

Partial ownership, financial constraint, and FDI*

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Abstract

Using matched firm-bank-FDI data over the period 1989–2016, this study explores how a firm’s financial constraints affect its choice of foreign affiliate ownership structure. Importantly, it tests the hypothesis that parent firms with banks as their largest shareholders hold lower ownership shares in their foreign subsidiaries, in part due to typical bank risk-averse behavior. The empirical analysis confirms that foreign subsidiary ownership ratios are negatively associated with parent firms’ debt ratios. Moreover, this study finds evidence that greater bank ownership of the investing parent leads to lower foreign affiliate ownership shares. However, this result is not robust to two specifications: “crisis times” when bank lending is greatly restricted to all borrowers, and a follow-the-customer relationship where the bank already has an overseas subsidiary in the host country.

JEL-Classification: F21, F23, G32, L24.

Keywords: foreign direct investment, financial constraint, multinational enterprise, Japan

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1 Introduction

This study examines how financial constraints affect a multinational enterprise's (MNE) decision regarding its foreign affiliates' ownership structures. As is conventional in the literature, the MNE borrows to pay for a portion of the newly established subsidiary. This creates two channels through which financial frictions arise that affect the firm's ownership structure decision; a demand-side, or "borrowing channel" that constrains the MNE's ability to borrow, and a "lending channel" through which frictions facing banks and other lending institutions impact their ability to provide loans to MNE borrowers. This study differs from previous studies in how we model the lending channel. Rather than making assumptions about loan-investment links or lenders' financial health, this study explores lending constraints through a key characteristic of Japanese firm-level data that identifies the degree to which these lenders serve as owners and shareholders of their investing clients. By identifying where these relationships exist and the extent to which the lender can regulate its client's behavior, we can explore a different line of heterogeneity among investing firms while more accurately characterizing the lending-channel constraints faced by investing firms.

The financial constraints literature (see, among others [Buch et al. 2014](#); [Bilir et al. 2019](#); [Yan et al. 2018](#)) assumes firms typically borrow to finance at least part of their foreign investments. Investors face borrowing-channel constraints because they typically collateralize the amount borrowed. Difficulties in doing so or other balance sheet-related issues (e.g., high debt) raise the cost of borrowing, limiting the firm's ability to finance its investment projects. In contrast, lending-channel frictions arise from weak credit markets, typically resulting from decreased institutional health. In most cases, both theoretical and empirical research shows that financial frictions in both the lending and borrowing channels negatively impact investment totals and affect ownership choice decisions.

While the traditional FDI theories often assumed wholly-owned foreign subsidiaries, global investment data clearly identifies a sizeable fraction of joint venture and partially owned foreign subsidiaries. Parent firm ownership ratios, which vary significantly across parents and even within an individual parent's own affiliate network, have been shown to be significantly tied to parent firm productivity (e.g., [Raff et al. 2009a,b, 2012](#); [Cieřlik and Ryan 2009](#); [Ito and Tanaka 2022](#)). This study expands on this literature in two ways: it begins by examining how a parent firm's financial constraints affect the ownership structures of its foreign subsidiaries. Controlling for parent productivity, we investigate how parent firms' financial constraints relate to their overseas subsidiaries' ownership structures. We hypothesize that financially healthy firms can obtain financing from financial institutions and establish wholly-owned subsidiaries. In contrast financially constrained firms, even if productive enough to invest abroad, may find it difficult to obtain financing from financial institutions and tend to choose joint ventures with other firms. In other words, the more financially constrained a firm is, the more likely it will choose to establish a foreign subsidiary in the form of a joint venture instead of using indirect financing. In this manner, this study contributes to the emerging literature on FDI and corporate finance with respect to affiliate ownership choice.¹

Our choice of examining foreign subsidiary ownership decisions of Japanese firms from 1989 to 2016 is not by accident. While Japan has and continues to serve as a prominent FDI source, it is

¹[Foley and Manova \(2015\)](#) concisely survey the literature on FDI and corporate finance.

the availability of Japanese firm-level FDI and balance sheet data that allows us to tie individual firms' financial health to their investment activities. In doing so, we derive our second significant contribution to this literature, in that we identify the impact of the "parent of the parent" on affiliate ownership choice. That is, since we are able to identify who serves as the primary shareholders of the Japanese MNEs establishing new foreign affiliates, we can control for both parent and the parent's parent characteristics when examining FDI behavior. Why is this important? In many cases, the Japanese MNEs' primary shareholder is a bank, or in many cases, several banks. Not only do these banks own sizeable shares of the parent, they often serve as the parent firm's primary lending source, allowing the bank the opportunity to exert significant influence on firm's investment behavior. In coupling the assumptions that banks are typically risk-averse with the notion that foreign investment is more risky than domestic investment, we hypothesize that bank ownership of Japanese MNEs likely reduces outward FDI and, for those affiliates that are established, decreases their Japanese ownership shares.

Highlighting our empirical results on firm-level Japanese FDI in 58 host countries between 1989-2016, we find that foreign subsidiary ownership ratios are negatively associated with parent firm debt ratios. As the standard Melitz-type theory predicts, we find evidence that more productive parent firms tend to have higher ownership ratios of their foreign subsidiaries in some specifications. Turning to the MNE parent-bank-owner relationship, we find that the larger the shareholding of the MNE by banks, the greater the likelihood of JV and the lower the ownership share of the main MNE parent controls. This result, however, is sensitive to Japanese business cycle fluctuations and the bank's own FDI behavior.

The remainder of this paper is organized as follows. Section 2 provides a brief theoretical outline that serves as the basis for our empirical research, while section 3 details our FDI and firm balance sheet data. Next, Section 4 highlights our empirical methodology, with Section 5 presenting our empirical results. Finally, Section 6 concludes and highlights the relevant policy implications of this study. An online Appendix presents the list of countries used in empirical analysis, a description of production function estimation, as well as additional robustness exercises and empirical evidence not included in the main text.

2 Theoretical overview and testable hypotheses

Much has been written on how parent firms' productivity, financial constraints, and host country characteristics jointly determine parent firms' ownership share of foreign subsidiaries; modeling all these factors is beyond the scope of our study's empirical focus. However, we investigate the impact of these topics individually, and through these examinations, we establish several testable hypotheses on the determinants of affiliate ownership ratios.

To begin, we note the voluminous firm-level heterogeneity literature following [Melitz \(2003\)](#) and [Helpman et al. \(2004\)](#) that show FDI likelihood increases with firm-level productivity. Building from that, several papers such as ([Raff et al., 2009b](#); [Ito and Tanaka, 2022](#)) identify increased firm-level productivity increases affiliate ownership. This is because more productive firms have higher FDI sales and are able to self-finance a larger proportion of their fixed costs of FDI. Stemming from this

literature, we establish our first hypothesis:

Hypothesis 1 *The multinational firm's ownership share of foreign subsidiaries increases with its productivity.*

As an extension of this, as shown by [Asiedu and Esfahani \(2001\)](#) and others, greater firm-specific assets, especially intangible assets, often lead to greater foreign affiliate ownership shares. This research shows that the parent firm's ownership share rises with the importance of its assets. This leads us to our next testable hypothesis:

Hypothesis 2 *Parent firms with a higher ratio of intangible assets tend to own a higher ownership share of their foreign subsidiaries for fear of knowledge leakage.*

Recently, several papers have added financial constraint heterogeneity to the list of firm-level FDI influences. While [Manova \(2013\)](#) extends the [Melitz \(2003\)](#) model and shows that firms with tighter financial constraints have smaller export profits due to interest payments and higher export cutoffs, others identify that financial frictions reduce overall FDI likelihood or require many firms to borrow to finance at least part of their foreign investments ([Buch et al. 2014](#), [Bilir et al. 2019](#), [Yan et al. 2018](#)). As a result, for many investors, a joint venture arrangement may be the only possible method of establishing a foreign subsidiary, as discussed below.² We therefore pose the following hypothesis:

Hypothesis 3 *Parent firm financial constraints reduce its ownership share in the foreign subsidiaries. The more severe the financial constraints of the parent firm, the lower the parent firm's ownership share in the foreign subsidiaries.*

Importantly, investors face borrowing-channel constraints because they typically collateralize the amount borrowed. Difficulties in doing so or other balance sheet-related issues (e.g., high debt) raise the cost of borrowing, limiting the firm's ability to finance its investment projects.³ By contrast, lending-channel frictions arise from weak credit markets, typically resulting from decreased institutional health.⁴

However, one drawback is that assumptions must be made regarding the firm-lender relationship. Contracts between these parties are incomplete, and we cannot typically observe individual contracts or data that tie individual loans and collateral requirements to FDI projects.⁵ To ease these identification issues, assumptions are made as to who serves as the firm's main lending institution

²This is in contrast to earlier ownership choice studies that assumed the parent could establish a wholly owned subsidiary (WOS) and that the ownership choice decision was based on other factors, such as solving ex-post incentive problems and contractual issues. See [Asiedu and Esfahani \(2001\)](#), [Grossman and Hart \(1986\)](#), [Raff et al. \(2009a\)](#), and [Raff et al. \(2009b\)](#).

³Many firms use the land to collateralize investment loans and decreases in real estate prices have been shown to negatively impact both total investments (e.g., [Gan 2007a](#) and [Chaney et al. 2012](#)) as well as FDI ([Raff et al. 2018](#)).

⁴[Gibson \(1995\)](#), [Klein et al. \(2002\)](#) and [Alba et al. \(2007\)](#) illustrated that declining bank health decreases outward Japanese FDI. Regarding overall investment, [Gan \(2007b\)](#) found that Japanese firms borrowed less from banks with greater exposure to real estate markets.

⁵This is in contrast to [Amiti and Weinstein \(2018\)](#) who, while utilizing data on individual bank-firm loan arrangements, cannot tie these loans to individual investment projects. In contrast, this study does not examine individual loan arrangements but rather the actual ownership relationships of these banks. For the role of incomplete contracts and the organization of multinational enterprises (MNEs), see [Antràs \(2003\)](#) and [Antras and Helpman \(2004\)](#).

(“main bank”)⁶ and the firm limits its borrowings to this institution. However, the power of the main reference bank as the sole lender is generally limited, contrary to the norm.⁷ In fact, the Nikkei NEEDS “Corporate Borrowings from Financial Institutions Database” of matched bank-firm loan data indicates that approximately 70% of Japanese firms borrowed from more than one bank between 1985–2019.

This study avoids this issue by not focusing on an assumed lending relationship, but rather on MNE ownership by a bank. In contrast to the U.S. and other major FDI source countries, many Japanese firms have banks or other lending institutions as their major owners.⁸ Additionally, unique to Japan, serving as major shareholders, they often have personnel sit on the firm’s board of directors and (to varying degrees) participate in operational decisions.⁹ In these ways, among others, the main bank as a top shareholder can not only exert power over a firm but also serve as a conduit of investment information (see, for example, [Inui et al. 2015](#) and [Degryse et al. 2009](#)).

Nevertheless, bank monitoring capabilities are likely to be limited in foreign countries. The information asymmetries between a firm and its main owner bank can be larger for outward FDI than for domestic investment. Therefore, the main bank’s risk aversion can lower a firm’s ownership ratio of its foreign subsidiary.¹⁰ This leads us to the following testable hypothesis:

Hypothesis 4a (*Risk-averse banks hypothesis*) *The more shares of a parent firm are owned by its main bank, the lower the parent firm’s stake in its foreign subsidiaries, especially in a host country where the main bank does not have enough ability to monitor the firm.*

As the shareholding bank’s profit is directly related to the firm’s profit, the main bank has the incentive to provide financial and informational support for the firm’s profitable FDI project. [Aoki and Patrick \(1994\)](#) argue that close ties between banks and firms in Japan have helped solve agency problems and asymmetric information between banks and firms. [Hoshi et al. \(1991\)](#) find that for investment, firms with close ties to their main bank are much less sensitive to their liquidity than firms raising their capital through more arms-length transactions. They posit that this finding implies that the main banking system can minimize agency and information problems. This leads us to the following supplementary hypothesis:

⁶In Japan, a “main bank” refers to a financial institution that serves as the primary relationship bank for a firm. Main banks provide a range of financial services to their clients, including lending, investment advice, foreign exchange, and trade finance. Main banks typically hold a significant share of the clients’ equity and monitor their activities closely by appointing personnel to senior positions on their boards ([Weinstein and Yafeh 1998](#)). Thus, the Japanese main banks play a dual role as creditors and shareholders ([Prowse 1992](#)).

⁷The dramatic deregulation and liberalization of the financial system in the 1980s significantly improved the non-financial firms’ access to corporate borrowing from bond markets and raising of equity in capital markets ([Weinstein and Yafeh 1998](#)). This process renders the main reference bank less important for manufacturing firms.

⁸Unlike the Anglo-Saxon countries, Japan and Germany have employed long-term close ties between main banks and their client firms to accelerate their industrial development ([Weinstein and Yafeh 1998](#)).

⁹See [Kaplan and Minton \(1994\)](#) and [Morck and Nakamura \(1999\)](#), among others.

¹⁰Japanese banks are traditionally known for their conservative lending and risk management. [Konishi and Yasuda \(2004\)](#) show that 1993’s capital adequacy requirement implementation further reduced Japanese bank risk-taking behavior. [Limpaphayom et al. \(2019\)](#) find that bank ownership incentivizes Japanese firms to reduce risk exposures. [Sakawa and Watanabel \(2021\)](#) present evidence that close bank ties drove publicly listed Japanese firms to take fewer risks between 2007–2016.

Hypothesis 4b (*Minimizing agency problems hypothesis*) *The more shares of a parent firm are owned by its main bank, the higher the parent firm's stake in its foreign subsidiaries if the main bank has enough information.*

Subsidiaries established in countries where the parent's main bank shareholder already operates banking subsidiaries should see information asymmetries alleviated, resulting in higher ownership percentages. This situation mimics those found in the "follow the customer" literature, where FDI information issues regarding the host country are less prominent, and thus the bank sees these investments as a better lending risk.¹¹ Here, the main bank's foreign branches serve to reduce the fixed cost of FDI as the branch has information on the local branch and works to reduce cost/uncertainty in the local market, allowing the firm to more likely establish a WOS.

While we should consider the role of local partners, our data lacks detailed information on local partners. We, therefore, focus on the parent firm and host country characteristics as the determinants of the ownership structure of FDI. Regarding these host country characteristics, the standard literature too vast to cite here documents the variety of host country characteristics that affect FDI choice. From this, we point to two important literature that we examine in our paper- host country financial development and host country market size. As seen in [Bilir et al. \(2019\)](#) and [Desbordes and Wei \(2017a\)](#), among others, greater host financial development leads to increased FDI and increased affiliate ownership. As such,

Hypothesis 5 *Financial development in host countries increases the share of multinational ownership.*

Likewise, the host country's market size is shown to have an ambiguous effect on inward FDI. [Raff et al. \(2009b\)](#) show that ownership ratios are independent of host market size, while [Ito and Tanaka \(2022\)](#) show that the optimal ownership ratio is increasing in market size. In countries with larger markets, the availability of JV partners may be greater, which may result in a lower equity stake. Which prediction is more plausible can only be answered empirically. That leads us to our last hypothesis:

Hypothesis 6 *The impact of market size on ownership ratios is ambiguous.*

3 The FDI, bank, and borrower data

3.1 The FDI data

The Japanese firm-level FDI data are taken from Toyo Keizai Inc.'s *Overseas Japanese Companies Data* (hereinafter, OJC data) to investigate foreign subsidiary ownership structures. The OJC data are based on the annual questionnaire survey Toyo Keizai, which has been conducted for 50 years and is widely recognized as providing the most comprehensive coverage of Japanese parents' overseas subsidiaries.¹² On average, the OJC lists 19,957 foreign subsidiaries held by 4,108 Japanese parent

¹¹See, among others, [von der Ruhr and Ryan \(2005\)](#) who find that Japanese MNEs choose foreign hosts in which their main bank has already established subsidiaries.

¹²The OJC data is also known in its book format as *Japan Overseas Investment: A Complete Listing by Firms and Countries* or *Kaigai Shinshutsu Kigyo Soran* in Japanese. See the detail at <https://biz.toyokeizai.net/en/data/service/detail/id=860>. Our study focuses on FDI into manufacturing affiliates in 58 hosts: 29 OECD and 29 non-OECD countries. A more detailed analysis of investments across host countries can be found in our [Online Appendix](#).

firms per year during the 1990–2016 period, representing the vast majority of Japanese foreign subsidiary holdings. Owing to these distinct advantages, many previous studies (Head and Ries, 2001; Raff et al., 2009a,b, 2018) have employed OJC data. The OJC provides a wealth of information on its overseas subsidiaries. For each foreign subsidiary, the OJC lists the firm's name, geographic location, year of establishment, industry affiliation, capital stock, number of employees, and investment objectives. Essentially, this study also provides the names of all parent firms, whether Japanese, local, or third-country, as well as their ownership percentages.¹³ Similar to this study, several previous studies (Head and Ries, 2001; Raff et al., 2009a,b, 2018) have employed the OJC data. As is standard in the empirical FDI literature, we follow the OECD's definition of FDI and restrict our sample to subsidiaries in which Japanese firms maintain at least a 10% ownership share. Note that this does not eliminate many firms from the OJC sample.¹⁴

3.2 The DBJ data

To acquire detailed information on parent firms, we employ the Development Bank of Japan's *Corporate Financial Data Bank* (DBJ data), published by the Japan Economic Research Institute Inc.¹⁵ The DBJ data provide more than 60 years of non-consolidated corporate financial records for our investing firms, a timeframe that considerably exceeds our study period. This enables us to explore the relationship between parent firms' characteristics and their foreign subsidiary ownership decisions during the 1989–2016 period. The DBJ data cover all listed firms in Japan except those in the finance and insurance industries.¹⁶ The DBJ data, used in numerous previous studies (e.g., Abe 2002), include numerous balance sheet and income statement variable standards.

3.3 Debt ratio

We employ DBJ data to calculate the parent firm's *Debt_Ratio*, a measure we use to examine the severity of a firm's financial constraints. We adopt a commonly used definition of debt ratio. This is calculated as the ratio of a firm's total debt to its total assets.¹⁷ The higher the firm's *Debt_Ratio*, the more severe its financial constraints. For instance, firms whose debt ratios exceed 1 (= 100%) are insolvent and financially at risk. Firms in this extreme debt position accounted for only 0.3% of the listed firms in the 2016 sample. In contrast, firms with a debt ratio of more than 0.5 (= 50%) find

¹³The Toyo Keizai files on the investing Japanese parent firms are limited, and for that reason, we use Development Bank of Japan data as discussed in Section 2.2.

¹⁴<https://www.oecd.org/daf/inv/investment-policy/2487495.pdf>.

¹⁵Officially, this is the *Kigyo-Zaimu-Data-Bank*. The DBJ does not provide data description in English. Detailed information is provided in Japanese on the following page: https://www.jeri.co.jp/about/data_develop/data. The information on the aggregated version of the DBJ data, *Industrial Financial Data* is provided in English on the following page: <https://www.dbj.jp/ricf/en/databank/index.html>

¹⁶The DBJ data cover firms listed on the First and Second Sections of the Tokyo (including the former Osaka) and Nagoya stock exchanges, regional stock exchanges (Sapporo, Fukuoka including the former Hiroshima, Niigata, and Kyoto), JASDAQ (including the former Hercules and JASDAQ NEO), Mothers, Centrex, Ambitious and Q-Board.

¹⁷Todo (2011) uses fixed liabilities over total assets, $\frac{\text{fixed liabilities}}{\text{total assets}}$, as his measure of debt ratio. However, it is unclear why he ignores current liabilities. One problem with this definition is that it does not correspond to the equity ratio calculated as a proportion of the total assets financed using the capital provided by shareholders. Our definition of the debt ratio, $\frac{\text{total debt}}{\text{total assets}}$, is close to Todo (2011), but we depart from Todo (2011) in our use of total debt as the numerator instead of fixed liabilities.

themselves in a financially undesirable position of having debt greater than their equity. In 2016, approximately 40% of the listed firms in Japan had debt ratios above 0.5, suggesting that financial constraints affect a substantial portion of Japanese listed firms. In fact, the median debt ratio for our sample was greater than 0.5 between 1994 and 2004.

3.4 Investment-level FDI data

We employ OJC establishment year data to create yearly investment-level FDI data for the 1989–2016 period. The OJC and DBJ provide subsidiary and parent industry affiliations, allowing us to isolate the establishment of foreign manufacturing subsidiaries by parent manufacturing firms. Between 1989 and 2016, 4,759 new overseas manufacturing subsidiaries were established across the globe. We match parents to their subsidiaries using the parents' unique four-digit stock code, allowing us to combine Toyo Keizai's OJC data with the DBJ data at the parent firm level. For subsidiaries with more than one Japanese owner, we consider the firm with the largest ownership ratio as the primary Japanese parent and use their DBJ-located firm-level data in our regression analysis. Listed firms account for 43.94% of all parent firms, whereas their foreign subsidiaries account for 72.18% of all foreign manufacturing subsidiaries listed in the OJC. The matched parent-subsidiary data cover 3,435 manufacturing FDI projects of listed manufacturing firms between 1989 and 2016. As shown in Figure 1, there is substantial variation in the ownership ratio among FDI projects in our merged sample.

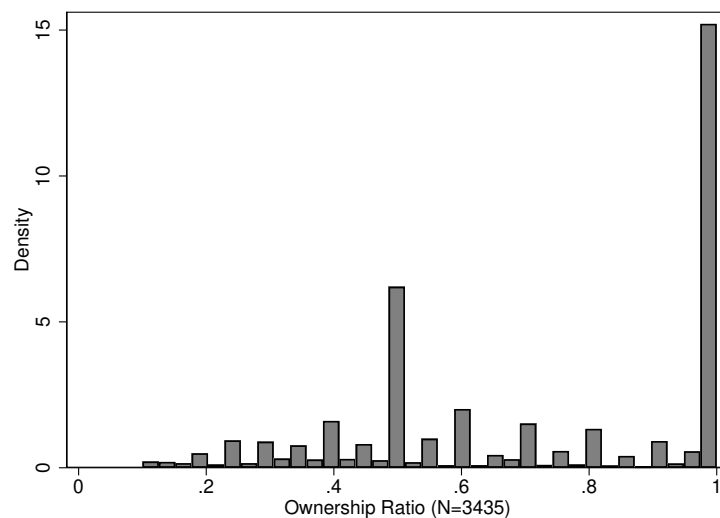


Figure 1: Distribution of Japanese firms' ownership ratio of new overseas subsidiaries in manufacturing from 1989 to 2016.

Source: Authors' compilation based on the OJC data of Toyo Keizai Inc.

3.5 Bank information

The DBJ data contains information on shareholders for each parent firm.¹⁸ We, therefore, can identify whether a bank is the largest owner of a parent firm. In addition, the OJC data tells us whether a bank

¹⁸Unfortunately, the DBJ data does not cover the banks' balance sheets and income statements. Therefore, we cannot obtain detailed information on the banks from the DBJ data.

has a foreign subsidiary in our sample period. According to the OJC data, 64 Japanese banks have established 5,697 foreign subsidiaries in 40 countries for the years between 1989 and 2016. The most popular destination is the US (1,170), followed by China (727), and the UK (521). To analyze the role of the main banks on FDI structure, we match these main bank information from the DBJ and OJC data to the parent firms of overseas affiliates. For the regression analysis, we thus use the resulting foreign affiliates-level data, i.e., investment-level data. Since this data contains information on the Japanese parent firm and its main bank for each foreign affiliate, our data is the matched affiliate-parent-bank data. In our matched sample, 249 parent firms whose largest shareholders are 36 banks conducted 740 manufacturing investments (21.54% of all 3,435 investments) in 37 countries.

3.6 Stickiness of ownership ratio

This study analyzes the decisions of parent firms when foreign direct investment occurs, particularly the foreign subsidiary's ownership ratios at the establishment date. We note that ownership ratios generally appear sticky and typically remain unchanged over the years when the firm is listed in the OJC data. For example, 84% of foreign subsidiaries did not experience a change in their largest shareholders between 1989 and 2016. In addition, during this period, 53.4% of foreign subsidiaries did not experience a change in the largest shareholder's ownership ratio. The median frequency of changes in the largest shareholder's ownership ratio during the first 17 years is zero. Consequently, more than 97% of wholly owned foreign subsidiaries remained wholly owned during the analysis period. Similarly, more than 98% of the majority-owned foreign subsidiaries remained majority-owned during the analysis period.

3.7 Investment and ownership trends

With the bursting of the Japanese asset price bubble policy in the early 1990s, the Japanese economy experienced a prolonged period of stagnation, known as the "lost 20 years" in the 1990s and 2000s. However, during this period of stagnation, Japanese manufacturing firms continued to establish new subsidiaries abroad as shown in Figure 2. During the 2000 bursting of the IT bubble and the 2009 global financial crisis, the number of new foreign subsidiaries was relatively small. Nonetheless, we observe relatively significant investment increases soon after each collapse.

In addition to the number of new foreign subsidiaries, we also observe a distinctive trend in the ownership ratio. The study period was divided into three parts. In the first period, 1989–1993, the average ownership ratio declined by 15 percentage points, from 69% to 54%, perhaps due to the Japanese recessionary economy. In contrast, the second period (1993–2003) saw the average subsidiary ownership ratio of Japanese parent firms increase by more than 28 percentage points, from approximately 54% to 83%. This sharp rise in the ownership ratio may reflect the relaxation of inward FDI restrictions by developing countries after the Asian financial crisis of 1997 and China's 2001 WTO accession. Since 2003, the average ownership ratio has stagnated at approximately 77–85%. The 77–85% ownership ratio appears to be in equilibrium.

No clear explanations exist as to why new foreign subsidiaries' ownership ratios never signifi-

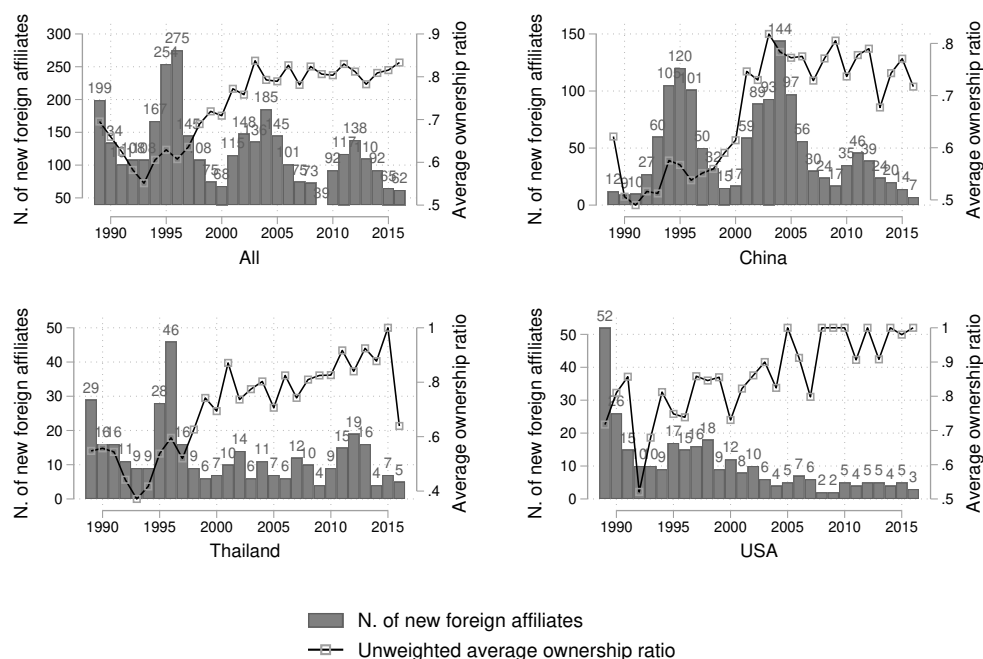


Figure 2: Number of new foreign subsidiaries and their average ownership ratio in manufacturing, 1989–2016.

Source: Authors' compilation based on Toyo Keizai Inc.'s OJC data.

cantly approached whole ownership during this period.¹⁹ The persistence of this result suggests that partial ownership is desirable for parent firms. Perhaps these lower ownership totals represent joint ventures through local distribution, logistics, and/or marketing companies with better local market knowledge. Alternatively, as we suggest, the combination of financially constrained firms borrowing from risk-averse banks leads to greater joint venture investment likelihood and lower ownership shares.

Finally, we note the similarities between the US and Japanese manufacturing FDI. Desai et al. (2004) report that the US MNEs' tendency to have partially owned subsidiaries relative to wholly owned subsidiaries has declined during the period 1982–1997. This trend is similar to Japan's declining trend in partial ownership from 1993 to 2003.

Figure 3 shows the proportion of wholly and partially owned foreign subsidiaries among all new foreign subsidiaries in the manufacturing sector. During the first period, 1989–1993, the proportion of wholly owned subsidiaries decreased from 40.0% to 16.7%. From 1993 to 2003, the proportion of wholly owned foreign subsidiaries steadily increased from approximately 16.7% to 53.1%. This trend probably reflects the relaxation of inward FDI restrictions in developing countries during the 1990s and the early 2000s. After the remarkable FDI liberalization period in developing countries, the proportion of wholly owned foreign subsidiaries stagnated at approximately 50% in the third period, between 2003 and 2016. During this period, the proportion of wholly owned foreign subsidiaries is almost equal to that of partially owned foreign subsidiaries. This finding indicates that partial ownership remains a vital option for Japanese parent firms even after the FDI liberalization period.

¹⁹Typically, 100% ownership indicates a wholly owned subsidiary. However, a 95% ownership threshold is occasionally used as well. In most cases, the use of either threshold does not significantly affect regression outcomes.

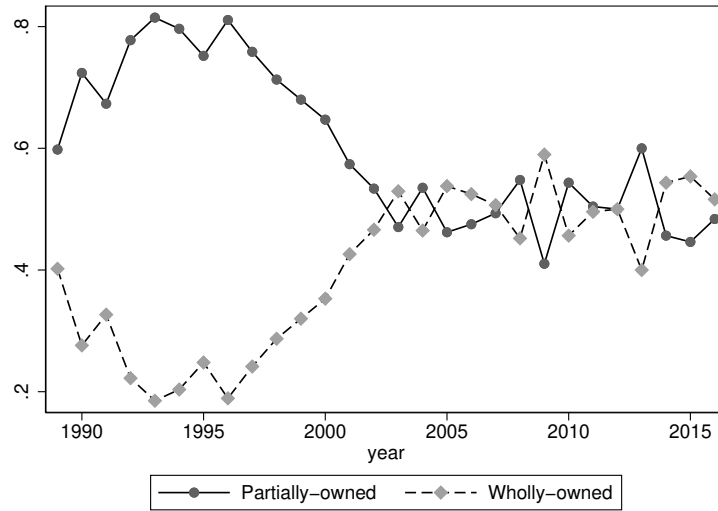


Figure 3: Fractions of wholly and partially owned foreign subsidiaries among all new foreign subsidiaries in manufacturing, 1989–2016.

Source: Authors' compilation based on OJC data of Toyo Keizai Inc.

Figure 4 shows that the higher the debt ratio, the lower the MNE's ownership ratio of foreign affiliates tends to be. The slopes differ slightly across the three periods, but the negative correlation holds across all periods. We estimate their relationship by time period in later sections.

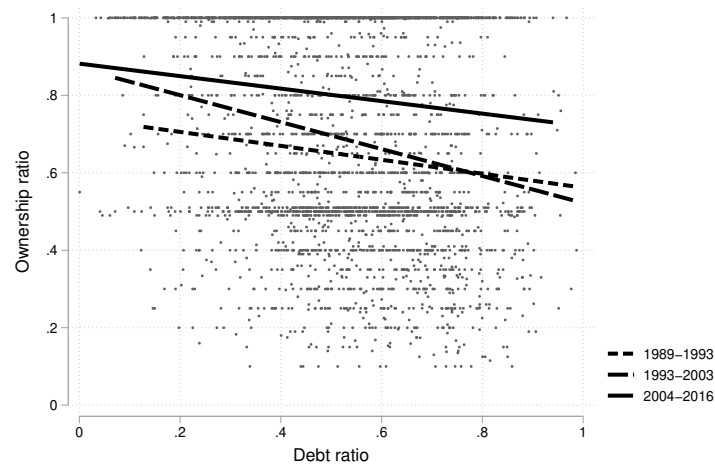


Figure 4: Parent firms' debt ratio and their average ownership ratio of foreign subsidiaries in manufacturing, 1989–2016.

Source: Authors' compilation based on OJC data of Toyo Keizai Inc. and DBJ data of Development Bank of Japan.

Note: Firms with debt ratios exceeding one are excluded.

4 Empirical method

4.1 Fractional logit model

Our key variable of interest is the Japanese firms' ownership ratio of foreign subsidiaries, which takes values between 0 and 1. The linear regression model is inadequate for estimating the fractional

variable bounded between 0 and 1 because the predicted values from an OLS regression can never be guaranteed to lie in the unit interval.

Considering the bounded nature of the ownership ratio, we employ a fractional response model. Fractional response models have been used for outcomes, such as rates, proportions, and fractional data, and have been applied to various economic topics.²⁰ Our objective is to know the relationship between the ownership ratio of foreign subsidiary i , $y_i \in [0, 1]$, and its parent firm's debt ratio, productivity, and other explanatory variables \mathbf{x}_i . We assume that

$$E(y_i|\mathbf{x}_i) = G(\mathbf{x}_i\boldsymbol{\beta}),$$

for all i , where $G(\cdot)$ is a known function satisfying $0 < G(z) < 1$ for all $z \in \mathbb{R}$.

We employ the Papke and Wooldridge (1996) quasi-maximum likelihood estimator (QMLE). As Papke and Wooldridge (1996) discussed, we do not need to know the true distribution of $G(\cdot)$ in the quasi-likelihood estimation to obtain consistent estimates if we have a correct specification of the conditional mean. We choose the logistic function for $G(\cdot)$, such that $G(z) = \frac{\exp z}{1+\exp z}$.

Following Papke and Wooldridge (1996), we use logit QMLE to estimate the nonlinear model:

$$\begin{aligned} E(\text{Ownership_Ratio}_{it} | \mathbf{x}) = & G(\beta_1 + \beta_2 \log(\text{TFP}_{i,t-2}) + \beta_3 \text{Debt_Ratio}_{i,t-2} \\ & + \beta_4 \text{Top_Bank_Ratio}_{i,t-2} + \beta_5 \text{Intangibles_Ratio}_{i,t-2} \\ & + \mathbf{Z}_{i,t-2}\boldsymbol{\gamma} + \text{Country_FE}_i + \text{Industry_FE}_i + \text{Year_FE}_t) \end{aligned} \quad (1)$$

where i indicates foreign subsidiaries and t indicates the year of establishment. As some parent firms have more than one foreign subsidiary, we use standard errors clustered at the parent firm level.

Serving as our dependent variable is *Ownership_Ratio*, the primary parent firm's ownership ratio of its foreign subsidiary. Regarding our independent variables, *TFP* is the parent firm's TFP obtained from the production function estimation using the Wooldridge (2009) method, following Rovigatti and Mollisi (2018) and using the "prodest" Stata package.²¹ As discussed previously, *Debt_Ratio* is the parent firm's debt divided by its total assets.²² *Top_Bank_Ratio* is the largest shareholder bank's ownership ratio of the parent firm's stock. To calculate *Top_Bank_Ratio*, we identify firms whose largest shareholder is a bank and use such bank's ownership of the parent firm, setting this variable to zero for parents whose largest shareholder is not a bank. Following Alimov and Officer (2017), we define *Intangibles_Ratio* as the total intangible fixed assets of parent firms over total fixed assets. The year fixed effects, *Year_FE*, capture macroeconomic shocks, whereas the host country fixed effects, *Country_FE*, capture country-specific factors. The parent firm's industry fixed effects, *Industry_FE*, are also expected to absorb industry-specific factors. To address reverse causality, all firm-level explanatory variables are calculated two years before the establishment of a foreign subsidiary.²³

²⁰Papke and Wooldridge (1996) analyzed employee participation rates in 401(k) pension plans and Papke and Wooldridge (2008) applied the models to test pass rates in Michigan.

²¹The Online Appendix describes our TFP estimation in detail.

²²Appendix D shows the estimation results using alternative measures of financial constraints.

²³Hijzen et al. (2011) argue that the approach using a one-year lag explanatory variables may be unsatisfactory when the decision to invest is taken one or two years before the investment and when the decision to invest is taken in conjunction with other decisions that affect the observable characteristics of the firm because part of the causal effect due to the decision

We control for time-invariant host country's characteristics by including the host country fixed effects, *Country_FE*. In addition to them, time-varying country factors can impact the ownership structure of FDI. We, therefore, include a vector of time-varying host country characteristics, *Z*, in the estimation. We include host countries' GDP and per capita GDP from the World Bank's *World Development Indicators* to control for the market potential and availability of "good" JV partners.

As Bilir et al. (2019) and others find, a host country's financial development increases inward foreign investment.²⁴ As we stated in section 2, we presume that financial constraints become more stringent in host countries with low levels of financial development. To test this hypothesis, we construct a country-level measure of financial development. Bilir et al. (2019) used the total amount of bank credit extended to the private sector as a share of GDP from Beck et al. (2010) as their measure of host-country financial development. Following Bilir et al. (2019), we use private credit from deposit money banks and other financial institutions for GDP (%) as an indicator of financial development, *Financial Dev.*, and include it as an explanatory variable in regression analysis.²⁵

Further, We employ the level of intellectual property protection from Walter G. Park's index (Park, 2008), *IPR protection*, because some firms may avoid JVs to avoid infringement on their intellectual property (Alimov and Officer 2017). Lastly, we use the OECD's FDI restrictiveness index of host countries, *FDI restrictiveness*, because some countries have imposed strict ownership restrictions on foreign subsidiaries.

4.2 Logit model

Although the ownership ratio is a continuous variable, whole ownership (= 1) and majority ownership (> 0.5) have distinct meanings. Whole ownership enables a parent firm to make all decisions on its own and take all profits, whereas majority ownership enables the parent firm to control its foreign subsidiary while sharing the subsidiary's costs and profits. Considering the distinct features of whole and majority ownership, we use a logit model to estimate parent firms' decisions on whole

to invest abroad may actually occur before the year of the investment in such a case. Following Hijzen et al. (2011), we employ the specification with two-year lags as it allows for some anticipatory effects. In addition, we confirm that the main results do not change even if we use one-year lag explanatory variables in Appendix C.

²⁴Bilir et al. (2019) employ the data on the US Multinational Enterprises (MNEs) to assess the impact of the host country's financial development on the US MNEs' strategy. They illustrated that financial development in a host country increases the entry of US MNEs and their sales to the US and third countries. These effects are more pronounced in financially vulnerable sectors. Desbordes and Wei (2017a) use a database on manufacturing FDI projects worldwide and empirically investigate the effects of financial development in source and destination countries on FDI. By exploiting variations in both country-specific financial development and sectoral financial vulnerability, they establish causality and show that both the source and destination countries' financial development have a significant positive impact on greenfield, expansion, and M&A FDI. Desbordes and Wei (2017b) examine the effects that source and destination countries' financial development have on FDI in normal and crisis times. Using a difference-in-differences method, they find that the financial development of source and destination countries has a strong positive impact on the relative volume of FDI in financially vulnerable sectors during normal times. They likewise find that the relative volume of FDI in financially vulnerable sectors fell more in financially developed source and destination countries during the 2008–2010 global financial crisis. Finally, Alquist et al. (2019) model cross-border M&A and test the model prediction using domestic and international M&A data in an emerging market before the global financial crisis from Thompson's International Mergers and Acquisitions Database. They confirm that the share of full foreign acquisitions is higher in sectors dependent on external financing, countries with less-developed finances, and countries with higher-quality institutions.

²⁵More specifically, we employ "private credit by deposit money banks and other financial institutions to GDP (%)" ("pcrdbgdp") from Beck et al. (2010)'s *Financial Development and Structure Dataset* available at <https://www.worldbank.org/en/publication/gfdr/data/financial-structure-database>.

Table 1: Descriptive statistics

	Mean	SD	Min	Max	N
<i>Ownership Structure</i>					
Ownership ratio (t)	0.718	0.272	0.100	1.000	3435
Wholly owned or not (t)	0.375	0.484	0.000	1.000	3435
Majority-owned or not (t)	0.694	0.461	0.000	1.000	3435
<i>Parent Firm Characteristics</i>					
log TFP (t-2)	0.977	0.036	0.739	1.086	3332
Debt ratio (t-2)	0.531	0.176	0.001	1.325	3352
Intangibles ratio (t-2)	0.010	0.020	0.000	0.472	3311
N of subsidiaries (t-2)	5.639	11.703	0.000	157.000	3435
<i>Parent Firm and Bank Relationships</i>					
Top bank ratio (t-2)	0.016	0.033	0.000	0.300	3241
Bank as top owner (t-2)	0.215	0.411	0.000	1.000	3435
Bank subsidiaries (t-2)	0.061	0.239	0.000	1.000	3236
N of bank subsidiaries (t-2)	0.135	0.628	0.000	8.000	3236
<i>Host Country Characteristics</i>					
log GDP (t-2)	27.606	1.455	20.557	30.419	3313
log percapita GDP (t-2)	8.290	1.300	6.108	11.312	3313
IPR protection (t-2)	3.082	1.095	0.200	4.875	3423
log Financial Dev. (t-2)	4.312	0.584	-0.232	5.276	3312
FDI restrictiveness (t-2)	0.418	0.192	0.004	0.849	2294

ownership and majority ownership of their foreign subsidiaries as follows:

$$\begin{aligned}
 \Pr (Ownership_Type_{it} = 1 \mid \mathbf{x}_i) &= \frac{\exp (\mathbf{x}_i \beta)}{1 + \exp (\mathbf{x}_i \beta)} \\
 &= F(\beta_1 + \beta_2 \log(TFP_{i,t-2}) + \beta_3 Debt_Ratio_{i,t-2} \\
 &\quad + \beta_4 Top_Bank_Ratio_{i,t-2} + \beta_5 Intangibles_Ratio_{i,t-2} \\
 &\quad + \mathbf{Z}_{i,t-2} \gamma + Country_FE_i + Industry_FE_i + Year_FE_t)
 \end{aligned} \tag{2}$$

where *Ownership_Type* is a dummy variable for the ownership type. When estimating the whole ownership decision, we use a dummy variable that takes the value of one if the parent firm wholly owns a foreign subsidiary. Similarly, we use a dummy variable that takes the value of one if the parent firm has the majority of a foreign subsidiary when estimating the decision on majority ownership. The explanatory variables are the same as those in the fractional logit model.

5 Results

5.1 Baseline results

Column (1) of Table 2 presents the baseline fractional logit results. Column (1) shows the results using all host countries. As expected, the coefficient of TFP is positive, and the coefficient of the debt ratio is negative; both are statistically significant. The finding that the parent firm's ownership ratio increases as parent firm productivity increases is consistent with our hypothesis in section 2 and the theoretical predictions of existing research such as Raff et al. (2009b) and Ito and Tanaka (2022). The negative relationship between the parent firm's debt ratio and the parent firm's ownership ratio of foreign subsidiaries supports our hypothesis that financial constraints are an important determinant of FDI ownership structure.

As expected, the host countries' financial development is positively associated with Japanese firms' higher ownership ratios of their foreign subsidiaries, indicating that financial constraints on FDI projects have become less stringent in financially developed countries. The host country's market size, or GDP, is negatively associated with Japanese firms' ownership ratios of their foreign subsidiaries. These results may reflect the availability of JV partners in large countries. The host countries' per capita GDP is positively associated with the Japanese firms' ownership ratio of their foreign subsidiaries. This may reflect that richer countries tend to have less strict ownership restrictions.

Table 2 also shows that a bank's ownership ratio as the largest shareholder is negatively related to the foreign subsidiary's ownership ratio. The intangible asset ratios are not statistically significant²⁶

Column (2) of Table 2 shows the estimation results that include FDI restrictiveness as a covariate. This inclusion results in a large decrease in the number of observations due to limited coverage

²⁶While our main focus is on investment into manufacturing affiliates, we recognize that a non-trivial amount of investment occurs in non-manufacturing subsidiaries as well. Our results from these regressions suggest that parent firm TFP affects FDI in wholesale/retail and debt ratios affect FDI in services, similar to manufacturing FDI. However, the top banks' influence on FDI is positive in the services sector. This may be because these investments are viewed as less risky than manufacturing subsidiaries, and are smaller in size, resulting in lower fixed establishment costs and marginal operational costs, indicating that they require less funding from lending banks. A more complete discussion can be found in our [Online Appendix](#).

Table 2: Baseline results

	Fractional logit		Logit	
	(1) Share	(2) Share	(3) Whole	(4) Majority
log TFP (t-2)	1.909** [0.908]	2.070* [1.066]	2.635 [1.693]	0.852 [1.642]
Debt ratio (t-2)	-0.957*** [0.177]	-1.032*** [0.203]	-1.060*** [0.314]	-1.404*** [0.330]
Top bank ratio (t-2)	-2.043** [0.832]	-2.483*** [0.907]	-2.671* [1.487]	-3.326* [1.762]
Intangibles ratio (t-2)	2.130 [2.341]	1.464 [2.429]	0.006 [3.030]	10.478** [4.401]
log GDP (t-2)	-3.197*** [0.901]	-5.292*** [1.364]	-3.789*** [1.201]	-5.541*** [1.438]
log percapita GDP (t-2)	2.647*** [0.817]	4.434*** [1.203]	3.943*** [1.121]	4.814*** [1.338]
IPR protection (t-2)	0.143 [0.106]	0.121 [0.139]	0.152 [0.198]	0.153 [0.198]
log Financial Dev. (t-2)	0.378*** [0.121]	0.417*** [0.154]	0.446* [0.241]	0.197 [0.223]
FDI restrictiveness (t-2)		0.122 [0.448]		
Observations	3061	2142	3012	3020
N of Subsidiaries	3061	2142	3012	3020
N of Parent firms	931	833	929	929
N of Banks	35	32	35	35
N of Countries	49	35	29	33
Mean of Dep. Var.	0.717	0.755	0.374	0.692
Country FE	YES	YES	YES	YES
Parent Industry FE	YES	YES	YES	YES
Year FE	YES	YES	YES	YES

Notes: Robust standard errors are clustered by parent firm. Dep. var. in (1)–(2): Parent firms' ownership ratio of foreign subsidiaries (t). Dep. var. in (3): Dummy variable for whole ownership (t). Dep. var. in (4): Dummy variable for majority ownership (t). Columns (1)–(2) are estimated by the fractional logit model. Columns (3)–(4) are estimated by the logit model. Host countries' log GDP, log per capita GDP, level of IPR protection, and financial development are included in the estimation. A list of countries is presented in the Online Appendix. * 10% level, ** 5% level, and *** 1% level.

of the OECD FDI restrictiveness index. Nonetheless, the results are close to the baseline results in column (1). FDI restrictiveness is insignificant, presumably reflecting other variables such as the host country's fixed effect and per capita GDP account for FDI restrictiveness. In the following analysis, we, therefore, present the results of estimation without including FDI restrictiveness.

Columns (3) and (4) of Table 2 show the estimation results of the logit models. The dependent variables in columns (3) and (4) are dummy variables for whole and majority ownership, respectively. The debt ratios are significantly and negatively associated with selecting whole ownership or majority ownership, suggesting that financial constraints force firms to choose partially owned or minority-owned foreign subsidiaries rather than wholly owned ones. The coefficients of TFP are positive in line with the standard heterogeneity model of FDI but insignificant for both whole and majority ownership. The top bank ratio is negatively significant, suggesting that banks are risk-averse to foreign investments. Host countries' GDP is negatively and per capita GDP is positively significant. Host countries' financial development is positively related to selecting whole ownership as expected, while it is insignificant for the majority ownership choice.²⁷ Finally, Host countries' level of IPR protection remains insignificant, while parent firms' intangible ratio is positively associated with majority ownership, as expected.

5.2 Financial development in host countries

To further investigate the role of host countries' financial development, we compute the median level of financial development and categorize countries below the median of the financial development variable as "Low" and those above as "High." We examine whether differences in host countries' financial development affect parent firms' decisions on the ownership ratio in columns (1) and (2) and the whole and majority ownership choices in columns (3)–(6) of Table 3.²⁸ The average ownership ratio, share of the whole ownership, and share of the majority ownership are all lower in host countries with low levels of financial development. However, we find no remarkable systematic differences in the estimation results for the debt ratio between host countries with high and low levels of financial development. The estimated coefficients are almost qualitatively similar between host countries with high and low levels of financial development. The debt ratio is significantly negative in all columns but column (4), suggesting that financial constraints affect ownership choices, even in host countries with a high level of financial development.

A notable difference is that parent firms' TFP is not significant in host countries with a low level of financial development, whereas it is positively significant for the ownership ratio in host countries with a high level of financial development. TFP is insignificant for the ownership percentage and the whole and majority ownership decisions in the host countries with low levels of financial development. This result suggests that parent firms' productivity is not a significant determinant of

²⁷This finding is not consistent with that of [Alquist et al. \(2019\)](#) who use data on domestic and foreign acquisitions in emerging markets over the period 1990–2007 and show that the share of full foreign acquisitions is higher in countries with lower financial development. The reasons for the different results are that our data includes all countries, not just emerging markets, and that our data includes greenfield investments.

²⁸It may be interesting to examine the interactions between the host countries' financial development and industry-level financial dependency. However, the DBJ data provide incomplete coverage of internal cash flows from operations, which prevents us from constructing a measure of industry-level financial dependency based on [Rajan and Zingales \(1998\)](#).

Table 3: Financial Development and Ownership Structure

	Share		Whole		Majority	
	(1) High	(2) Low	(3) High	(4) Low	(5) High	(6) Low
log TFP (t-2)	3.535** [1.386]	1.557 [1.123]	5.115** [2.258]	0.406 [2.338]	4.460** [2.213]	-0.488 [2.333]
Debt ratio (t-2)	-0.976*** [0.269]	-0.923*** [0.199]	-1.263*** [0.411]	-0.759 [0.477]	-1.330*** [0.459]	-1.425*** [0.416]
Top bank ratio (t-2)	-1.548 [1.114]	-1.725 [1.244]	-1.890 [1.863]	-1.260 [2.482]	-1.183 [2.054]	-4.256 [3.074]
Intangibles ratio (t-2)	0.568 [2.830]	8.054** [3.612]	-0.838 [3.430]	6.193 [5.926]	9.741* [5.550]	21.135** [8.667]
Observations	1502	1581	1488	1544	1483	1545
N of Subsidiaries	1502	1581	1488	1544	1483	1545
N of Parent firms	684	633	682	629	679	629
N of Banks	28	30	28	30	28	30
N of Countries	20	46	15	26	15	29
Mean of Dep. Var.	0.770	0.665	0.468	0.282	0.766	0.620
Country FE	YES	YES	YES	YES	YES	YES
Country-level vars.	YES	YES	YES	YES	YES	YES
Parent Industry FE	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES

Notes: Robust standard errors are clustered by parent firm. Dep. var. in (1)–(2): Parent firms' ownership ratio of foreign subsidiaries (t). Dep. var. in (3)–(4): Dummy variable for whole ownership (t). Dep. var. in (5)–(6): Dummy variable for majority ownership (t). Columns (1)–(2) are estimated by fractional logit model. Columns (3)–(6) are estimated by logit model. Host countries' log GDP, log per capita GDP, and level of IPR protection are included in the estimation. The level of financial development of each country is classified as High or Low based on the median ratio of private sector lending by financial institutions to GDP. * 10% level, ** 5% level, and *** 1% level.

the FDI ownership structure in host countries with a low level of financial development. In contrast, parent firms' productivity is positively associated with the ownership ratio in host countries with a high level of financial development. In other words, parent firms' productivity is a significant determinant of the ownership ratio in host countries with a high level of financial development, while financial constraints are a more important determinant of the ownership ratio in host countries with a low level of financial development.

We also find that parent firms' intangible ratio is positively associated with the ownership ratio in host countries with a low level of financial development and that it is positively significant in the majority ownership decision in host countries with both low and high levels of financial development. This result suggests that parent firms' intangible assets are a significant determinant of the ownership decision especially in host countries with a low level of financial development.

5.3 FDI experience and first FDI in a host country

Firms may be able to learn how to set up foreign subsidiaries through their past FDI experience, thereby reducing their fixed cost for FDI. Experienced parent firms can easily obtain external financing by providing existing foreign subsidiaries with collateral. In such cases, the experienced parent firms' financial constraints and productivity can become less important determinants of their foreign subsidiaries' ownership structures.

Considering this possibility, we create a subsample covering the first FDI projects in each host country for each parent firm. To capture the global experience of FDI, we also construct a measure

of global FDI experience, $N_of_subsidiaries$, which is the parent firm's total number of foreign subsidiaries in all industries worldwide.

$$\begin{aligned}
E(Ownership_Ratio_{it} | \mathbf{x}) = & G(\beta_1 + \beta_2 \log(TFP_{i,t-2}) + \beta_3 Debt_Ratio_{i,t-2} \\
& + \beta_4 Top_Bank_Ratio_{i,t-2} + \beta_5 Intangibles_Ratio_{i,t-2} \\
& + \beta_6 N_of_subsidiaries_{i,t-2} + \mathbf{Z}_{i,t-2}\gamma + Year_FE_t \\
& + Country_FE_i + Industry_FE_i)
\end{aligned} \tag{3}$$

Table 4: First FDI at a host country and FDI experience

	First FDI			Global experience		
	(1) Share	(2) Whole	(3) Majority	(4) Share	(5) Whole	(6) Majority
log TFP (t-2)	0.609 [1.018]	1.038 [1.846]	-1.048 [2.032]	1.044 [0.915]	1.096 [1.665]	-0.230 [1.700]
Debt ratio (t-2)	-1.023*** [0.191]	-1.203*** [0.356]	-1.438*** [0.382]	-0.941*** [0.175]	-1.022*** [0.313]	-1.388*** [0.326]
Top bank ratio (t-2)	-2.141** [1.068]	-2.427 [1.935]	-4.972** [2.268]	-1.503* [0.839]	-2.075 [1.495]	-2.633 [1.779]
Intangibles ratio (t-2)	4.094 [3.574]	4.449 [4.997]	15.951** [6.465]	2.361 [2.397]	0.185 [3.120]	10.939** [4.488]
N of subsidiaries (t-2)				-0.010*** [0.003]	-0.013*** [0.005]	-0.013** [0.006]
Observations	1957	1911	1917	3061	3012	3020
N of Subsidiaries	1957	1911	1917	3061	3012	3020
N of Parent firms	888	886	886	931	929	929
N of Banks	32	32	32	35	35	35
N of Countries	49	29	33	49	29	33
Mean of Dep. Var.	0.723	0.386	0.688	0.717	0.374	0.692
Country FE	YES	YES	YES	YES	YES	YES
Country-level vars.	YES	YES	YES	YES	YES	YES
Parent Industry FE	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES

Notes: Robust standard errors are clustered by parent firm. Dep. var. in (1) and (4): Parent firms' ownership ratio of foreign subsidiaries (t). Dep. var. in (2) and (5): Dummy variable for whole ownership (t). Dep. var. in (3) and (6): Dummy variable for majority ownership (t). Columns (1) and (4) are estimated by the fractional logit model. Columns (2)–(3) and (5)–(6) are estimated by the logit model. Host countries' log GDP, log per capita GDP, level of IPR protection, and financial development are included in the estimation. * 10% level, ** 5% level, and *** 1% level.

Table 4 presents the estimation results using the subsample in columns (1)–(3) and the results using the measure of global FDI experience in columns (4)–(6). The results are essentially similar to the baseline results in Table 2 in that parent firms' debt ratio is significantly and negatively associated with ownership ratio, whole ownership, and majority ownership. The parent firms' TFP is not significant in all columns, suggesting that parent firm productivity is not as important as financial constraints. The top bank ratio is negatively significant in columns (1), (3), and (4), suggesting that banks are risk-averse to foreign investments, especially those by inexperienced firms. The fact that bank ownership is not significant in columns (2), (5), and (6) means that bank influence is not universal. It is reasonable to assume that bank influence is stronger for inexperienced parent firms and weaker for experienced parent firms. In addition, bank influence does not work strongly for firms that could choose full ownership, but for firms that are considering whether to choose majority

ownership. The intangible asset ratio is positively significant in columns (3) and (6), suggesting that parent firms' intangible assets are a significant determinant of majority ownership.

A notable feature of Table 4 is that the number of foreign subsidiaries is negative and significant for all the ownership choices, suggesting that global FDI experience leads parent firms to lower their ownership ratio in a new foreign subsidiary and avoid establishing a wholly- or majority-owned subsidiary. This result implies the possibility that parent firms' global FDI experience enables them to learn how to find a joint venture partner and set up foreign subsidiaries together in an easier manner. This learning effect can also be explained by the flip side that parent firms' global FDI experience assures the host countries' governments and partners that the parent firms are reliable partners.

5.4 Top host countries

Next, we analyze the ownership structures of foreign subsidiaries in the selected countries. We do so because Japanese foreign subsidiaries are unevenly distributed worldwide and are concentrated in several countries. The top three host countries in our sample period are China, Thailand, and the United States. Estimating the equations separately for each host country makes country-fixed effects unnecessary at the cost of fewer observations. Table 5 presents the estimation results. For foreign subsidiaries in China, the debt ratio is negatively significant and TFP is positively significant, as expected. The top bank ratio is also negatively significant, suggesting that banks are risk-averse to investments in China.

Table 5: Parent ownership ratio in top host countries

	(1) CHN	(2) THA	(3) USA
log TFP (t-2)	3.658*** [1.217]	-2.696 [2.361]	5.934 [4.130]
Debt ratio (t-2)	-0.853*** [0.244]	-0.634 [0.409]	-1.933** [0.775]
Top bank ratio (t-2)	-2.061* [1.096]	-3.812 [2.614]	5.200 [4.524]
Intangibles ratio (t-2)	0.711 [2.704]	9.268 [8.097]	-4.541 [13.096]
Observations	1267	331	274
N of Subsidiaries	1267	331	274
N of Parent firms	611	256	203
N of Banks	28	15	14
Mean of Dep. Var.	0.679	0.672	0.802
Parent Industry FE	YES	YES	YES
Year FE	YES	YES	YES

Notes: Robust standard errors are clustered by parent firm. Dep. var.: Parent firms' ownership ratio of foreign subsidiaries (t). Columns (1)–(3) are estimated by the fractional logit model. Host countries' log GDP, log per capita GDP, level of IPR protection, and financial development are not included in the estimation. * 10% level, ** 5% level, and *** 1% level.

For foreign subsidiaries in Thailand, all parent firm variables are insignificant. The possible reason for the insignificance is that firms investing in Thailand often do so in conjunction with the expansion of their business partners.

Meanwhile, firms investing in the U.S. tend to establish wholly-owned subsidiaries because FDI regulations are much less restrictive. This country-specific factor may have contributed to the in-

significance of TFP. However, the debt ratio is significantly negative even in the U.S., suggesting that parent firms' financial constraints are more important for Japanese firms' ownership choice of FDI in the U.S. than their productivity.

5.5 Period

Figure 3 shows that the share of partial ownership fluctuated during the sample period. The proportion of partial ownership increased during the first period, 1989–1993. In the next period, 1994–2003, the proportion of partial ownership is decreasing. From 2004 to 2016, the proportion of partial ownership was steady at nearly 50%. Considering these differences in trends, we perform a regression analysis for each of the three time periods. The results in columns (1)–(3) of Table 6 reveal that, in the first period (1989–1993), when partial ownership increases, the intangible asset ratio matters rather than the debt ratio and productivity of the parent firm. Table 6 exhibits that in the next period (1994–2003) and the last period (2004–2016), the debt ratio and productivity of the parent firm, and not the intangible assets ratio of the parent firm, are important. A comparison of these period-specific estimates suggests that the liberalization of FDI in host countries reinforced the role of the parent firm's financial constraints and productivity in determining the ownership structure of its foreign subsidiaries.

Table 6: Estimation by period

	Period			Normal versus Crisis	
	(1) 1989–1993	(2) 1994–2003	(3) 2004–2016	(4) Crisis	(5) Normal
log TFP (t-2)	-1.228 [1.730]	3.469*** [1.199]	3.096** [1.450]	1.804 [1.639]	2.082** [1.012]
Debt ratio (t-2)	-0.249 [0.391]	-1.206*** [0.239]	-0.961*** [0.294]	-0.441 [0.303]	-1.082*** [0.207]
Top bank ratio (t-2)	0.305 [2.478]	-2.049 [1.661]	-2.113** [0.992]	-0.698 [2.003]	-2.634*** [0.910]
Intangibles ratio (t-2)	17.756** [7.260]	-3.151 [5.234]	2.764 [2.555]	12.676*** [4.705]	0.062 [2.377]
Observations	569	1303	1189	679	2211
N of Subsidiaries	569	1303	1189	679	2211
N of Parent firms	321	552	609	386	823
N of Banks	19	25	12	22	31
N of Countries	32	36	40	37	45
Mean of Dep. Var.	0.632	0.673	0.804	0.660	0.728
Country FE	YES	YES	YES	YES	YES
Country-level vars.	YES	YES	YES	YES	YES
Parent Industry FE	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES

Notes: Robust standard errors are clustered by parent firm. Dep. var. : Parent firms' ownership ratio of foreign subsidiaries (t). Columns (1)–(5) are estimated by fractional logit model. The crisis times include the 1991–1993, 1997–1998 and 2008–2010 financial crises. The normal times include the years 1989–1990, 1994–1996, 2000–2007, and 2012–2016. Host countries' log GDP, log per capita GDP, level of IPR protection, and financial development are included in the estimation. * 10% level, ** 5% level, and *** 1% level.

After [Krugman \(2000\)](#) investigated the reason for the surge in FDI into a host country during a crisis, several studies have found that the nature of FDI is different during financial crises than during normal times ([Raff et al. 2018](#), [Alquist et al. 2019](#), and [Desbordes and Wei 2017b](#)). Our sample period covers both crisis and normal times. In Columns (4) and (5) of Table 6, we compare normal

times with crisis times. For crisis times, we include the 1991–1993 bubble burst, the 1997–1998 Asian financial crisis, and the 2008–2010 global financial crisis. As for normal times, we include 1989–1990, 1994–1996, 2000–2007, and 2012–2016. We exclude 2011, the year of the Great East Japan Earthquake and the resulting Fukushima nuclear plant accident from both periods since the earthquake and the nuclear accident were unique in that they caused exogenous shocks to the Japanese economy but did not result in a financial crisis. The estimation results show that the parent firm's debt ratio and productivity are not significant in times of crisis, whereas both are significant in normal times. The main bank ownership ratio is significant in normal times but not in crisis times. Comparing crisis and normal times, we conclude that parent firms' debt ratios, productivity, and main banks matter only in normal times, whereas they do not matter in crisis times. It suggests that the borrowing channel—parent firms' ability to borrow—is important for MNEs' ownership choice of FDI in normal times, while they become irrelevant in crisis times when the lending channel—banks' ability to lend—is restricted.²⁹

5.6 Joint venture partners

We now examine how Japanese parent firms choose their partners for a joint venture. There are at least three cases in our data:

1. Whole ownership. A Japanese parent firm has no partner because it chooses to establish a wholly-owned subsidiary. It consists of 37.5% of all FDI projects.
2. JPN-only. All partners of a Japanese parent firm are Japanese firms. It consists of 8.1% of all FDI projects.
3. Non-JPN. Some of the partners of a Japanese parent firm are local/third-country firms. It consists of 54.4% of all FDI projects.

We use a multinomial logit model to simultaneously estimate parent firms' decisions on whole ownership and joint venture (JV) partners. We explore the type of partner a more productive and less financially constrained company would choose. We set whole ownership as the base category for the estimation.³⁰ We do not include host country and industry fixed effects because they prevent convergence. Table 7 presents the estimation results. Compared with whole ownership, JV with local and non-Japanese partners tend to be associated with a lower TFP of Japanese parent firms. We do not find a similar tendency for JV with Japanese partners. This indicates that less productive firms tend to choose JV with foreign partners.

Moreover, we also find that JV tends to be associated with higher debt ratios for Japanese parent firms. In other words, firms with tighter financial constraints tend to choose JV over whole ownership. This suggests that firms with strict financial constraints are forced to choose JV.

²⁹This finding corresponds to that of Raff et al. (2018) who use Japanese FDI data for the period 1980 to 2000 and find deterioration in bank health due to decreasing land values reduced the predicted number of investments via the lending channel.

³⁰Nested logit models can also be considered here because a two-level decision tree might exist if Japanese firms (1) choose whole ownership or JV, and then if JV, (2) pick their partner/ownership level. However, we fail to use the nested logit model because it requires explanatory variables for the second stage (partner decision) that are different from those for the first stage (JV or whole ownership decision).

Table 7: Multinomial Logit (Base category= Whole ownership)

	Joint venture partners	
	JPN-only	Non-JPN
log TFP (t-2)	-0.719 [2.884]	-3.175* [1.698]
Debt ratio (t-2)	0.756* [0.437]	1.318*** [0.308]
Top bank ratio (t-2)	-2.700 [2.567]	2.594* [1.465]
Intangibles ratio (t-2)	-9.510* [5.654]	-3.822 [2.917]
log GDP (t-2)	0.182** [0.073]	0.385*** [0.044]
log percapita GDP (t-2)	-0.126 [0.106]	-0.067 [0.067]
IPR protection (t-2)	-0.221 [0.180]	-0.750*** [0.111]
log Financial Dev. (t-2)	-0.492*** [0.145]	-0.365*** [0.101]
Observations	3060	
N of Subsidiaries	3060	
N of Parent firms	931	
N of Banks	35	
N of Countries	49	
Mean of Dep. Var.	2.174	
Country FE	NO	
Parent Industry FE	NO	
Year FE	YES	

Notes: Robust standard errors are clustered by parent firm. Dep. var. : Nationality of joint venture partners (*t*). All results are estimated by multinomial logistic regression. Host countries' log GDP, log per capita GDP, level of IPR protection, and financial development are included in the estimation. * 10% level, ** 5% level, and *** 1% level.

The percentage owned by the largest shareholder bank is associated with a higher percentage of foreign (local or 3rd country) ownership, suggesting that banks are risk-averse and tend to seek the JV with foreign partners that have better knowledge of the host market. In contrast, there is no significant relationship between the percentage owned by the largest shareholder bank and the choice of Japanese JV partners.

As expected, the choice of JV is negatively associated with host countries' financial development. This suggests that firms tend to choose JV in financially less-developed countries. In addition, the choice of JV with foreign partners is negatively associated with host countries' level of IPR protection, suggesting that firms tend to avoid JV in countries with a lower level of IPR protection. Finally, the choice of JV is also positively associated with host countries' GDP, suggesting that firms tend to choose JV in countries with a larger market size.

5.7 The role of the banks

Several Japanese firms have a substantial percentage of their shares held by banks. Banks are the largest shareholders in 21.5% of firms in our sample as shown in Table 1. Therefore, banks play an important role in Japan's outward FDI. As the largest shareholders, main banks can increase profits by supporting Japanese firms' FDI projects. There is the possibility that firms with higher bank ownership are less susceptible to more severe financial constraints. If so, then these firms optimize their FDI with the help of their main banks, even if they are financially constrained.

Nevertheless, there is a principal-agent problem. Information asymmetries between firms and banks are greater for foreign than domestic investments. How banks influence firms' ownership decisions of foreign subsidiaries cannot be determined without empirical analysis. We create an indicator variable, *Bank_as_top_owner*, which takes the value of 1 if the largest shareholder of the parent firm is a bank.³¹ Table 8 shows that parent firms whose largest owners are banks tend to have a lower ownership ratio of their foreign subsidiaries and tend to choose minority rather than majority ownership of foreign subsidiaries. The results suggest that banks, as shareholders, prefer risk-averse FDI with a lower ownership ratio of foreign subsidiaries.³²

In columns (4)–(6) of Table 8, we interact parent firms' debt ratio with *Bank_as_top_owner*. The debt ratio remains negatively significant, while *Bank_as_top_owner* and the interaction term are not significant, suggesting that parent firms' financial constraints and main banks are individually related to the parent firms' ownership ratio of foreign subsidiaries. It also suggests that parent firms' financial constraints are the more important factor determining the FDI ownership structure.

If the information asymmetry problem is eased, banks may become less risk-averse and more willing to support foreign investments as we discussed in section 2.³³ To test this, we identify Japanese banks' overseas networks worldwide. Using Toyo Keizai's OJC data, we identify the number of foreign subsidiaries owned by Japanese banks in the host country h in year $t - 2$. As explained previously, we can also identify the largest shareholder bank for each parent firm. We now create a dummy

³¹For simplicity, we ignore the ownership ratio of banks that are not the largest shareholder.

³²See Betschinger (2015) for Japanese banks' behavior.

³³von der Ruhr and Ryan (2005) reveal the importance of banking FDI in Japanese manufacturing firms' FDI.

Table 8: Bank as the largest shareholder

	(1) Share	(2) Whole	(3) Majority	(4) Share	(5) Whole	(6) Majority
log TFP (t-2)	2.200** [0.892]	3.134* [1.663]	1.225 [1.603]	2.225** [0.886]	3.117* [1.663]	1.258 [1.590]
Debt ratio (t-2)	-0.962*** [0.176]	-1.082*** [0.311]	-1.413*** [0.325]	-0.850*** [0.203]	-0.923*** [0.344]	-1.217*** [0.353]
Bank as top owner (t-2)	-0.126* [0.066]	-0.182 [0.119]	-0.235* [0.134]	0.116 [0.202]	0.177 [0.361]	0.199 [0.430]
Intangibles ratio (t-2)	2.276 [2.335]	0.614 [3.047]	9.920** [4.244]	2.252 [2.335]	0.608 [3.043]	9.846** [4.245]
Bank as top owner * Debt ratio				-0.435 [0.331]	-0.691 [0.618]	-0.779 [0.736]
Observations	3147	3098	3105	3147	3098	3105
N of Subsidiaries	3147	3098	3105	3147	3098	3105
N of Parent firms	965	963	963	965	963	963
N of Banks	35	35	35	35	35	35
N of Countries	49	29	33	49	29	33
Mean of Dep. Var.	0.717	0.375	0.692	0.717	0.375	0.692
Country FE	YES	YES	YES	YES	YES	YES
Country-level vars.	YES	YES	YES	YES	YES	YES
Parent Industry FE	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES

Notes: Robust standard errors are clustered by parent firm. Dep. var. in (1) and (4): Parent firms' ownership ratio of foreign subsidiaries (t). Dep. var. in (2) and (5): Dummy variable for whole ownership (t). Dep. var. in (3) and (6): Dummy variable for majority ownership (t). Columns (1) and (4) are estimated by the fractional logit model. Columns (2)–(3) and (5)–(6) are estimated by the logit model. Host countries' log GDP, log per capita GDP, level of IPR protection, and financial development are included in the estimation. * 10% level, ** 5% level, and *** 1% level.

variable that takes the value of 1 if the bank owner of a Japanese parent firm has a foreign subsidiary in host country h of the FDI project at $t - 2$, $Bank_subsidiaries_{i,t-2,h}$. These variables were included in the regression as follows:

$$\begin{aligned}
& E(Ownership_Ratio_{i,t,h} \mid \mathbf{x}) \\
& = G(\beta_1 + \beta_2 \log(TFP_{i,t-2}) + \beta_3 Debt_Ratio_{i,t-2} + \beta_4 Intangibles_Ratio_{i,t-2} \\
& \quad + \beta_5 Bank_as_top_owner_{i,t-2} + \beta_6 Bank_subsidiaries_{i,t-2,h} \\
& \quad Z_{i,t-2}\gamma + Country_FE_{i,h} + Industry_FE_i + Year_FE_t)
\end{aligned} \tag{4}$$

Furthermore, we create the number of foreign subsidiaries of the bank in the host country of the FDI project at $t - 2$, $N_Bank_subsidiaries_{i,t-2,h}$, and include this in the regression as well.

Table 9 presents the estimation results. Accordingly, Japanese parent firms whose largest shareholder is a bank tend to prefer lower ownership and higher non-Japanese ownership of foreign subsidiaries. However, in the host countries where their main banks have foreign subsidiaries, they tend to increase their ownership and lower their non-Japanese ownership of their foreign subsidiaries. The number of overseas subsidiaries of their main bank is also associated with higher ownership of Japanese parent firms and lower ownership of non-Japanese partners. It is in line with our hypothesis 4b in section 2 and suggests the possibility that main banks are more cooperative in allowing Japanese firms to increase their ownership percentages of their foreign subsidiaries if the banks have enough information on the host country via their own subsidiaries. In columns (2) and (5) of Table 9, an interaction term between parent firms' debt ratio and the top bank dummy is not significant,

while parent firms' debt ratio and the bank subsidiaries dummy are significant. It again suggests that parent firms' financial constraints and bank subsidiaries play an important role in the determination of FDI ownership structure.

Table 9: Overseas subsidiaries of the largest shareholder bank

	Top JPN ownership			Non-JPN ownership		
	(1)	(2)	(3)	(4)	(5)	(6)
log TFP (t-2)	2.685*** [0.883]	2.705*** [0.880]	2.668*** [0.885]	-2.639*** [0.924]	-2.661*** [0.922]	-2.615*** [0.926]
Debt ratio (t-2)	-0.927*** [0.175]	-0.800*** [0.205]	-0.940*** [0.175]	0.835*** [0.191]	0.715*** [0.229]	0.853*** [0.192]
Intangibles ratio (t-2)	2.381 [2.373]	2.355 [2.374]	2.443 [2.377]	-2.141 [2.558]	-2.111 [2.556]	-2.213 [2.562]
Bank as top owner (t-2)	-0.219*** [0.081]	0.049 [0.193]	-0.217*** [0.075]	0.249*** [0.089]	-0.000 [0.207]	0.246*** [0.083]
Bank subsidiaries (t-2)	0.268** [0.111]	0.286** [0.113]		-0.331*** [0.126]	-0.348*** [0.128]	
Bank as top owner * Debt ratio		-0.493 [0.320]			0.458 [0.341]	
N of bank subsidiaries (t-2)			0.122*** [0.043]			-0.151*** [0.048]
Observations	2972	2972	2972	2971	2971	2971
N of Subsidiaries	2972	2972	2972	2971	2971	2971
N of Parent firms	951	951	951	951	951	951
N of Banks	34	34	34	34	34	34
N of Countries	47	47	47	47	47	47
Mean of Dep. Var.	0.718	0.718	0.718	0.232	0.232	0.232
Country FE	YES	YES	YES	YES	YES	YES
Parent Industry FE	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES

Notes: Robust standard errors are clustered by parent firm. Dep. var. in (1)–(3): Japanese firms' ownership ratio of foreign subsidiaries (*t*). Dep. var. in (4)–(6): Non-Japanese firms' ownership ratio of foreign subsidiaries (*t*). Columns (1)–(6) are estimated by the fractional logit model. Host countries' log GDP, log per capita GDP, level of IPR protection, and financial development are included in the estimation. * 10% level, ** 5% level, and *** 1% level.

6 Concluding remarks

This study's results reveal that a parent firm's debt ratio is closely related to the ownership structure of its foreign subsidiaries. The empirical analysis shows that firms with stricter financial constraints tend to choose lower ownership ratios for their foreign subsidiaries. This implies that firms tend to seek JV partners when borrowing from banks is limited. Furthermore, we find suggestive evidence that the main banks—the bank that is the largest shareholder of the parent firm—play a role in determining the ownership structure of their customer's foreign subsidiaries. The percentage of ownership of a bank as the largest shareholder of an MNE parent is negatively correlated with the percentage of ownership of its foreign subsidiary. However, an MNE's ownership of FDI projects tends to be higher in host countries where the bank, as its largest shareholder, has an overseas subsidiary. This suggests that if information asymmetries between investing firms and banks are reduced, the financial constraints on firms investing in foreign subsidiaries may be eased. In addition, our analysis shows that the host country's financial development is positively associated with the MNE ownership ratio of foreign subsidiaries as expected. We also find that the parent firm's pro-

ductivity is positively related to the ownership ratio of foreign subsidiaries, but the relationship is not as robust as that we find for financial constraints and ownership ratio.

Recent events provide excellent examples of policy prescriptions in our results. For example, the ongoing COVID-19 pandemic has taught us that global supply chains are fairly fragile. Consequently, many firms are looking to vertically integrate their supply chains to minimize the bottleneck issues that arise with the use of contract suppliers. However, this requires MNE parents to branch out and create or acquire subsidiaries in new sectors outside of their traditional competencies. Broadening the scope of subsidiary activities leads to greater risk-taking by the firm than continual investment in the main business lines. Given the risk-averse nature of main banks, these investments are likely to face significant funding scrutiny from main banks, creating sizeable roadblocks to these supply chain reorganizations. Recognizing the importance of these supply chains to national welfare, the government could assist by creating an agency to help fund riskier investments. This would alleviate potential roadblocks for shareholding banks by reducing their risk. It would also allow many of these new subsidiaries to be wholly owned and not joint ventures, eliminating many of the contractual and supply issues that helped create these supply chain bottlenecks. This also safeguards innovation and minimizes negative technology and other IPR-related informational spillovers to local firms, which often arise through joint ventures with local companies.

In addition, our results suggest it would be desirable for the government to assist shareholding banks' outward FDI and follow the subsidiary relocation. In doing so, they can assist their clients by providing investors with increased host country information. This lowers the riskiness of the new investment, subsequently making these investments cheaper and more desirable for shareholding banks. It also signals future bank clients that they can serve their subsidiaries in these host countries as well. Overall, these policy prescriptions suggest changes to the current outward FDI funding policy. However, these changes signal to firms and banks that the government is willing to take on some of the investment risks and help ensure the future success of the subsidiary relocation process.

There remains much scope for further research. This study analyzes the FDI of listed firms but does not consider the possibility that they cover FDI fixed costs through equity finance. How firms use equity finance to cover fixed costs of FDI is a topic for future research. Unlike listed firms, non-listed firms that have insufficient access to equity finance and are more reliant on debt finance may have more severe financial constraints on their FDI. This may result in making JVs a better option for non-listed firms. The impact of financial constraints on FDI by non-listed firms is another topic for future research.

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Appendices

A Interaction between firm and host country characteristics

In the main text, we analyze how parent firm characteristics and host country characteristics affect ownership choices. Here, we further include interaction terms of parent firms' characteristics with host country characteristics in the regression in Table A1. Three interaction terms were incorporated. The first is the interaction between the debt ratio and the host country's financial development, *Debt_Ratio * Financial Dev.*. The second is the interaction term between parent firms' intangible assets to total assets and the level of host countries' IP protection, *Intangible_Ratio * IPR protection*. Using the host country-level IP protection rates and parent-firm-level intangible asset data, we test the possibility that IPR-intensive firms may have a higher share of subsidiary ownership in countries with lower IP protection. The third is the interaction between TFP and FDI restriction index *TFP * FDI restrictiveness*. Table A1 indicates that there is no interaction between the host country and parent firm characteristics because all interaction terms are insignificant.

Table A1: Interaction between firm and host country characteristics

	JPN onwership ratio			
	(1)	(2)	(3)	(4)
log TFP (t-2)	1.851** [0.912]	1.179 [2.880]	1.895** [0.903]	1.306 [2.940]
Debt ratio (t-2)	-1.596* [0.952]	-1.056*** [0.207]	-0.961*** [0.176]	-1.327 [1.134]
log Financial Dev. (t-2)	0.199 [0.169]			0.335 [0.204]
Debt ratio (t-2) × log Financial Dev. (t-2)	0.143 [0.225]			0.062 [0.270]
Top bank ratio (t-2)	-1.948** [0.824]	-2.525*** [0.897]	-1.762** [0.816]	-2.545*** [0.901]
Intangibles ratio (t-2)	1.943 [2.340]	1.532 [2.527]	9.393 [8.362]	3.974 [9.513]
FDI restrictiveness (t-2)		-1.054 [5.649]		-0.619 [5.779]
log TFP (t-2) × FDI restrictiveness (t-2)		1.582 [5.785]		1.089 [5.925]
IPR protection (t-2)			-0.047 [0.079]	-0.040 [0.130]
Intangibles ratio (t-2) × IPR protection (t-2)			-1.953 [2.025]	-0.767 [2.264]
Observations	3090	2165	3188	2142
N of Subsidiaries	3090	2165	3188	2142
N of Parent firms	936	833	947	833
N of Banks	35	32	36	32
N of Countries	57	37	52	35
Mean of Dep. Var.	0.717	0.754	0.716	0.755
Country FE	YES	YES	YES	YES
Parent Industry FE	YES	YES	YES	YES
Year FE	YES	YES	YES	YES

Notes: Robust standard errors are clustered by parent firm. Dep. var.: Parent firms' ownership ratio of foreign subsidiaries (*t*). Columns (1)–(4) are estimated by the fractional logit model. Host countries' log GDP, log per capita GDP, level of IPR protection, and financial development are included in the estimation. * 10% level, ** 5% level, and *** 1% level.

B The role of the bank as a lender

The matched bank-firm loan data. The DBJ data contain no information on the main reference bank as a lender after 2001. This is because the disclosure of supplementary documents, including the “Schedule of Long-Term Debt” and “Schedule of Short-Term Debt” in non-consolidated financial statements, has been omitted since 2001 due to changes in the accounting system. The DBJ data contains information on parent firms’ bank loans prior to 2000. However, loan data are incomplete because they do not cover all listed firms.

Thus, loan data is generally unavailable from the official financial statements in Japan. Instead, Nikkei builds its data on listed firms’ loans from individual firms’ documents and original research. The coverage of Nikkei’s data on loans is still incomplete. However, [Amiti and Weinstein \(2018\)](#) used these data. We likewise use the loan data in the Appendix.

Table A2: Main bank’s healthiness

	(1) Share	(2) Whole	(3) Majority
log TFP (t-2)	3.102** [1.523]	3.789 [2.985]	3.159 [2.585]
Healthy Bank (t-2)	0.246 [0.390]	0.631 [0.616]	-0.205 [0.685]
Debt ratio (t-2)	-1.151*** [0.338]	-0.623 [0.677]	-2.145*** [0.636]
Debt ratio * Healthy Bank (t-2)	-0.492 [0.659]	-1.274 [1.066]	0.299 [1.127]
Intangibles ratio (t-2)	5.164 [3.623]	4.045 [4.730]	5.221 [5.763]
Observations	1253	1228	1226
N of Subsidiaries	1253	1228	1226
N of Parent firms	434	433	431
N of Banks	29	29	29
N of Countries	39	24	24
Mean of Dep. Var.	0.704	0.346	0.683
Country FE	YES	YES	YES
Country-level vars.	YES	YES	YES
Parent Industry FE	YES	YES	YES
Year FE	YES	YES	YES

Notes: Robust standard errors are clustered by parent firm. Dep. var. in (1): Parent firms’ ownership ratio of foreign subsidiaries (t). Dep. var. in (2): Dummy variable for whole ownership (t). Dep. var. in (3): Dummy variable for majority ownership (t). Column (1) is estimated by the fractional logit model. Columns (2)–(3) are estimated by logit model. Host countries’ log GDP, log per capita GDP, level of IPR protection, and financial development are included in the estimation. * 10% level, ** 5% level, and *** 1% level.

Using the loan data from *the Nikkei NEEDS FinancialQUEST*, we identify the capital ratio of the largest lender for each parent firm. We define capital ratio as a bank’s own capital-to-total assets ratio. We create an indicator variable for the healthiness of a bank, *Healthy_Bank*, which takes the value of one if the capital ratio exceeds four percent.³⁴ Table A2 presents the estimation results using the indicator variable and its interaction with parent firms’ debt ratios. We cannot directly compare Table A2 with the other tables because the number of observations is halved because of missing information on the main banks. However, we find qualitatively similar results in Table A2, that is, positive coefficients of productivity and negative coefficients of the debt ratio. However, the results

³⁴We choose the four percent as a threshold, following the spirit of the Basel Accord.

indicate that the main reference banks' healthiness does not affect the ownership structure of foreign subsidiaries.

Bank type and foreign share. We obtain capital adequacy ratio (CAR) and bad debt ratio (BDR) from *the Nikkei NEEDS FinancialQUEST*. Based on the Financial Reconstruction Law, BDR is defined as risky assets over total assets. We calculate the top three main lenders' average CAR and BDR for each parent firm. Table A3 indicates that the main bank's BDRs are not significantly related to the non-Japanese ownership ratio of Japanese firms' foreign subsidiaries. We merge Toyo Keizai's OJC data with the main lender's type from *the Nikkei NEEDS FinancialQUEST*. We identify "city banks" and "regional banks" and create city and regional bank dummies. We expect city banks to have a richer experience in financing FDI than regional banks. However, Table A3 shows that the bank-type dummies are insignificant. In addition, we identify "mega banks" which means the three biggest banks in Japan after 2006: MUFG Bank, Mitsui Sumitomo Bank, and Mizuho Bank. Due to the overwhelming financial power of megabanks, we assume that foreign investment by firms whose main bank is a mega bank would be a prominent feature. Table A3 again shows that megabanks do not play a significant role.

Table A3: Banks and non-Japanese partners' ownership share

	Dep. var.: Non-Japanese partners' ownership ratio				
	(1)	(2)	(3)	(4)	(5)
log TFP (t-2)	-3.108* [1.876]	-2.984 [1.896]	-2.256* [1.307]	-1.877 [1.325]	-4.008* [2.374]
Debt ratio (t-2)	1.205*** [0.452]	1.151** [0.467]	1.025*** [0.314]	0.993*** [0.311]	1.470** [0.648]
Top bank ratio (t-2)	1.533 [1.233]	1.962 [1.242]	2.139* [1.117]	1.961* [1.119]	3.844** [1.613]
Intangibles ratio (t-2)	-3.650 [4.417]	-2.589 [4.562]	-3.789 [3.307]	-3.944 [3.247]	-1.066 [4.803]
Banks' bad debt ratio (t-2)	-3.390 [4.498]				
Banks' cap. adeq. ratio (t-2)		-1.608 [1.848]			
City bank (t-2)			-0.046 [0.087]		
Regional bank (t-2)				-0.276 [0.191]	
Mega bank (t-2)					-0.084 [0.179]
Observations	846	812	1676	1676	487
N of Subsidiaries	846	812	1676	1676	487
N of Parent firms	387	379	497	497	287
N of Banks	21	19	32	32	9
N of Countries	34	33	43	43	30
Mean of Dep. Var.	0.180	0.175	0.248	0.248	0.178
Country FE	YES	YES	YES	YES	YES
Country-level vars.		YES	YES	YES	YES
Parent Industry FE	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES

Notes: Robust standard errors are clustered by parent firm. Dep. var. in (1)–(5): Non-Japanese partners' ownership ratio of foreign subsidiaries (*t*). Columns (1)–(5) are estimated by fractional logit model. Host countries' log GDP, log per capita GDP, level of IPR protection, and financial development are included in the estimation. * 10% level, ** 5% level, and *** 1% level.

C Estimation using one-year lagged control variables

In the main text, we use two-year lagged control variables for the regression as our preferred specification. This appendix uses one-year lagged control variables as a robustness check. Table A4 shows the estimation results when we use the one-year lagged control variables. Overall, the results are almost similar to the baseline results in Table 2. A difference is that parent firms' TFP turned insignificant. Most importantly, we confirm that parent firms' financial constraints, the debt ratio, are still negatively significant, even if we use one-year lagged covariates.

Table A4: One-year lagged control variables

	Fractional logit	Logit	
	(1) Share	(2) Whole	(3) Majority
log TFP (t-1)	1.287 [0.923]	1.181 [1.698]	0.118 [1.627]
Debt ratio (t-1)	-0.948*** [0.175]	-1.154*** [0.315]	-1.358*** [0.338]
Top bank ratio (t-1)	-2.565*** [0.823]	-3.527** [1.438]	-3.961** [1.740]
Intangibles ratio (t-1)	0.524 [2.123]	-0.909 [2.743]	6.051 [3.916]
log GDP (t-1)	-3.121*** [0.884]	-3.652*** [1.194]	-5.075*** [1.440]
log percapita GDP (t-1)	2.588*** [0.793]	3.862*** [1.106]	4.459*** [1.320]
IPR protection (t-1)	0.147 [0.104]	0.097 [0.188]	0.122 [0.200]
log Financial Dev. (t-1)	0.400*** [0.114]	0.636*** [0.233]	0.211 [0.221]
Observations	3092	3043	3051
N of Subsidiaries	3092	3043	3051
N of Parent firms	941	939	939
N of Banks	35	35	35
N of Countries	49	29	33
Mean of Dep. Var.	0.717	0.374	0.693
Country FE	YES	YES	YES
Parent Industry FE	YES	YES	YES
Year FE	YES	YES	YES

Notes: Robust standard errors are clustered by parent firm. Dep. var. in (1)–(2): Parent firms' ownership ratio of foreign subsidiaries (t). Dep. var. in (3): Dummy variable for whole ownership (t). Dep. var. in: Dummy variable for majority ownership (t). Columns (1)–(2) are estimated by the fractional logit model. Columns (3)–(4) are estimated by the logit model. Host countries' log GDP, log per capita GDP, level of IPR protection, and financial development are included in the estimation. A list of countries is presented in the Online Appendix. * 10% level, ** 5% level, and *** 1% level.

D Alternative measures of financial constraints

We have employed parent firms' total debt over total assets, *Debt_Ratio*, as a measure of their financial constraint. However, there are several alternative measures of financial constraints. We, therefore, conduct robustness tests with different measures of financial constraints. First, we use the short-term debt ratio which is defined as short-term debt over total assets. We calculate it as current liabilities over total assets. Second, we use the long-term debt ratio which is defined as long-term debt over total assets. As in [Todo \(2011\)](#), we calculate it as fixed liabilities over total assets. [Bergin et al. \(2021\)](#) find that exporting firms tend to be more leveraged than non-exporting firms in terms of long-term debt as the result of their optimal choices. If this is true for Japanese MNEs, the long-term debt ratio and ownership ratio could be positively related.

We also use the measures of financial constraints used in finance literature such as the KZ and the WW index. We have to note that there is a limitation to calculating these indices using Japanese data. For calculating these indices, we need cash flow statements. In Japan, however, cash flow statements were introduced in 2000 and are still not as common as they are in the U.S. and European countries. The DBJ data's cash flow statements have a large number of missing values. Given this, it is not practical to construct the KZ and WW index using the cash flow statement as in the literature. Instead, we attempted to construct the KZ and WW index using the DBJ data's balance sheet and profit and loss statement.

Following [Baker et al. \(2003\)](#), we employ the four-variable version of the KZ index as follows:

$$KZ = -1.002 \times \frac{CF}{A} - 39.368 \times \frac{DIV}{A} - 1.315 \times \frac{C}{A} + 3.139 \times LEV \quad (5)$$

where C is the current cash and deposits as a measure of cash flow, while CF is a growth of the cash and deposits defined as $C_t - C_{t-1}$. A is the total assets and DIV is the total dividends paid. LEV is defined as total liabilities over total assets. Following [Schauer et al. \(2019\)](#), we calculate the WW index as follows:

$$WW = 0.091 \times CF - 0.062 \times Dividend_Dummy + 0.021 \times LEV \\ - 0.044 \times SIZE - 0.102 \times ISG - 0.035 \times SG \quad (6)$$

where *Dividend_Dummy* is a dummy variable that takes the value of one if the firm pays cash dividends. *SIZE* is the natural logarithm of total assets. *ISG* is the growth of industry-level sales, while *SG* is the growth of firm-level sales.

Table A5: Correlation matrix of financial constraint indices

	Debt ratio	Short-term debt ratio	Long-term debt ratio	WW index	KZ index
Debt ratio	1.00				
Short-term debt ratio	0.80***	1.00			
Long-term debt ratio	0.63***	0.04*	1.00		
WW index	0.03	0.02	0.03	1.00	
KZ index	0.07***	0.05**	0.05**	0.00	1.00

Table A5 presents a correlation matrix of our five measures of financial constraints. It indicates

that our primary measure, the debt ratio, is correlated with short-term and long-term debt ratios and the KZ index, while it is not significantly correlated with the WW index. The WW index is not correlated with the other three measures of financial constraints, suggesting that it does not fit Japanese firms' financial constraints well.

Table A6 compares the results of estimation using five measures of financial constraints. Column (1) replicates our baseline result in Table 2 and columns (2)–(5) present results using the other four measures of financial constraints. With the exception of the results using the WW index, the results using all other alternative measures of financial constraints are similar to the baseline results. In other words, the financial constraints of the parent firms are significantly negatively related to the parent firms' ownership ratio of foreign subsidiaries. Furthermore, the parent firms' TFP is positive and significant in all columns except column (3). We also confirm that the top bank ratio is negatively significant in all columns as in the baseline results. In summary, our main results largely hold when we use alternative measures of financial constraints.

Table A6: Alternative financial constraint index

	Index of Financial Constraints				
	(1) Baseline	(2) Short	(3) Long	(4) KZ	(5) WW
log TFP (t-2)	1.909** [0.908]	2.622*** [0.918]	1.475 [0.940]	2.481** [0.975]	2.575*** [0.933]
Top bank ratio (t-2)	-2.043** [0.832]	-2.078** [0.843]	-1.982** [0.841]	-2.111** [0.858]	-2.043** [0.854]
Intangibles ratio (t-2)	2.130 [2.341]	2.319 [2.356]	1.392 [2.343]	2.853 [2.632]	1.984 [2.385]
Debt ratio (t-2)	-0.957*** [0.177]				
Short-term debt ratio (t-2)		-0.756*** [0.215]			
Long-term debt ratio (t-2)			-1.319*** [0.275]		
KZ index (t-2)				-0.040 [0.042]	
WW index (t-2)					-0.000* [0.000]
Observations	3061	3061	3059	2945	3059
N of Subsidiaries	3061	3061	3059	2945	3059
N of Parent firms	931	931	930	898	930
N of Banks	35	35	35	35	35
N of Countries	49	49	49	49	49
Mean of Dep. Var.	0.717	0.717	0.717	0.714	0.717
Country FE	YES	YES	YES	YES	YES
Parent Industry FE	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES

Notes: Robust standard errors are clustered by parent firm. Dep. var.: Parent firms' ownership ratio of foreign subsidiaries (*t*). Columns (1)–(5) are estimated by the fractional logit model. Host countries' log GDP, log per capita GDP, level of IPR protection, and financial development are included in the estimation. * 10% level, ** 5% level, and *** 1% level.