods		
Raw materials	35	23.8
Components and processed goods	23	15.6
Semi-finished products	22	15.0
Finished products	51	34.7
Etc.	16	10.9

5.2. Exploratory Factor Analysis Results

An exploratory factor analysis was conducted to find whether the sub-elements of transaction characteristics, market characteristics, and importer characteristics, which are the main research constructs of this study, are grouped as expected. Principal Component Analysis was used for the factor extraction method, and according to the theoretical basis, the number of factors was designated as payment criteria, settlement efficiency, buyer reliability, and unrecovered experience. Varimax Rotation, which is a right angle rotation method, was used for clear analysis between factors. First, as a result of factor analysis of transaction characteristics, four sub-elements that were the same as expected were found (see Table 3). Factor loading values all exceeded 0.7, showing a high level of convergence validity.

Table 3. Transaction Characteristics

Construct	Item	Varimax-Rotated Loadings			
		Factor1	Factor2	Factor3	Factor4
Standard of Payment	One-time Export Volume	**.824**	-.015	.091	.072
	Criteria for Payment Choice	**.704**	.149	.014	.024
Payment Efficiency	Efficient Export Settlement	-.097	**.871**	.094	.127
	Easy Trading	.248	**.821**	.117	-.025

Table 3. (Continued)

Construct	Item	Varimax-Rotated Loadings			
		Factor1	Factor2	Factor3	Factor4
Buyer Trust	Long Trading Period	-.116	.032	**.706**	.341
	High Credit Rating of Buyers	.261	.130	**.720**	.249
	Buyer's Payment Practices	.250	.014	**.815**	.144
Unrecovered Experience	Uncollected Export Amount	-.029	.092	.039	**.863**
	Other Firms' Case of Uncollected Export Amount	-.078	.113	.127	**.860**

In the same way, factor analysis was conducted on market characteristics, and as expected, sub-factors were found in the two dimensions of technical competence and competitive environment. In addition, it has a high level of convergence validity as it exceeds all of 0.7 or more (see Table 4).

Table 4. Market Characteristic

Construct	Item	Varimax-Rotated Loadings	
		Factor1	Factor2
Technological Capabilities	Recognized Technology	**.880**	-.001
	High-Quality Products	**.872**	.021
	High Brand Value	**.764**	.245
Competitive Environment	Heavy Competition	.037	**.843**
	Market Uncertainty	.167	**.819**

Finally, the results of factor analysis of importer characteristics are shown in Table 5. As expected, it was divided into two sub-dimensions, buyer character and buyer market power, and convergence validity is supported at a high level.

Table 5. Importer Characteristics

Construct	Item	Varimax-Rotated Loadings	
		Factor1	Factor2
Buyer Character	Buyer's Size	**.791**	.271
	Unpaid Risk	**.751**	.086
	Buyer's Integrity	**.712**	.006
Market Power	Buyer's Request for Change of Payment Method	.186	**.847**
	Change of Existing Trading Conditions	.130	**.843**
	Buyer's High Bargaining Power	.166	**.745**

As described above, it can be seen that the concepts of this study, such as transaction characteristics, market characteristics, and importer characteristics, all constitute the sub-dimensions as expected. The characteristics of exporters consisted of nominal scales such as company size and industry, and were excluded from factor analysis.

5.3. Logistic Regression Results

First, looking at the results of the fitness of the model with pre-remittance as a dependent variable, the -2LL difference between the model without the independent variable and the model with the independent variable was 31.741.

When the degree of freedom was 12 in the χ^2 distribution, the probability of significance was 0.002, and this difference is statistically significant. In other words, it can be confirmed that the explanatory power of the dependent variable was significantly increased by the input of the independent variable. The -2LL value was 705.216, Cox & Snell's $R^2 = 0.053$, and Nagelkerke's $R^2 = 0.074$. The variable affecting the advance remittance was interpreted as Exp(B) as follows. First, in terms of the size of the company, the probability of a medium-sized or larger company receiving payment by advance remittance was 1.449 times higher than that of a small company.

Manufacturers with more than 21 years of export experience were also less likely to receive advance remittance payments by 0.614 times than those with less than 10 years of export experience. However, these effects were not found to be significant at the 5% significance level, so they did not receive statistical support. In addition, the higher the experience of non-recovery of the exporter, the more likely it was that the possibility of payment by advance remittance was 1.244 times higher than that of other payment options. Moreover, the better the buyer's character, a 1.655 times increase in the likelihood that the exporter will receive payment by pre-remittance occurred.

When market power is on the side of the importer, the possibility of advance remittance decreased by 0.704 times. Namely, if the importer had strong market power, the possibility of advance remittance was reduced to some extent. Next, as for the model fit of post remittance, the -2LL difference between the model without the independent variable and the model with the independent variable was 104.119. This difference is statistically significant with a significance probability of 0.000 when the degrees of freedom were 12 in the χ^2 distribution. Also, it can be seen that the explanatory power of the dependent variable significantly increased as the independent variable was introduced. The -2LL value was 659.965, Cox & Snell's $R^2 = 0.162$, and Nagelkerke's $R^2 = 0.223$.

Here, it was found that the probability of receiving payment by post remittance was 1.642 times higher than that of small companies when the size of export company was larger than medium. In addition, the likelihood of payment through post remittance from companies that produce semi-finished and finished products increased by 1.918 times over raw materials or processed products. It was also shown that the likelihood that a company with 11-20 years of export experience will receive payment by post remittance was 3.449 times higher than that of a company with less than 10 years.

In the case of export companies with established payment criteria, the likelihood of post remittance increased by 1.384 times compared to other payment terms, and the possibility of post remittance increased by 1.655 times as the buyer's characteristics were better. On top of this, it was confirmed that the higher the market power of the importer, the higher the possibility of post remittance by 1.348 times, but it was not significant at a significance level of 5%.

Table 6. Logistic Regression Analysis on Remittance

Payment Type	Predictor	B	S.E.	Wald	d.f	p	Exp(B)
Advance Remittance	Size_Dum	.371	.221	2.811	1	.094	1.449
	Category_Dum	-.116	.195	.356	1	.551	.890
	Experience_Dum1	-.342	.256	1.777	1	.182	.711
	Experience_Dum2	-.488	.275	3.148	1	.076	.614
	Standard of Payment	-.159	.141	1.261	1	.261	.853
	Payment Efficiency	.215	.125	2.981	1	.084	1.240
	Buyer Trust	.015	.169	.008	1	.928	1.015
	Unrecovered Experience	.219	.111	3.859	1	.049	1.244
	Technological Capabilities	-.095	.146	.418	1	.518	.910
	Competitive Environment	-.130	.128	1.018	1	.313	.878
	Buyer Character	.504	.149	11.471	1	.001	1.655
	Market Power	-.351	.144	5.972	1	.015	.704
	Constant	1.098	.963	1.300	1	.254	.333
Later Remittance	Size_Dum	.496	.222	4.975	1	.026	1.642
	Category_Dum	.651	.202	10.419	1	.001	1.918
	Experience_Dum1	1.238	.301	16.895	1	.000	3.449
	Experience_Dum2	.318	.317	1.003	1	.317	1.374
	Standard of Payment	.325	.155	4.378	1	.036	1.384
	Payment Efficiency	.151	.135	1.261	1	.262	1.163
	Buyer Trust	.307	.178	2.963	1	.085	1.359
	Unrecovered Experience	.138	.112	1.510	1	.219	1.148
	Technological Capabilities	.278	.155	3.208	1	.073	1.321
	Competitive Environment	.034	.132	.068	1	.795	1.035
	Buyer Character	.504	.154	10.759	1	.001	1.655
	Market Power	.298	.158	3.549	1	.060	1.348
	Constant	8.941	1.190	56.440	1	.000	.000

Notes: Dum means Dummy Variable.

Next, in the model fitness of the linked remittance linking pre-remittance and post-remittance, the -2LL difference between the model without the independent variable and the model with the independent variable was 77.922; when the degree of freedom was 12 in the χ^2 distribution, the significance probability was 0.000. The difference is also statistically significant. In other words, it can be seen that the explanatory power of the dependent variable was significantly increased by the input of the independent variable. The -2LL value

is 737.192, Cox & Snell's $R^2 = 0.124$, and Nagelkerke's $R^2 = 0.165$. Here, the possibility that companies exporting semi-finished products and finished products will receive linked remittance payments is 1.490 times higher than that of other payments (see Table 7).

In addition, when the export company's payment standard was established, the possibility of linked remittance was reduced by 0.463 times, but when the efficiency of payment increased by one unit, the likelihood of linking remittance increased by 1.388. This proves the fact that when paying for trade payments, linked remittance is made when the efficiency of payment is important.

Table 7. Logistic Regression Analysis on Connected Remittance and L/C

Payment Type	Predictor	B	S.E.	Wald	d.f	p	Exp(B)
Connected Remittance	Size_Dum	-.281	.214	1.715	1	.190	.755
	Category_Dum	.399	.189	4.437	1	.035	1.490
	Experience_Dum1	-.290	.261	1.240	1	.266	.748
	Experience_Dum2	-.490	.272	3.239	1	.072	.613
	Standard of Payment	-.769	.143	28.849	1	.000	.463
	Payment Efficiency	.328	.121	7.292	1	.007	1.388
	Buyer Trust	-.127	.165	.591	1	.442	.881
	Unrecovered Experience	-.141	.109	1.699	1	.192	.868
	Technological Capabilities	.522	.145	12.918	1	.000	1.686
	Competitive Environment	.230	.124	3.417	1	.065	1.259
	Buyer Character	.102	.141	.522	1	.470	1.107
	Market Power	.604	.148	16.742	1	.000	1.829
	Constant	2.563	.969	6.999	1	.008	.077
Letter of Credit	Size_Dum	-.474	.218	4.727	1	.030	.622
	Category_Dum	.496	.196	6.408	1	.011	1.642
	Experience_Dum1	1.837	.287	41.031	1	.000	6.277
	Experience_Dum2	1.832	.307	35.606	1	.000	6.248
	Standard of Payment	-.282	.149	3.600	1	.058	.754
	Payment Efficiency	-.051	.128	.161	1	.688	.950
	Buyer Trust	.330	.168	3.869	1	.049	1.391
	Unrecovered Experience	.157	.109	2.089	1	.148	1.170
	Technological Capabilities	-.041	.148	.077	1	.781	.960
	Competitive Environment	-.519	.133	15.303	1	.000	.595
	Buyer Character	.077	.146	.273	1	.601	1.080
	Market Power	-.374	.144	6.705	1	.010	.688
	Constant	1.162	.975	1.421	1	.233	3.196

Note: Dum means Dummy Variable.

Additionally, the higher the technology competency of the exporter, the more likely the linked remittance was made increased 1.686 times, and the more competitive the environment, the higher the probability of linked remittance increased 1.259 times. However, it was not significant at the 5% significance level. It was found that the stronger the market power of the importer, the more likely the payment will be made by linked remittance increased 1.828 times higher than that of other payment possibilities.

For credit payment, the -2LL difference between the model without the independent variable and the model with the independent variable was 105.464; when the degree of freedom was 12 in the χ^2 distribution, the significance probability was 0.000, which is statistically significant.

In other words, it can be seen that the explanatory power of the dependent variable was significantly increased by the input of the independent variables. The -2LL value is 707.471, Cox & Snell's R2 = 0.164, and Nagelkerke's R^2 = 0.219.

Here, it was found that the likelihood of paying with a L/C for medium-sized enterprises decreased by 0.622 times more than that of small-sized firms. On the other hand, it was analyzed that the likelihood that companies that export semi-finished and finished products were more likely to make payments using a L/C was 1.642 times higher than that of companies that export raw materials and primary products.

Table 8. Logistic Regression Analysis on Mixed Payment

Payment Type	Predictor	B	S.E.	Wald	d.f	p	Exp(B)
Mixed Payment	Size_Dum	.476	.225	4.491	1	.034	1.610
	Category_Dum	-.305	.196	2.428	1	.119	.737
	Experience_Dum1	.187	.269	.483	1	.487	1.206
	Experience_Dum2	.354	.285	1.547	1	.214	1.425
	Standard of Payment	-.096	.146	.428	1	.513	.909
	Payment Efficiency	-.173	.131	1.749	1	.186	.841
	Buyer Trust	.349	.173	4.059	1	.044	1.418
	Unrecovered Experience	.012	.112	.012	1	.912	1.012
	Technological Capabilities	-.577	.150	14.706	1	.000	.562
	Competitive Environment	-.016	.131	.015	1	.902	.984
	Buyer Character	-.966	.154	39.345	1	.000	.380
	Market Power	-.245	.148	2.752	1	.097	.782
	Constant	4.815	1.025	22.057	1	.000	123.324

Note: Dum means Dummy Variable.

Companies with 11-20 years of export experience were also more likely to pay with an L/C by 6.277 times than companies with less than 10 years of export experience, and companies with more than 21 years of export experience were more likely to use an L/C than companies with less than 10 years of export experience by 6.248 times. This result can be attributed to the fact that companies with long experience in the export market prefer an L/C to avoid the risk of settlement.

When an exporter has clearly established a payment standard, the possibility of using an L/C also decreased by 0.754 times. Moreover, even if an export company had a long business relationship with a buyer, and the buyer has creditworthiness, the possibility of transacting with an L/C is 1.391 times higher than that of other payments.

Meanwhile, in a competitive market environment, the possibility that an exporter will receive payment with an L/C decreased by 0.595 times, and when an importer is in control, the probability of receiving payment by L/C was also analyzed to decrease by 0.688 times. Since the beneficiary of the credit is an exporter, and the importer has various burdens due to the opening of credit, it can be interpreted that if the importer has market power, the utilization of the credit is also reduced.

Content related to mixed payment can be found in Table 8. First, the -2LL difference between the model without the independent variable and the model with the independent variable was 75.939, when the degree of freedom was 12 in the χ^2 distribution and the significance probability was 0.000, which is statistically significant. Namely, the explanatory power of the dependent variable increased significantly by the input of the independent variable. The -2LL value is 688.164, Cox & Snell's $R^2 = 0.121$, and Nagelkerke's $R^2 = 0.167$. Here, when the export company's size is relatively large, the possibility of mixed payment increased by 1.610 times, and when the credit to buyers was also high, the chance of mixed payment increased by 1.418 times.

However, when the export company's technical competence is high, the probability of mixed payment decreased by 0.562 times, and the buyer's characteristics reduced mixed payment by 0.380.

Table 9 is a result of the analysis of how the export amount and transaction period, which are considered important variables in selecting a trade payment, have an effect on export company adoption of trade payment. First, companies whose export amount is more than 100 million to 1 billion won have are 2.484 times more likely to pay by pre-remittance compared to companies with less than 100 million won. Exporters with more than 1 billion won have an increased possibility of advance remittance by 1.976 times compared to those with less than 100 million won. In other words, the greater the export amount, the greater the possibility of advance remittance.

Meanwhile, export companies whose transaction period with importers is 6-10 years were reduced by 0.632 times more than that of exporters with 5 years or less. Companies older than 11 years were also less likely to pay by advance remittance by 0.352 times compared to companies with less than 5 years.

Regarding post remittance, it was found that the likelihood that exporters with export amounts of more than 100 million to 1 billion won receive payment by post remittance was 2.817 times higher than that of companies under 5 years. As the transaction period increases, post remittance also increases. In other words, the possibility of an exporter with a transaction period of 6-10 years receiving post remittance was 1.856 times higher than that of a company with less than 5 years. It was also analyzed that the likelihood that exporters older than 11 years receiving post remittance was 1.927 times higher than that of exporters older than 5 years.

The only variable that had a significant effect on linked remittance was export amount, but the possibility that an exporter with an export amount of more than 100 million to 1 billion will receive linked remittance was reduced by 0.483 times compared to an exporter of less than 100 million won.

In the case of an L/C, export amount did not have much effect on the choice of payment with an L/C, and in particular, export companies with a transaction period of 6-10 years were 2.094 times more likely to receive payments by L/C than exporters with less than 5 years.

Table 9. Logistic Regression Analysis of Export Amount and Transaction Period on Payment Type

Payment Type	Predictor	Estimate	95 %Confidence Interval		S.E.	z	p	Odds ratio
			Lower	Upper				
Advance Remittance	Export Amount_Dum1	.910	.452	1.367	.234	3.90	.001	2.484
	Export Amount_Dum2	.681	.188	1.173	.251	2.71	.007	1.976
	Transaction Period_Dum1	-.459	-.893	-.024	.222	-2.07	.039	.632
	Transaction Period_Dum2	-1.045	-1.530	-.559	.248	-4.22	.001	.352
Later Remittance	Export Amount_Dum1	1.036	.589	1.482	.228	4.55	.001	2.817
	Export Amount_Dum2	.422	-.066	.911	.249	1.69	.090	1.526
	Transaction Period_Dum1	.618	.158	1.079	.235	2.63	.008	1.856
	Transaction Period_Dum2	.656	.178	1.133	.243	2.69	.007	1.927
	Export Amount_Dum1	-.728	-1.135	-.320	.208	-3.50	.001	.483
Connected Remittance	Export Amount_Dum2	-.139	-.577	.298	.223	-.624	.533	.870
	Transaction Period_Dum1	.111	-.302	.525	.211	.528	.598	1.118
	Transaction Period_Dum2	-.359	-.797	.079	.224	-1.60	.108	.698
Letter of Credit	Export Amount_Dum1	-.111	-.518	.296	.208	-.534	.593	.895
	Export Amount_Dum2	.067	-.372	.508	.225	.302	.763	1.070
	Transaction Period_Dum1	.739	.324	1.154	.212	3.49	.001	2.094
	Transaction Period_Dum2	.833	.393	1.272	.224	3.71	.001	2.300
Mixed Payment	Export Amount_Dum1	-.622	-1.038	-.206	.212	-2.93	.003	.537
	Export Amount_Dum2	-.984	-1.452	-.515	.239	-4.12	.001	.374
	Transaction Period_Dum1	.342	-.098	.783	.225	1.52	.128	1.408
	Transaction Period_Dum2	.501	.038	.964	.236	2.12	.034	1.651

Note: Dum1 and Dum2 mean Dummy Variables.

In addition, it was analyzed that the likelihood of an export company with a transaction period of 11 years or more receiving payment through an L/C increased by 2.300 times compared to a company with less than 5 years. This result contradicts the common sense of general payment that the utility of an L/C generally decreases as the transaction period of an import/export company increases. In the combined payment of remittance and L/C, the likelihood that exporters with an export amount of more than 100 million to 1 billion will receive payment through mixed payments was reduced by 0.537 times compared to those with less than 100 million. In addition, the likelihood of companies with more than 1 billion won to receive payments with mixed payments decreased by 0.374 times compared to those with less than 100 million. In addition, the chance of an export company with a transaction period of 11 years or more receiving payment by mixed payment was 1.651 times higher than that of an exporter less than 100 million.

Fig. 4 shows the relationship between advance remittance and export amount more intuitively. The possibility of advance remittance significantly increased when the dummy variable was 1 compared to when the dummy variable was 0. Fig. 5 indicates the relationship between advance remittance and the transaction period. When the dummy variable was 1, it can be seen that the possibility of pre-remittance was significantly reduced.

Fig. 4. Relationship between Advance Remittance & Export Amount
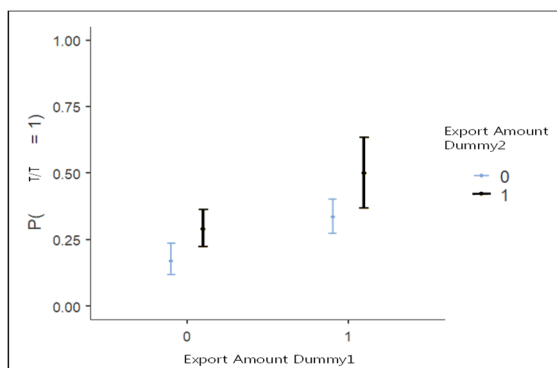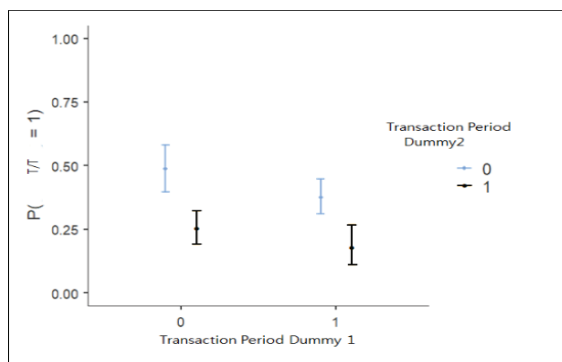

Fig. 5. Relationship between Advance Remittance & Transaction Period

6. Discussion & Implication

In international trade, exporters prefer to receive payments as quickly as possible, and importers want to make payments as late as possible. In this respect, the payment field, a basic condition for trade transactions, is also representative in which the positions of exporters and importers conflict. In addition, there are many cases in which various variables must be considered rather than only one specific variable representatively affecting payment.

For instance, from the importer's point of view, if the quality of the exported goods is excellent or scarce, the importer is likely to make payment before shipment to preempt it in the global market. However, if market power is with the importer, the possibility of pre-payment will be lowered.

Also, in organization theory, some organizations do not easily accept a change due to the inertia of the organization, even when the external environment changes or any innovation is selected (Gilbert, 2005). In other words, even if embracing changes in the external environment is beneficial to most organizations in the long term, there are cases in which they cannot be implemented (Besson and Rowe, 2012). Therefore, it is generally predictable to maintain any practice for a certain period of time to the extent that it does not significantly affect the corporate profit structure.

In the meantime, the utilization of the L/C, which has held a key role in trade payment, has gradually decreased, and the utilization rate of the export L/C has remained at more than 10% of the total amount of an export payment. In addition, the situation related to trade payments has changed recently as remittances occupy vacant places where there was an L/C. Furthermore, although not much has been revealed academically, remittance payments are more subdivided and utilized in practice. As the trade payment environment changes, an academic approach to these changes has been required, but it has been difficult to find studies that satisfy these demands. This study was conducted to fill the academic gap required in this respect. The main results analyzing the L/C and mixed payment are presented and discussed as follows.

First, as a result of analyzing the relationship between export experience and L/C, it was found that companies with high export experience were more likely to choose L/C transactions than those with low export experience. Specifically, even if buyers have high credit ratings, they are more likely to choose an L/C. This result suggests that companies with greater export experience are more likely to choose payment methods such as an L/C that can more effectively manage risks arising from the market. To interpret the reason why the L/C has a high utilization even when a buyer's credit is favorable, the buyer will stand a chance to accept the request of the exporter in good faith when there is a demand for an L/C from an exporter. These results remind us that there is a favorable relationship that satisfies each parties' needs in similar businesses rather than a one-dimensional view that buyer post-payments increase if a buyer's credibility is high.

Meanwhile, in a competitive market environment, the selection of the L/C is decreasing, and as the market power of importers increases, the choice of the L/C also decreases. In other words, if competition among companies in the global market is intense and/or market uncertainty is large, the possibility of using an L/C will decrease. Thus, in a case where fierce competition between companies or of high market uncertainty, faster logistics and provision of services may be highly required, but in the case of an L/C, there are relatively many restrictions in this respect. A practice such as the surrendered B/L, which is widely used to provide fast logistics services to local importers, is also hampered in the L/C system where requesting original documents is in principal.

If market power belongs to the importer, the use of a cumbersome L/C payment for the importer decreases. When it comes to mixed payments, the larger the company, the greater the possibility of using mixed payments. On the other hand, it was found that the higher the technical competence of an exporter and the more reliable the buyer's character, the less likely a mixed payment.

When we juxtaposed these results with linked remittance and post remittance, it can be considered that the higher the technical competence of the exporter, the higher the possibility of linked remittance over mixed payment. A buyer's character also can be judged to be more meaningful in the selection of post remittance over a mixed payment.

Finally, the results of analyzing how the export amount and transaction period affect the choice of payment type are as follows.

First, the greater the export amount, the greater the possibility of advance remittance, and post remittance only increased when the export amount was more than 100 million to 10 billion won. On the other hand, linked remittance decreased when the export amount was more than 100 million to 10 billion. In the L/C, there was no significant relationship with export amount, and mixed payment decreased as the export amount increased.

These results are believed to reflect the fact that remittance payments occupied the largest part of trade settlement in recent years, and that the use of T/T-based remittance payments have increased even for relatively large trade payments. In addition, as the export amount increases, it can be thought that the utilization of a mixed settlement combined with advance remittance and an L/C will increase, but this study clearly exemplifies that it is decreasing. The reason for this is that the difference in export amount is relatively small due to the majority of this study sample being concentrated in small enterprises.

Next, when examining the effect of the transaction period on the selection of payment type, it was confirmed that when the transaction period with the importer is prolonged, pre-remittance significantly decreases, and post remittance increases significantly. Therefore, it is understood that Korean exporters tend to receive payments by post remittance when the transaction period with the importer is long.

In general, it is known that the longer the transaction period between the exporter and the importer, the more credit is accumulated with the importer, such that a simpler payment tool is preferred instead of an L/C. On the other hand, according to the results of this study, the possibility of selecting an L/C persists even when the transaction period is long.

These research results can be considered in connection with this research sample. In other words, as most of the subjects of this study are small exporters, these small-scale exporters are often have insignificant financing capabilities. In this case, even if the transaction period is extended, there is relatively little room to change to other payment terms.

For example, small-scale exporters have to procure raw materials to export overseas. In this case, an exporter uses a local L/C to relieve the burden of investing equity capital. As such, the original L/C is required to benefit from trade finance, which means that the demand for an export L/C does not diminish for small exporters. Also, as is well known, there are many cases in practice that importers consider the situation of small exporters in good faith. The main implications of this study are as follows.

First, this study subdivided trade payment types into pre- and post-remittance, as well as linked remittances linked with pre- and post-remittance, and mixed payments linked with pre-remittances and letters of credit, focusing on remittances that have been widely used in recent trade payments. Until now, little research has been done on which the types related to remittances have been subdivided and applied, and this research can be expected to expand related research perspectives on international trade payments. Second, this study also

provides implications in terms of trade payment methodology.

In other words, the significance of this study is recognized in that payment type was subdivided into advance remittance, post remittance, linked remittance, L/C, and mixed payment, and a binominal logit analysis model was established for, resulting in meaningful results. Generally, it is hard for researchers to collect payment data, not least because exporters often use more than one payment method, such as advance remittance or L/C.

In this respect, as many previous studies did, the assumption that one enterprise only uses one payment is not suitable for a real situation. In order to overcome these limitations, this study categorizes the data using a ranked scale for the most used payment. Then, through logit analysis, the probability of selecting a corresponding payment method and other payment methods was calculated.

Therefore, this attempts of this study are considered to have a large spin-off in subsequent studies in that it not only reflects the latest payment environment but also attempts a more realistic methodological approach.

The main results of this study are presented and discussed as follows. First, from the analysis results of the remittance sector, including pre-remittance, post remittance and linked remittance, it was confirmed that the more experience the exporter has with unrecovered trade payments, the more likely it is to choose advance remittance. The possibility of advance remittance was also significantly reduced when the market power of the importer was large.

On the other hand, the possibility of post remittance increased when the amount of an export was large, or when the exporter had certain payment standards for trade payments. In terms of export amount, the greater the amount to be paid, the greater the burden on the importer, such that there was a high possibility of post payment.

In addition, the more reliable a buyer's character, the higher the possibility of post-remittance, which can be thought of as an agreement on post-remittance in order for the exporter to believe in the integrity of the importer and strengthen the business relationship. What is a more remarkable result of linked remittance is that the possibility of linked remittance increases when the efficiency of payment is emphasized. The higher the technical competence of the exporter, the greater the possibility of a linked remittance. This result tells the possibility that if the export amount is large and the quality of the exported goods is superior, advance payment for raw material procurement costs is paid first by a buyer, and the balance is settled afterwards. Furthermore, even when the market power of the importer is high, the possibility of linked remittance is significantly increased.

Despite this study making such an academic contribution to the field of trade payment, there are also limitations. First, 147 copies of data were collected mainly from export manufacturers located in Seoul, but the collected data were not sufficient to attempt various analyses. In addition, since most of the research samples were concentrated in small-scale enterprises, caution is advised in generalizing the results of this study.

Second, despite the growing number of transactions between head offices and branch offices in international payments, the lack of control over these areas is also a limitation. For instance, it is presumed that special circumstances, such as transactions between a head office and branch offices, are somewhat different from the payment mechanism chosen by exporters and importers, who are far apart and lacking mutual trust. Thus, it is judged that more detailed research is needed to supplement these limitations in future research.

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