

## Lending Behavior of Japanese Megabanks in the Thai Project Finance Market

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— *Review of* —  
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### ABSTRACT

This study aims to demonstrate the characteristics of the lending behavior of Japanese megabanks in international project finance markets, and to measure their international competitiveness. Overseas lending is one of the key growth strategies of megabanks, and international project financing attracts great interest from the banking industry. However, this topic has not been researched from the academic perspective. In order to investigate lending behavior, this study uses detailed data of project finance deals that were executed between 2009 and 2014. We employ a multilevel mixed logit model to analyze 2,685 samples. Estimation results demonstrated that megabanks prefer project finance denominated in United States dollars (USD) because they have difficulties in financing in local currency. The participation probability of megabanks is not affected by loan maturities. This behavior differs from that of local banks, whose participation probability is affected by loan maturities, so that longer maturity enhances local bank participation in project financing. This difference indicates that local banks have the advantage in local currency funding, and they consider relationships with sponsor companies.

Keywords: Project finance, Japanese banks, Multilevel mixed logit model

### 1. Introduction

Overseas lending has strengthened its presence as a prime growth strategy of Japanese megabanks<sup>1</sup>. The megabanks recorded a significant increase in overseas lending as of September 2014. According to their financial reports, Bank of Tokyo-Mitsubishi UFJ, Sumitomo Mitsui Bank, and Mizuho Bank increased their annual overseas lending by 24.2%, 24.8%, and 23.8%, respectively. This expansion of overseas lending result in a larger interest rate margin because domestic revenues are shrinking due to a prolonged decline in long-term interest rates. Further, the international business divisions of these megabanks earn a significant share of their total profits. The share of international

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<sup>1</sup> Here, we call Mizuho Bank, Sumitomo Mitsui Bank, Bank of Tokyo-Mitsubishi UFJ as megabanks, excluding Resona Bank which did not participate project financing in Thailand.

business divisions in net operating profits are 28.7%, 40.9%, and 24.6% for Mizuho Bank, Bank of Tokyo-Mitsubishi UFJ, and Sumitomo Mitsui Bank, respectively. Hence, overseas lending attracts a great interest from the banking industry including regional banks<sup>2</sup>.

Among the various types of overseas lending, megabanks have increased their presence specifically in international project financing markets. They occupied the top three positions in the ranking of project financing in 2014: Bank of Tokyo-Mitsubishi UFJ was ranked first, and Sumitomo Mitsui Bank, and Mizuho Bank were ranked second and third, respectively. Furthermore, Bank of Tokyo-Mitsubishi UFJ has maintained its position for three consecutive years. Additionally, BNP Paribas and Credit Agricole ranked fourth and fifth, respectively. Megabanks have outpaced French banks, which have demonstrated competitiveness in project financing markets for a long time.

The behavior of megabanks as lenders of project financing is an important aspect, and we have not yet studied the details of competition in this market. Only league tables have depicted the activities of megabanks by demonstrating the ranking in terms of arranger banks. Hence, this study uses detailed data of project finance transactions, and presents the competitive situation in the market. Specifically, we investigate the project finance market in Thailand, being one of the developing countries that have an increasing demand for project financing. Subsequently, we demonstrate characteristics of megabanks based on comparisons with lending behavior of local banks.

The remainder of this paper is structured as follows. In the next section, we depict overview of the project finance market in Thailand by ranking of the league table. Section 3 presents a typology of related literature, which investigates differences in lending behavior between bank types. Then, we demonstrate similarities and differences of this study with related literature and show the academic positioning of this study based on the typology. Section 4 presents an overview of project finance deals from several perspectives, and introduces an analytic method: multilevel mixed logit model. Section 5 presents characteristics of megabanks from estimation results, and discusses major results. Finally, Section 6 summarizes the results of our investigation, and explains their implications for future studies.

## **2. Review of project finance market**

We demonstrate activities of Japanese megabanks in Thai project finance market from

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<sup>2</sup> Regional banks also is expanding overseas lending. See Yamaguchi (2015) for details of regional bank participation in international syndicated loans.

the league table. This league table covers transactions that were executed from 2009 to 2014. This research period is rational to investigate lending behavior of megabanks because they expanded overseas activities during this period. The league ranks major banks in terms of total amount of deals in which they participated.

Table 1. Participation ranking

Rank	Lender	Amount (Million USD)	Deal Count
1	Kasikorn Bank *	10,974	69
2	Siam Commercial Bank *	9,260	32
3	Bangkok Bank *	8,904	19
4	Bank of Ayudhya *	6,286	24
5	Krung Thai Bank *	5,920	23
6	Mitsubishi UFJ Financial Group	5,802	9
7	Mizuho Financial Group	5,028	14
8	TMB Bank *	4,551	18
9	Export-Import Bank of Thailand *	3,931	8
10	Siam City Bank *	3,153	4
11	Sumitomo Mitsui Financial Group	2,612	9
12	Land & Houses Bank *	2,376	9
13	CIMB Group	2,000	2
14	Asian Development Bank	1,169	6
15	TISCO Bank *	1,036	7
16	Japan Bank for International Cooperation	1,025	3
17	Natixis	980	2
18	HSBC	980	2
19	Societe Generale	956	2
20	Oversea-Chinese Banking Corp	804	2

Source: Thomson Reuters, *DealScan*

Note: Asterisk denotes local bank.

The amount indicates the accumulated amount of all deals in which each bank participated.

Table 1 presents the actual ranking, which differs from prior expectations. We expected the megabanks and other foreign banks to dominate the league table because megabanks occupy the top three positions in the global project finance ranking of 2014 and, they additionally reached a record-high market share of 14.9% as arranger bank. However, Thai local banks, such as Kasikorn Bank, Siam Commercial Bank, and Bangkok Bank

dominate the project finance market, and Japanese megabanks do not necessarily exhibit competitive advantage in contrast to their global ranking.

Our prior expectation is based on the assumption that only few financial institutions such as the US, European and Japanese banks that are eager to conduct overseas business, play the role of lead arranger. This is because project financing requires sophisticated know-how about screening of project risks and understanding of laws and regulations. Conventional corporate financing measures the repayment probability based on borrowers' credibility and collateral. In addition, screening of project financing analyzes cash flow and profit of the project, and measures the value of project assets as collateral because repayment sources of project financing are limited to cash flows generated by the project. Further, project financing entails several risks that should be monitored. For example, monitoring consists of diversified components: verification of construction progress updates, cost repayments in the construction stage and confirmation about operation, and financial reporting of special purpose company (SPC) in the operation stage.

However, the league table shows the competitive advantages of local banks. We can present two reasons to explain the current situation in Thailand. First, higher profits facilitate participation in project financing. The significance of infrastructure development to banks is not restricted to the fact that these big projects require huge loan demands. Project financing presents various revenue opportunities such as underwriting fee and agency fee because most of loans require bank syndication for sale of all portions of a loan<sup>3</sup>.

Second, an increase in the number of infrastructure projects in which local sponsor companies participate facilitates local banks' penetration into the project financing market based on relationship between local sponsors and local banks<sup>4</sup>. The primary business area of Thai banks is domestic loans, and they have recently started extending Thai Baht loans to a neighboring country. Specifically, Thai banks provide loans for the construction and operation of power plants because Thailand imports electricity generated by water power plants in Lao, and its payment is denominated in Thai Baht.

On the other hand, the entry of local banks poses a concern regarding the standards of these banks as not being compliant with the global standards for project screening and loan protection. Measures to protect loans that are arranged by local banks are weak and different from those that apply to the rest of the world. This is because local banks

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<sup>3</sup> In addition, the arranger bank often concurrently serves as an agent bank. The agent bank is required to conduct variable operations in order to protect credited loans. These operations include managing bank deposits, repayments, and money transfers of SPC, and placement of mortgage on assets of SPC.

<sup>4</sup> Sponsor companies from developed countries have led infrastructure projects in Asia.

emphasize more on long-term relationships with local sponsor companies, as compared to project feasibility, and these relationships affect banks' judgment about lending. Moreover, local banks' screening ability about project feasibility is yet limited.

The league table indicates that local banks emerge as formidable competitors to megabanks contrary to our expectation. These local banks have accumulated expertise about project finance and extend their competitive edge. To understand how megabanks behave in such a competitive market environment, we demonstrate characteristics of megabanks based on comparisons with local banks.

### **3. Related literature**

This study investigates differences in lending behavior between bank types, which is a major topic in banking research. This section presents a taxonomy of related literature. We can divide the literature into three categories from the perspectives of confrontations between bank types.

The first type of investigation compares local banks with foreign banks. For example, Haselmann and Wachtel (2011) examine foreign banks' motives in participating in cross-border deals in 25 European countries. They identified differences between local and foreign banks. The usual argument is that foreign banks are at a disadvantage compared to their domestic counterparts because they lack soft information, and thus tend to lend to firms that are more transparent. However, the empirical results demonstrated that this relationship only holds true in relatively small financial systems, and that foreign banks grant loans to riskier companies and projects in countries with a developed financial market.

In another study, Pessarossi, Godlewski, and Weil (2010) answered a question regarding the possible effect of information asymmetry on foreign bank participation in syndicated loans. They built a measurement to capture information asymmetry based on ownership concentration of the borrower. They introduced this measurement as an explanatory variable to estimate the equation, and regressed this measurement to an explained variable: the ratio of foreign banks among participant banks. Estimation results confirmed that the ownership concentration does not affect foreign bank participation, but high leverage of borrower tends to discourage foreign bank participation in syndicated loans.

Similar studies focused on decisions on spread, which is an additive interest rate, in measuring lending behavior. Specifically, this type of analysis used an estimation equation in which the explained variable is spread and the explanatory variables include

loan terms as well as dummy variables representing bank types.

The second type investigates differences between commercial banks and investment banks. Harjoto, Mullineaux, and Yi (2006) examined 6080 syndicated loans in the US conducted from 1996 to 2003. They investigated differences in spread decisions between bank types. Their empirical results showed that investment banks granted loans with longer maturities and higher spreads to companies with relatively lower profitability and higher leverage. The difference in spread between these two types of financial institutions can be attributed to funding sources, financial regulations, accounting rules and relationships with customer companies. This result implies that there is a segmentation of banks in syndicated loan markets.

The third type studies differences between regional banks and nationwide banks. Yamaguchi (2015) examines the factors that explain the lending behavior of regional banks in the international syndicated loan market from 2009 to 2014. Through a comparative analysis and probit model using data from 11,565 transactions, it is found that regional banks prefer to participate in syndicated loans of lower amounts. The denomination of loans in Japanese yen is the most important factor in increasing the probability of regional banks participating in these loans. The second most important consideration in explaining the lending behavior of regional banks relates to the characteristics of the borrowers. Regional banks prefer Asian borrowers who are in the financial services industry. Risk-taking and funding capacities can explain the characteristics of regional banks.

The overview of the previous literature shows the position of this study in the research field from three perspectives. First, this study is similar to existing studies in having a common research purpose, which is to investigate lending markets related to the syndication. In addition, this study focuses on the project finance market, and has social significance from the perspective of emerging market countries that have many infrastructure projects. Second, this study is similar to the first type in terms of a comparative framework, while our interest specializes in lending behavior of Japanese megabanks. This study is important in understanding the growth strategies of the Japanese economy. Third, previous studies used binary-choice model to investigate binary responses of banks, while this study employs the multilevel mixed logit model to lending behavior in project finance market in identifying characteristics of respective banks. This study differs from related literature in the above-mentioned ways, and these differences enable us to contribute to a major research topic.

#### **4. Methodology**

#### 4.1 Sample

Our investigation requires detailed data that includes loan terms such as loan amount, and borrower characteristics. We obtained the required information from the *DealScan* database, provided by Thomson Reuters LPC. This is the world's largest database specializing in loan transactions, and contains information on over 150,000 loan transactions covering Asia, North America, South America, and Europe. Many related studies, including those of Haselmann and Wachtel (2011), and Yamaguchi (2015), have employed this database. The sample to be examined comprises 98 deals including 181 tranches, executed from 2009 to 2014.

Table 2. Deal overview: Continuous variables

Variables	Mean	Standard Deviation	Min	Max	sample
Amount (USD million)	95.3	236	0.2	1965	181
Maturity (year)	13.5	6.7	0.16	25	179
Size	2.5	1.4	1	9	181

*Source:* Author's calculation based on *DealScan*

Table 2 represents transactions in terms of three continuous variables. It is significant to note the high standard deviation of 236 million USD in the loan amount. In general, though the loan amount of project finance is very large, the loan size is very small. The purpose of these small loans is the payment of value added tax, and we confirmed the tendency of these loans to be extended as the second tranche of loans for construction of solar power plants. Alternately, the purpose of large-sized loans is the construction of gas-fired power plants. The large size of these facilities requires large amount of loans, and this variation is greater than our expectation.

The average period of loan maturity is 13.5 years, and the maximum is 25 years. These figures are in accordance with the general assumption that infrastructure projects require long-term loans. Additionally, there exist loans with extremely short maturity periods, such as bridge loans with maturity of less than 1 year. Bridge loans help in bridging the gap between short-term cash requirements and long-term loans. These loans are normally extended for a period of 12 months. We additionally find diversified types of loans in terms of their maturity periods.

Size indicates a syndicate size as measured by the number of participant banks including arranger banks in a bank syndicate. We expected a bank syndication to attract

several banks in considering large-sized infrastructure projects. However, the average number of participant banks is 2.5, which is much smaller than our expectation, because the share of transactions denominated in Thai Baht is large. A relatively small number of local participant banks that finance the abundant Thai Baht deposit can extend these loans.

Table 3 demonstrates deal characteristics from several perspectives. We find an overwhelming share of transactions denominated in Thai Baht currency. This is an unexpected result because project financing in developing countries was generally denominated in foreign currencies before the Asian currency crisis. The situation has completely changed, and local currency financing is now prevalent in the project finance market. This is because it is rational for infrastructure projects to finance in local currencies since projects generate more revenues in local currency.

Table 3. Deal characteristics

(Unit: %)

Distribution method	Syndication	53.7	Currency	Foreign	15.4
	Club	24.8		Thai Baht	84.6
	Bilateral	21.5	Facility type	Term loan	79.8
Project type	Solar	46.4		Revolving	3.8
	Wind	5.5		Guarantee	7.1
	Fire	46.9		VAT	7.7
Tranche	First tranche	51.4	Bridge	1.6	
	Second tranche	27.6	Public	ADB	3.8
	Third tranche	12.1	Financial	JBIC	1.6
	Below third	8.9	Institution	IFC	2.2

*Note:* ADB, JBIC, and IFC indicate Asian Development Bank, Japan Bank for International Cooperation, and International Finance Corporation, respectively.

*Source:* Author's calculation based on *DealScan*

The power generation project type is observed to dominate the market<sup>5</sup>. This is because Thailand implemented electricity market reforms in 1992, and enabled privatization of the power generation industry in the form of Independent Power Producers (IPP), and Small Power Producers (SPP). Private companies, as sponsors, have financed

<sup>5</sup> Infrastructure projects can be divided into two major categories: economic and social infrastructure. The former comprises construction of power plants, water supply and sewerage systems, railways, airports, and express ways. They are suitable for public-private partnership.



construction of power plants through project financing since the 1990s. These experiences accumulated sufficient know-how of project financing, and the purpose of almost all transactions is the construction of water and gas-fired power generation plants.

The result about distribution methods complies with the general assumption. The method of extending loans by several banks in the form of syndicated loans or club deals accounts for approximately 80%. In general, infrastructure projects such as construction of power plants are large-scale, with a large size of financing. Bilateral loans to such large-scale projects are difficult to avoid concentration risk<sup>6</sup>. Banks are inclined to seek a diversifying effect by extending loans with several banks. Hence, syndication and club deals dominated the distribution method results.

Term loans dominate facility types with a 79.8% share. However, facility types includes several forms but term loans. Revolving loan is mainly used to address demands for working capital on the premise of commitment line. Guarantee includes the issuance of a standby letter of credit. It serves as a parallel (collateral) payment source in case the primary source fails to meet its obligations in part or in full, and is a substitute for a performance bond or payment guarantee. VAT loan provides a financing for value-added tax payment. Bridge loan is a type of short-term debt that covers the time period between the conclusion of a prior loan and the commencement of another loan. Thus, the recipient is committing to obtain long-term financing shortly that will pay off the bridge loan.

With reference to public financial institutions, we find that ADB participated in 21 transactions, while JBIC and IFC participated in 9 and 12 transactions, respectively. Among these transactions, the guarantee facility is significant because both ADB and JBIC provided six and three guarantees, respectively. These guarantee facilities were provided to other private banks. Provision of funds by public financial institutions has a pump-priming effect, and facilitates participation of private banks in project financing.

About half of the transactions have tranche structure. The tranche is defined as a portion, or slice of a loan. This portion is one of several related loans that are offered simultaneously, but have different risks and maturities. The tranche structure aims to attract much participant banks by addressing a variety of their preferences. We observed that facility types, excluding term loans were often used in below-the-second tranche.

## 4.2 Method

We use the multilevel mixed logit model to investigate binary responses about whether respective banks participate in a transaction or not. This examination demonstrates

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<sup>6</sup> Concentration risk is the risk of amplified losses that may occur from having a large portion of holdings in a particular investment, asset class, or market segment relative to the overall portfolio.

characteristics of Japanese megabanks in the project finance market.

The multilevel mixed logit model has two major advantages over the simple logit model. First, this model enables us to extract unobservable differences between economic subjects as random effects. Controlling changing factors caused by other observable variables permits to detect unobservable variables. Second, compared to conventional cross-section or time-series data, this model significantly increases the number of observations, and hence the estimation accuracy can be expected to increase. Let us suppose that there exist 100 transactions, and 10 participant banks. In conventional cross-section analysis, we investigate the average response of ten participants from a sample size of 100. Meanwhile, the multilevel mixed logit model can examine responses of the respective ten banks to 100 transactions. Using this model can increase the sample tenfold, and the efficiency and unbiasedness of estimators can be expected to increase due to the augmented information amount.

Our multilevel mixed logit model has random effects only on intercept, and is structured into two levels. Level-1, the lower level, comprises transactions ( $i = 1, 2, 3, \dots, N$ ), and Level-2, the upper level, comprises banks ( $j = 1, 2, 3, \dots, K$ ). This hierarchical structure can examine factors to explain the responses of individual bank  $j$  on each transaction  $i$ , that is whether bank  $j$  participates in transaction  $i$  or not.

Our model expresses bank  $j$ 's willingness to participate in transaction  $i$  by employing latent variable  $y_{ij}^*$ . This unobservable variable is defined as follows.

$$y_{ij} = \begin{cases} 1: \text{bank } j \text{ participates in transaction } i \text{ if } y_{ij}^* > 0 \\ 0: \text{bank } j \text{ does not participates in transaction } i \text{ if } y_{ij}^* \leq 0 \end{cases}$$

Level-1 of our model is specified as follows<sup>7</sup>.

$$\text{logit}(p_{ij}) = \beta_{0j} + \beta_1 x_{ij} + e_{ij}$$

Here  $p_{ij}$  denotes the response probability  $Pr(y_{ij}=1)$  for the decision-making process of bank  $j$  on transaction  $i$ . For simplicity, this equation has only one explanatory variable  $x_{ij}$ , which has a common fixed effect among transactions. Intercept  $\beta_{0j}$  includes random effects which are different for individual banks. This intercept is formulated at level-2 of our model as follows.

$$\beta_{0j} = \beta_0 + u_{0j}$$

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<sup>7</sup> This model specification follows Hedeker and Gibbons (2006).

Here  $\beta_0$  is a common intercept among transactions, and  $u_{0j}$  is a random intercept that is different among banks. Random effect is assumed to be normally distributed, and independent from explanatory variables. Level-1 residual  $e_{ij}$  is assumed to be a logistic distribution, and independent from random effects and explanatory variables, respectively<sup>8</sup>.

This model can separate unobservable differences between banks from error terms by considering both common fixed effects that the respective banks share, and random effects that differ among banks. We estimate equations for local banks and megabanks separately, and consequently we show characteristics of megabanks based on comparisons with local banks.

Control variables consist of four categories of explanatory variables: loan terms, distribution methods, project types, and facility types. The first category of loan terms includes three variables. The first variable is the loan amount converted to millions of USD, and we use its log value (*LAMOUNT*) as the explanatory variable in the estimation equation. We forecast the coefficient of *LAMOUNT* for megabanks to be positive. That is, megabanks prefer loan transactions of larger amounts. We expect that megabanks are inclined to arrange and participate in larger projects organized by sponsors from developed countries. Additionally, outstanding funding ability of megabanks permits participation in large-sized project financing.

The second variable is *MATURITY*, which is the loan period represented in years. We expect the coefficient of *MATURITY* for megabanks to be negative. This is because a longer maturity period increases credit risk due to the difficulty of predicting the future project performance. Hence, shorter maturities are assumed to have a positive effect on megabank participation in loan transactions. In addition, we indicate the possibility of coefficient of *MATURITY* for local banks to be positive. Local banks have long-term relationships with local sponsor companies, and extend longer-term loans considering future relationships as more important than project feasibility.

The third variable, *FOREIGN*, is a dummy variable that equals to one if the loan is denominated in foreign currencies, and zero otherwise. The sign of *FOREIGN* for megabanks is expected to be positive. It is much easier for megabanks to fund in foreign currencies in inter-bank markets because they have only one branch in Bangkok, and thus cannot collect abundant Thai Baht deposit. In contrast, local banks prefer loan transactions denominated in Thai Baht because of their funding structure.

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<sup>8</sup> We used STATA 12 for model estimation. On the initial setting, STATA computes an optimum solution by using Gauss-Hermite quadrature approximation.

The second category of explanatory variables is the distribution method including two variables that capture the different effects of syndicated loans. *CLUB* is a dummy variable taking a value of one if the loan is extended in the form of a club deal. *BILATERAL* is a dummy variable taking a value of one if a loan is extended at bilateral base. We expect the signs of both variables for megabanks to be negative. This is because megabanks expect to participate in large-sized transactions, which require bank syndication to successfully extend large amount of loans. Alternatively, the signs for local banks are expected to be positive. We forecast that local banks prefer smaller amount of loans based on relationships with local sponsors.

The third category includes the project types, *SOLAR* and *FIRE*. *SOLAR* is a dummy variable indicating whether the loan's purpose is the construction of solar power plants; and if the purpose fits the definition, this variable takes a value of one. *FIRE* is a dummy variable taking a value of one if the loan's purpose is the construction of gas-fired power plants. The signs of *SOLAR* and *FIRE* for megabanks are expected to be negative and positive respectively. Megabanks may prefer projects related to construction of gas-fired power plants because of their large project size and finance. However, the signs for local banks are unpredictable based on the limited information provided in Table 3.

The fourth category of variables includes the facility types: *REVOLVE*, *VAT*, *GUARANTEE*. These variables aim to differentiate between the effects on loan participation from term loans.

*REVOLVE*: Dummy variable taking a value of one if the facility type is a revolving loan.

*VAT*: Dummy variable taking a value of one if the type is a VAT loan

*GUARANTEE*: Dummy variable taking a value of one if the type is a guarantee facility

We forecast the signs of these variables for megabanks and local banks to be negative and positive respectively. Unusual types of loans require detailed information about the projects. We expect local banks to have an advantage on this point because they may have information channels with local sponsors based on long-term relationships.

## 5. Empirical Results

### 5.1 Local banks

Table 4 presents the estimation results for local banks. Likelihood ratio tests confirmed that the multilevel mixed logit model is more suitable as compared to the logit model. These tests rejected the applicability of the conventional logit model for all models, and

indicate that banks' preferences towards transactions differ among individual banks. It is suitable to distinguish unobservable bank characteristics as random effects. Further, it is appropriate to extract random effects in considering large variations in the participation number as observed in Table 1.

We discuss four major results. First, the sign of *MATURITY* is positive, and statistically significant. Longer-term loans facilitate local bank participation in project financing, and this result complies with our expectation. However, this result differs from the assumption banks are reluctant to extend a loan with longer maturity. It is difficult to forecast the economic situation, and fuel prices for the distant future, and therefore banks have difficulty to evaluate success and failure of infrastructure projects. These situations result in larger credit risk because the uncertainty of debt repayments increases depending on the length of the maturity period<sup>9</sup>. In fact, local banks can extend loans of longer maturity period. This situation could be attributed to the advantages of local banks in information production.

Table 4. Estimation results: Local banks

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<sup>9</sup> Flannery (1986) suggests that companies with higher credit risk issue longer-term debt.

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
<i>LAMOUNT</i>	0.084 (0.049)	-0.041 (0.050)	-0.053 (0.051)	-0.053 (0.051)	-0.036 (0.052)	-0.048 (0.050)	-0.055 (0.051)
<i>MATURITY</i>	0.037** (0.013)	0.053** (0.013)	0.037* (0.015)	0.054** (0.013)	0.034* (0.015)	0.034 (0.014)	0.022 (0.015)
<i>FOREIGN</i>	-1.663** (0.233)	-1.682** (0.236)	-1.751** (0.237)	-1.700** (0.236)	-1.839** (0.241)	-1.677** (0.236)	-1.737** (0.237)
<i>CLUB</i>	-0.052 (0.169)						
<i>BILATERAL</i>		-1.679** (0.243)	-1.732** (0.241)	-1.696** (0.244)	-1.899** (0.256)	-1.753** (0.244)	-1.817** (0.244)
<i>SOLAR</i>	-0.935** (0.168)	-0.627** (0.172)		-0.685** (0.174)		-0.852** (0.184)	
<i>FIRE</i>			0.940** (0.196)		0.915** (0.198)		0.986** (0.195)
<i>REVOLVE</i>				-0.825* (0.369)			
<i>VAT</i>					0.807** (0.310)		
<i>GUARANTEE</i>						-1.142** (0.318)	-0.852** (0.302)
<i>Constant</i>	-3.418** (0.924)	-1.403 (0.959)	-1.620 (0.963)	-1.162 (0.977)	-1.970 (0.976)	-0.848 (0.982)	-1.426 (0.973)
random effects							
Variance	1.611** (0.366)	1.658** (0.375)	1.668** (0.377)	1.664** (0.376)	1.675** (0.378)	1.673** (0.377)	1.677** (0.378)
AIC	1562.2	1503.6	1494.2	1500.1	1489.8	1490.9	1487.3
Sample size	2148	2148	2148	2148	2148	2148	2148
Number of group	12	12	12	12	12	12	12

\*, \*\* indicate that parameters are statistically significant at confidence level of 95% and 99%, respectively

The second point for discussion is loan denomination. Table 4 presents the preference to local currency denomination. The sign of *FOREIGN* is negative and statistically significant as we forecasted. This result is rational for local sponsors because most types of projects are related to power generation. The source of debt repayment is the domestic revenue of electricity sales in Thai Baht. If SPC borrows a loan denominated in a foreign currency, it means that SPC bears foreign exchange risk. In addition, it is easy for local sponsors to fund in Thai Baht because they have long-term relationships with local banks.

Distribution methods constitute the third point to be examined. We cannot find

statistically significant results about *CLUB*. However, *BILATERAL* produced statistically significant results, and its sign is negative. This result indicates that local banks do not have a tendency to extend a loan at bilateral base because some local banks and public financial institutions extended bilateral loans. Siam Commercial Bank extended 23 out of 39 bilateral loans. Kasikorn Bank and public financial institutions executed eight bilateral loans each. Further, 32 transactions were extended for the purpose of solar power plant construction. Bilateral loans included 10 VAT loans. Some local banks can extend loans at bilateral base because they are relatively small-sized.

The fourth point of estimation results is the facility types. The sign of both *REVOLVING* and *GUARANTEE* is negative, which is contrary to our expectation. These results indicate that it is not general for even local banks to extend these types of facilities. There were seven revolving loans, and 13 guarantee facilities executed during the research period especially first-tier by banks in the ranking.

Table 5. Estimates of random effects

Bank name	Random effect	Bank name	Random effect
Kasikorn Bank	3.266	Krung Thai Bank	0.054
Siam Commercial Bank	1.852	Export-Import Bank of Thailand	0.054
Land & Houses Bank	0.720	TISCO Bank	-0.056
TMB Bank	0.603	Siam City Bank	-1.743
Bangkok Bank	0.437	Government Savings Bank	-2.261
Bank of Ayudhya	0.208	Thanachart Bank	-2.639

Our model can produce estimates of random effects of individual banks. Table 5 demonstrates estimation results in descending order. These results show that random effects vary significantly banks. Alternately, each bank has very different random intercepts. Observing Table 1 and Table 5 simultaneously reveals that some banks with a large random effect such as Kasikorn Bank and Siam Commercial Bank participated in several transactions. However, Thanachart Bank and Government Savings Bank, which have very small random effects, participated in comparatively few transactions. Random effects demonstrate differences in activities in the project finance market.

## 5.2 Japanese megabanks

We reveal characteristics of Japanese megabanks by comparing their lending patterns with those of local banks. Table 6 demonstrates the estimation results for megabanks. Likelihood ratio tests do not reject null hypothesis: it is suitable to employ the conventional logit model for estimations. This result indicates that there are no significant

differences in lending behavior among megabanks.

We discuss three major points of estimation results. First, foreign currency denomination increases the participation probability. The sign of *FOREIGN* is positive and stable for all models. This lending pattern is in contrast to that of local banks, and exhibits preferences to local currency loans. Sumitomo Mitsui Bank participated in 13 transactions, of which 11 were foreign currency loans. Mizuho Bank participated in 24 transactions, of which 16 transactions were foreign currency loans. Bank of Tokyo-Mitsubishi UFJ participated in 13 transactions, of which 12 transactions were foreign currency loans<sup>10</sup>.

It is rational for megabanks to participate in foreign currency loans because they confront difficulties with funding in Thai Baht. There are two modes for foreign bank entry into Thailand: first, as a commercial bank registered in Thailand, and second, as a full branch of the foreign bank. All megabanks selected the second option as their preferred entry mode. The full branch is permitted to establish only one branch, which make it is difficult to collect abundant local currency deposits. Participating in Thai Baht transactions presents a significant hurdle for megabanks.

This is a key point of contention for looking towards a future strategy in the project finance market. This is because local currency denomination is suitable for funding of infrastructure projects. For example, revenues generated from railway and water supply projects are ordinarily denominated in local currency. Long-term infrastructure projects that depend on local currency revenues require project finances in local currency. In fact, transactions in Thai Baht account for well over 80% of the total because sponsors prefer local currency funding in order to avoid foreign currency risk. However, it is not easy for banks of developed countries including Japanese megabanks to fund in local currency<sup>11</sup>.

The second point of discussion includes project types. Megabanks have high probability to participate in gas-fired power plant projects. The sign of *FIRE* is positive, and statistically significant. This lending pattern is same as that of local banks. The purpose of all transactions for Sumitomo Mitsui Bank and Bank of Tokyo-Mitsubishi UFJ is the construction of gas-fired power plants. Mizuho Bank participated in 24 transactions, of which 22 were with the purpose of construction of gas-fired power plants. Megabanks participated in very few solar power generation projects because all such projects are denominated in Thai Baht.

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<sup>10</sup> All foreign currency loans were denominated in USD.

<sup>11</sup> Bank of Tokyo-Mitsubishi UFJ completed an acquisition of Bank of Ayudhya in January 2015. It is the fifth largest bank in terms of asset size, and has a network of over 600 offices. This implies an end to difficulties in local currency funding.



Table 6. Estimation results: Japanese banks

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
<i>LAMOUNT</i>	0.154 (0.157)	0.119 (0.167)	0.116 (0.167)	0.119 (0.167)	0.147 (0.155)	0.073 (0.70)
<i>MATURITY</i>	0.000 (0.028)	-0.011 (0.029)	-0.011 (0.029)	-0.011 (0.029)	0.003 (0.028)	-0.011 (0.029)
<i>FOREIGN</i>	2.653** (0.428)	2.451** (0.430)	2.459** (0.431)	2.452** (0.435)	2.682** (0.434)	2.459** (0.433)
<i>CLUB</i>	0.610 (0.401)	0.650	0.661 (0.405)	0.650 (0.404)	0.677 (0.406)	0.761 (0.409)
<i>SOLAR</i>	-1.427 (0.834)				-1.345 (0.833)	
<i>FIRE</i>		1.979** (0.851)	1.978** (0.851)	1.979** (0.851)		2.114** (0.872)
<i>REVOLVE</i>			0.238 (0.867)			
<i>VAT</i>				-0.006 (0.791)		
<i>GUARNTEE</i>					0.567 (0.615)	0.910 (0.643)
<i>Constant</i>	-6.039** (2.744)		-6.926** (2.786)	-6.974** (2.803)	-6.073** (2.680)	-6.407** (2.778)
Sample size	537	537	537	537	537	537
Pseudo $R^2$	0.369	0.379	0.379	0.379	0.371	0.385

\*, \*\* indicate that parameters are statistically significant at confidence level of 95% and 99%, respectively

Shares of *SOLAR* and *FIRE* are 46.9% and 46.4%, respectively, and they are almost the same as shown in Table 3. However, the coefficient of *SOLAR* is negative for both local banks and megabanks. The numbers of tranche for *SOLAR* and *FIRE* are almost the same, with the number of participant banks for *SOLAR* and *FIRE* being 132 and 248, respectively. This difference is due to the size of the loan amount. The medians of loan amount are 71 million USD for *FIRE*, and 15 million USD for *SOLAR*. This smaller loan amount size contributes to lesser bank participation.

The third point, *MATURITY* demonstrates differences between megabanks and local banks. The sign of *MATURITY* for megabanks is not statistically significant, while that of local banks is positive. Local banks extend long-term loans for infrastructure projects,

and easily to supply long-term funds because they have sufficient Thai Baht deposit, and very low risk of refunding. Further, local banks have the advantages of information production. Project financing requires different types of techniques for credit appraisal. For example, monitoring consists of diversified components: verification about construction progress update, cost repayments in the construction stage and confirmation about operation, and financial reporting of SPC in the operation stage. Local banks have long-run relationships with local sponsors, and maintain robust channels of information with them. These aspects enable long-term monitoring of projects, and lead to local bank advantage.

## 6. Conclusion

This study aimed to reveal characteristics of Japanese megabanks in international project finance markets, and to observe the international competitiveness of megabanks. Overseas lending is one of the pillars of growth strategies of megabanks, and international project financing, among others, attracts a great interest from the banking industry. However, this topic has not been elucidated from the academic perspective. In order to investigate lending behavior, this study used detailed data of project finance deals executed from 2009 to 2014. We employed the multilevel mixed logit model to analyze 2,685 samples.

Empirical results presented three main findings about lending patterns of megabanks. First, foreign currency denomination increases participation probability. It is rational for megabanks to participate in foreign currency loans because they confront difficulties with funding in Thai Baht. Megabanks have a significant hurdle to participate in Thai Baht transactions. This is a significant point of contention for understanding the future strategy in the project finance market. Second, megabanks have high probability to participate in gas-fired power plant projects. Megabanks participated in very few solar power generation projects because all such projects are denominated in Thai Baht. Further, smaller size of loan amount for solar power plant projects contributes to lesser bank participation. Third, there is a difference in loan maturity periods between megabanks and local banks. Local banks extend long-term loans for infrastructure projects. Long-run relationships with local sponsors, robust channels of information, and ultralong-term monitoring of projects are the reasons for the distinction.

Possible extension of this research is to investigate the generality of lending patterns for megabanks. This study revealed the characteristics of megabanks in Thailand, which may vary depending on market environments. Hence, we further examine the lending behavior

of megabanks not only in developing countries such as Indonesia but also in developed countries.

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