WINPEC Working Paper Series No. E2505
April 2025

Do Underwriters Utilize Soft Information in their Businesses?

Yue Cai Kazuo Yamada

Waseda INstitute of Political EConomy
Waseda University
Tokyo, Japan

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Yue Cai† Kazuo Yamada‡

April 23, 2025

Abstract

This study re-examines the role of underwriters as a soft information acquisition process. Our paper utilizes the data from Japan for two reasons. First, using the data from Japan allows us to use a unique merger event between a commercial bank and a securities company in Japan. The event enabled the underwriter to access the private information that the commercial bank holds. Secondly, distinct features characterize the Japanese IPO process: (1) regulations explicitly prohibit setting the offering price outside of the filing range; and (2) although bookbuilding in Japan is intended to engage institutional investors, the majority of IPO shares are allocated to retail investors, which diminishes the incentive for these institutions to provide private information. Our main analysis reveals a narrowing of the IPO price filing range and an increase in the likelihood that the offer price is set inside the range. Additional analysis shows that such an effect is particularly pronounced among firms exhibiting higher levels of information asymmetry. The paper concludes that private information enables the underwriter to determine the pricing of issuance securities.

Keywords: Information production, Underwriters, IPOs, Commercial banks

JEL Classification: G12, G30, G41, N25

*We appreciate the comments from Charles Wang and Iichiro Uesugi. We thank to the seminar participants at Sydney Banking Stability Conference. This project is financially supported by JSPS(23K01477; 23K22131).

†University of Niigata Prefecture

‡GSM, Kyoto University. *ymdkazuo+a5@gmail.com*

1 Introduction

Underwriters are widely believed to play a critical role in the equity issuance process, particularly by their certification role for issuers' quality (Booth and Smith, 1986; Chemmanur and Fulghieri, 1994). This role assumes that issuers' private information is generally inaccessible to outsiders, including investors, while underwriters possess the expertise to acquire and interpret such soft information through the underwriting process. In such a situation, high-quality underwriters are able to select issuers using the soft information they receive. Consequently, investors may perceive newly issued securities underwritten by reputable underwriters as certification of high issuer quality. Among various types of securities, this certification role is particularly important for IPOs, as it facilitates the absorption of private information and reduces information asymmetries between issuers and investors.

While the certification role of underwriters has been examined by a large number of studies, the conclusion from these previous studies has certain limitations. The first limitation arises from the fact that the majority of the empirical studies use underpricing as the proxy of asymmetric information, which remains inconclusive due to various influencing factors. These studies generally assume that high-quality underwriters can mitigate asymmetric information, resulting in a low degree of underpricing. While some studies report supportive evidence (Carter and Manaster, 1990), subsequent research finds contradictory results (Allen and Faulhaber, 1989; Beatty and Welch, 1996; Loughran and Ritter, 2001) due to the fact that various factors influence underpricing.[1] More importantly, utilizing the data from the Taiwanese pre-IPO market, Chang et al. (2017) we find that asymmetric information explains a small amount of underpricing indicating the fact that the factors other than asymmetric information have a pronounced impact on asymmetric information. Therefore, it is essential to seek additional evidence regarding underpricing to better understand the role of information production by underwriters in the IPO process.

A second limitation is that there might be an alternative explanation regarding the role of underwriters in mitigating the asymmetric information of issuers. One such role is that underwriters act as information intermediaries, which suggests that underwriters have the ability to gather soft information from other institutional investors (Benveniste and Spindt, 1989). This assumption contrasts with the theoretical argument in certification role literature, which posits that such private information is inaccessible to investors Chemmanur and Fulghieri (1994). In such a situation, underpricing is regarded as the compensation for investors to provide private information Hanley (1993).

[1]These factors include risk (Hughes and Thakor, 1992; Lowry, 2003), market conditions (Lowry and Shu, 2002), and other determinants (Loughran and Ritter, 2004; Liu and Ritter, 2010). Additionally, some studies suggest that underwriters may deliberately use underpricing to maximize their profits through practices such as IPO spinning (Liu and Ritter, 2010).

Our empirical analysis uses the Japanese IPO data for two primary reasons. The first reason is that Japanese data enables us to analyze the unique event where a commercial bank acquired one of Japan's top securities companies.[2] In 2012, SMBC, a major commercial bank, acquired Nikko Securities, one of the largest securities companies in Japan. The merger allowed the securities company to utilize the private information owned by the commercial bank.[3] Commercial banks can obtain such information *via* lending channels (Schenone, 2004; Drucker and Puri, 2005; Uchida, 2011).[4] Such soft information is particularly important for evaluating IPOs, which are often young and growth-oriented and hence more likely to suffer a high degree of asymmetric information (Kim et al., 2008). Obviously, the ability of the executives and corporate culture are vital for the rapid growth of IPO companies. At the same time, such qualitative factors are difficult for outsiders to observe.[5] This underscores the critical role of underwriters. Consequently, the merger event enabled the consolidated underwriter to utilize the soft information the commercial bank had for its bookbuilding process, which led to the certification role of the commercial banks on the IPO firms (Ogura, 2017).

Second reason is that utilizing Japanese data enables us to use the filing range instead of underpricing as the proxy for private information owned by underwriters.

n Japan, most IPO shares are allocated to retail investors, which is contrary to the US where the majority of shares are allocated to institutional investors.[6] While the filing range is determined by the opinions of institutional investors, they are less likely to be allocated the IPO shares. Usually, retail investors are regarded as irrational and have less ability to interpret public information compared with institutional investors (Chiang et al., 2011; Hiraki and Ito, 2023). If so, replying to the opinions of retail investors does not necessarily include the information disclosed during the bookbuilding process in the offering price.

In contrast to the US, the underwriters and issuers are required to set offering prices within the filing range, in Japan. This requirement has several advantages. First of all, it highlights the role of private information by underwriters. Even after the issuers realize high demand for the IPO stock and the offering price is higher than they thought, they cannot set the offering price more than the maximum price, resulting in the concern of high underpricing and more 'money

[2]The business criteria of the securities companies are almost the same as that of investment banks. The difference of them comes from their origin. Historically, securities companies, *shoken-gaisha* in Japanese, started their business as stock-brokers before World War II and then expanded to underwriting services.

[3]More importantly, majority of the information gathered by the underwrites are 'soft' information, which is non-financial and hence difficult to access from outsiders including investors.

[4]Previous studies also highlights how commercial banks gather information via their subsidiary venture capitals (Hellmann et al., 2008), which is useful for securities companies, including the underwriting process of newly issued securities (Puri, 1999) and bonds (Yasuda, 2005).

[5]The importance of the CEOs' ability, not necessarily restrict to startups and IPO firms, is well-explained in Kaplan and Sorensen (2021). Furthermore Yang et al. (2011) examine the CEO's characteristics on the firm performance of startups.

[6]See Kutsuna and Smith (2004); Hiraki et al. (2021) that explain the details of the Japanese bookbuilding process.

left on the table.' Such restrictions for determining the offering price make the information production process by the underwriter critical.

Moreover, the Japan unique setting enables ruling out the alternative explanation of underwriters for mitigating asymmetric information during the IPO process: information intermediate role by underwriters (Benveniste and Spindt, 1989). As we argued above, by convention in Japan, most IPO shares are allocated to retail investors. Consequently, underwriters in Japan have limited incentive to act as information intermediaries, making this role less plausible.

Our empirical analyses use two variables to describe the IPO filing range. The first one is the filing range, defined as the difference between the maximum and minimum of the filing range divided by the mid-range. If underwriters have more private information, they can narrow the range. The idea is that, as the offering price should be inside the range in Japan, a low maximum price leads to concern about high underpricing. However, the wide filing range is less informative for investors. Consequently, an underwriter and an issuer face the trade-off of deciding the filing range. On the one hand, they prefer to make the range as wide as possible. The investor demand for IPO shares is determined after fixing the filing range.

The second one is the probability that the offering price is set inside the range.[7] In Japan, the price of the offering should be set inside the range. Even if the subscription for the bookbuilding is more than the expectation, it is prohibited to set the offering price out of the range, causing higher underpricing. Contrarily, the wider range is uninformative for investors as it can not be the guidance for investors to rely on to predict the offering price. Therefore, setting the offering price inside the range indicates that the filing range is informative.

The empirical findings are as follows. First, this study demonstrates that the merger led to a substantial narrowing in the price filing range. The estimated coefficients show that IPOs with the consolidated underwriter exhibited narrower filing ranges post-merger, which suggests that the underwriter's access to additional private information from the commercial bank improved the accuracy of IPO pricing. This reduction in the filing range implies a decrease in information asymmetry between issuers and investors.

Second, we find that the probability that the offering price is set in the range increased significantly after the merger. This suggests that the merger helped the underwriter set more accurate filing ranges, making it more likely that the final offer price would be set within this range rather than at its extremes. The results of this analysis remained robust even after controlling for industry and issuer characteristics.

Additional tests explore the role of lending relationships. The idea is that our paper assumes that the commercial bank holds private information through the lending relationship. Therefore, the volume of the private information depends on the lending relationship before going public.

[7]In this paper, we distinguish to use the phrase 'within range', which include both maximum and minimum prices of the filing range where as 'inside of range' does not include both maximum and minimum prices.

Then, we test the analysis by adding an explanatory variable that represents whether the IPO firm intends to repay the loan by its IPO proceeds. In Japan, issuance companies are required to disclose how to use the proceeds. revealing that issuers with prior loan contracts with commercial banks experienced more precise pricing after the merger. This finding highlights the importance of the private information generated from lending relationships in enhancing the underwriter's ability to set appropriate filing ranges.

We also conduct an additional analysis for testing the cross-sectional comparison of asymmetric information. The degree of asymmetric information differs among IPO companies. Therefore, the role of the private information that commercial banks hold on the filing range differs by the degree of asymmetric information. This finding shows that the impact of the information generation process by the consolidated underwriter is pronounced for issuers facing high asymmetric information.

This paper proceeds as follows. Section 2 explains the detailed institutional setting of Japanese IPO markets and its process on determining the filing range and offering price. Section 3 briefly explains the previous studies related to this paper and builds our empirical hypotheses. Section 4 introduces our empirical strategy and variable definitions. Our main findings are reported in Section 5 and several additional findings are reported in 6. Section 7 concludes.

2 Institutional Setting

Before developing our hypotheses, this section explains the background and institutional setting, which is closely related to our hypothesis and empirical strategy. Section 2.1 explains the process for determining the price in Japan. Next, Section 2.2 explains the details of the merger of Nikko with SMBC, which we use as our main exogenous shock.

2.1 Bookbuilding process in Japan

Japanese IPOs employ the book-building method, while its process is not strictly the same as that of the United States (See Figure 1). The process unfolds as follows. The first process is the disclosure of the preliminary prospectus. A company intending to go public needs to choose a securities company as its underwriter. The underwriter analyzes the company's condition including the organizational structure, internal rules, financial health, prospects, and current market conditions. Then, the issuer and its underwriter submit the proposal for the IPO to the stock market. If the proposal is approved, the issuer and the underwriter prepare to go public including preparing the preliminary prospectus that includes the preliminary stock price, termed the "original price."

Second process is that for publishing the revision of the prospectus. The issuer and its underwriter conduct "roadshow" that is the process to explain the potential growth opportunity of the company to institutional investors. During this phase, the underwriter gathers the interests of the institutional investors. After the roadshow, the underwriter establishes upper and lower limits for the public offering price, referred to as the "filing range," which is our variable of interest.

Third, the second revised prospectus is issued. Investors indicate their interest by specifying the number of shares they would purchase and at what price within the given range. The underwriter uses this demand information to determine the final "offering price."

Fourth and the end, trading begins on the stock exchange, and the IPO closing price in the market is determined.

The bookbuilding process in Japan is different from that in the US, as shown in Figure 1. First, while in the US, underwriters conduct a pre-hearing, which is a process for various institutional investors who potentially purchase the IPO shares. The filing range is determined based on the results of pre-hearings. Based on the filing range, the underwriters conduct a roadshow for various institutional investors, and then the order book is built. In Japan, the filing range is determined on the basis of the feedback at the roadshow. The underwriters build an order book based on the filing range.

It is worth mentioning two unique aspects of the Japanese bookbuilding process. The first one is the nature of the filing range. In the U.S., the filing range does not necessarily affect the offering price. The final offer price may exceed the upper limit if investor demand exceeds initial expectations. In contrast, weak demand can result in a price below the lower limit. In Japan, the filing range is more rigid. Regardless of the strength of the demand, setting the offering price above the upper limit is unconventional. The filing range effectively acts as a binding constraint on the final price.

The second point is the type of investor. In the U.S., the lead underwriter's demand survey and the primary allocation of new shares target institutional investors. Aggarwal (2003) reports that 72.8% of IPO stocks in 1997-1998 were allocated to institutional investors. Contradictorily, in Japan, most of the newly issued shares are ultimately purchased by retail investors even though the roadshows target only institutional investors. Funaoka (2008) shows that 74.1% of the IPO stocks between 2006 and 2008 were allocated to retail investors in Japan.

The small lots of allocation for institutional investors may prevent them from providing private information they have. Benveniste and Spindt (1989) argue that the underwriter plays an important role in acquiring private information that investors own, which is empirically supported by Cornelli and Goldreich (2001). However, the Japanese setting indicates it makes it difficult to absorb the information that investors own as the majority of the investors are individuals who are usually assumed to invest irrationally Chiang et al. (2011).

These unique characteristics of the Japanese market lead to an important distinction: in Japan, the filing range is primarily determined by underwriters and almost entirely reflects the information they produce. As Kaneko (2019) notes, the "original price" and the midpoint of the filing range are positively correlated, with a very high correlation coefficient of 0.991. The high correlation between the opinions of institutional investors is hardly reflected when determining the filing range. Overall, the findings above indicate that the filing range is much more important than that in the US IPO process.

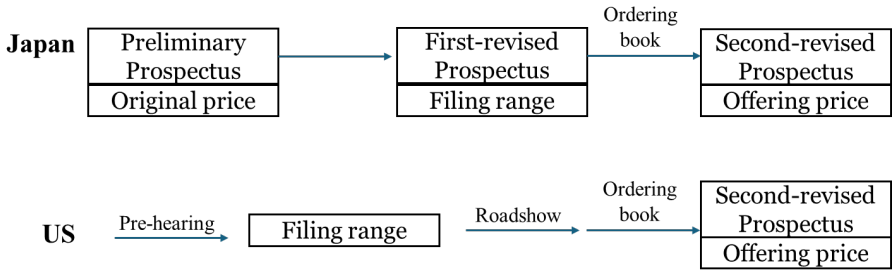

Figure 1: IPO underwriting process in Japan

2.2 Separation of banks and underwriters in Japan and the merger event

This subsection explains how the separation of commercial banks and underwriters was relaxed in Japan, and the details of the merger event we use in this paper.

2.2.1 Sepration of banks and underwriters

Like the Glass-Steagall Act in the US, in Japan, the Securities and Exchange Law of 1947 (Article 65) prohibited commercial banks from engaging in securities-related business due to the concern of conflicts of interest. The law was relaxed later. In 1992, the Financial System Reform Act significantly relaxed the regulations separating banking and securities businesses. This allowed for mutual entry between banks and securities companies by establishing sector-specific subsidiaries.

While the act in 1992 allowed banks to hold subsidiary securities companies, it did not allow the underwriting businesses at that time. The rule was relaxed in 1999. Therefore, after 1999, the banks were enabled to conduct underwriting business through their subsidiary securities companies.

Following this reform, banks could share confidential corporate client information between a parent bank and its underwriter subsidiary securities company if the client firm agrees. This provision was outlined in Article 44-3(1)(iv) of the Financial Instruments and Exchange Act.

The 2009 revision to financial regulations further liberalized information sharing practices for banks. Under the new rules, banks can provide the private information of corporate clients to their subsidiaries without obtaining prior written approval unless the client has explicitly designated certain items as confidential. This change significantly enhanced the information flow between parent banks and their underwriter subsidiaries, potentially streamlining their collaborative operations.

2.2.2 The merger event

Daiwa Securities SMBC was established in 1999 through the Sumitomo Bank's securities company and the investment bank division of Daiwa Securities. According to Nikkei Business (2012), the two entities had different management philosophies after the merger. An executive of Sumitomo Mitsui Banking Corporation expressed frustration: "In 2001, when our bank merged with Sakura Bank (whose predecessors were the former Mitsui Bank and the former Taiyo Kobe Bank), it should have brought significant benefits to Daiwa, as Mitsui-affiliated companies became customers in addition to Sumitomo-affiliated companies. Although the project started to create Japan's top securities company together, the relationship hasn't progressed." On September 10, 2009, Sumitomo Mitsui Financial Group and Daiwa Securities Group Inc. held separate press conferences to announce the dissolution of their joint venture.[8]

On May 1, 2009, SMBC officially announced that it had agreed to acquire Nikko Cordial Securities from US-based Citi Group with 545 billion yen of deal size. Although it became a wholly owned subsidiary of US-based Citi Group in 2008, the combined assets under management of Nikko Cordial Securities, which focuses on retail customers, and Nikko Citigroup Securities, which serves corporate clients, ranked third in the industry. This marked the first acquisition of a major securities company by a mega-bank in the context of financial restructuring amid market turmoil. The acquisition targets include all business operations of Nikko Cordial Securities, which focuses on retail (individual) customers, and the equity and bond underwriting operations of Nikko Citigroup Securities, which serves corporate clients. The acquisition was completed on October 1, 2009.

In the subsequent analysis, we will see how the merger event changed the market share of the consolidated-underwriter (Figure 2). We can observe that after being acquired by SMBC, Nikko consistently maintained its position among the top four in the industry. Moreover, in most years, it replaced Daiwa Securities to occupy the second place in the market. In 2011, the name was changed to Nikko SMBC Securities.

[8] See Akiyoshi (2019) for more detail.

3 Related Literature and Hypothesis

3.1 Previous Studies

This paper relates to several strands of literature: such as the IPOs and asymmetric information, the role of underwriters in IPO markets, and the soft information process by commercial banks and investment banks.

First, this study relates to the literature on the role of underwriters in mitigating asymmetric information between issuers and investors, commonly referred to as the *certification role* (Booth and Smith, 1986; Chemmanur and Fulghieri, 1994).

Furthermore, the results in previous studies are inconclusive. Prior research has primarily examined underwriters' information production through the lens of IPO underpricing, but the findings remain inconclusive. Several studies report the evidence that supports the theoretical prediction that underwriters reduce information asymmetry and enhance IPO pricing efficiency (Carter and Manaster, 1990). However, subsequent studies do not find the strong empirical support for this claim (Allen and Faulhaber, 1989; Beatty and Welch, 1996; Loughran and Ritter, 2001). This inconsistency suggests that various factors, including the nature and source of underwriters' information, may influence their effectiveness.

However, underwriters do not always act in the best interests of issuers and investors. Some studies suggest that underwriters exploit underpricing to increase their profits through a practice known as IPO spinning (Liu and Ritter, 2010). Given these conflicting incentives, further research beyond the lens of underpricing is needed to better understand the role of underwriters in information production.

Another relevant strand of literature focuses on the role of commercial banks in collecting and utilizing private information. Banks acquire significant amounts of soft information—non-financial qualitative insights about their client firms through their lending relationships (Diamond, 1984; Uchida, 2011). This information often includes assessments of corporate management and strategic outlook, which are difficult to quantify using traditional financial metrics. Soft information obtained through lending channels (Schenone, 2004; Drucker and Puri, 2005) or through bank-affiliated venture capital subsidiaries (Hellmann et al., 2008) plays a crucial role in financial intermediaries. Prior studies indicate that such information is valuable in underwriting newly issued securities (Puri, 1999) and bonds (Yasuda, 2005; Butler, 2008).

3.2 Hypothesis Development

The merger between a commercial bank and a securities company can fundamentally change the dynamics of information availability in the IPO process by underwriters. Prior to the merger, the underwriter typically has limited access to the issuer's private information, which

may result in a wider IPO price filing range to accommodate potential uncertainties.

The merger with a commercial bank enables the underwriter to set a more adequate filing range , especially when the commercial bank can access the private information through lending relationships. This additional information can significantly enhance the accuracy of the issuer's valuation, allowing for a more precise pricing decision. As a result, the IPO price filing range is likely to become narrower, reflecting a small degree of asymmetric information and more confidence in the estimated value of the issuing firm.

Furthermore, with improved information accuracy stemming from the merger, the probability of setting the final IPO offer price within the initial filing range also increases. Typically, the filing range is established based on the underwriter's initial assessment of the issuer's value, which may involve considerable asymmetric information in the absence of comprehensive private information. By utilizing the commercial bank's private information, the underwriter can reduce the likelihood of significant deviations from the filing range, thereby enhancing pricing precision. Consequently, the final IPO offer price is more likely to fall within the predetermined range after the merger. Therefore, we hypothesize the following:

H1: The merger between a commercial bank and a securities company reduces the IPO price filing range.

H2: The probability that the final IPO offer price is set inside the filing range increases after the merger.

The hypotheses are assumed that the asymmetric information matters for the filing range itself. Then it is required to examine the validity of the assumption. The impact of the merger on the setting of the filing range is pronounced, especially when the commercial bank can obtain private information through the lending channel. Therefore, we propose the following hypothesis:

H3: The effects of the merger on IPO pricing are pronounced for firms with lending from commercial banks before IPOs.

Furthermore, we examine whether the degree of private information affects the impact of the merger on the setting offering price. The idea is that the role of private information that the commercial bank holds plays a critical role, especially when the degree of asymmetric information is high and, therefore, hard for the underwriter to obtain it. Then, we establish the following hypothesis:

H4: The effects of the merger on IPO pricing are pronounced for firms with high information asymmetry.

4 Methodology and Data

4.1 Empirical specification

We test whether the merger of a securities company and a commercial bank affects the filing range of IPO stocks by estimating:

$$Range_{ijyu} = \alpha + \alpha_u + \alpha_j + \alpha_y + \beta_1 Treat_{ut} \times Post_t + \sum \gamma X_{ijyu} + \epsilon_{jiyu}, \quad (1)$$

where $Range_{ijyu}$ is the filing range of the IPO firm i in industry j that went public in year y underwritten by the underwriter u. $Range_{ijyu}$ is defined as the difference between the maximum and minimum of the filing range, divided by the mid-range of the filing range (Hanley, 1993). More specifically, $Range$ is defined as $\frac{(p_{max}-p_{min})}{(p_{max}+p_{min})/2}$, where p_{min} is the minimum of the range and p_{max} is the maximum of the range. $Treat$ takes the value of one for the IPOs underwritten by the acquired securities company, Nikko. $Post$ is an indicator for IPOs underwritten after the merger event. Our parameter of interest is β_1, which is the estimated coefficient of $Treat \times Post$. If the merger with a commercial bank improves the securities company's private information, we expect a narrower filing range after the merger event; hence, we predict $\beta_1 < 0$.

As our sample consists of IPOs, which usually firms experience once in their life, the observations before the merger event are different from those after the event. Therefore, to control for the difference of various aspects of the issuers, we add a vector of control variables X, which potentially correlates with our dependent variable. The dependent variables include firm size measured by total assets ($Asset\ size$), profitability ($EBITDA\ ratio$), research and development expenditure($R\&D$), cash ratio ($Cash$), financial leverage($Leverage$), and secondary share ratio ($Secondary\ share$). The definitions are summarized in the appendix document.

The type of underwriter can affect the outcome of IPOs in various ways (Puri, 1996; Fang, 2005). Indeed, in our sample, as we will show in Table 3, we find some differences in the various aspects of the issuers' unobservable characteristics among underwriter types. Therefore, we control for underwriter-specific time-invariant characteristics by adding underwriter-level fixed effects (α_u). We also control for industry-level heterogeneity in the IPO market by adding industry-fixed effects (α_j). Furthermore, we add year-fixed effects (α_y) as we will show in the descriptive statistics; there could be some unobservable time-series trends.

Next, we test whether the merger event affects the probability of offering prices in the middle

of the range by estimating:

$$Within\ Range_{ijyu} = \alpha + \alpha_u + \alpha_j + \alpha_y + \beta_2 Treat_{ut} \times Post_t + \sum \gamma X_{ijyu} + \epsilon_{jiyu}, \quad (2)$$

where $Within\ Range_{ijyu}$ is an indicator for the IPOs with offering price set inside the range. It takes the value of one if the offering price is determined to be greater than the minimum and less than the maximum price, and zero if the offering price is the same as the maximum or minimum of the heterogeneity of the standard errors clustered at the underwriter level. More specifically, $Within\ Range_{ijyu}$ equals one if $p_o = (p_{min}, p_{max})$ and equals zero if $p_o \in \{p_{min}, p_{max}\}$. We predict the increase in the probability that the offering price is set inside the range after the merger, in other words: $\beta_2 > 0$. We also use various types of fixed effects that are used in Eq. 1. We estimate Eq. 1 and 2 with a linear probability model using OLS estimates.

4.2 Definitions of control variables

The vector X contains factors that can affect asymmetric information between issuers, underwriters, and investors. First, we add $EBITDA\ ratio$ as the measure of firm profitability. The idea is that if the IPO firm is profitable enough, the risk of future cash flow is low, making it easy for investors to predict future free cash flow. R&D expenditure, $R\&D$, is included because private information scares the issuers of high R&D-intensive firms. Secondary shares in IPOs can lead to agency conflict. Therefore, we add a secondary share ratio. Lastly, we also control the firm's financial condition by adding the cash ratio and financial leverage. Section A-1 of the Appendix material provides the list of variable definitions.

4.3 Data

We collect the IPO information from INDB's Funding Eye database. The Funding Eye collects detailed information on securities issuance in the Japanese stock market. The dataset covers equity issuance by listed companies in Japanese stock markets. We restrict the records tagged as "IPOs" from Funding Eye. We eliminate REITs and ETFs.

The sample period of this paper is between 2000 and 2015. We start our sample period in 2000 as the IPO listing requirement became easier around 2000. Several new stock sections are established in order to make it easy for young and small companies to go public. Our sample period ends in 2015 almost 5 years after the merger event for two reasons. First, JPX made the screening process strict in March 2015 due to some scandals by IPO firms.[9] The rule change indicates there are two-stage screenings, firstly by underwriters and secondly by the

[9] https://www.jpx.co.jp/corporate/news/press-conference/nlsgeu000000u0mh-att/20150331reference.pdf.

stock exchanges. Before that, quality of IPO firms varies, indicating the private information production is meaningful. However, the strict screening by the stock exchange may weaken the certification role of the underwriter. Second, there is a possibility that the merger event may change the characteristics of the IPO firms in the long term. If issuers anticipate that the merger event improves the quality of underwriting by the consolidated underwriter, there is a possibility that high-quality firms are more likely to choose the consolidated underwriter. In this case, a selection problem would occur. In the subsequent analysis, we will show that such a change in the characteristics of IPO firms occurred during our sample period, until 2015. Our final sample consists of a total of 1,116 IPOs.

We collect stock price and accounting information from Nikkei's NEEDS FinancialQUEST service, which is widely used in the analysis of Japanese listed companies. The FinancialQUEST covers all companies listed on all stock exchanges in Japan, including IPO firms.

4.4 Identify Lead Underwriter

Identifying the lead underwriter is a critical issue as they play a significant role during the process of IPOs. As we have explained, in Japan, a lead underwriter consults with the issuer for more than two years.

The lead underwriter is identified using the data from Funding Eye. In the case of global offerings, we regard the name of "Underwriter1" in the Funding Eye dataset as the lead underwriter. In the case of global offerings, usually, both domestic and foreign investment banks (securities companies) are designated as the co-lead underwriters. In this case, we use the name of the top domestic securities companies as the lead underwriter.

Figure 2 shows the time-series trend of the underwriter shares by the so-called top-4 securities companies (Nomura, Daiwa, Mizuho, in addition to Nikko). We find the market share fluctuates highly among the four. The number of IPOs declines around 2008 during the global financial crisis. Most of our sample period, the market share of Nikko, the consolidated underwriter, is somehow lower than that of other top underwriters. Therefore, there could be some fundamental difference even among the top four underwriters; hence it is important for controlling some underwriter-level unobservable factors.

4.5 Descriptive Statistics

Table 1 shows the descriptive statistics of the variables used in this study. In order to show the difference by underwriter, we compare them with the consolidated underwriter, other major underwriters (Nomura, Daiwa, Mizuho), and the rest of the underwriters.

Price Range, one of our concerns of interest, is about 15.2% for the consolidated underwriter, which is somehow higher than that of other major underwriters (14.1%) ($p < 0.1$) and

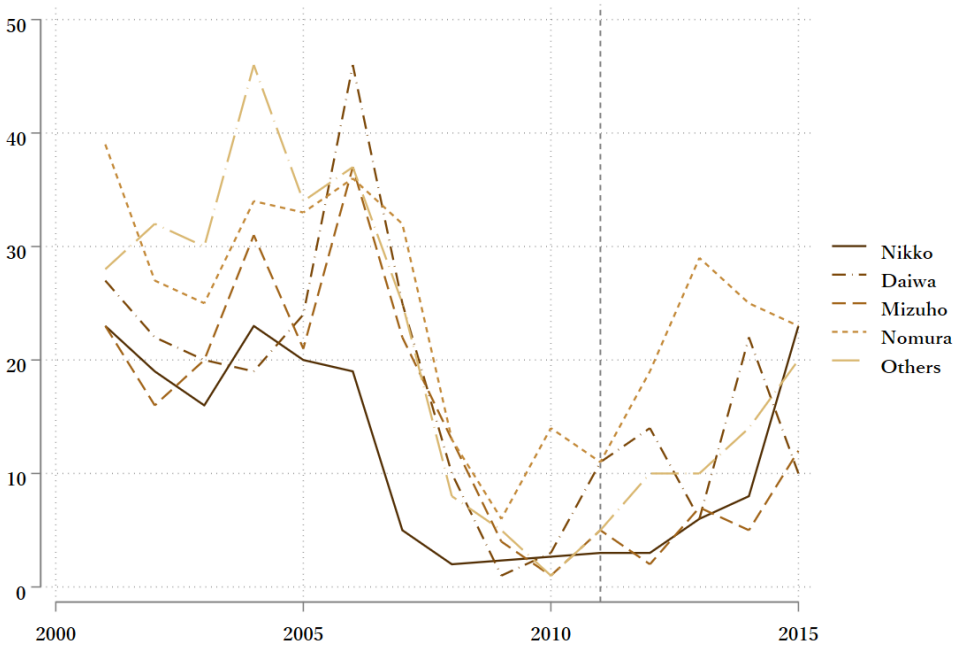

Figure 2: Underwriting market share

almost equivalent to that of the rest of the underwriters (15.4%). The results indicate that even conventionally, the consolidated underwriter is regarded as one of the top underwriters in Japan; we need to carefully consider fundamental differences among them.

The other major dependent variable, *Price Range*, is about 7.3% for the consolidated underwriter, whereas that of the other major underwriters (rest of underwriters) is 10.8% (5.4%) and the difference is statistically insignificant.

Mean of *Initial Return* is 35.2% for consolidated underwriter, 29.3% for other major underwriter, and 38.4% for the others. There are no differences for these three groups. This result is noteworthy as the difference in initial return by underwriter's reputation is observed in the US Carter and Manaster (1990); Allen and Faulhaber (1989); Beatty and Welch (1996); Loughran and Ritter (2001).

Average size of the *Proceeds* for consolidated underwriters is 1.753 billion yen (=exp(21.285 billion)) which is equivalent to 15 million USD.[10] The size is almost close to that of other major underwriters. However, the size is larger than that of other underwriters ($p < 0.01$). We also confirm that major underwriters support the larger issuers as the asset size (*Asset size*) of major underwriters, both consolidated and others, is larger than that of the other underwriters ($p < 0.01$). The trend that major security companies underwrite large issuers is confirmed from the difference *Small*, which is an indicator for the IPOs in the bottom quartile, as reported at the bottom of the table: 22% of the IPOs is small for consolidated underwriters, whereas that

[10]In most of our sample period, 1USD equals about 90 to 110 Japanese yen.

for others is 37.2%. These results indicate that major underwriters prefer to undertake larger issuers, consistent with the story of underwriters' certification role.

The financial leverage of the IPO companies by consolidated underwriter is 54.7%, which is not different from that of other major underwriters (53.2%) nor from the others (53.3%).

We find that major underwriters are more likely to underwrite R&D intensity companies. The probability of firms with R&D expenditure for consolidated underwriters is 46.1%. We do not find the difference in profitability among the types of underwriters.

On average, *Cash Ratio* of the consolidated underwriter is 32.2%, which is not different from that of other major underwriters (30.1%) nor from the others (32.6%).

Ratio of secondary shares to total shares offered at the IPO is 44.3% for consolidated underwriter, which is equivalent to that of other major underwriters (42.8%), but higher than that of the other underwriters (38.8%, $p < 0.01$).

The additional analysis extracts the intention of the proceeds in our analysis, especially focusing on the intention for loan repayment. We find that 35.1% of IPOs by consolidated underwriters plan to use some of the proceeds for loan repayment, which is lower than that by other major underwriters (27.7%, $p < 0.1$), and higher than that of others (23.0%, $p < 0.01$).

We do not find the difference in firm age between consolidated underwriters and all others. $Young$ is an indicator for the youngest quartile among our sample.

Table 2, Panel A compares the differences before and after the merger of the consolidated underwriter during our sample period.

We find that the *Price Range* after the event is narrower than that before the event ($p < 0.01$). Interestingly, *Price Range*, the probability to be inside the range before the event is higher than that after the event ($p < 0.01$). The results show the possibility of the unobservable time-series trend for the process of determining the IPO offering process. We also find that, on average, underpricing ($Initial\ return$) before the event is lower than that after the event ($p < 0.01$).

We also find that the size of IPOs after the event is smaller than that before the event ($p < 0.01$), but the size of proceeds is almost the same. After the event, these firms are less likely to spend proceeds for loan repayment and are younger.

Table 2, Panel B reports the distribution of industry. Most of the IPOs concentrate on the wholesale, retail trading, real estate, and service industries. The consolidated underwriter seems to underwrite firms in the food, electrical appliance, and service industries more than others.

Table 1: Descriptive Statistics

This table reports the summary statistics of the variables used in this study.

	Merged UW.		Other Major UW.		Others					
	Mean [1]	S.D.	Mean [2]	S.D.	Mean [3]	S.D.	[1]-[2]	*t*-stats.	[1]-[3]	*t*-stats.
Price Range	0.152	0.084	0.141	0.079	0.154	0.082	0.011	1.661*	-0.002	-0.218
Within Price Range	0.073	0.261	0.108	0.311	0.054	0.227	-0.035	-1.622	0.019	0.860
Initial return	0.352	0.523	0.293	0.671	0.384	0.557	0.059	1.325	-0.032	-0.680
Proceeds	21.285	1.142	21.274	1.297	20.553	0.945	0.011	0.119	0.733	7.665***
Asset Size	8.729	1.302	8.874	1.419	8.136	1.127	-0.145	-1.372	0.593	5.351***
EBITDA ratio	0.122	0.219	0.120	0.200	0.121	0.144	0.001	0.082	0.001	0.048
Leverage	0.546	0.231	0.532	0.224	0.533	0.228	0.014	0.764	0.013	0.634
R&D	0.461	0.500	0.431	0.496	0.313	0.464	0.029	0.736	0.148	3.429***
Cash	0.322	0.217	0.301	0.212	0.326	0.202	0.021	1.190	-0.005	-0.252
Secondary share	0.443	0.186	0.428	0.189	0.388	0.173	0.015	1.033	0.055	3.436***
Loan Repayment Demand	0.351	0.479	0.277	0.448	0.230	0.421	0.074	1.956*	0.121	2.968***
Young	0.288	0.454	0.254	0.435	0.331	0.471	0.034	0.950	-0.043	-1.053
Small	0.220	0.415	0.202	0.402	0.372	0.484	0.018	0.547	-0.152	-3.919***

5 Empirical Findings

5.1 Determinants of the filing range

We begin our analysis by examining the relationship between the bank merger and the filing range by estimating Eq. 1.

Table 4, Column 1 reports the results without industry-fixed effects. The estimated coefficient of our variable of interest, $Treat \times Post$, is negative ($p < 0.01$). The negative coefficient indicates that the consolidated underwriter allowed the filing ranges to narrow after the merger event, after controlling for various factors.

The control variables show the following findings, which are reasonable. The size of the firm is negatively correlated with the filing range. The negative relation indicates that asymmetric information is a key factor that affects the filing range if the degree of asymmetric information is negatively correlated with firm size. Firm profitability is also negatively correlated with the filing range. Investors find it difficult to distinguish between low-quality and low-profitable firms and high-growth potential and low-profitable firms. Then, the degree of asymmetric information is high for low-profitable firms. The negative correlation between profitability and filing range is consistent with the prediction. R&D expenditure is negatively correlated with the filing range. R&D intensive firms face high asymmetric information due to their technology-driven business model. Our findings show that these firms have a narrow filing range.

Table 4, column 2 adds industry-fixed effects in order to control for the industry-level heterogeneity. The bank merger is negatively correlated with the filing range even after controlling for industry-level unobservable heterogeneity. The economic magnitude is meaningful. As shown in Table 3, the standard deviation of the filing range is 0.05. Then, the merger leads to a 0.4 standard deviation shrinkage of the filing range.

The results of the control variables are as follows. *Price Range* is negatively correlated with the size of the firm, measured by total assets and profitability. This is supportive evidence of our assumption that the filing range is explained by asymmetric information, as asymmetric information is high for small firms and low-performing companies.

We also find that the filing range is negatively correlated with R&D expenditure, which supports the view that the filing range is a function of asymmetric information, as it is difficult to evaluate firms with high intangible assets.

Lastly, we find that the secondary share ratio is negatively correlated with the filing range. If managers have a strong incentive to disclose more private information when they sell at the timing of the IPO, they are more likely to disclose information that narrows the filing range.

Table 2: Descriptive Statistics

This table reports the summary statistics of the variables used in this study. Panel A compares the differences before and after the merger of the consolidated underwriter during our sample period. Panel B reports the industry distribution between the consolidated underwriter (Nikko), and others.

Table 3: Descriptive Statistics

Panel A: Before and after the merger event

	Before the Event		After the Event			
	Mean [1]	S.D.	Mean [2]	S.D.	[1]-[2]	t-statistics
Price Range	0.160	0.081	0.095	0.052	0.065	17.068***
Within Price Range	0.103	0.304	0.039	0.194	0.064	4.441***
Initial return	0.296	0.641	0.435	0.551	-0.140	-3.792***
Proceeds	21.081	1.226	21.086	1.261	-0.004	-0.052
Asset Size	8.730	1.375	8.386	1.450	0.344	3.840***
EBITDA ratio	0.129	0.156	0.090	0.278	0.038	2.306**
Leverage	0.549	0.225	0.477	0.228	0.072	4.947***
R&D	0.416	0.493	0.356	0.480	0.060	1.929*
Cash	0.286	0.199	0.401	0.232	-0.115	-7.991***
Secondary share	0.407	0.176	0.463	0.212	-0.055	-4.195***
Loan Repayment Demand	0.293	0.455	0.203	0.403	0.091	3.397***
Young	0.279	0.449	0.278	0.449	0.001	0.049
Small	0.222	0.416	0.353	0.479	-0.131	-4.359***

Panel B: Industry distribution

	Nikko	Others
Air Transportation	1	1
Chemicals	4	35
Construction	3	24
Electric Appliances	13	57
Fishery, Agriculture & Forestry	0	4
Foods	9	16
Glass & Ceramics Products	2	3
Information & Communication	39	313
Insurance	1	1
Iron & Steel	0	2
Land Transportation	0	7
Machinery	5	45
Metal Products	4	9
Mining	0	2
Nonferrous Metals	1	5
Oil & Coal Products	0	2
Other Financing Business	3	13
Other Products	2	32
Pharmaceutical	1	26
Precision Instruments	3	19
Pulp & Paper	0	4
Real Estate	12	92
Retail Trade	27	167
Securities & Commodity Futures	1	10
Services	42	256
Textile & Apparels	0	3
Transport Equipment	0	8
Warehousing and Harbor transportation	1	9
Wholesale Trade	17	84

Table 4: Determinants of the filing range

This table reports the determinants of the filing range, *Price Range*. The definitions of variables are summarized in the Appendix. OLS estimates are used in both estimations. Both columns use underwriter and year fixed effects. Column 2 adds industry-fixed effects. Standard errors after controlling the clustering at the underwriter-level are reported in parentheses. ***, **, and * report the statistical significance at the 1, 5, and 10% levels respectively.

	(1) *Price Range*	(2) *Price Range*
Treat×Post	-0.0244***	-0.0154**
	(0.00813)	(0.00689)
Asset size	-0.00900***	-0.00911***
	(0.00192)	(0.00219)
EBITDA ratio	-0.0239**	-0.00264
	(0.00944)	(0.0118)
R&D	0.00260	0.000752
	(0.00427)	(0.00528)
Cash	0.0172	0.0153
	(0.0126)	(0.0131)
Leverage	-0.000454	0.00462
	(0.0118)	(0.0121)
Secondary share	-0.0150	-0.0137
	(0.0111)	(0.0122)
Proceeds	0.00531**	0.00409
	(0.00246)	(0.00266)
Underwriter FE	Yes	Yes
Industry FE	No	Yes
Year FE	Yes	Yes
Observations	1116	1116

5.2 Probability to be inside the range

Next, we examine whether the offering price is set in the middle of the filing range by estimating Eq. 2 where *Within Range* is the dependent variable.

Table 5, column 1 reports the results without industry-fixed effects. The estimated coefficient of our variable of interest, $Treat \times Post$, is positive ($p < 0.01$), suggesting that the probability of setting the offering price inside the range increases after the merger event.

Table 5, column 2 shows the results with industry-fixed effects. The results are similar to those of column 1; the estimated coefficient of our variable of interest, $Treat \times Post$, is positive ($p < 0.01$).

The economic size of the merger is nontrivial. The estimated coefficient is 0.08. As we have shown in Table 3, which reported the summary statistics in the entire sample, the *Within Range* of the consolidated underwriter (0.073) is lower than other major underwriters (0.108), but statistically insignificant . There is a possibility that the probability increased after the merger.

The results of the control variables are as follows. *Within Range* is positively correlated with the size of the firm, measured by total assets and profitability (except for column 1). We do not find any coefficients with estimated coefficients ($p < 10\%$).

6 Additional Test

In this section, we conduct various additional cross-sectional analyses to clarify the channel of our findings.

6.1 Matched sample analysis

Next, we examine the possibility that the characteristics of issuers, confounding variables, underwritten by the consolidated underwriter are different from those of other issuers. Our previous analyses used a regression model to control the issuers' characteristics. However, the regression model assumes a linear relationship between the dependent variable and the independent variable. If we cannot assume this assumption, regression models produce biased estimates. To eliminate the endogeneity, we conduct two types of analysis.

6.1.1 Propensity score matching

We conduct a regression with the sample chosen by propensity score matching (PSM) to further verify the robustness of the results. PSM-DiD mainly consists of the following steps: First, we

use a logit model to estimate the probability of a company being underwritten by Nikko Securities. The model incorporates the following explanatory variables: *Asset size*, *EBITDA ratio*, *R&D*, *Cash*, *Secondary share*, and *Proceeds*. Next, based on the underwriting probabilities obtained from the logit estimation, we match issuers underwritten by Nikko with those not underwritten by Nikko using caliper matching. To ensure high-quality matches, we: a) Impose the common support condition, which excludes treatment observations whose propensity scores fall outside the range of the control group's propensity scores. b) Set the caliper at 0.05, which means that matches are only accepted if the difference in propensity scores between the treated and control units is less than 0.05. Finally, we calculate PSM-DiD estimates according to Eq 1 weighted by propensity scores.

Table 6, Panel A reports the results with the observation of the treated and matched firms. The treated group consists of the firms underwritten by the consolidated underwriter, and matched firms are chosen for each treated issuer. The sample size declines as a result of the restriction of the observations. The empirical findings are similar to those we have already observed. We find that the merger with commercial banks enables the underwriter to narrow down the filing range (column 1) and increases the probability that the offering price is inside the range (column 2) after controlling for various factors that may affect the filing range.

6.1.2 Entropy balancing procedure

The PSM contains some controversial issues, including that it eliminates the sample size as we use both target and their matched observations: in other words, we eliminate the information of the non-target firms that are not used as the matched observations. Indeed, the analysis shown in Panel A is 797 dropped from 1116 in the full sample.

Instead, entropy balancing procedure takes advantage of these issues. Unlike PSM, the entropy balancing does not omit the observations of the control group. Rather, entropy balancing sets the weight for each observation of the control firms by conducting iteration to find the set of first to third moments of covariates, and use the weight for regression. The weights of controls are calculated to equalize the covariates of treatment and control groups in high-dimensional moments. In our case, the weight of the control group is calculated to equalize for up to the third-order moments of covariates.

Table 6, Panel B reports the results using entropy balancing. The sample size is the same as that in the previous tables, indicating the analysis uses the information of all IPOs.

As same with our main analyses and PSM in Panel A, we find the narrow filing range (column 1) as the sign of the coefficient estimates of $Target \times Post$ is negative. Moreover, in column 2, the sign of the coefficient estimates of $Target \times Post$ is positive, indicating that IPOs underwritten by the consolidated underwriter are more likely to be inside the range after the

merger event.

6.2 Lending relationship

Commercial banks can provide private information when there has been a loan contract between an issuer and a bank (Diamond, 1984; Agarwal and Hauswald, 2010). Therefore, we predict that the amount of private information that can be used to determine the filing range increases when the former loan relationship exists. The specification comes from the assumption that the underwriter accesses private information when the relationship between the underwriter and commercial bank is strong. The incentive could be especially strong when the issuer attempts to maximize the proceeds at the IPOs. If the bank lends before IPOs and the firm plans to repay it using the proceeds, the securities company and commercial banks will use the private information carefully, which affects the price filing range in the prospectus.

We test the role of lending relationships by estimating:

$$\begin{aligned} Y_{ijyu} = \alpha + \alpha_u + \alpha_j + \alpha_y + \beta_3 Treat_{ut} \times Post_t \times Loan\ Repayment\ Demand \\ + \sum \gamma X_{ijyu} + \epsilon_{jiyu}, \end{aligned} \tag{3}$$

where the dependent variable Y is one $Within\ Range_{ijyu}$ or $Price\ Range_{ijyu}$ as same as the previous analyses. We add an indicator *Loan repayment demand*, which takes the value of one for IPOs that intend to use proceeds for loan repayment.[11] Furthermore, we add its interaction terms with $Treat \times Post$ that capture the heterogeneity of the availability of private information from the loan relationship.

We predict that underwriters can obtain more information with previous loan relationships, leading to a narrower filing range ($\beta_3 < 0$ when *Price Range* is the dependent variable) and a higher probability to set the offering price within the narrower filing range ($\beta_3 > 0$ when *Within Range* is the dependent variable).

Table 7 shows the impact of the previous loan relationship on the determinants of the filing range where the dependent variable is $Range_{ijyu}$ in columns 1 and 2 and $Within\ Range_{ijyu}$ in columns 3 and 4. The results are reported in Table 7, where all specifications support the view that prior loan relationships lead to providing more information from the parent commercial bank to its subsidiary underwriter. Columns 1 and 2 show the evidence that commercial banks provide more soft information for deciding the IPO pricing. In both columns,the estimated coefficient of the $Treat_{ut} \times Post_t \times Loan\ Repayment\ demand$ is negative ($p < 0.05$), indicating that issuers with loan repayment demand lead to a narrower filing range.

Next, columns 3 and 4 show the relation of loan relationship and the probability that the

[11] In Japan, issuers are required to disclose how they use proceeds in the prospectus such as investment, repaying loan, covering working capital, and advertisement.

offering price sets inside the range. In both columns, the estimated coefficient of the $Treat_{ut} \times Post_t \times Loan\ Repayment\ demand$ is positive ($p < 0.01$), indicating that the underwriter and the issuer can set the range that covers the offering price.

6.3 Degree of the information asymmetry

Our argument assumes that the merger event improves the private information that the consolidated underwriter has, which affects the decision for filing range. The importance of private information by the underwriter on offering price depends on the degree of asymmetric information between investors and the issuer. Therefore, we conduct additional analyses that show that the addition of the variable relates to the asymmetric information between the issuer and investors in order to examine the impact of the bank merger on determining the offering price.

Specifically, we test the role of the lending relationship by estimating:

$$Y_{ijyu} = \alpha + \alpha_u + \alpha_j + \alpha_y + \beta_4 Treat_{ut} \times Post_t \times Asyn + \beta_5 Treat_{ut} \times Post_t + \sum \gamma X_{ijyu} + \epsilon_{jiyu}. \quad (4)$$

The variable *Asyn* is an indicator for the issuers facing a high degree of asymmetric information. We predict that the role of generating soft information by the underwriter is pronounced for firms who suffer a higher degree of asymmetric information. In other words, we expect the impact of the merger is pronounced and leads to a narrower filing range ($\beta_5 < 0$) when *Price Range* is the dependent variable and a higher probability to set the offering price within the narrower filing range ($\beta_5 > 0$ when *Within Range* is the dependent variable).

We employ three variables to measure the information asymmetry faced by issuers.

First, we add an indicator for issuer size, assigning a value of 1 for the IPOs whose size is ranked among the bottom 25% and 0 otherwise. Smaller issuers often have fewer insiders and thus retain more proprietary information, posing a greater asymmetric information problem for investors.

Second, we use the firm age of the issuer as a proxy for information asymmetry. We assign a value of 1 for the issuer's age ranked among the bottom 25%, and 0 otherwise. Similarly, younger issuers typically face more severe information asymmetry due to their shorter track records and potentially less-established reporting practices.

The first and the second measurements come from the idea of Hadlock and Pierce (2010), which argues that the degree of asymmetric information can be expressed as the combination of firm size and age.

Third, we use the firm's R&D investments to gauge the level of information asymmetry. R&D investments create information asymmetries because their feasibility is unobservable for outsiders, which makes it harder to evaluate the net present value of these investments.

Table 8, Panel A reports the results where the degree of asymmetric information is measured

by firm size. As we have shown in Table 4 and 5, firm size is positively related to the filing range and negatively related to the probability of being the offering price inside the range. These results support the assumption that firm size is a proxy for the asymmetric information between the issuer and investors. Moreover, in columns 1 and 2 of Panel A, we find that the sign of the estimated coefficient of the $Treat \times Post \times Small$ is negative and statistically significant. The results indicate that small size issuers are successful in setting their filing range narrower with the bank-consolidated underwriter, indicating the underwriter can reduce the asymmetric information after the merger event.

Columns 3 and 4 use the *Within Range* as the dependent variable. In this case, while the estimated coefficient of the triple interaction term is positive, which supports the view that the impact of the merger is pronounced for firms facing asymmetric information, it is not statistically significant.

Table 8, Panel B uses firm age as the proxy for firm age. In this case, all four estimations show a supportive view that the impact of the merger is pronounced for firms facing asymmetric information. The coefficient estimate of the triple interaction term in columns 1 and 2 is negative, indicating that consolidated underwriters can set the range narrower, and that in columns 3 and 4 are positive, that they are more likely to set their offering price inside the range.

Lastly, Panel C of Table 8 reports the results adding R&D expenditure as the degree of asymmetric information. We find that the filing range narrows for the R&D intensive IPOs (columns 1 and 2). This result supports the view that the merger underwriter can utilize its private information from its parent commercial bank to fix the filing range. Tasker (1998) finds that R&D-intensive firms conduct more conference calls with analysts, implying a stronger investor demand for information about firms' R&D activities. Following a merger, banks have a stronger incentive to produce information related to R&D-intensive issuers that is of interest to investors, as this information is both more valuable and harder to obtain.

However, as opposed to the prediction, the sign of the triple interaction term in column 3 is negative, while we find the positive sign in Panels A and B.

6.4 Alternative explanation

There is the possibility that the merger of commercial and securities companies changes the certification role of the underwriter. If so, the filing range changes not because of the increase in the private information that the underwriter has but because the merger attracts high-quality companies to be underwritten by the merged securities company. If the quality of the companies relates to the filing range, the decline of the filing range comes from the change of the underwriter's reputation instead of the increase in the private information that the underwriter

has, as we predict. We tackle this possibility by two ways. First, we conduct the subsample period analysis. Second, we demonstrate the characteristics of the firms underwritten by the consolidated underwriter. We examine this possibility by two types of additional analyses.

6.4.1 Restricted sample period analysis

In Japan, usually, firms choose an underwriter about 2 years prior to their going public, which is longer than the typical IPOs in the US.[12] Japanese major stock exchanges require firms to disclose two years of audited accounting information prior to when they propose to go public and require sophisticated internal corporate disclosure and governance structures. Underwriters support firms in preparing such processes. Then, in Japan, underwriters can acquire more soft information during the process of preparing for going public.

We first test the alternative explanation of our finding by conducting an analysis with a subsample period, which restricts the sample of IPOs to two years after the merger.

Practically, an issuer determines the underwriter two to three years prior to their IPOs in Japan. Therefore, if the bank merger changes the underwriter's reputation and attracts high-quality companies, the impact comes three years or later. Then, we re-estimate with the observation of IPOs two years within the merger event.

Table 9, column 1 reports the results where *Price Range* is the dependent variable. As in the previous analysis, the estimated coefficient of $Treat \times Post$ is negative and statistically significant.

Table 9, Column 2 reports the results where the dependent variable is an indicator for the within filing range. In this case, we do not find evidence of increased frequency within the filing range. As in the previous analysis, the estimated coefficient of $Treat \times Post$ is negative and statistically significant.

We also analyze the data within one-year after the event and obtain similar results with Table 9. The results are reported in the appendix file.

6.4.2 Changes in firm characteristics

There is a concern that the merger changes the characteristics of the firms underwritten by the consolidated underwriter. If issuers prefer to be underwritten by bank-affiliated underwriters, the merger changes the characteristics of the issuers between before and after the merger.

Therefore, we examine whether the characteristics of the offering and the characteristics change due to the merger. If a bank-affiliated underwriter is preferred by more reputable firms, the size of offerings and issuers becomes larger after the merger. Based on the argument, we

[12] In the US, underwriter support usually less than one year. See such as the blog article by Pitchbook: https://pitchbook.com/blog/ipo-process-explained.

examine the following estimation:

$$Size_{ijyu} = \alpha + \alpha_u + \alpha_j + \alpha_y + \beta_6 Treat_{ut} \times Post_t + \sum \gamma X_{ijyu} + \epsilon_{jiyu}, \tag{5}$$

where the size is the size of offering ($Proceeds$) and firm size($AssetSize$). The main explanatory variables are $Treat \times Post$. If the underwriter experienced that the merger can attract good quality companies, the size of the issuers would become larger. If so, we expect a positive coefficient for the interaction term.

Table 10 shows the characteristics of the IPO issuers underwritten by Nikko, the consolidated underwriters, before and after the event by estimating Eq. 5. The estimated coefficients of $Treat \times Post$ are statistically insignificant in both columns.

The results reject the possibility that the consolidated underwriter can attract good issuers by being the stronger bank relationship. Therefore, the relationship between the merger event and the filing range is not caused by the fundamental differences between IPO firms after the merger event.

6.5 Underpricing

Lastly, we examine whether the information production due to the merger affects the post-IPO stock performances, especially the initial return and long-term return. Some may have concerns that the merger between an underwriter and a commercial bank can influence the stock returns around and after IPOs.

We also examine the impact of the merger event on the underpricing. In this aim, we use underpricing, which is defined as the difference between the open price on the IPO day and the offering price divided by the offering price,zo as the dependent variable.

Previous studies have found various determinants of underpricing, including asymmetric information. Table 11 shows the results of the estimation. We find evidence that the merger event influences the underpricing, as the estimated coefficient of $Treat \times Post$ is statistically insignificant.

7 Conclusion

This paper argues the role of underwriters' private information-generating process by focusing on the filing range and utilizing the data of Japanese IPOs for two reasons. First, we are able to use the acquisitions of securities companies by a commercial bank in Japan. Second, in the Japanese bookbuilding process, the filing range is determined by the underwriters' information. The idea of our paper is that the merger with commercial banks increases the volume of private

information that underwriters have. If the private information is used to determine the filing range, the underwriter with the private information of commercial banks can propose a more narrow filing range for investors participating in the book-building process.

Our empirical analyses support our prediction. We find that firms underwritten by the consolidated underwriter propose a narrow filing range, and their offering prices are more likely to be in the range, indicating that their filing range is informative.

Unlike previous studies, our article provides evidence of information production by underwriters without using underpricing, which is determined by various factors.

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Table 5: Probability that offering price is determined in the middle of the filing range
This table reports the determinants of the filing range, *Within Range*. The definitions of variables are summarized in the Appendix. OLS estimates are used in both estimations. Both columns use underwriter and year fixed effects. Column 2 adds industry fixed effects. Standard errors after controlling the clustering at the underwriter level are reported in parentheses. ***, **, and * reports the statistical significance at the 1, 5, and 10% levels respectively.

	(1) Within the filing range	(2) Within the filing range
Treat×Post	0.0743***	0.0939***
	(0.00740)	(0.0113)
Asset size	0.0250***	0.0254*
	(0.00872)	(0.0126)
EBITDA ratio	-0.00172	0.0474***
	(0.00879)	(0.0113)
R&D	-0.0163	-0.0104
	(0.0149)	(0.0209)
Cash	-0.00974	-0.0102
	(0.0464)	(0.0427)
Leverage	-0.0692	-0.0625
	(0.0630)	(0.0637)
Secondary share	0.0533*	0.0543
	(0.0302)	(0.0378)
Proceeds	-0.0126	-0.0152
	(0.0172)	(0.0224)
Underwriter FE	Yes	Yes
Industry FE	No	Yes
Year FE	Yes	Yes
Observations	1116	1116

Table 6: Estimations with Matched Sample

This table shows the results with sample matching using propensity score matching in Panel A and entropy balancing matching in Panel B. In each panel, column 1 (2) uses *Price Range* (*within*). See Appendix material for the definitions of variables. All specifications use underwriter and year fixed effects. Standard errors after controlling the clustering at the underwriter level are reported in the parentheses. ***, **, and * reports the statistical significance at the 1, 5, and 10% levels respectively.

Panel A: PS Matching

	(1) *Price Range*	(2) Within the filing range
Treat×Post	-0.0210***	0.105***
	(0.00647)	(0.00902)
Asset size	-0.0116***	0.0215
	(0.00303)	(0.0144)
EBITDA ratio	-0.0315	-0.0511
	(0.0215)	(0.0582)
R&D	0.000931	-0.0211
	(0.00491)	(0.0219)
Cash	0.0345*	0.0323
	(0.0179)	(0.0742)
Leverage	0.00328	-0.0305
	(0.0171)	(0.0670)
Secondary share	-0.00606	0.131**
	(0.0189)	(0.0478)
Proceeds	0.00586	-0.0253
	(0.00436)	(0.0207)
Underwriter FE	Yes	Yes
Year FE	Yes	Yes
Observations	797	797

Panel B: Entropy Balancing

	(1) *Price Range*	(2) Within the filing range
Treat×Post	-0.0340***	0.0664***
	(0.0102)	(0.00888)
Asset size	-0.0140***	0.0260***
	(0.00215)	(0.00385)
EBITDA ratio	-0.0338***	0.00724
	(0.0119)	(0.00867)
R&D	-0.00468	-0.0286***
	(0.00817)	(0.00729)
Cash	-0.00213	-0.0703
	(0.0138)	(0.0441)
Leverage	-0.00542	-0.0398
	(0.0162)	(0.0403)
Secondary share	-0.0351*	0.0776**
	(0.0176)	(0.0331)
Proceeds	0.0109***	-0.0183*
	(0.00168)	(0.00956)
Underwriter FE	Yes	Yes
Year FE	Yes	Yes
Observations	1116	1116

Table 7: Heterogeneous Effects: Lending Relationship

This table reports whether the bank loan relationship influences the filing range at the timing of IPOs underwritten by consolidated securities company. Indicator *Loan repayment demand* takes the value of one for IPOs that disclose they plan to use proceeds for loan repayment in their prospectus. Columns 1 and 3 use *Price Range*, and columns 2 and 4 use *Within Range* indicator for the dependent variable. Standard errors after controlling the clustering at the underwriter level are reported in the parentheses. ***, **, and * report the statistical significance at the 1, 5, and 10% levels, respectively.

	Price Range		Within the filing range	
	(1)	(2)	(3)	(4)
Treat×Loan repayment demand	0.0167**	0.0154**	-0.0222*	-0.0308**
	(0.00611)	(0.00659)	(0.0120)	(0.0130)
Treat×Post	-0.0189**	-0.00881	0.0389**	0.0530**
	(0.00795)	(0.00717)	(0.0174)	(0.0196)
Controls	Yes	Yes	Yes	Yes
Underwriter FE	Yes	Yes	Yes	Yes
Industry FE	No	Yes	No	Yes
Year FE	Yes	Yes	Yes	Yes
Observations	1116	1116	1116	1116

Table 8: Heterogeneous Effects: Information Cost

This table reports the impact of information cost on the sensitivity of the underwriter and bank merger event on the IPO filing range. The degree of information asymmetry is measured by firm age (Panel A), Firm size (Panel B), and the R&D expenditure (Panel C). The variable $R\&D$ takes the value of one if the firms disclose R&D expenditure, $Young$ takes the value of one if the firm age at the timing of IPO is younger than the 25 percentile, and $Small$ takes the value of one for a firm with total asset is less than the 25 percentile. In each panel, columns 1 and 3 use filing range, and columns 2 and 4 use the indicator for within range. Columns 2 and 4 show the results with industry fixed-effects. Standard errors after controlling the clustering at the underwriter level are reported in parentheses. ***, **, and * report the statistical significance at the 1, 5, and 10% levels, respectively.

Panel A Firm Size

	Price Range		Within the filing range	
	(1)	(2)	(3)	(4)
Treat×Post×Small	-0.0275***	-0.0330***	0.0335	-0.0224
	(0.00845)	(0.00818)	(0.0363)	(0.0263)
Treat×Post	-0.0181**	-0.00691	0.0708***	0.108***
	(0.00770)	(0.00664)	(0.00759)	(0.0118)
Controls	Yes	Yes	Yes	Yes
Underwriter FE	Yes	Yes	Yes	Yes
Industry FE	No	Yes	No	Yes
Year FE	Yes	Yes	Yes	Yes
Observations	1116	1116	1116	1116

Panel B Firm Age

	Price Range		Within the filing range	
	(1)	(2)	(3)	(4)
Treat×Post×Young	-0.0327**	-0.0292**	0.0822**	0.0823***
	(0.0140)	(0.0120)	(0.0335)	(0.0214)
Treat×Post	-0.0136	-0.00556	0.0469***	0.0658***
	(0.00955)	(0.00768)	(0.0118)	(0.0142)
Controls	Yes	Yes	Yes	Yes
Underwriter FE	Yes	Yes	Yes	Yes
Industry FE	No	Yes	No	Yes
Year FE	Yes	Yes	Yes	Yes
Observations	1116	1116	1116	1116

Panel C R&D Expenditure

	Price Range		Within the filing range	
	(1)	(2)	(3)	(4)
Treat×Post×R&D	-0.0279***	-0.0236***	-0.0543*	-0.0344
	(0.00536)	(0.00808)	(0.0288)	(0.0206)
Treat×Post	-0.0123	-0.00575	0.0996***	0.111***
	(0.00834)	(0.00731)	(0.0125)	(0.00999)
Controls	Yes	Yes	Yes	Yes
Underwriter FE	Yes	Yes	Yes	Yes
Industry FE	No	Yes	No	Yes
Year FE	Yes	Yes	Yes	Yes
Observations	1116	1116	1116	1116

Table 9: Sub-Sample Period

This table reports the results with sample covering two-years after the merger. Dependent variable is *Price Range* in column 1 and *Within Range* in column 2. Standard errors after controlling the clustering at the underwriter-level are reported in parentheses. ***, **, and * report the statistical significance at the 1, 5, and 10% levels, respectively.

	(1) *Price Range*	(2) Within the filing range
Treat×Post	-0.0510**	0.00863
	(0.0188)	(0.0271)
EBITDA ratio	0.00466	0.0581***
	(0.0121)	(0.0164)
Leverage	0.00604	-0.0806
	(0.0103)	(0.0714)
R&D	0.000985	-0.00238
	(0.00504)	(0.0236)
Cash	0.0182	-0.00672
	(0.0157)	(0.0493)
Secondary share	-0.0174	0.0667
	(0.0137)	(0.0438)
Asset size	-0.00968***	0.0284*
	(0.00288)	(0.0145)
Proceeds	0.00168	-0.0228
	(0.00326)	(0.0296)
Underwriter FE	Yes	Yes
Industry FE	Yes	Yes
Year FE	Yes	Yes
Observations	942	942

Table 10: Characteristics of Issuers around the Event

This table reports the estimated coefficients from Eq. 5. Dependent variable is the size of proceed in column 1 and firms size in column 2. Standard errors after controlling the clustering at the underwriter-level are reported in parentheses. ***, **, and * report the statistical significance at the 1, 5, and 10% levels, respectively.

	(1) Proceeds	(2) Asset Size
Treat×Post	0.0411	-0.138
	(0.119)	(0.135)
EBITDA ratio	0.314	-0.0346
	(0.315)	(0.205)
Leverage	-0.966***	1.221***
	(0.184)	(0.203)
R&D	0.0321	0.0479
	(0.0348)	(0.0565)
Cash	0.759**	-1.471***
	(0.292)	(0.261)
Secondary share	0.588***	-0.0451
	(0.167)	(0.134)
Underwriter FE	No	No
Industry FE	Yes	Yes
Year FE	Yes	Yes
Observations	1124	1124

Table 11: Underpricing

This table reports the results where the dependent variable is the underpricing. The definition of variables are summarized in Appendix. OLS estimates are used in both estimations. Both columns use underwriter and year fixed effects. Column 2 adds industry fixed effects. Standard errors after controlling the clustering at the underwriter level are reported in the parentheses. ***, **, and * reports the statistical significance at the 1, 5, and 10% levels respectively.

	(1) Initial return	(2) Initial return
Treat×Post	0.0991	0.110
	(0.0592)	(0.0637)
Asset size	-0.0551***	-0.0402*
	(0.0181)	(0.0214)
EBITDA ratio	0.269***	0.273***
	(0.0513)	(0.0667)
R&D	0.0155	0.0266
	(0.0252)	(0.0325)
Cash	0.235***	0.181***
	(0.0748)	(0.0606)
Leverage	-0.0587	-0.0688
	(0.0799)	(0.0783)
Secondary share	-0.126*	-0.119*
	(0.0612)	(0.0613)
Proceeds	-0.0802***	-0.0950***
	(0.0199)	(0.0208)
Underwriter FE	Yes	Yes
Industry FE	No	Yes
Year FE	Yes	Yes
Observations	1116	1116

Table 12: Underpricing and borrowing

We add *Loan repayment demand* that takes the value of one for IPOs intending toe use proceeds for loan repayment. Standard errors after controlling the clustering at the *** level are reported in the parentheses. Columns 1 and 3 use *Price Range*, and columns 2 and 4 use *Within Range* indicator for the dependent variable. ***, **, and * report the statistical significance at the 1, 5, and 10% levels, respectively.

	Initial return	
	(1)	(2)
Treat×Post×Loan repayment demand	-0.184**	-0.177**
	(0.065)	(0.076)
Treat×Post	0.131***	0.138***
	(0.024)	(0.030)
Controls	Yes	Yes
Underwriter FE	Yes	Yes
Industry FE	No	Yes
Year FE	Yes	Yes
Observations	1116	1116

Supplementary Appendix

This material is prepared as the additional supplementary information. Section A-1 explains the definition of variables used in our study. Section A-2.1 contains some additional analyses that are not used in the manuscript.

A-1 Variable definition

This appendix section explains the definitions of variables used in this paper. The variable names are written in *italic* font. Data sources are expressed in **bold font**.

Price Range measures the width of the filing range defined as *Range* is defined as $\frac{(p_{max}-p_{min})}{(p_{max}+p_{min})/2}$. Here, p_{min} is the minimum of the range and p_{max} is the maximum of the range. **INDB's Funding Eye**

Within Range is an indicator that takes the value of one if the offering price is smaller than the maximum and larger than the minimum. $Within\ Range_{ijyu} = \begin{cases} = 1 \text{ if } p_o = (p_{min}, p_{max}) \\ = 0 \text{ if } p_o \in \{p_{min}, p_{max}\}. \end{cases}$, where p_o is the IPO offering price. **INDB's Funding Eye**

Treat takes the value of one for the IPOs underwritten by the merged underwriter, Nikko.

Post is an indicator for IPOs underwritten after the merger event.

Asset size represents the firm size defined as the natural logarithm of total assets. **Nikkei NEEDs**

EBITDA ratio represents profitability defined as the sum of Operating profit and Depreciation divided by revenue. **Nikkei NEEDs**

R&D represents the R&D ratio defined as research and development expenses divided by total revenue. **Nikkei NEEDs**

Cash represents the cash ratio defined as the sum of cash and deposits divided by total assets. **Nikkei NEEDs**

Leverage represents financial leverage divided by the sum of short- and long-term liabilities divided by total assets. **Nikkei NEEDs**

Secondary share represents the ratio of secondary shares defined as a total number of shares offered from existing shareholders divided by the sum of a total number of shares offered from existing shareholders and the number of new shares. **INDB's Funding Eye**

Proceed represents the size of the funds raised at the IPO offering, defined as the natural logarithm of the total amount raised at the offering. **INDB's Funding Eye**

Initial Return: represents the underpricing defined as $\frac{p_c}{p_o} - 1$, where p_c is the first trading day closing price. **INDB's Funding Eye**

A-2 Additional Analysis

A-2.1 More shorter sample period

In our manuscript, we conduct an additional analysis that the sample period after the event is restricted to 2 years within the merger. Such sample restriction is conducted to avoid the possibility that a firm's preferences over the underwriter change due to the bank's acquisition. In Japan, usually, it takes two years from the underwriter choice to an IPO; therefore, limiting within two years is enough to avoid the self-selection problem by the issuers. Here, we also conduct an analysis that restricts to one year after the event.

The results are shown in Table A-1.

Table A-1: One years after the event

We add *Loan repayment demand* that takes the value of one for IPOs intending toe use proceeds for loan repayment. Standard errors after controlling the clustering at the *** level are reported in the parentheses. Columns 1 and 3 use *Price Range*, and columns 2 and 4 use *Within Range* indicator for the dependent variable. ***, **, and * report the statistical significance at the 1, 5, and 10% levels, respectively.

	(1) *Price Range*	(2) Within the filing range
Treat×Post	-0.0442***	-0.0219
	(0.0148)	(0.0391)
EBITDA ratio	0.00145	0.0729***
	(0.0123)	(0.0220)
Leverage	0.00678	-0.0804
	(0.00986)	(0.0717)
R&D	0.000785	-0.00161
	(0.00487)	(0.0244)
Cash	0.0196	0.00869
	(0.0169)	(0.0487)
Secondary share	-0.0125	0.0784*
	(0.0152)	(0.0435)
Asset size	-0.00992***	0.0306**
	(0.00266)	(0.0146)
Proceeds	0.000869	-0.0304
	(0.00341)	(0.0285)
Underwriter FE	Yes	Yes
Industry FE	Yes	Yes
Year FE	Yes	Yes
Observations	942	942