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The Real Estate Channel of Unconventional Monetary Policy*

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Abstract

This study investigates how unconventional monetary policy affects the economy when the central bank purchases equities issued by non-bank institutions, focusing on the Bank of Japan's Real Estate Investment Trust (REIT) purchase program. Unlike previous studies that examine the impact of monetary policy on the real estate sector primarily through the bank lending channel, this program influences the sector through the risk-taking channel by purchasing equities issued by non-bank institutions. Using detailed data on REITs, we find that: (1) the central bank's purchases lowered both equity and loan costs for targeted REITs; (2) these REITs acquired riskier properties with higher expected returns; (3) banks reallocated lending from listed real estate companies toward the REIT sector, especially targeted REITs; and (4) real estate prices of properties adjacent to those purchased by REITs increased more than those of more distant properties and the tendency is more pronounced when the properties were purchased by targeted REITs. Together, these findings indicate that central bank equity purchases stimulate risk-taking in targeted non-bank institutions and affect the broader loan and real estate market.

Keywords: Real Estate Investment Trusts (REITs); risk-taking; monetary policy; Large-Scale Asset Purchases (LSAPs); banks
JEL classification: E52; G21; G23; R30

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1. Introduction

Several channels have been proposed to explain how monetary policy affects the economy. The primary mechanism is the interest rate channel, through which changes in funding costs influence firms' capital investment and households' expenditures on housing and durable goods. Another important mechanism is the balance sheet channel, which emphasizes frictions in financial markets: monetary policy alters the strength of borrowers' balance sheets, thereby affecting their external financing costs.

In recent years, growing attention has been paid to the risk-taking channel, which suggests that prolonged periods of low interest rates may encourage financial institutions to assume greater risks. Borio and Zhu (2012) and Adrian and Shin (2010) were among the first to introduce this concept, arguing that a persistently low interest rate environment can alter banks' risk perceptions. Numerous empirical studies provide evidence of such behavior in both advanced and emerging economies (Jiménez et al., 2014; Ioannidou et al., 2015; Dell'Ariccia et al., 2017; Bonfim and Soares, 2018; Paligorova and Santos, 2017; Takaoka and Takahashi, 2022; Morais et al., 2019; Kandrac and Schlusche, 2021). Collectively, these studies show that monetary easing and low interest rates contribute to increased risk-taking by banks.

Beyond interest rate cuts, research has also examined the risk-taking channel under large-scale asset purchases (LSAPs), a key unconventional policy tool increasingly used by central banks since the global financial crisis. Di Maggio et al. (2020), Chakraborty et al. (2020), and Rodnyanski and Darmouni (2017) analyze the Federal Reserve's mortgage-backed securities (MBS) purchase program, while Grosse-Rueschkamp et al. (2019) study the European Central Bank's corporate bond purchase program. A key limitation of this literature, however, is its focus on banks' lending behavior. Little attention has been paid to the non-bank sector and to financial instruments other than loans, even though unconventional policies often involve the purchase of

assets such as corporate bonds or equities and there is a growing concern about the behavior of non-bank financial institutions.

This study fills that gap by focusing on one of the Bank of Japan's (BOJ's) unconventional LSAP programs: its purchases of equities issued by real estate investment trusts (REITs). We examine how these purchases affected the risk-taking behavior of REITs in acquiring real estate properties. The BOJ implemented this policy for about 15 years, accumulating a substantial REIT portfolio relative to market capitalization. The stated objective was to reduce the risk premium, but such interventions may also have altered REITs' investment choices. Moreover, the increased loan demand by REITs could have induced spillover effects on banks, prompting them to reallocate their lending portfolios.

Using a comprehensive dataset covering REIT-level real estate acquisitions, loan transactions, nationwide real estate transactions, and firm-bank matched loan exposures, we address three questions. First, we test whether equity and loan financing costs for REITs declined after the BOJ's purchases. A reduction in equity risk premia should encourage REITs to issue more equity, while improved creditworthiness may lower loan costs and expand borrowing. Second, we examine whether eligible REITs took greater risks in property acquisitions in search of higher returns—purchasing properties with higher expected returns, greater age, and higher operational and capital expenditures. We also assess the ex-post performance of these properties in terms of appraisal values and rental income. We further investigate whether these properties were located in markets with more volatile transaction prices, exposing REITs to greater capital risk. Third, we analyze whether banks reallocated loans from listed real estate companies toward REITs, thereby reshaping their loan portfolios.

Our empirical analysis yields four main findings. First, both equity costs and loan interest rates for REITs eligible for the BOJ's program declined, leading to an increase in their equity

issuance and borrowing. Second, eligible REITs engaged in more risk-taking, acquiring older properties with higher expected returns but also greater expenses and more volatile local market conditions; ex-post, these properties exhibited lower appraisal values and rental income than those acquired by non-eligible REITs. Third, banks reallocated their lending away from listed real estate firms toward REITs, increasing the share of long-term loans to eligible REITs in their portfolios. Fourth, real estate prices of properties adjacent to those purchased by REITs increased more than those of more distant properties and the tendency is more pronounced when the properties were purchased by targeted REITs.

Taken together, these results suggest that the BOJ's REIT purchase program uniquely affected the real estate sector by directly encouraging risk-taking among non-bank institutions. This stands in contrast to findings from previous studies, such as Chakraborty et al. (2020), where banks shifted portfolios within lending markets in response to MBS purchases. We refer to this mechanism as the "real estate channel of unconventional monetary policy."[1]

This paper contributes to three strands of literature. First, it extends research on the risk-taking channel of monetary policy by identifying a new pathway operating through non-bank institutions. While prior studies emphasized banks' risk tolerance, we show how central bank interventions can affect risk-taking outside the banking sector and generate feedback effects on banks. Second, it contributes to the literature on the effectiveness of large-scale asset purchases. While earlier studies focused on corporate or banking sectors (Di Maggio et al., 2020; Rodnyanski and Darmouni, 2017; Charoenwong et al., 2021; Grosse-Rueschkamp et al., 2019), our analysis—closely related to Frame and Steiner (2022) and Hattori and Yoshida (2024)—highlights how the central bank's REIT purchase program reduced risk premia while simultaneously increasing

[1] Similarly, Grosse-Rueschkamp et al. (2019) examined the impact of the ECB's corporate bond purchase program on the capital structure of firms whose bonds were likely to be purchased, referring to this mechanism as the "capital structure channel of monetary policy."

REITs' risk-taking. Third, it adds to the literature on REIT real investment behavior, which has typically focused on acquisition and divestment patterns (Crane and Hartzell, 2010; Suzuki et al., 2023) as well as to the literature on financial investment behavior of other non-bank financial institutions such as insurance companies (Becker and Ivashina, 2015; Koijen and Yogo, 2015) and mutual funds (Choi and Kronlund, 2018; Goldstein, Jiang, and Ng, 2017). By linking investment behavior of non-banks directly to monetary policy interventions, our study sheds new light on this area.

The remainder of the paper is organized as follows. Section 2 describes the institutional setup of REITs and the BOJ's purchase program. Section 3 presents the data and empirical methodology. Section 4 reports the results, and Section 5 concludes.

2. REITs and the Bank of Japan's Unconventional Monetary Policy

2.1 Structure of REITs

Real estate investment trusts (REITs) are investment vehicles that raise funds from investors, invest these funds in real estate properties, and distribute the proceeds of rental income and capital gains to the investors. Investors indirectly own real estate and receive investment income through REITs.

REITs were first created in the United States following the enactment of the Real Estate Investment Trust Act of 1960. REITs in the U.S. can be broadly divided into equity REITs and mortgage REITs (mREITs). REITs must meet their own requirements, i.e. equity REITs must invest at least 75% of their total assets in real estate, while mREITs must invest at least 75% of their total assets in mortgage-backed securities. In addition, both types of REITs are required to distribute at least 90% of their taxable income to shareholders.

2.2 REITs in Japan

In Japan, the Act on Investment Trusts and Investment Corporations was amended in 2000, and the REIT market was established on the Tokyo Stock Exchange (the TSE) in 2001. Unlike REITs in the United States, only equity REITs are listed in Japan. On the other hand, similar to the U.S., REITs are required to hold at least 70% of their total assets in real estate and to distribute at least 90% of their taxable income to shareholders.

Since then, the market for listed REITs in Japan has developed. From just two REITs with a capitalization of 260.3 billion yen, the market has grown to 58 REITs with a total market capitalization of 15.4 trillion yen by the end of 2023. This is almost the same size as the market capitalization of blue-chip real estate companies, which is 16.5 trillion yen for 52 companies in the TSE Prime Market. This indicates that REITs in Japan have a non-negligible presence in the asset market, although it is much smaller than the total market capitalization of all listed blue chip companies (833 trillion yen for 1656 companies in the prime market) on the TSE. Based on the market capitalization of listed REITs worldwide, Japan accounts for 6% of the market, second only to the United States.

2.3 REITs' real estate acquisitions

Along with their growing market capitalization, REITs in Japan have been expanding the size of their real estate holdings, as they are required to hold at least 70% of their assets in real estate. The amount of assets under management has grown from 44 properties and 319.4 billion yen at the beginning of the REIT market to approximately 4,700 properties and 22.7 trillion yen at the end of 2023. During the period, the amount of asset acquisition by the REITs reached its lowest point in 2009, the period of recession following the global financial crisis, and then began to increase after 2010, when the BOJ began purchasing REITs, and exceeded 2 trillion yen in 2013.

Since then, it has continued to acquire assets of about 2 trillion yen each year through 2021.

The types of properties held by REITs are diverse. The REIT that were listed shortly after the start of the listed REIT market in Japan held only office buildings, but REITs that were listed on the market later held not only office buildings but also residential properties, commercial properties, logistics facilities, and hotels in their portfolios. The respective shares of their market capitalization are 39%, 15%, 14%, 20% and 8%. The geographical regions in which real estate is located have also become more diversified. In 2001, half of the properties included in the REITs were located in one of the five central wards of Tokyo's 23 special districts. However, by the end of 2023, 30% of the properties were located in the five central wards of Tokyo special wards, 15% in the other 18 wards, 24% in the Kanto region, and 15% in the Kinki region. This indicates a growing geographical diversification of REIT portfolios. (Sumitomo Mitsui Trust Research Institute, 2024)

Since REITs in Japan are required to distribute at least 90% of their taxable income to shareholders, it is difficult for them to use retained earnings to acquire properties. Instead, they raise funds through public equity offerings or debt financing. In addition, each REIT sets its own voluntary limit on the LTV ratio, which is the ratio of debt to asset value, in order to maintain a healthy financial status and avoid excessive reliance on debt. In fact, the average LTV ratio for REITs has been below 50% and stable over time. As a result, REITs find it difficult to continue acquiring real estate solely through debt; instead, they typically borrow in conjunction with raising equity through public offerings.

2.4 Unconventional monetary policy including the purchase of REITs

The BOJ has been easing monetary policy since the early 1990s following the bursting of the bubble economy, and initiated unconventional monetary policy in 1999, first with the zero-interest

rate policy and later with the quantitative easing policy. After the Global Financial Crisis, the BOJ introduced another set of unconventional monetary policies in 2010, which was called the comprehensive monetary easing policy. One of the key features of this policy was the establishment of funds to purchase risky assets such as corporate bonds (CBs), commercial papers (CPs), equity traded funds (ETFs), and REITs. The objective of this policy was to improve investor sentiment by lowering long-term interest rates and risk premiums through the purchase of risky assets. Subsequently, under the quantitative and qualitative monetary easing that began in 2013, the amount of risky assets purchased was further increased.

2.5 Criteria for the purchase of REITs by the BOJ

Our focus here is on the BOJ's purchase of REITs and how it was implemented. Note that the BOJ did not intend to purchase all REITs listed on the market, but rather REITs with relatively high credit quality. Specifically, the BOJ set the following purchase criteria: (1) REITs with adequate credit quality, including a credit rating of AA category (i.e., AA-, AA, or AA+) or higher, and (2) REITs that have been traded continuously for at least 200 days and have an annual trading volume of at least 20 billion yen. As a result of these criteria, there are REITs that were eligible for being purchased by the BOJ, while there are other REITs not eligible for the purchase. In the following empirical analysis, we will adopt an intention-to-treat (ITT) framework and compare these two groups of REITs based on the ex-ante eligibility criterion and not on realized purchase amount.

2.6 Development of BOJ's REIT purchases

The BOJ initially set the total purchase limit for REITs at 50 billion yen and capped purchases of each REIT at 5% of its outstanding equity. The BOJ subsequently raised the overall limit, especially during the quantitative and qualitative monetary easing (QQE) that began in April 2013.

At the start of QQE, the BOJ set the annual purchase cap at 30 billion yen and then tripled it to 90 billion yen in 2014. During COVID-19, the BOJ temporarily doubled the annual limit to 180 billion yen. It also later raised the cap for the purchases of each REIT at 10% of its outstanding equity in December 2015.

Thereafter, the actual amount of purchases declined as the QQE was gradually modified. The BOJ made its last QQE REIT purchase in June 2022, and it ended both REIT and ETF purchases when the negative interest rate policy was lifted in March 2024. The cumulative amount of purchases from the start in 2010 to the end in 2022 was 682.3 billion yen. And the increase in the cumulative amount of purchases was most significant when the maximum annual amount of purchases was raised to 90 billion yen in 2014. The ratio of the market value of BOJ-owned REITs to the total market value of REITs was 5.2 percent at the highest point (end of March 2021). As the purchases were concentrated on a limited number of eligible REITs, some REITs were held by the BOJ close to the 10% limit.

In the above we have examined the overall trend of REITs in Japan and the BOJ's purchase of REITs. In the following sections we will examine how the BOJ's REIT purchases have affected the real estate acquisition behavior of REITs.

3. Empirical approach

In this section we detail our empirical approach. We describe our data sources and explain about the estimation procedure used to test hypotheses about the impact of the BOJ's REIT purchase policy on various economic activities.

3.1 Data

For our analysis, we employ four data sources: the Japan REIT DB provided by Prop Tech Plus

Incorporated; The database on individual real estate transactions collected and disclosed by the Ministry of Land, Infrastructure, Transport, and Tourism (MLIT) of the Japanese government; The NEEDS-FinancialQUEST database provided by the Nikkei Incorporated; and the database on yields of the Japanese government bonds (JGBs) provided by the Ministry of Finance (MOF) of the Japanese government. Using one or several of these sources, we construct datasets for empirical estimations we detail in the next subsection.

The Japan REIT DB is a database of publicly traded REITs updated every fiscal year. It contains information on the properties purchased and held by the REITs, their financial statements, and loan issuance. It includes characteristics of individual properties owned by the REITs such as appraisal prices, rental income, rental expenses, capital expenditures, acquisition and construction dates, building floor area, number of stories, land size, distance from the nearest station, names of sellers and appraisers, and other rental-related expenses and income, among others. The database provides information from balance sheets and income statements at the REIT level, including total assets, short- and long-term debt, market capitalization, operating income, and other items related to the REITs' financial conditions. The database also provides detailed information on the new loan issuances by REITs at the loan contract level. This information includes loan amounts, interest rates, collateral status, maturity dates, interest rate types (fixed or floating), lender names, and loan contract start and end dates.

The MLIT's database on individual real estate transactions is reported on the quarterly basis and includes information on transaction prices, location, land size and shape, building use and structure, floor size, building establishment year, distance from the nearest train station, land use designation by the local government's land use plan, land-to-structure ratio, and floor-to-land ratio. The NEEDS-FinancialQUEST database provides the financial information on listed companies, including REITs, and banks with which these companies transact on a fiscal year basis. The

database provides information on the stock prices of the REITs on a daily basis, which is unavailable in the Japan REIT DB. It also provides information on the outstanding loan amounts extended by banks with which each of listed firm and REIT transacts. The Ministry of Finance's (MOF's) database on the Japanese government bonds (JGBs) provides daily information on the yields of the JGBs with maturities ranging from one to forty years.

Using the Japan REIT DB, we construct a dataset to examine the characteristics of real estate properties that are acquired by REITs using the following sample selection procedure. First, we restrict the sample to properties acquired by each REIT between 2005 and 2022, given that the BOJ began purchasing REITs in 2010. Finally, we drop observations for REITs that were newly listed on the stock exchange after 2011 and those that were private or bankrupt after 2011. Following these steps, we obtain a sample of 1,917 properties from 31 REITs covering the period from 2005 to 2022. Regarding loan contracts, we use loan issuance data from the 31 REITs in our sample from 2005 to 2022.

To the above dataset we add information on other real estate transactions located near the properties acquired by the REITs using the MLIT's database. This allows us to construct variables representing the characteristics of the local real estate market. We define the neighborhood of each REIT's purchased properties as a circle with a radius of certain kilometers.[2] We then use transaction records within this circle to construct variables representing the local real estate market's status in the vicinity of the REITs' purchased properties.

We construct another dataset to examine the issuance of equities by the REITs and the allocation of loan portfolio for the banks. For this purpose we employ the NEEDS-FinancialQUEST database and the BOJ's JGBs database. For examining equity issuance and its costs, we integrate the former data source with the latter. For examining the impact on banks' loan

[2] We will provide further details of the empirical specifications, including the exact radii, in Section 3.2.4.

portfolio, we use the information on loan amount outstanding for each bank that listed firms including REITs transact with and construct banks' loan portfolio to the REITs and that to listed real estate companies for many years. The panel dataset enables us to examine how banks changed their loan supply from real estate companies to REITs after the introduction of the BOJ's REIT purchase program.

3.2 Hypothesis building and empirical specifications

This section sets out the empirical hypotheses and corresponding estimation specifications. First, we hypothesize how the BOJ's purchases of REITs affect the equity and loan risk premia, as well as the issuance volumes of equities and loans by REITs. Second, we propose a hypothesis on how these purchases influence REITs' risk-taking behavior in real estate investment. Finally, we examine potential spillover effects on the loan and the real estate market.

3.2.1 Lower risk premium for and larger issuance of equities and loans

The primary objective of the BOJ's REIT purchase program was to reduce risk premiums in the financial market. By purchasing equities issued by REITs, the BOJ aimed to lower the risk premium on the eligible REITs' equity after the program's introduction. Lower funding costs, in turn, are expected to encourage these REITs to issue more equity.

Because Japanese REITs impose voluntary upper limits on their loan-to-value (LTV) ratios, issuing additional equity expands their borrowing capacity. This implies both a quantity and a price effect, that is, eligible REITs are expected to increase debt financing and to face lower risk premiums, resulting in lower loan interest rates compared with non-eligible REITs. Based on this reasoning, we propose the following hypothesis regarding REIT financing:

Hypothesis 1: After the start of the BOJ's REIT purchase program, eligible REITs face lower equity and loan financing costs and raise larger amounts of equity and debt than non-eligible REITs.

To test Hypothesis 1 concerning the equity financing costs and equity issuance of eligible REITs, we employ a DID approach and estimate the following equations (1) and (2), respectively:

$$Equity\_costs_{jt} = \beta_1 Eligible_{jt} + \beta_2 Eligible_{jt} * Post_t + \delta_1 X_{jt} + \theta_j + \mu_t + \varepsilon_{jt} \quad (1)$$

$$New\_equity_{jt} = \beta_1 Eligible_{jt} + \beta_2 Eligible_{jt} * Post_t + \delta_1 X_{jt} + \theta_j + \mu_t + \varepsilon_{jt} \quad (2)$$

where $Equity\_costs_{jt}$ and New_equity_{jt} respectively denote the cost of equity issuance for REIT j in year t and the ratio of new equity issuance to total assets for the REIT in year t. The data on equity costs and new equity issuance are generated at different frequencies and in different formats. For equity issuance costs, we apply the Capital Asset Pricing Model (CAPM) framework and regress the risk premium of an individual REIT's stock return on the market return to obtain β on an annual basis. By applying the formula to calculate equity costs, $r_f + \hat{\beta}(\bar{r}^M - r_f)$, where r_f is the yield of 10-year Japanese Government Bonds and $\bar{r}^M$ is the market return of REITs in Tokyo Stock Exchange, we construct a balanced panel dataset for the equity cost. In contrast, for the size of equity issuance, we use information on individual REIT equity issuance, which results in a dataset with pooled observations.

For the explanatory variables, $Eligible_{jt}$ is an indicator that equals one if REIT j was eligible for the BOJ's purchase program in year t, and zero otherwise. $Post_t$ equals one if t is after year 2011, reflecting the fact that the BOJ established its REIT purchase procedure in October 2010 and conducted its first purchase in December 2010. X_{jt} denotes the characteristics

of REIT j in year t, such as size, profitability, interest coverage, and market-to-book ratio. We control for REIT and year fixed effects by θ_j and μ_t, respectively.[3] If the risk premium decreased for eligible REITs after the start of the BOJ's purchases, the coefficient of β_3 is expected to be negative in the equity cost estimation. In the equity issuance estimation, a lower risk premium facilitates access to external finance for eligible REITs, leading to greater equity issuance compared with non-eligible REITs. Thus, the coefficient of β_2 is expected to be positive.

For loan costs of eligible REITs and the amount of loan issuance, we employ the following specification of the equation (3):

$$Y_{bjt} = \beta_1 Eligible_{jt} + \beta_2 Eligible_{jt} * Post_t + \delta_1 X_{bjt} + \delta_2 Z_{jt} + \delta_3 W_{bt} + \theta_j + \mu_t + \varepsilon_{bjt} \quad (3)$$

where Y_{bjt} is interest rate or the amount of new loan issuance to the total assets for REIT j from bank b in year t. The frequency and format of the dataset is the same between the interest rate and the loan amount estimations. X_{bjt} represents characteristics of the loan contract extended by bank b to REIT j that consist of maturity, number of banks that REIT j transacts with, relationship with bank b, type of interest rate (floating or fixed), and collateralization. Z_{jt} represents characteristics of REIT j. W_{bt} represents bank b's characteristics consisting of size, profitability, and capital ratio. We control for the REIT and year fixed effects by θ_j and μ_t, respectively. If eligible REITs face lower interest rates after the BOJ's purchasing program, the coefficient β_2 is expected to be negative in the interest rate estimation. On the other hand, in the loan amount estimation, the lower interest rate environment for eligible REITs will increase their loan demand more than that of non-eligible REITs, resulting in a positive β_2.

[3] We omit the standalone $Post_t$ term from the equations because it is absorbed by the year fixed effects.

3.2.2 More risk-taking in real estate investment

The risk-taking channel under a lower risk premium operates through several mechanisms. Lower interest rates or compressed risk premia tend to increase REITs' willingness to take risks. One mechanism is that lower interest rates raise collateral asset values and improve REITs' balance sheets, thereby increasing their risk tolerance. Another is the "reach-for-yield" mechanism: when safe returns fall, the gap between target returns and market yields widens, inducing REITs to search for higher-yielding, riskier assets. We therefore expect them to purchase riskier properties with higher returns rather than safer properties with lower returns. To test this prediction, we posit the following hypothesis regarding risk-taking in investment:

Hypothesis 2: Following the introduction of the BOJ's REIT purchase program, eligible REITs purchase more profitable but riskier properties than non-eligible REITs.

We examine the characteristics of real estate properties purchased by the REITs and how they changed after the BOJ's REIT purchase. We employ the DID framework but use different sets of dependent and explanatory variables for the estimation as in the equation (4):

$$Y_{ijtr} = \beta_1 Eligible_{jt} + \beta_2 Eligible_{jt} * Post_t + \delta_1 X_{it} + \delta_2 Z_{jt} + \theta_j + \mu_{tr} + \varepsilon_{ijtr} \quad (4)$$

where Y_{ijt} is the characteristics of the real estate property i that are located in region r and purchased by REIT j in year t. There are two types of characteristics. For the first type of variables, we use the return of a real estate property, property age, a dummy for middle-aged property, rental expenses and capital expenditures for a property.

As real estate properties age, they require higher maintenance expenditures and greater

investment in renovation. Such properties also face an increased risk of future income decline due to obsolescence and higher vacancy rates. Consequently, older properties—those requiring substantial maintenance and renovation—are riskier and thus expected to offer higher returns as compensation. Following Yoshida et al. (2024), we construct a dummy variable for middle-aged properties (10–21 years old), which typically require renovation investment. We then examine whether eligible REITs are more likely than non-eligible REITs to purchase riskier but potentially more profitable properties.

For the second type of dependent variables, we assess the ex-post riskiness of properties acquired by REITs. Specifically, we construct two dummy variables that indicate whether a property's appraisal value and operating income, respectively, decline within several quarters after acquisition. This allows us to examine whether eligible REITs are more likely to acquire properties whose value or income subsequently falls.

For the explanatory variables, $Eligible_{jt}$ equals one if the REIT which acquired the property was eligible for the BOJ's purchase program in year t, and zero otherwise. $Post_t$ equals one for years after 2011. X_{it} denotes property-level characteristics, consisting of building size, land size, number of stories, and distance to the nearest train station. We also include REIT fixed effects θ_j, prefecture-year fixed effects μ_{tr}, property-type fixed effects.

Using these two types of dependent variables—the property's physical characteristics and rate of return, and the ex-post riskiness of acquired properties—we test whether eligible REITs take on more risk after the BOJ's purchase program. If eligible REITs began acquiring riskier properties than non-eligible REITs, the coefficient of β_2 would be positive not only in specifications using property characteristics as the dependent variable, but also in those using ex-post riskiness of the properties.

3.2.3 Spillover effect in the loan market

For the third analysis, we examine the reallocation of loans among eligible REITs, non-eligible REITs, and publicly traded companies in the real estate industry. While listed real estate companies engage in activities similar to REITs—developing land, constructing buildings, and renting properties—they differ from eligible REITs in that their shares were not directly purchased by the BOJ and thus they had no incentive to increase risk-taking.

We expect that banks, recognizing that higher risk-taking by eligible REITs generates stronger loan demand relative to non-eligible REITs or listed real estate companies, accommodate this demand. As a result, banks are expected to have reallocated their loan portfolios away from publicly traded real estate companies toward eligible REITs following the BOJ's REIT purchase program. Summarizing these conjectures, we propose the following hypothesis:

Hypothesis 3: After the start of the BOJ's REIT purchase program, banks reallocated their loan portfolios from publicly traded real estate companies to eligible REITs, reflecting a spillover effect of the program on the allocation of bank credit.

To examine this hypothesis, we employ the following specification for estimation of the equation (5):

$$Loan_{bjt} = \beta_1 EligibleREIT_{jt} + \beta_2 NonEligibleREIT_{jt} + \beta_3 EligibleREIT_{jt} * Post_t + \beta_4 NonEligibleREIT_{jt} * Post_t + \beta_5 X_{jt} + \beta_6 Z_{bt} + \theta_j + \varphi_b + \xi_t + \varepsilon_{bjt} \quad (5)$$

where $Loan_{bjt}$ is the ratio of outstanding loan amount extended to REIT j by bank b in year t to the total outstanding loan amount extended by the bank b. $EligibleREIT_{jt}$ and

$NonEligibleREIT_{jt}$ are dummies for the loans extended to the eligible REITs and non-eligible REITs, respectively. $Post_t$ is a dummy that the year is after 2011. X_{jt} represents characteristics of REIT or firm j consisting of its size, profitability, interest coverage, and market-to-book ratio. Z_{bt} represents characteristics of bank b consisting of its size, profitability, and capital ratio. We also control for the REIT or firm, bank, and year fixed effects by θ_j, φ_b, and ξ_t respectively. In this estimation, if banks allocate their funds toward eligible REIT from listed real estate companies after the introduction of the BOJ's purchasing program, and the key variable β_3 is expected to be positive.

3.2.4 Spillover effect in the real estate market

For the final analysis, we examine whether property acquisitions by REITs—particularly eligible REITs—affect local real estate markets. While one of the objectives of unconventional monetary policy is to reduce risk premia, it remains unclear whether such central bank interventions exert a direct impact on individual asset markets.

Previous studies show that REIT prices incorporate forward-looking information and contribute to price discovery in real estate markets. Because REITs are traded in public securities markets, they can help predict future performance in the underlying real estate market (e.g., Barkham and Geltner, 1995; Clayton and MacKinnon, 2001; Yavas and Yildirim, 2011; Hoesli and Oikarinen, 2012). Based on this evidence, we expect that REIT investment has a substantial impact on local real estate markets.

A natural question is whether eligible REITs generate stronger spillover effects in local real estate markets than non-eligible REITs. If our hypotheses hold—namely, that eligible REITs purchase riskier but more profitable properties—their investment activities are likely to generate larger shocks to neighboring property markets than those of non-eligible REITs. However, the

response of other market participants to such shocks may be either positive or negative. If investments by eligible REITs are interpreted as acquisitions of undervalued real estate assets, they may induce follow-on investment and generate positive spillovers. Conversely, if these investments are perceived as excessively risky, follow-on investment may be limited, leading to negative spillovers. Based on these considerations, we propose the following hypothesis:

Hypothesis 4: After the start of the BOJ's REIT purchase program, purchases of real estate properties by eligible REITs generate more positive spillover effects in local real estate markets than those by non-eligible REITs when market participants interpret these transactions as value investments. Conversely, the spillover effects are more negative when such purchases are perceived as excessively risky.

To assess the spillover effects of REIT purchases, we adopt a ring-DID approach following Asquith et al. (2023), who analyze spillovers in residential real estate markets. In their framework, a circular area with a 600-meter radius is defined, where the treatment area corresponds to an inner circle of a smaller radius, and the control area is given by the surrounding ring within the 600-meter boundary but outside the treatment area.

In our setting, we expand the outer radius to 1.2 kilometers to account for the broader geographic scope of commercial real estate markets. Treatment areas are then defined as inner circles with smaller radii of between 0.2 to 1.0 kilometers within this boundary.

For each of the properties purchased by the eligible REITs and those by the non-eligible REITs after the introduction of the BOJ's REIT purchases, we construct a sample of treatment areas that are close to the properties purchased by the REIT and control areas that are distant from the purchased properties within the circles of the radius of 1.2 kilometers. Figure 1 provides a

graphical image of the treatment and the control area. We then aggregate all the real estate transactions in the treatment and the control area at the quarterly basis for five years before and after the purchases of properties by the REITs.

(Figure 1)

A key concern is that many properties acquired by REITs are located in close proximity to one another, so that drawing circles with a radius of 1.2 kilometers leads to substantial overlap. In such cases, a location included in the treatment area for one REIT-acquired property may simultaneously be included in the control area for another property acquired by a different REIT, thereby creating confounding.

To address this issue, we include in the sample only areas surrounding REIT-acquired properties that satisfy at least one of the following conditions: (i) the 1.2-kilometer radius around a given property does not overlap with that around another REIT-acquired property; or (ii) if two areas overlap, the difference in acquisition timing between the overlapping properties exceeds five years.

As a result, the number of properties available for constructing treatment and control areas is 11 for eligible REITs and 24 for non-eligible REITs. For each property, we construct outcome variables by aggregating, at the quarterly level over a ten-year window (five years before and after acquisition), the number of transactions and the transaction price per square meter within the treatment and control areas. We employ these outcomes for dependent variables and estimate the following equation (6):

$$Y_{iq} = \beta_1 Treatment\ area_i + \beta_2 Treatment\ area_i * Post_q + \beta_3 X_{iq} + \theta_i + \varphi_q + \varepsilon_{iq} \quad (6)$$

where Y_{iq} is the logged number of property transactions and average logged transaction prices per square meter in area i in quarter q. For the explanatory variables, $Treatment\ area_i$ is an indicator that equals one if transactions are located within an inner circle centered by a property purchased by REITs and zero otherwise. $Post_q$ equals one for quarters after the date of the REIT's property acquisition. X_{iq} represents the averaged characteristics of transacted properties in each area, including property age, distance from the nearest station, and land size. We control for area and quarter fixed effects by θ_i and φ_q, respectively. If the first part of Hypothesis 4 holds true, β_2 is positive and more sizable for the sample of areas surrounding the properties purchased by eligible REITs than the coefficient for areas surrounding the properties by non-eligible REITs.

4. Results

In this section, we present the estimation results and evaluate the hypotheses outlined in the previous section regarding the impact of the Bank of Japan's (BOJ) REIT purchase program. Sections 4.1 and 4.2 focus on the effects on equity and loan issuance by REITs, respectively. Section 4.3 examines changes in REITs' risk-taking behavior in their property acquisitions. Section 4.4 explores potential spillover effects of REITs' behavior on the broader loan market. Finally, Section 4.5 examines spillover effects on the local real estate market. Definitions of variables employed for estimations are explained in Table 1 and their summary statistics are presented in Table 2.

(Tables 1 and 2)

4.1 Equity costs and issuance of new equities

Hypothesis 1 posits that the BOJ's REIT purchase program lowers risk premiums for eligible REITs. We therefore expect these REITs to experience reduced equity financing costs compared

to non-eligible REITs. As a result, we anticipate a greater volume of equity issuance among eligible REITs following the program's introduction.

(Table 3)

Table 3 shows the results for equity costs. The most important coefficient in the estimations is that on the interaction between Eligible and Post, which measures the change in equity costs for the eligible REITs after the start of the BOJ's REIT purchase policy. The coefficients are negative in all columns whether we control for the attributes of the REITs or their fixed effects. The size of the decline ranges between 0.36 to 0.74 percentage points and are economically substantial.

Focusing on the column (4) that employs the most comprehensive set of explanatory variables, we find that the size of REITs has a negative and significant coefficient, which may indicate that investors may interpret asset expansion as leverage expansion that is not fully captured by the other riskiness measure of the interest coverage ratio.[4]

(Table 4)

Table 4 shows the results for the size of equity issuance. Throughout the columns, with or without controlling for the attributes of REITs, the coefficients on the interaction between Eligible and Post are all positive and significant with their size ranging from 0.62 to 0.86. This indicates that the size of the individual equity issuance relative to the total assets becomes larger for the eligible REITs after the BOJ's policy by 62 to 86 percentage points. We find that the results of Tables 3 and 4 are consistent with the prediction regarding equity costs and the issuance of equities of Hypothesis 1.

[4] In the DID framework for evaluating treatment effects, it is a crucial identifying assumption that no pre-trend exists. In this paper, for all estimation results reported in Tables 3 through 12, we conduct pre-trend tests—namely, tests of the null hypothesis that the coefficients on the treatment variable are jointly equal to zero in the pre-treatment period. More specifically, we augment the specification with interactions $Eligible_{it} \times Pre_{t=\tau}$ for pre-treatment years τ until 2010, omitting 2010 as the reference, and test the joint null hypothesis that all such coefficients on the interactions equal zero. We fail to reject the null at the 5% level for all the estimations whose results are reported in the tables.

4.2 Loan costs and issuance of new loans

We next examine the impact of the BOJ's program on REITs' debt financing. In line with the expectations for equity markets, we predict lower borrowing costs and increased loan issuance for eligible REITs relative to non-eligible ones after the BOJ's intervention.

(Table 5)

Table 5 shows the results for the interest rate charged for the REITs. In all the columns coefficients on the interaction term are negative and statistically significant, indicating that the decline in the loan interest rate for the eligible REIT after the BOJ's policy is about 0.1 percentage points. Considering that the level of interest rates during the period of analysis is extremely low in Japan, the margin of the decline is substantial.

In addition to the impact of the BOJ's policy for the eligible REITs, a few relevant findings regarding the determinants of the interest rates are in order. For the variables on bank characteristics, coefficients on bank size and bank capital ratio are positive without REIT-bank fixed effects in the column (2) indicating that larger and healthier banks are able to charge higher interest rates to the REIT, while the coefficients become insignificant after these fixed effects are controlled for in the column (3). For the variables on loan contracts, interest rates charged to REITs tend to be higher when the loans have fixed interest rates, longer maturities, and are secured by collateral. Interest rates are marginally higher when REITs borrow from banks with which they had a prior lending relationship in the previous year. For the attributes of REITs, interest rates charged to REITs tend to be higher when the REITs are smaller, and have lower interest coverage and market to book value ratios in the stock market.

(Table 6)

Table 6 shows the results for the size of loan issuance. In all the columns, with or without

controlling for the attributes of banks and REITs, the coefficients on the interaction between Eligible and Post are all positive and significant with their size ranging from 0.004 to 0.009. This indicates that the size of the individual loan issuance relative to total assets held by the REIT becomes larger for the eligible REITs after the BOJ's policy by 0.4 to 0.9 percentage points. Note that the size of the coefficients is substantially smaller here than in Table 4, in which the size of the individual equity issuance becomes larger by more than 60 percent.[5]

To summarize the results of Tables 5 and 6, interest rates are lower and the issuance amount is larger after the introduction of the BOJ's purchase for the eligible REITs. These are consistent with the prediction regarding loan costs and the issuance of loans of Hypothesis 1.

4.3 Risk-taking in property acquisitions

Given the observed decline in equity and loan financing costs - and the associated increase in the issuance of credit - for eligible REITs, it is plausible that these REITs also increased their capacity and willingness to take on risks. Hypothesis 2 proposes that eligible REITs respond to this enhanced capacity by engaging in riskier real estate acquisitions than non-eligible REITs. We investigate this hypothesis using several dimensions of risk in property acquisitions.

Specifically, we estimate models using two types of dependent variables: (i) characteristics of the properties acquired by REITs at the time of purchase and (ii) ex-post performance of the acquired properties.

4.3.1 Characteristics of acquired properties at the time of purchase

We assess whether eligible REITs acquired properties with riskier characteristics - such as older buildings requiring higher operating and capital expenditures - relative to non-eligible REITs. We

[5] One possibility is that eligible REITs increased the number of loan issuances, while they increased the volume of each loan issuance by a very slim margin after the introduction of the BOJ's purchases.

also examine whether eligible REITs offset these risks by targeting more profitable properties.

(Table 7)

Table 7 shows the results for the estimations of several characteristics of the acquired real estate properties. The columns (1) and (2) show results for the age of the acquired properties and the dummy for middle-aged buildings that all the coefficients on the interaction term are positive and significant. These indicate that the eligible REITs purchase older properties after the start of BOJ's policy relative to non-eligible REITs. The columns (3) and (4) show results for operating expenses and capital investment expenditures. Coefficients on the interaction terms are positive, indicating that the eligible REITs undertake more expenditures for maintenance and investment possibly for renovation. We interpret that older properties involve higher operating expenses and capital expenditures and are exposed to a greater risk of obsolescence. The results of all these columns are consistent with Hypothesis 2 that the eligible REITs invest in riskier properties after the BOJ's REIT purchase policy.

Table 8 reports the results of estimations that examine whether these obsolescence risks are associated with higher returns. In the column (1) the coefficient on the interaction between Eligible and Post is positive, indicating that the eligible REITs invest in more profitable properties after the introduction of the BOJ's policy relative to the non-eligible REITs. The results become stronger when we restrict the sample to purchases made shortly after the policy introduction. Columns (2) to (4) report estimates using subsamples limited to real estate properties purchased by 2011, 2015, and 2018, respectively. The coefficient on the interaction term is largest for the subsample restricted to purchases up to 2011, indicating that the impact of the policy was the strongest shortly after its introduction.[6]

[6] We implemented a battery of robustness checks for the results in Tables 7 and 8 and show the results in the appendix. These include estimations using matched sample (Table A1 and A2), placebo test (Table A3), estimations limiting the sample to marginally eligible (AA-) or marginally ineligible (A+) REITs (Table A5), estimations with a finer classification among eligible REITs (Table A6).

Our variable Eligible is allowed to vary over time. As shown in Table A4, the share of REITs whose rating changes from ineligible to eligible is about 5% per year, indicating that eligibility is relatively stable. However, if the determinants of eligibility are correlated with ex post outcomes, the estimated treatment effects may be biased. To address this concern, we restrict the sample to properties purchased by REITs whose eligibility status remains unchanged—either always eligible or always ineligible—throughout the sample period. The results are reported in column (5). The coefficient on the interaction term remains positive, consistent with the baseline, and is larger in magnitude than in the baseline specification.

(Table 8)

Next, we combine the results of the previous two tables rather than separately examine the riskiness and profitability of the acquired properties. In other words, we examine if the eligible REITs started to purchase high-risk and high-return properties. For this purpose we construct dummy variables by combining a variable for riskiness of a property (e.g., property age, operating expenses, capital investment expenditures) with a variable for profitability of the property. we construct a HighReturn_HighAge dummy in which the value of one is assigned for the property whose rate of return and property age are respectively higher than each of the medians and the value of zero is assigned for the property whose rate of return and property age are respectively lower than each of the medians. In a similar manner we construct a HighReturn_Middle_aged_building, HighReturn_HighOE (operating expenses), and a HighReturn_HighCAPEX (capital expenditures) dummy. Table 9 shows that for three out of the four dependent variables, the coefficients on the interaction term are positive and significant, which is consistent with Hypothesis 2.

(Table 9)

4.3.2 Ex-post performance of acquired properties

To further assess the extent of risk-taking by the eligible REITs, we examine the post-acquisition performance of the properties acquired by REITs. If eligible REITs pursued higher-risk investments, we may observe underperformance of the invested properties—such as declines in appraisal values and rental income—relative to properties acquired by non-eligible REITs.

(Table 10)

Table 10 shows the results. Panel A reports the estimation results using a dummy for declining appraisal values of the purchased properties as the dependent variable. We run six separate estimations by varying the post-purchase period, and the coefficients on the interaction between Eligible and Post are positive and significant in four cases. Similarly, panel B presents coefficients on the interaction term for the estimation of the declining rental income. In half of the estimations, the signs are positive and marginally significant. These results suggest that eligible REITs acquire properties with greater risk, which are more prone to post-purchase declines in appraisal values and, to a lesser extent, rental income than those acquired by non-eligible REITs.

4.4 Spillover effects in the loan market

Our preceding results suggest that the BOJ's purchase program reduced risk premiums and encouraged risk-taking by eligible REITs. In this subsection, we test Hypothesis 3 by investigating whether these changes have spillover effects on bank lending behavior - specifically, whether banks reallocate loans from non-REIT sectors to REITs, particularly those eligible for the BOJ's purchases.

To examine this, we compare trends in loan allocation across three groups: publicly traded real estate companies, non-eligible REITs, and eligible REITs. This analysis provides insight into

whether increased credit flows to eligible REITs came at the expense of other sectors, implying a reallocation of credit within the real estate financing market.

(Table 11)

Table 11 reports the results for all loans, short-term loans, and long-term loans. In the estimations for total loans and long-term loans, we find that bank lending to REITs increased following the policy introduction, with a particularly large increase for eligible REITs. In contrast, the estimations for short-term loans yield the opposite result: lending to REITs declined after the policy, with a more pronounced decrease for eligible REITs.

In column (2), which reports the results for total loans, the coefficient on the interaction term between Eligible REIT and Post is 0.023. This implies that the share of bank lending allocated to an eligible REIT increased by 2.3 basis points after the policy introduction. Although smaller in magnitude, the share of lending to a non-eligible REIT also increased by 0.8 basis points.

The magnitude of this coefficient reflects the increase in the share of lending to individual eligible and non-eligible REITs in a bank's total loan outstanding amount. Since lending to REITs is typically conducted by large financial institutions such as large city banks, the share of loans to any individual REIT in a given bank's total lending is very small. The mean of this share is 5.1 basis points, with a standard deviation of 7.7 basis points. Relative to these moments, the estimated treatment effects of 2.3 basis points and 0.8 basis points respectively for eligible REITs and non-eligible REITs can be considered economically meaningful in magnitude.

The coefficients obtained in column (6) for long-term loans are larger. The share of bank lending to an eligible REIT increased by 4.4 basis points, while that to a non-eligible REIT increased by 1.4 basis points. By contrast, the estimates for short-term loans reported in column (4) yield negative coefficients. The share of bank lending to an eligible REIT declined by 1.9 basis

points, and that to a non-eligible REIT declined by 0.6 basis points after the policy.

Overall, these results suggest that, in response to the increased loan demand of eligible REITs induced by the policy change by the Bank of Japan, bank lending shifted from other real estate–related listed firms toward REITs—particularly eligible REITs—most notably in the form of long-term loans.

4.5 Spillover effect in the local real estate market

In this subsection we test Hypothesis 4 regarding the impact on the local real estate market. Table 12 reports the estimation results for each of the two samples: the sample of areas around the properties purchased by eligible REITs (Panel A) and the sample of areas around properties purchased by non-eligible REITs (Panel B).

Across several alternative definitions of the treatment and control areas, the estimated treatment effects in Panel A are more often positive and statistically significant than those in Panel B. Even when restricting attention to statistically significant estimates, the treatment effects in Panel A are generally larger.

When the treatment area is defined using a radius of 0.2 kilometers and transaction prices are examined, we find that prices increase by 15.5% following acquisitions by eligible REITs, whereas no statistically significant effect is observed following acquisitions by non-eligible REITs. When the treatment area is defined using a radius of 0.6 kilometers and the number of transactions is considered, the number increases by 15.3% after acquisitions by eligible REITs, compared with an increase of 8.2% following acquisitions by non-eligible REITs. Taken together, these results support the first part of Hypothesis 4, indicating that the spillover effects of acquisitions by eligible REITs are stronger than those of acquisitions by non-eligible REITs.

(Table 12)

5. Conclusion

In this study, we examined how one form of unconventional monetary policy—central bank purchases of equity in real estate investment trusts (REITs)—affects the real economy. Leveraging the unique characteristics of REITs, which primarily hold real estate assets, we focused on the risk profile of their property holdings to assess the presence of a risk-taking channel in monetary policy transmission.

Using detailed data on REITs, we conducted several empirical analyses and found that: (1) the central bank's equity purchases reduced both equity financing and borrowing costs for the targeted REITs; (2) these REITs subsequently acquired riskier, higher-return properties; (3) banks reallocated lending away from non-REIT real estate firms toward REITs; and (4) there exists a spillover effect to the local real estate market around the properties purchased by the eligible REITs. These findings suggest that central bank equity purchases encourage greater risk-taking among targeted institutions and influence the broader loan and real estate market. We argue that these effects are distinctive enough to be considered a new transmission mechanism: the real estate channel of unconventional monetary policy.

There are a few issues that remain for future research. The most important one that we are aware of is a deeper understanding of how monetary policy affects the economy when the central bank purchases equity rather than debt. Our analysis shows that the reduction in equity issuance costs was greater than the decline in loan costs following the Bank of Japan's REIT purchase program. However, it remains unclear whether one unit of equity purchase has a larger impact on financing costs than an equivalent unit of debt purchase. Exploring this further would yield valuable insights into the relative effectiveness of different monetary policy tools. A second issue is the impact of weaker corporate governance for the eligible REITs. Because the BOJ's purchases

left it holding non-trivial passive stakes in a subset of eligible REITs, a complementary agency-cost channel may have operated: elevated passive block-holdings by a price-insensitive central bank can weaken market discipline and permit empire-building by entrenched managers, an interpretation compatible with our risk-taking evidence but conceptually distinct from the reach-for-yield mechanism. Disentangling this governance channel from the financing-cost channel is an important next step.

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Table 1 Variable definitions

Variables	Definitions
(A) Variables used for real estate property-level estimation	
Characteristics of purchased properties	
Return	Annual rental income of a property / its appraisal price
lnProperty_Age	Log(1+Property age in months)
Middle-aged_Building	1 if property age is between 10 and 21 years, and 0 otherwise
lnOperating_Expense	Log(1+rental expenses for a property in million yen)
lnCapital_Expenditure	Log(1+capital expenditures for a property in million yen)
Decrease_in_Prices	1 if appraisal price for a property decreases after acquisition, and 0 otherwise.
Decrease_in_Income	1 if rental income from a property decreases after acquisition, and 0 otherwise.
HighReturn_HighAge	1 if return is higher than median and property age is above the median, and 0 if return is no higher than the median and the property age is below the median.
HighReturn_HighOE	1 if return is higher than median and property rental expenses are above the median, and 0 if return is no higher than the median and rental expenses are below the median.
HighReturn_HighCAPEX	1 if return is higher than median and capital expenditures are above the median, and 0 if return is no higher than the median and capital expenditures are below the median.
lnStory	Log(1+the number of stories)
lnFloor_Size	Log(1+floor size of the building in square meters)
lnLand_Size	Log(1+land size in square meters)
lnDistance	Log(1+distance from the nearest train station in meters)
Characteristics of REITs	
Post	1 if year is after 2011, and 0 otherwise.
Eligible	1 if a REIT satisfies the following two conditions for being eligible for the Bank of Japan's purchase: (1) it has credit ratings of AA or better and (2) annual transaction volume is more than or equal to JPY2 billion and there are more than or equal to 200 days in which it has positive transactions in the market, and 0 otherwise.
REIT_Size	Total assets held by a REIT in million yen
REIT_ROA	Operating revenue of a REIT / its total assets
REIT_ICR	(REIT's EBITDA / interest payments)
REIT_Market to book ratio	(Short- and long-term debt held by a REIT + its market capitalization) / its total assets

Table 1 Variable definitions (continued)

Variables	Definitions
(B) Variables used for loan contract estimation	
Characteristics of loans	
New_loan	Amount of a new loan extended to a REIT / Total assets held by a REIT
Interest rate	Interest rate (%)
Floating	1 if interest rate is floating, and 0 otherwise.
Relation	1 if a REIT had a loan contract with a bank in the previous year, and 0 otherwise.
Short-term	1 if loan maturity is less than one year, and 0 otherwise.
N_banks	Number of banks that a REIT has transaction relationship with
Collateral	1 if a REIT provides collateral in the loan contract, and 0 otherwise.
Characteristics of banks	
Bank_size	Total assets held by a bank in million yen
Bank_capital ratio	BIS capital ratio for a bank (%)
Bank_cash flow	Operating revenue of a bank / its total assets
Bank_NPL ratio	Non-performing loans of a bank/ its total loans
(C) Variables used for firm/REIT-bank relationship level estimation	
Loan_ratio	Outstanding amount of loans extended by a bank to a firm/ total amount of loans extended by the bank (%)
Short-term_loan_ratio	Outstanding amount of short-term loans extended by a bank to a firm/ total amount of loans extended by the bank (%)
Long-term_loan_ratio	Outstanding amount of long-term loans extended by a bank to a firm/ total amount of loans extended by the bank (%)
(D) Variables used for equity cost estimation	
Equity_costs	The yield of 10-year Japanese government bonds + Beta*the average of (the market return of REITs in Tokyo Stock Exchange - the yield of 10-year JGB) (%)
(E) Variables used for equity issuance estimation	
New_equity	Amount of new equity issued by a REIT / Total assets held by the REIT
(F) Variables used for estimation of the spillover effect on the real estate market	
Number of transactions	Log(1+quarterly median number of transactions)
Transaction prices	Log(1+quarterly median transaction price per square meter)
Property age2	Log(1+quarterly median property age)
Distance2	Log(1+quarterly median distance from the nearest train station in meters)
Land size2	Log(1+quarterly median land size in square meters)

Table 2 Summary statistics

	Obs.	Mean	S.D.	Min	Median	Max
(A) Property characteristics						
Return	1,917	0.024	0.013	0.001	0.024	0.066
Income	1,917	88.834	131.253	1.051	38.774	781.000
Property Age	1,917	134.492	115.969	1.000	99.000	468.000
Middle-aged building	1,917	0.258	0.438	0.000	0.000	1.000
Operating Expense	1,917	32.777	51.947	0.088	14.053	315.000
Capital Expenditure	1,917	2.314	6.231	0.000	0.254	42.368
Decrease_in_prices	1,917	0.236	0.425	0.000	0.000	1.000
Decrease_in_rental income	1,917	0.117	0.321	0.000	0.000	1.000
HighReturn_HighAge	1,051	0.499	0.500	0.000	0.000	1.000
HighReturn_HighOE	1,169	0.500	0.500	0.000	0.000	1.000
HighReturn_HighCAPEX	1,220	0.499	0.500	0.000	0.000	1.000
lnFloor_size	1,917	8.355	1.171	6.307	8.154	11.975
lnHeight	1,917	2.326	0.443	1.099	2.398	3.638
lnLand_size	1,917	6.907	1.152	5.014	6.680	10.658
lnDistance	1,917	5.772	0.791	4.394	5.771	7.601
(B) REIT characteristics						
Post	1,917	0.570	0.495	0.000	1.000	1.000
Eligible	1,917	0.329	0.470	0.000	0.000	1.000
REIT_size	1,917	266977	225887	8485	201546	1367720
REIT_ROA	1,917	0.016	0.004	0.008	0.016	0.028
REIT_ICR	1,917	8.723	5.373	0.779	7.824	28.027
REIT_market to book ratio	1,917	1.011	0.216	0.643	0.979	1.703
(C) Characteristics of loan provision						
New_loan	6,305	0.011	0.017	0.001	0.005	0.110
Interest rate (%)	4,307	0.751	0.470	0.050	0.675	2.070
Floating	6,305	0.675	0.468	0.000	1.000	1.000
Relation	5,991	0.259	0.438	0.000	0.000	1.000
Short-term	6,305	0.314	0.464	0.000	0.000	1.000
N_banks	6,305	1.680	1.618	1.000	1.000	9.000
Collateral	6,305	0.039	0.194	0.000	0.000	1.000
Bank_size	6,300	82200000	79000000	72006	42100000	285000000
Bank_capital ratio (%)	6,218	15.555	3.657	8.540	15.550	28.060
Bank_cash flow	6,300	0.014	0.006	0.005	0.013	0.033
REIT_size	6,305	412594	282413	8485	325666	1367720
REIT_ROA	6,305	0.017	0.004	0.008	0.016	0.041
REIT_ICR	6,304	11.659	6.187	3.216	10.407	36.577
REIT_market to book ratio	6,305	1.071	0.224	0.535	1.069	1.691

Table 2 Summary statistics (continued)

	Obs.	Mean	S.D.	Min	Median	Max
(D) Characteristics of bank loan allocation						
Loan_ratio (%)	20,371	0.051	0.077	0.000	0.023	0.436
Short-term_loan_ratio (%)	20,371	0.006	0.018	0.000	0.000	0.112
Long-term_loan_ratio (%)	20,371	0.044	0.072	0.000	0.018	0.409
Bank_size	20,355	40100000	60900000	224225	9090890	268000000
Bank_capital ratio (%)	20,134	12.905	3.762	7.350	11.910	26.290
Bank_cash flow	20,355	0.019	0.006	0.008	0.019	0.037
REIT_size	20,376	270171	387950	511	132349	4548822
REIT_ROA	20,376	0.043	0.043	-0.092	0.030	0.185
REIT_ICR	20,262	13.053	22.788	-16.064	8.409	175.000
REIT_market to book ratio	19,936	1.009	0.338	0.497	0.967	2.703
(E) Characteristics of equity issuance						
Equity_costs (%)	435	2.941	0.683	0.576	2.997	4.096
REIT_size	415	293211	228997	14039	221210	1306855
REIT_ROA	415	0.016	0.003	0.008	0.016	0.031
REIT_ICR	413	10.443	6.391	1.310	8.762	36.452
REIT_market to book ratio	415	1.010	0.217	0.515	1.031	1.544
New equity	322	0.490	0.855	0.006	0.243	5.294
REIT_size	322	376897	270302	8485	294700	1367720
REIT_ROA	322	0.016	0.004	0.008	0.016	0.030
REIT_ICR	322	10.949	6.913	2.994	9.092	43.011
REIT_market to book ratio	322	1.061	0.193	0.524	1.072	1.544
(F) Characteristics of real estate transactions						
Number of transactions	2,170	10.713	9.384	1.000	8.000	40.000
Transaction prices	2,170	27.844	19.430	0.576	24.290	376.667
Property age2	2,039	2.680	0.977	0.000	2.944	3.892
Distance2	2,170	6.687	0.578	5.081	6.735	7.784
Land size2	2,170	4.625	0.524	3.258	4.511	6.567

This table reports summary statistics for the samples used for the estimations. Variable definitions are provided in Table 1.

Table 3 Equity costs

	(1)	(2)	(3)	(4)
Dependent variable:	Equity costs			
Eligible	0.916***	0.318	0.328***	0.248
	(0.216)	(0.189)	(0.115)	(0.165)
Eligible*Post	-0.532**	-0.736***	-0.361***	-0.546***
	(0.222)	(0.202)	(0.107)	(0.161)
REIT_size			0.545***	0.286**
			(0.089)	(0.106)
REIT_ROA			-0.002	-0.001
			(0.004)	(0.007)
REIT_ICR			-1.865	0.052
			(7.862)	(7.389)
REIT_market to book ratio			-0.189	0.205
			(0.207)	(0.153)
Year FE	Yes	Yes	Yes	Yes
REIT FE	No	Yes	No	Yes
Observations	435	435	413	413
R-squared	0.353	0.740	0.584	0.754

This table reports the estimation results for the impact of the BOJ's REIT purchases on REIT equity costs. The dependent variable is Equity Costs. The specification follows the equation (1) and includes year and REIT fixed effects. Standard errors are clustered at the REIT–year level. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively. Variable definitions are provided in Table 1.

Table 4 Size of equity issuance

	(1)	(2)	(3)	(4)
Dependent variable	New equity			
Eligible	-0.963***	-0.761**	-0.562**	-0.543
	(0.279)	(0.352)	(0.250)	(0.330)
Eligible*Post	0.840***	0.862***	0.617**	0.637*
	(0.264)	(0.280)	(0.235)	(0.311)
REIT_size			-0.224**	-0.512**
			(0.087)	(0.181)
REIT_ROA			16.174	34.458
			(18.383)	(36.348)
REIT_ICR			-0.010	-0.004
			(0.009)	(0.014)
REIT_market to book ratio			0.047	-0.780
			(0.305)	(0.465)
Year FE	Yes	Yes	Yes	Yes
REIT FE	No	Yes	No	Yes
Observations	322	322	322	322
R-squared	0.481	0.533	0.513	0.542

This table reports the estimation results for the size of equity issuance and estimates the impact of the BOJ's REIT purchases on REIT equity issuance size. The dependent variable is New equity. The specification follows the equation (2) and includes year and REIT fixed effects. Standard errors are clustered at REIT-year level. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively. Variable definitions are provided in Table 1.

Table 5 Loan interest rates

	(1)	(2)	(3)	(4)
Dependent variable:	Interest rate			
Eligible	-0.092**	0.005	0.049	0.051
	(0.039)	(0.042)	(0.042)	(0.042)
Eligible*Post	-0.095*	-0.052	-0.149***	-0.102**
	(0.052)	(0.048)	(0.050)	(0.050)
Bank_size			0.010*	0.048
			(0.006)	(0.034)
Bank_capital ratio			0.005***	-0.005
			(0.002)	(0.003)
Bank_cash flow			0.382	-0.727
			(0.923)	(0.920)
Floating	-0.325***	-0.337***	-0.335***	-0.343***
	(0.024)	(0.024)	(0.022)	(0.023)
Relation	0.016*	0.001	0.014	0.004
	(0.010)	(0.009)	(0.009)	(0.008)
Short-term	-0.204***	-0.098***	-0.143***	-0.101***
	(0.028)	(0.024)	(0.029)	(0.023)
N_banks	0.014***	0.000	0.005	-0.003
	(0.005)	(0.006)	(0.005)	(0.006)
Collateral	0.414***	0.310***	0.299***	0.207**
	(0.048)	(0.066)	(0.055)	(0.090)
REIT_size			-0.084***	-0.218***
			(0.020)	(0.055)
REIT_ROA			3.185	5.026
			(2.616)	(3.118)
REIT_ICR			-0.009***	-0.003
			(0.002)	(0.002)
REIT_market to book ratio			-0.252***	-0.099*
			(0.049)	(0.057)
Year FE	Yes	Yes	Yes	Yes
REIT-Bank FE	No	Yes	No	Yes
Observations	3,456	3,456	3,397	3,397
R-squared	0.755	0.833	0.781	0.839

This table reports the estimation results for the loan costs and estimates the impact of the BOJ's REIT purchases. The dependent variable is Interest rate. The specification follows the equation (3) and includes year and REIT-bank fixed effects. Standard errors are clustered at REIT-year level. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively. Variable definitions are provided in Table 1.

Table 6 Size of loan issuance

	(1)	(2)	(3)	(4)
Dependent variable:	New loan			
Eligible	-0.009***	-0.007***	-0.004	-0.003**
	(0.002)	(0.002)	(0.002)	(0.002)
Eligible*Post	0.010***	0.008***	0.007***	0.005***
	(0.002)	(0.002)	(0.002)	(0.002)
Bank_size			0.001***	-0.005***
			(0.000)	(0.001)
Bank_capital ratio			0.000***	-0.000
			(0.000)	(0.000)
Bank_cash flow			0.093**	-0.048
			(0.043)	(0.041)
Floating	0.001	0.000	-0.000	0.000
	(0.001)	(0.001)	(0.001)	(0.001)
Relation	-0.000	-0.000	-0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)
Short-term	-0.002*	0.000	0.000	-0.000
	(0.001)	(0.001)	(0.001)	(0.001)
N_banks	0.004***	0.004***	0.004***	0.003***
	(0.000)	(0.000)	(0.000)	(0.000)
Collateral	0.023***	0.018***	0.019***	0.009***
	(0.004)	(0.003)	(0.004)	(0.003)
REIT_size			-0.006***	-0.024***
			(0.001)	(0.002)
REIT_ROA			-0.089	-0.078
			(0.085)	(0.094)
REIT_ICR			0.000	0.000
			(0.000)	(0.000)
REIT_market to book ratio			0.001	-0.000
			(0.002)	(0.002)
Year FE	Yes	Yes	Yes	Yes
REIT-Bank FE	No	Yes	No	Yes
Observations	5,018	5,018	4,948	4,948
R-squared	0.483	0.611	0.522	0.663

This table reports the estimation results for the size of loan issuance and estimates the impact of the BOJ's REIT purchases. The dependent variable is New loan. The specification follows the equation (3) and includes year and REIT-bank fixed effects. Standard errors are clustered at REIT-year level. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively. Variable definitions are provided in Table 1.

Table 7 Characteristics of real estate properties acquired by REITs

	(1)	(2)	(3)	(4)
Dependent variable	lnProperty_Age	Middle-aged Building	lnOperating_Expense	lnCapital_Expenditure
Eligible	-0.546*	-0.122	-0.198	-0.433**
	(0.321)	(0.091)	(0.189)	(0.173)
Eligible*Post	0.561*	0.242***	0.346*	0.475**
	(0.329)	(0.092)	(0.190)	(0.192)
Size	0.107	-0.067	0.774***	0.168**
	(0.125)	(0.046)	(0.106)	(0.070)
Story	-0.482***	-0.049	-0.042	-0.145
	(0.143)	(0.050)	(0.110)	(0.089)
Land size	0.090	0.083**	-0.032	-0.019
	(0.106)	(0.041)	(0.096)	(0.061)
Distance	-0.058	-0.009	-0.020	0.022
	(0.051)	(0.018)	(0.034)	(0.031)
REIT_size	-0.125	-0.051	0.553***	0.152
	(0.177)	(0.056)	(0.104)	(0.094)
REIT_ROA	-10.220	-7.874	0.579	-13.816
	(20.300)	(5.723)	(14.520)	(10.933)
REIT_ICR	-0.018	-0.003	-0.023**	-0.011
	(0.019)	(0.005)	(0.009)	(0.011)
REIT_market to book ratio	0.471	0.120	0.399	0.230
	(0.399)	(0.132)	(0.267)	(0.207)
REIT FE	Yes	Yes	Yes	Yes
Property-type FE	Yes	Yes	Yes	Yes
Prefecture-year FE	Yes	Yes	Yes	Yes
Observations	1,917	1,917	1,917	1,917
R-squared	0.626	0.526	0.813	0.493

This table reports the estimation results for the characteristics of real estate properties acquired by the REITs and estimates the impact of the BOJ's REIT purchases. The dependent variable is lnProperty Age, Middle-aged Building dummy, Operating expenses, and Capital expenditure. The specification follows the equation (4) and includes property-type, REIT, and prefecture-year fixed effects. Standard errors are clustered at REIT-year level. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively. Variable definitions are provided in Table 1.

Table 8 Return of real estate properties acquired by REITs

	Baseline	Years of property acquisitions			REITs that are stable in ratings
		≤ 2011	≤ 2015	≤ 2018	
Dependent variables: Return	(1)	(2)	(3)	(4)	(5)
Eligible	-0.006**	-0.010***	-0.008***	-0.005*	-0.020***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.006)
Eligible*Post	0.009***	0.016***	0.010***	0.009***	0.023***
	(0.003)	(0.004)	(0.003)	(0.003)	(0.006)
Size	-0.000	-0.000	0.000	-0.001	-0.003
	(0.002)	(0.002)	(0.002)	(0.002)	(0.003)
Story	-0.001	0.001	-0.001	0.000	0.003
	(0.002)	(0.002)	(0.002)	(0.002)	(0.003)
Land size	0.002	0.001	0.001	0.003**	0.005**
	(0.001)	(0.001)	(0.002)	(0.001)	(0.002)
Distance	0.000	0.000	0.001	0.000	0.001
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
REIT_size	0.004**	0.007***	0.006**	0.005**	0.004
	(0.002)	(0.003)	(0.002)	(0.002)	(0.003)
REIT_ROA	0.379**	0.761***	0.472**	0.503***	0.013
	(0.191)	(0.234)	(0.211)	(0.195)	(0.419)
REIT_ICR	-0.000***	-0.001***	-0.001***	-0.000***	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
REIT_market to book ratio	0.005	0.003	-0.001	0.002	0.012*
	(0.004)	(0.007)	(0.005)	(0.004)	(0.007)
REIT FE	Yes	Yes	Yes	Yes	Yes
Property-type FE	Yes	Yes	Yes	Yes	Yes
Prefecture-year FE	Yes	Yes	Yes	Yes	Yes
Observations	1,917	1,004	1,350	1,669	1,020
R-squared	0.651	0.714	0.648	0.643	0.752

This table reports the estimation results for the characteristics of real estate properties acquired by the REITs and estimates the impact of the BOJ's REIT purchases. The dependent variable is Return. The specification follows the equation (4) and includes property-type, REIT, and prefecture-year fixed effects. Estimation of columns (5) limits the sample to properties acquired by REITs that maintained a credit rating of AA− or higher, or A+ or lower, throughout the sample period. Standard errors are clustered at REIT-year level. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively. Variable definitions are provided in Table 1.

Table 9 Combinations of characteristics of real estate properties acquired by REITs

Dependent variables:	(1) HighReturn_HighAge	(2) HighReturn_Middle_aged Building	(3) HighReturn_HighOPE	(4) HighReturn_HighCAPEX
Eligible	-0.440***	-0.234**	-0.007	-0.273**
	(0.139)	(0.114)	(0.120)	(0.117)
Eligible*Post	0.367**	0.309**	0.011	0.400***
	(0.162)	(0.124)	(0.137)	(0.146)
REIT FE	Yes	Yes	Yes	Yes
Property-type FE	Yes	Yes	Yes	Yes
Prefecture-year FE	Yes	Yes	Yes	Yes
Property controls	Yes	Yes	Yes	Yes
REIT controls	Yes	Yes	Yes	Yes
Observations	1,051	1,008	1,169	1,043
R-squared	0.790	0.743	0.760	0.673

This table reports the estimation results for the characteristics of real estate properties acquired by the REITs and estimates the impact of the BOJ's REIT purchases. The dependent variable is the combinations of property characteristics of (high return and high Property Age) and (low return and low Property Age) for column (1), (high return and Middle-aged Building) and (low return and non-Middle-aged Building) for column (2), (high return and high Operating Expenses) and (low return and low Operating Expenses) for column (3), and (high return and high Capital Expenditure) and (low return and low Capital Expenditure) for column (4) The specification follows the equation (4) and includes property-type, REIT, and prefecture-year fixed effects. Standard errors are clustered at REIT-year level. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively. Variable definitions are provided in Table 1.

Table 10 Ex-post property performance

Panel A: Appraisal prices

	(1)	(2)	(3)	(4)	(5)	(6)
Dependent variable	Decrease_in_price					
	0.5 years	1.0 years	1.5 years	2.0 years	2.5 years	3.0 years
Eligible	-0.105	0.050	-0.029	-0.050	-0.068	0.003
	(0.070)	(0.083)	(0.083)	(0.080)	(0.076)	(0.074)
Eligible*Post	0.210***	0.064	0.160*	0.151*	0.158**	0.106
	(0.076)	(0.086)	(0.087)	(0.085)	(0.080)	(0.076)
REIT FE	Yes	Yes	Yes	Yes	Yes	Yes
Property-type FE	Yes	Yes	Yes	Yes	Yes	Yes
Prefecture-year FE	Yes	Yes	Yes	Yes	Yes	Yes
Property controls	Yes	Yes	Yes	Yes	Yes	Yes
REIT controls	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,917	1,917	1,917	1,917	1,917	1,917
R-squared	0.590	0.625	0.645	0.685	0.706	0.738
Panel B: Rental income						
	(7)	(8)	(9)	(10)	(11)	(12)
Dependent variable	Decrease_in_income					
	0.5 years	1.0 years	1.5 years	2.0 years	2.5 years	3.0 years
Eligible	-0.011	-0.037	0.076	0.006	-0.042	-0.123**
	(0.073)	(0.061)	(0.072)	(0.055)	(0.072)	(0.062)
Eligible*Post	0.020	0.113*	0.038	0.111*	0.122	0.128*
	(0.078)	(0.068)	(0.080)	(0.065)	(0.080)	(0.072)
REIT FE	Yes	Yes	Yes	Yes	Yes	Yes
Property-type FE	Yes	Yes	Yes	Yes	Yes	Yes
Prefecture-year FE	Yes	Yes	Yes	Yes	Yes	Yes
Property controls	Yes	Yes	Yes	Yes	Yes	Yes
REIT controls	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,917	1,917	1,917	1,917	1,917	1,917
R-squared	0.510	0.490	0.527	0.529	0.515	0.525

This table reports the estimation results for the ex-post performance of real estate properties acquired by the REITs and estimates the impact of the BOJ's REIT purchases. The dependent variable is a dummy for a decrease in appraisal prices for Panel A and a dummy for a decrease in rental income for Panel B. The specification follows the equation (4) and includes property-type, REIT, and year-prefecture fixed effects. Standard errors are clustered at REIT-year level. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively. Variable definitions are provided in Table 1.

Table 11 Reallocation of banks' loan portfolios

	(1)	(2)	(3)	(4)	(5)	(6)
Dependent variable	Loan ratio		Short-term loan ratio		Long-term loan ratio	
Non-Eligible	-0.118***	-0.062	0.004	0.010**	-0.122***	-0.072*
	(0.039)	(0.039)	(0.004)	(0.004)	(0.039)	(0.039)
Eligible	-0.123***	-0.078**	0.020***	0.024***	-0.145***	-0.104***
	(0.040)	(0.039)	(0.005)	(0.005)	(0.040)	(0.040)
Non-eligible*Post	0.029***	0.008**	-0.004**	-0.006***	0.033***	0.014***
	(0.004)	(0.004)	(0.002)	(0.002)	(0.004)	(0.004)
Eligible*Post	0.028***	0.023***	-0.019***	-0.019***	0.049***	0.044***
	(0.006)	(0.005)	(0.003)	(0.003)	(0.007)	(0.007)
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm-Bank FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm controls	No	Yes	No	Yes	No	Yes
Bank controls	Yes	Yes	Yes	Yes	Yes	Yes
Observations	20,118	19,553	20,118	19,553	20,118	19,553
R-squared	0.832	0.846	0.621	0.624	0.817	0.829

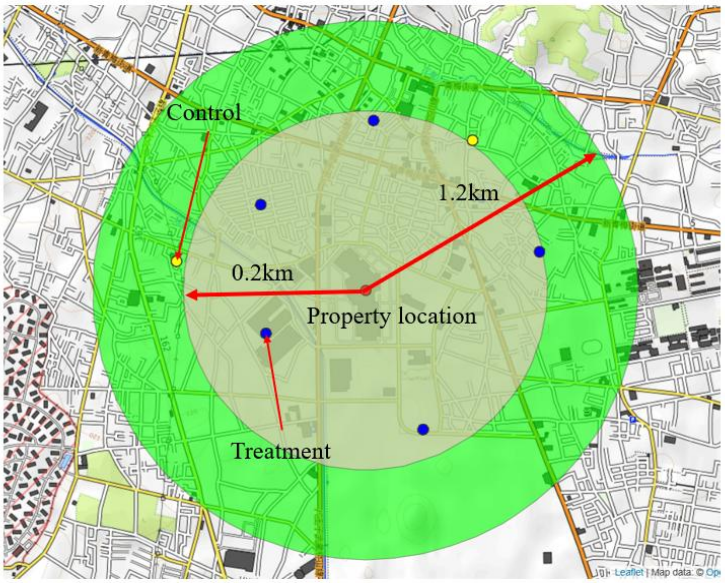
This table reports the estimation results for the reallocation of loan portfolio for banks between the REIT sector and non-REIT listed real estate companies and estimates the impact of the BOJ's REIT purchases. The dependent variable is the ratio of loans, short-term loans, and long-term loans to a firm extended by a bank to total loans by the bank. The specification follows the equation (5) and includes year and firm/REIT-bank fixed effects. Standard errors are clustered at firm-year level. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively. Variable definitions are provided in Table 1.

Table 12 Impact of property purchases by REITs on the local real estate market

Treatment area	Control area	Observations	Number of transactions		Transaction prices	
			(1)		(2)	
(A) Eligible REITs						
-0.2km	0.2km-1.2km	653	0.066	(0.084)	0.155***	(0.045)
-0.4km	0.4km-1.2km		0.211***	(0.067)	0.024	(0.026)
-0.6km	0.6km-1.2km		0.153**	(0.073)	0.070**	(0.028)
-0.8km	0.8km-1.2km		0.069	(0.052)	0.041*	(0.025)
-1.0km	1.0km-1.2km		-0.03	(0.053)	0.009	(0.030)
(B) Non-eligible REITs						
-0.2km	0.2km-1.2km	1,384	0.039	(0.069)	0.029	(0.037)
-0.4km	0.4km-1.2km		0.051	(0.047)	-0.002	(0.023)
-0.6km	0.6km-1.2km		0.082**	(0.041)	0.015	(0.020)
-0.8km	0.8km-1.2km		0.05	(0.037)	0.011	(0.018)
-1.0km	1.0km-1.2km		0.055	(0.040)	0.033	(0.021)

This table reports the estimation results for the impact of property purchases by REITs on the local real estate market and estimates the impact of the BOJ's REIT purchases. The dependent variable is number of real estate property transactions and transacted real estate prices aggregated at the area level. The specification follows the equation (6) and includes year and area fixed effects. Standard errors are clustered at area-quarter level. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively. Variable definitions are provided in Table 1.

Figure 1 An example of treatment area and control area around a property purchased by a REIT



This figure illustrates the definition of the treatment and control areas surrounding a property purchased by a REIT. The red dot indicates the location of the REIT-acquired property. The dim green area denotes the treatment area, while the bright green area denotes the control area. The blue and yellow dots represent properties transacted before and after the REIT's acquisition within the treatment and control areas, respectively.

Appendix Tables

Table A1 Results for matched sample

	(1)	(2)	(3)	(4)	(5)
Dependent variable	lnProperty_Age	Middle-aged building	Operating_Expense	Capital_Expenditure	Return
Eligible	-0.347	-0.102	-0.366	-0.520***	-0.008**
	(0.386)	(0.114)	(0.259)	(0.201)	(0.003)
Eligible*Post	0.585	0.257**	0.557**	0.634***	0.011***
	(0.404)	(0.118)	(0.265)	(0.213)	(0.004)
Size	0.103	-0.076	0.687***	0.169**	-0.001
	(0.134)	(0.051)	(0.115)	(0.074)	(0.002)
Story	-0.620***	-0.063	0.078	-0.100	0.000
	(0.162)	(0.058)	(0.122)	(0.093)	(0.002)
Land size	0.134	0.106**	0.024	-0.039	0.002
	(0.114)	(0.045)	(0.105)	(0.062)	(0.001)
Distance	-0.038	-0.000	-0.039	0.015	0.000
	(0.055)	(0.020)	(0.037)	(0.032)	(0.001)
REIT_size	-0.147	-0.040	0.584***	0.187**	0.005**
	(0.195)	(0.062)	(0.115)	(0.095)	(0.002)
REIT_ROA	-18.714	-13.662**	0.187	-13.322	0.386*
	(22.305)	(6.277)	(15.924)	(10.564)	(0.208)
REIT_ICR	0.010	0.001	-0.029**	-0.012	-0.001***
	(0.022)	(0.006)	(0.012)	(0.010)	(0.000)
REIT_market to book ratio	0.698	0.264*	0.485	0.214	0.008*
	(0.467)	(0.144)	(0.298)	(0.220)	(0.004)
REIT FE	Yes	Yes	Yes	Yes	Yes
Property-type FE	Yes	Yes	Yes	Yes	Yes
Prefecture-year FE	Yes	Yes	Yes	Yes	Yes
Observations	1,638	1,638	1,638	1,638	1,638
R-squared	0.669	0.564	0.812	0.497	0.677

Table A2 Balance test for REIT characteristics

Balance test for REIT size, ROA, interest coverage, and market to book ratio

	Mean		t-test	
Variable	Treatment	Control	t	p>t
REIT size	12.659	12.651	0.290	0.769
REIT ROA	0.016	0.016	-1.430	0.153
REIT ICR	9.355	10.129	-1.630	0.104
REIT market to book ratio	1.034	1.033	0.100	0.918

This table reports the results for balance test for covariates used in the propensity matching in Table A1. The t-test shows results for the examination of the null hypothesis that the mean of each covariate in the treatment group is equal to that in the control group.

Table A3 Placebo test

	(1)	(2)	(3)	(4)	(5)
Dependent variable	lnProperty_ Age	Middle-aged building	Operating_ Expense	Capital_Expenditure	Return
Eligible	-0.914*	-0.166	-0.747**	-0.710**	-0.014***
	(0.520)	(0.176)	(0.334)	(0.300)	(0.004)
Eligible*Post2008	-0.395	-0.195	0.742**	-0.198	0.002
	(0.609)	(0.147)	(0.364)	(0.275)	(0.006)
REIT FE	Yes	Yes	Yes	Yes	Yes
Property-type FE	Yes	Yes	Yes	Yes	Yes
Prefecture-year FE	Yes	Yes	Yes	Yes	Yes
Property controls	Yes	Yes	Yes	Yes	Yes
REIT controls	Yes	Yes	Yes	Yes	Yes
Observations	825	825	825	825	825
R-squared	0.658	0.615	0.855	0.528	0.684

This table reports placebo estimation results for the characteristics of real estate properties acquired by the REITs and estimates the impact of the BOJ's REIT purchases. Post2008 is a dummy variable that equals 1 if the year is between 2009 and 2010, and 0 if it is between 2005 and 2008. Standard errors are clustered at REIT-year level. ***, **, and * indicate coefficients are statistically significant at the 1, 5, and 10% level, respectively. Variable definitions are provided in Table 1.

Table A4 Transition of ratings for REITs

		Credit rating in previous period (in t-1)			
Credit ratings in current period (in t)		A+or below	AA-	AA	AA+
	A+or below	94.670	0.540	0.000	0.000
	AA-	4.930	95.650	0.870	0.000
	AA	0.390	3.800	98.260	3.850
	AA+	0.000	0.000	0.870	96.150

Table A5 Limited to REITs with ratings AA- or A+

Dependent variable	(1) lnProperty_Age	(2) Middle-aged building	(3) Operating_Expense	(4) Capital_Expenditure	(5) Return
EligibleAA$^-$	0.107	-0.139	-0.773***	-0.421	-0.011***
	(0.533)	(0.176)	(0.289)	(0.460)	(0.004)
EligibleAA$^-$*Post	-0.312	0.135	1.025***	0.369	0.012***
	(0.575)	(0.190)	(0.296)	(0.478)	(0.004)
REIT FE	Yes	Yes	Yes	Yes	Yes
Property-type FE	Yes	Yes	Yes	Yes	Yes
Prefecture-year FE	Yes	Yes	Yes	Yes	Yes
Property controls	Yes	Yes	Yes	Yes	Yes
REIT controls	Yes	Yes	Yes	Yes	Yes
Observations	849	849	849	849	849
R-squared	0.736	0.606	0.847	0.609	0.761

Table A6 Differentiating by credit ratings among eligible REITs

Dependent variable	(1) lnProperty_Age	(2) Middle-aged building	(3) Operating_Expense	(4) Capital_Expenditure	(5) Return
Eligible AA^-	-0.455	-0.115	-0.331*	-0.496***	-0.007**
	(0.322)	(0.093)	(0.196)	(0.174)	(0.003)
Eligible AA	-1.278	-0.084	0.207	-0.268	-0.002
	(1.119)	(0.292)	(0.292)	(0.699)	(0.005)
Eligible AA^+	-0.033	0.118	-0.546	-0.974**	-0.002
	(0.831)	(0.285)	(0.523)	(0.393)	(0.006)
Eligible AA^-*Post	0.456	0.229**	0.498**	0.518***	0.010***
	(0.330)	(0.095)	(0.197)	(0.193)	(0.003)
Eligible AA*Post	1.407	0.272	-0.316	0.476	0.003
	(1.113)	(0.296)	(0.291)	(0.710)	(0.006)
REIT FE	Yes	Yes	Yes	Yes	Yes
Property-type FE	Yes	Yes	Yes	Yes	Yes
Prefecture-year FE	Yes	Yes	Yes	Yes	Yes
Property controls	Yes	Yes	Yes	Yes	Yes
REIT controls	Yes	Yes	Yes	Yes	Yes
Observations	1,917	1,917	1,917	1,917	1,917
R-squared	0.627	0.527	0.815	0.501	0.652