Geography and Realty Prices: Evidence from International Transaction-Level Data[*]

Daisuke Miyakawa[†]
Hitotsubashi University, Graduate School of International Corporate Strategy

Chihiro Shimizu
National University of Singapore, Institute of Real Estate Studies

Iichiro Uesugi
Hitotsubashi University, Institute of Economic Research

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Abstract

In this paper, we examine the role of the international flow of capital in real estate prices by quantifying the relation between investors' geographical locations and the prices they pay for their realty investments. Our data set contains more than 30,000 realty investment transactions in Australia, Canada, France, Hong Kong, Japan, Netherlands, the United Kingdom, and the United States. First, we find that foreign investors pay significantly higher prices than domestic investors do even after taking a wide variety of controls into account. Second, this overpricing becomes smaller as the buyers' exposure to realty investments in the host countries becomes higher. Third, in support of these results, the investment returns of foreign investors are systematically lower than those of domestic investors. This negative excess return becomes smaller as the buyers' exposure to the host countries becomes higher. These results indicate that the overpricing of foreign investors occurs when investors are less informed about the local property market and lessens with the accumulation of investment experience.

Keywords: *Realty Price*; *Transaction Data*; *Geographical Location*; *Fixed Effects*
JEL classification: D83, F21, G12, R30

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[†] Corresponding author: Associate Professor, Graduate School of International Corporate Strategy, Hitotsubashi University, 2-1-2 Hitotsubashi, Chiyoda-ku, Tokyo 101-8439 JAPAN. E-mail: dmiyakawa@ics.hit-u.ac.jp. Tel: +81342123101. Fax: +81342123020.

1. Introduction

Given that international realty investment is one of the major alternative investments, a large body of literature has attempted to examine the impacts of the international money flow on realty prices. Such interaction between the international money flow and real estate markets becomes more relevant in the age of the global saving glut in which a large influx of capital from emerging economies lowers long-term interest rates and contributes to a run-up in asset prices (Bernanke 2005). Recently, many studies examine the argument that global imbalances in money flows have contributed to a massive fluctuation in asset prices, above all, real estate prices. On the one hand, Jordà et al. (2014) point out that a change in monetary policy in one country could play an important role in generating a large fluctuation in realty prices in other countries through a change in the international money flow. On the other hand, however, Favilukis et al. (2013) counter the presumption that the change in the international monetary flow leads to a large fluctuation in local realty prices. In this study, we examine this unsettled question by using a unique data set that accounts for a large number of international property investment transactions.

Suppose that the prices paid by foreign investors are systematically higher than domestic investors. Then, the international money flow could create a demand shock in the local market. Given that many pieces of anecdotal evidence suggest that foreign investors are the central cause of local property booms,[3] a considerable number of empirical studies examine the pricing implication of the international money flow in the context of realty prices. However, the majority of these studies use only aggregated data (e.g., Aizenman and Jinjarak 2009; Favilukis et al. 2013) and have yet to reach a decisive conclusion on the relation between foreign realty investments and its prices. This is partly due to a lack of international transaction-level data on realty investment, although a

[3] As one example of such a discussion, see "Hot in the City" *The Economist*, April 2, 2016.

limited number of exceptions exist such as Badarinza and Ramadorai (2015). To date, our knowledge on the characteristics of real estate transactions is not sufficiently clear on how the pricing patterns of domestic real estate investors differ from those of foreign investors.

The aim of this study is to investigate the impact of geography, especially the impact of crossing country borders, on the pricing patterns in real estate markets. We use the micro-level information associated with each investment transaction instead of aggregate-level data. To be more precise, we estimate the extent to which the prices that foreign investors pay for their realty investments are different from those of domestic investors. For this purpose, the estimations control for the comprehensive list of property characteristics (e.g., location, type, size, and age) and transaction characteristics (e.g., geographical locations of buyers and sellers, and the type of buyers and sellers).

Based on theoretical considerations, our empirical analysis further examines the role of the information accumulated by foreign investors in the real estate markets of host countries. Specifically, following the studies that focus on other financial markets, we assume that the information disadvantage of foreign investors gradually lessens over the course of their investment experience. Focusing on stock markets, for example, Coval and Moskowitz (2001) empirically show that the geographical distance between fund managers specializing in domestic corporate stocks and the portfolio companies matter for the performance of the fund managers. Based on their estimation results, they claim that the information advantage of fund managers that are geographically close to the target domestic firms contributes to better investment performance. While Coval and Moskowitz (2001) exclusively deal with the geographical distance between fund managers and domestic companies, the discussion of home country bias in the extant literature implies that distance matters more for the case of cross-border investments than for domestic investments. We further presume

that, in the case that the investors' location is different from the host country, the abovementioned "learning-by-investment" (e.g., Sorensen 2008, Gompers et al. 2008) might help them to acquire information associated with the local real estate. Notably, given that the heterogeneity associated with real estate is supposed to be much higher than that of other traditional assets (e.g., stocks and bonds), the research finds that the effect of accumulated cross-border investment experience should effectively suppress the price difference between foreign and domestic investors. As far as we concern, this study is the first to explicitly examine both the difference between the pricing behaviors of foreign and domestic investors in the context of the realty prices and the effect arising from firms' previous cross-border investment experience.

Our main findings are as follows. First, we find that foreign investors pay substantially higher prices than domestic investors do even after taking into account a wide variety of controls. Second, this price difference becomes smaller as the buyers' investment exposure to the host countries where the properties in their portfolio are located becomes higher. Third, consistent with these results, the investment returns of foreign investors are systematically lower than that of domestic investors. This negative excess return becomes smaller as the buyers' exposure to the host countries becomes higher. These results jointly indicate that the overpricing occurs especially when foreign investors are less informed about the local realty markets.

The remainder of this study is organized as follows. In Section 2 we briefly survey the related literature that provides the theoretical underpinnings of our empirical study. We explain the data and our empirical framework in Section 3. In Section 4 we examine and discuss the empirical results associated with the realty prices paid by foreign and domestic investors. Section 5 concludes and presents future research questions.

2. Related Literature and Theoretical Underpinnings

In this section, we first provide a brief survey of the studies on the impacts of international money flow on local realty prices. We then survey the literature that highlights the role of the geographical location of investors in various security prices.

A considerable number of studies quantitatively examine the determinants of real estate prices. Aizenman and Jinjarak (2009) use aggregate-level data on 43 countries from 1978 to 2008 and show that current account deficits, which are largely associated with the international money flow to these countries, have positive impacts on the realty prices. Justiniano et al. (2014) also posit that international money flows accounted for a sizable portion of the increase in US house prices before the recent financial crisis of 2008. In contrast with the studies that emphasize the importance of international money flow on real estate prices, however, Favilukis et al. (2013) use aggregate-level statistics and insist that the impact of the international money flow on real estate market is limited. Ferrero (2014) also focuses on the negative association between house prices and the current account in the United States and in several other countries and states that several domestic factors such as credit and preference shocks can explain this association. In sum, these studies have yet to reach a decisive conclusion regarding the role of international money flows in the local realty market.

A number of studies use the micro-evidence on the determination of realty prices to focus on the information asymmetry in real estate. Motivated by the theoretical discussion in Kurlat (2016), Kurlat and Stroebel (2015), for example, use the data on realty transactions for Los Angeles County in the United States and analyze the determinants of the change in realty prices. They find that the physical characteristics of both the property itself and nearby properties as well as the information asymmetry about these characteristics between insiders (i.e., residents in the area) and outsiders

determine realty prices. Based on the empirical evidence that the increase in prices after investment is smaller when the share of informed sellers is higher and the buyer is less informed, they conclude that information asymmetry is an important determinant of realty prices. In a similar vein, Garmaise and Moskowitz (2004) use the realty transaction data in the United States and find that the geographical distance between the buyers and the property becomes shorter as the information asymmetry faced by the buyers becomes larger. They also show that the median distance between the buyers and the property is short (i.e., 47km) and such a distance becomes shorter as the dispersions of evaluated value and transaction prices become larger. Furthermore, the latter becomes less apparent for older property. In sum, they show that the geographical distance between the buyers and the property is an important characteristic associated with information asymmetry. The difference between these studies and the present study is that we extend their discussion to international transactions. We presume that the theoretical predication in these studies becomes more critical in the context of international transactions where information asymmetry is more significant.

Somewhat in the same context, Badarinza and Ramadorai (2015), also feature the role of the proximity between buyers and property in the context of the transmission of shocks. In their study, they use detailed resident information in London and show that foreign residents transmit an exogenous shock in their home country (i.e., outside of UK) to the realty prices in the host country. This result indicates that the proximity between buyers and property affects the way of shocks in buyer countries to transmit to host countries, thus drives realty transactions. The biggest difference between their studies and the present study is that we use many pairs of buyer countries and the host countries where the properties are located so that we have greater heterogeneity to extract a more detailed mechanism that affects realty transactions.

Literature already exists on this importance of geographical characteristics on investments

in other financial markets. First, Coval and Moskowitz (2001) show that the geographical distance between the fund manager and the portfolio companies matter for performance. They find that the abnormal return associated with the investment with a shorter geographical distance tends to be larger. Further, this pattern is more apparent for the investments in companies in small towns where information asymmetry matters more. The authors also find that the advantage of geographical proximity shows some persistency. While such a result in Coval and Moskowitz (2001) specifically shows the advantage of local investors, we could also presume that greater exposure to the distant companies allows fund managers to learn, which Sorensen (2008) theoretically models and empirically studies in the context of venture capital funds. Gompers et al. (2008) also study the importance of venture capital funds' investment experience. Given these discussions, the present paper examines the advantage of local investors and how such an advantage varies as the investment to distant properties accumulates.[4]

Another strand of studies, such as Autor et al. (2014), argue that an exogenous shock induces price changes in nearby properties. They use the termination of rent control in Cambridge, Boston, in 1995. Their natural experiment shows that the prices of the properties close to the property facing the termination of rent control tends to increase. This spillover indicates that overpricing for other reasons, for example that of less informed investors, could exhibit a similar effect.

Given the abovementioned reasoning, we hypothesize that foreign investors pay substantially higher prices than domestic investors, which may result in lower returns, and that this price difference becomes smaller as the buyers' exposure to realty investments in the host country increases. In order to examine this hypothesis, we regress the log of property price on a wide variety

[4] There are also many studies that measure proximity through various measures (see, e.g., Hochberg et al 2007; Patnum 2013; Shue 2013; Fracassi 2014; Leary and Roberts 2014; Serafinelli 2015).

of variables including the investors' geographical locations and investment experience, while controlling for a comprehensive list of transaction-level and aggregate-level characteristics.

3. Data and Method

3.1. Data overview

The data used for this study are transaction-level data for the period from 2005 to 2015. We obtain the data from Real Capital Analytics Inc. (RCA), which is one of the most influential data vendors specializing in real estate investments. The data provided by RCA reflect institutional investment activities and cover relatively large investment transactions, which are roughly larger than one million USD in real estate prices. The original data cover 71,000 realty transactions in Australia, Canada, France, Hong Kong, Japan, Netherlands, the United Kingdom, and the United States. While the properties in a large number (i.e., 1,223) of cities are recorded in the data, a large part of the data are concentrated in properties located in the major cities in the eight countries: Amsterdam, Chicago, Kyoto, LA, London, New York, Osaka, Paris, San Francisco, Sydney, Tokyo, Toronto, and Vancouver. In this sense, the data we use are mainly for large investments in major cities.

The data contain various information associated with the investment transactions. The first group of information covers the property included in the transaction: the price measured in USD, the size of the property's structure in square feet, and the size of the property's land in acre, all of which are measured in natural logarithms (*LN_PriceUSD*, *LN_Floor*, and *LN_Land*). The data also contain the age of each structure (*Age*) as well as its type. The latter information is stored as a categorical variable accounting for apartment, development site, hotel, industrial, office, other, retail, and seniors housing and care facilities. In the present study, we construct eight dummy variables for

these property types (*Property type*).

A wide variety of transaction-related information is also stored in the data set. This information comprises the identification of the countries where the invested property is located (*Property location country*), the buyer's location (*Buyer country*), and the seller's location (*Seller country*). In our empirical analysis, we control for these characteristics by including eight dummy variables for *Property location country*, and at most 102 dummy variables for *Buyer country* and *Seller country*, respectively.[5]

The data further contains the characteristics of the buyers and the sellers in one categorical variable (*Buyer/Seller capital type*). The *Buyer/Seller capital type* accounts for the detailed characteristics of investment funds (e.g., corporate, developer/owner/operator, investment manager, or REIT). We construct dummy variables for these capital types in order to represent the relative bargaining power between buyer and seller or the difference in their funding environments. Each panel of Table 1 tabulates the number of observations falling into each category.

We use the data on the location country associated with the property and the buyer to construct a dummy variable that equals one if these two locations are different and zero otherwise (*ForeignBuyer*). We hypothesize that the higher information asymmetry in the case of *ForeignBuyer*=1 leads to higher transaction prices (or possibly lower returns) compared to the case of *ForeignBuyer*=0 (i.e., domestic buyer). Then, in order to take into account the impact associated with buyer's investment experience, we construct the accumulated investment amount of each buyer located in a buyer country to each host country and compute the sum of accumulated investment amount for all the buyers headquartered in the same country to each host country. This pairwise

[5] In the original data set, we have the information associated with the top three buyers and sellers. While this information is certainly important to characterize the transaction, we only use the information associated with the top buyer and seller because a large part of the data contain only one buyer and seller.

variable is measured for the periods up to the previous month of *t*. Although we can compute this variable for each buyer, we choose to construct the variable at the country level. This choice reflects our presumption that there is information sharing to some extent among the buyers in one country (Badarinza and Ramadorai 2015). Since this variable monotonically increases over the data periods, following Gompers et al. (2008), we standardize it to construct a variable *INVACC* by dividing it by the accumulated total sum of the investment amount of all the buyers located in a country to ALL the host countries measured until the previous month to each monthly data point. Table 2 lists the summary statistics for each variable. Note that the number of observations reduces from the original 71,000 to less than 30,000 due to the lack of information on some variables.

3.2. Empirical framework

Using our transaction-level data, we examine how the buyer's characteristics (especially, *ForeignBuyer*, *INVACC*, and their interaction term) as well as other transaction-specific information affect the transaction price in the following linear regression model:

$$LN\_PriceUSD_{i,p,b,s,t} = \alpha + \beta_1 ForeignBuyer_{i,p,b} + \beta_2 INVACC_{p,b,t} + \beta_3 ForeignBuyer_{i,p,b} \times INVACC_{p,b,t} + \boldsymbol{X}_{it}\boldsymbol{\gamma} + \eta_p^1 + \eta_b^2 + \eta_s^3 + \eta_t^4 + \varepsilon_t \quad (1)$$

The left-hand variable accounts for the natural logarithm of the transaction price of property *i* in country *p* that is sold by the seller in country *s* to the buyer in country *b* in time *t* (measured monthly). On the right-hand of the equation, property-level characteristics $\boldsymbol{X}_{it}$ including the property's size, age (time-variant), and type explain a substantial portion of fluctuations of the dependent variable. $ForeignBuyer_{i,p,b}$ accounts for the dummy variable that equals one if country

p and b are different. $INVACC_{p,b,t}$ is the standardized accumulated investment amounts from country b to country p for the periods up to the previous month of t. We include the interaction term $ForeignBuyer_{i,p,b} \times INVACC_{p,b,t}$ to test for the possibility that the impact associated with $ForeignBuyer_{i,p,b}$ varies with the change in $INVACC_{p,b,t}$. The four variables $\{\eta_p^1, \eta_b^2, \eta_s^3, \eta_t^4\}$ account for the country-level fixed-effect for the property location, country-level fixed-effect for the buyer location, country-level fixed-effect for the seller location, and the time-level fixed effects, respectively.

As another main specification, we also estimate the following equation:

$$LN\_PriceUSD_{i,p,b,s,t} = \alpha + \beta_1 ForeignBuyer_{i,p,b} + \beta_3 ForeignBuyer_{i,p,b} \times INVACC_{p,b,t} + \boldsymbol{X_i}\boldsymbol{\gamma} + \eta_{t,p}^1 + \eta_{t,b}^2 + \eta_{t,s}^3 + \eta_{t,x'}^4 + \varepsilon_t \quad (2)$$

In this equation, we include an individual effect associated with time and several characteristics of the real estate property $\{\eta_{t,p}^1, \eta_{t,b}^2, \eta_{t,s}^3, \eta_{t,x'}^4\}$ instead of time-invariant individual effects we have in equation (1) $\{\eta_p^1, \eta_b^2, \eta_s^3, \eta_t^4\}$. These characteristics that we allow to be time-variant are the property location, seller and buyer location, property type, and other property characteristics including buyer capital type, seller capital type, and buyer's objective of investment. In this model, some variables represent the change in macroeconomic conditions in host/buyer/seller countries while other variables including buyer/seller types represent how investors categorized in different types heterogeneously react to macroeconomic shocks during the sample period. Note that we exclude the variable of $INVACC_{p,b,t}$, which is also time-variant, from the equation in order to avoid a possible collinearity with other variables.

While we include a fair number of characteristics that affect the transaction price, there

could still be a concern about the existence of omitted variables. If, for example, we omit an important property characteristic that affects $LN\_PriceUSD_{i,p,b,s,t}$ and is correlated with $ForeignBuyer_{i,p,b}$, then the coefficient β_1 suffers from endogeneity bias. Among the characteristics potentially affecting the property price that we have not controlled for, the detailed location information (e.g., street) could be one potential omitted variable. In order to account for this concern, the six panels in Figure 1 depict the property locations bought by foreign investors (marked by a star) and domestic investors (marked by a dot) in Los Angeles, Paris, Toronto, London, Tokyo, and Sydney as illustrative examples. Since these panels show that there is no apparent fault line between the areas for properties bought by foreign and domestic investors, we include no further location-related variables in the baseline estimations. However, we will implement several additional analyses that further take into account this issue (i.e., potential heterogeneity associated with street-level location). To be more precise, in order to account for the concern on the lack of location information in a more systematic manner, we first employ the information on geographical proximity between properties bought by domestic investors and those purchased by foreign investors. Second, we focus on the properties that are transacted multiple times by both domestic and foreign buyers, and apply the repeat-sales methodology, which enables us to control for the property-level fixed-effect, to the samples.

4. Empirical Analysis

4.1. Baseline estimation

In this section, we show the results based on the linear estimations of equations 1 and 2 in Table 3. The first two columns (1) and (2) of Table 3 list the coefficients for the equation 1 and the next two columns (3) and (4) of the table list the coefficients for the equation 2. In each estimation,

the most important coefficients are those on the foreign investment ($ForeignBuyer_{i,p,b}$), the accumulated investment amount of a buyer country ($INVACC_{p,b,t}$), and their interaction term ($ForeignBuyer_{i,p,b} \times INVACC_{p,b,t}$).

First, we explain the results in Columns (1) and (2). The coefficient on $ForeignBuyer_{i,p,b}$ is positive and significant in Column (1), indicating that the transaction price is higher when the buyer is foreign (i.e., $\beta_1 > 0$). In Column (2), when we add the two variables $INVACC_{p,b,t}$ and $ForeignBuyer_{i,p,b} \times INVACC_{p,b,t}$, the coefficients on $ForeignBuyer_{i,p,b}$ and $INVACC_{p,b,t}$ are both positive and significant, while the coefficient on $ForeignBuyer_{i,p,b} \times INVACC_{p,b,t}$ is negative and significant. These coefficients indicate that the transaction price is higher for foreign investors (i.e., $\beta_1 > 0$) and that the extent of positive impact on transaction prices associated with the status of foreign investors diminishes as the investment experience from country *b* accumulates for country *p* (i.e., $\beta_3 < 0$).

They also indicate that the investment experience of one country increases transaction prices when the country undertakes domestic investment (i.e., $\beta_2 > 0$) but that the investment experience has an opposite impact when the country undertakes international investment (i.e., $\beta_3 < 0$ and $|\beta_3| > |\beta_2|$). The difference in the directions of impact caused by $INVACC_{p,b,t}$ between domestic and foreign buyers implies that the variable represents something different between them. While we interpret this variable to represent investment experience for foreign buyers, it could be a proxy for the precursor of a property bubble for domestic buyers. Because domestic buyers are already well informed of the local properties, a larger exposure means that the property bubble is heating up the market.

For the rest of the variables employed in the estimations in Columns (1) and (2), the coefficients are mostly in line with our common understanding. The transaction price is higher when

the size of the property's structure (*LN_Floor*) is larger, the structure is younger (*Age*), and the amount of investment from countries other than the buyer country becomes larger (*INV_OTHERS*). Note, however, that the size of land in the property (*LN_Land*) has a negative impact on the price once the size of the structure is controlled for.

Second, we focus on the estimations that are based on equation 2 and present the results in Columns (3) and (4) of Table 3. The coefficient on $ForeignBuyer_{i,p,b}$ is positive but insignificant in Column (3). Column (4), in which we add the variable $ForeignBuyer_{i,p,b} \times INVACC_{p,b,t}$, shows that the coefficient on $ForeignBuyer_{i,p,b}$ remains to be positive and significant and the coefficient on $ForeignBuyer_{i,p,b} \times INVACC_{p,b,t}$ is negative and significant. These coefficients indicate that the transaction price is higher for foreign investors (i.e., $\beta_1 > 0$) and that the extent of positive impact on transaction prices associated with the status of foreign investors diminishes as the investment experience from country *b* accumulates for country *p* (i.e., $\beta_3 < 0$). For the rest of the variables employed in the estimations in Columns (3) and (4), the coefficients are qualitatively the same as those in Columns (1) and (2).

Using the results in Column (2) of Table 3, we can evaluate the significance of the impact of foreign investment conditional on the values of $INVACC_{p,b,t}$ and show the results in Figure 2. In this figure, we measure the level of $INVACC_{p,b,t}$ along the horizontal axis and the size of the marginal impact of $ForeignBuyer_{i,p,b}$, which is conditional on the level of $INVACC_{p,b,t}$, on the transaction price along the vertical axis as well as its 95% confidence interval (two dashed lines). The estimated coefficients associated with $ForeignBuyer_{i,p,b}$ (0.409) and $ForeignBuyer_{i,p,b} \times INVACC_{p,b,t}$ (-0.798) indicate that the size of the conditional marginal impact associated with $ForeignBuyer_{i,p,b}$ takes downward sloping over the level of $INVACC_{p,b,t}$. According to the figure, the point estimate of the conditional marginal impact associated with $ForeignBuyer_{i,p,b}$ is positive

for the range of $INVACC_{p,b,t}$ being 0.51 or smaller. Taking into account of the summary statistics that the mean and standard deviation of $INVACC_{p,b,t}$ are 0.78 and 0.18, respectively, a relatively minor portion of transactions made by foreign investors are higher than those by domestic investors. This implies that the overpricing associated with foreign investors can be observed in the case that such foreign investors' exposure to host country is rather limited.

Apart from the discussion on the impact associated with $ForeignBuyer_{i,p,b}$, using the results in Column (4) of Table 3, we can examine the investment performance of each investor category. First, Figure 3 plots the difference between the time-variant seller capital type effect and the time-variant buyer capital type effect for the two types of capital: "Equity Fund" and "Pension Fund". We can interpret this number as the type-specific margin obtained if an average investor categorized in a specific investor capital type does purchase and sales transactions in a specific year. Figure 3 shows that regardless of the investor capital types, there was a sharp decline in such margin right after the financial crisis (i.e., 2009). Interestingly, the size of drop is larger for the case of "Equity Fund" than for the case of "Pension Fund", which is consistent with the notion that investors facing more frequent turnover in their liability (e.g., "Equity Fund") suffered more from the financial crisis due to, for example, forced fire-sale of their portfolio assets. Second, Figure 4 plots the mean and standard deviation of the differences between the time-variant seller capital type effect and the time-variant buyer capital type effect measured over the sample period (i.e., 2005-2015). We can see that the investor capital type such as "Equity Fund" and "Finance" exhibit higher risk and higher return profiles while "Pension Fund" shows lower risk and a lower return profile.

4.2. Estimations controlling for geographical proximity and property fixed effects

In the baseline estimation we implemented in the previous subsection, we assumed that the heterogeneity of realty prices across observations is controlled for by a number of explanatory variables including host/buyer/seller country dummies, property characteristics variables, and investor type dummies. However, it is still possible that geographical proximity between real estate properties may have not been adequately controlled for since there are only a limited number of variables that represent geographical information on real estate properties in the baseline estimation. In order to deal with the issue, we implement two additional estimations in this subsection: (1) Employing the information on geographical proximity between properties and pair the properties purchased by foreign investors and those by domestic ones, and (2) focusing on the properties that are transacted multiple times and apply the repeat-sales methodology.

First, we control for the geographical proximity by collecting information on real estate properties that are located close from each other. We take the following steps in order to pair the properties purchased by domestic investors with those located in their close proximity but purchased by foreign investors. We start from measuring geographical distances between all the pairs of real estate properties using the latitude and longitude information on each real estate property. Then, for each property that is purchased by domestic investors, we match the properties that are purchased by foreign investors and located closest to the property purchased by domestic investors. In the process of this matching, we set a threshold for the maximum radius within which the matching is done. For the length of the radius, we employ 100 meters and 500 meters interchangeably. Finally, we implement the estimation of realty prices on a set of explanatory variables employed for the baseline estimation.

As a result of the procedure, we drop a certain number of observations that are purchased

by foreign (domestic) investors but located remotely from any of the properties purchased by domestic (foreign) investors. In case that we construct the dataset by limiting the sample to those that satisfy the constraint of 500-meter radius, the sample size drops to slightly above 20,000. In case we further limit the sample with the constraint of 100-meter radius, the sample size is reduced to about 5,400. Columns (1) and (2) of Table 4 show the results. The most important coefficients are again those on $ForeignBuyer_{i,p,b}$, $INVACC_{p,b,t}$, and $ForeignBuyer_{i,p,b} \times INVACC_{p,b,t}$. In both of the columns, we observe the qualitatively the same coefficients on these variables as in the baseline estimation, which are, positive and significant for $dum\_forbuyer_{i,p,b}$ and $INVACC_{p,b,t}$ and negative and significant for their interaction terms. Somewhat surprisingly, the coefficient on $ForeignBuyer_{i,p,b}$ is substantially more sizable in Column (2) than in Column (1) even though the sample real estate properties are located in geographically narrow areas.

Second, we make one step further and employ a repeat-sales approach in order to control for the property-level fixed-effect in a more accurate manner than do the previous ones. To be more precise, we identify real estate properties that are transacted multiple times by using the latitude and longitude information of each property. We further limit the sample of these repeat-sales properties to those that are purchased both by domestic investors and by foreign investors at least once during the sample period. As a result of the sample selection, we have the sample of more than 4,500 properties, which is used for the estimation that controls for the property-level fixed effect. Note that some of the property characteristics variables such as *LN_Floor* and *Ln_Land* dropped out since they are time-invariant within the repeat-sales sample.

Columns (3) and (4) of Table 4 show the results. The coefficients in these estimations on $ForeignBuyer_{i,p,b}$, $INVACC_{p,b,t}$, and $ForeignBuyer_{i,p,b} \times INVACC_{p,b,t}$ are qualitatively the same as those in the baseline estimation. They are positive and significant for $ForeignBuyer_{i,p,b}$

and $INVACC_{p,b,t}$ and negative and significant for their interaction terms. The exception is the result in Columns (3), in which the coefficient on $ForeignBuyer_{i,p,b}$ is positive but statistically insignificant. This result implies that, at least in this sample, the unconditional marginal impact associated with $ForeignBuyer_{i,p,b}$ is not statistically apart from zero.

To summarize, we have put maximum effot to control for locational proximity and property-level fixed-effects so as to correctly identify the impact associated with the purchases by foreign investors. In both of the two approaches, i.e., limiting the sample to those located in close proximity and employing the repeat-sales sample, we find that foreign investors pay significantly higher prices than domestic investors do and that this overpricing becomes smaller as the buyers' exposure to realty investments in the host countries becomes higher.[6]

4.3. Subsample estimations

In this subsection, we examine how the estimation results in Table 3 are affected by the subsample analysis. First, we split the sample into the two subsamples corresponding to the early and the late transaction periods and present the results in Table 5. The first two columns show the results for subsamples before year 2010 (Column (1)) and after year 2011 (Column (2)) and the next two columns show the results for subsamples before year 2008 (Column (3)) and after year 2009 (Column (4)). Overall, the signs of coefficients in these columns are qualitatively the same as those in Table 3 with one exception in Column (3), where all the coefficients on $ForeignBuyer_{i,p,b}$, $INVACC_{p,b,t}$, and $Foreignbuyer_{i,p,b} \times INVACC_{p,b,t}$ are statistically insignificant.[7] There is one

[6] Given the possibility that the variable *INVACC* might take a value close to one in the case that investors headquartered in a country invest in a host country for the first time, we also conducted a robustness check for the estimation results by using only the *INVACC* smaller than one to exclude the case where a country has exposure to properties in only one country. We also employ the log of the numerator of *INVACC*, which is the accumulated investment amounts, instead of *INVACC*. Both the estimations provide consistent results with the baseline results.

[7] Note that these statistically insignificant coefficients for the period before 2008 may be due to the way *INVACC* is constructed. We need information on its investment amount for a substantial number of years in order to accurately

notable feature in the result in that the impact associated with $Foreignbuyer_{i,p,b}$ is substantially larger in Columns (2) and (4) than in Columns (1) and (3). Given that the latter periods correspond to the periods when the real estate markets revived from the global financial crisis, this result shows that under a heated market environment, the value of information asymmetry increases.

Second, we split the sample based on the property type and present the results in Table 6. In particular, we focus on the following five categories: apartment (Column (1)), hotel (Column (2)), industrial (Column (3)), office (Column (4)), and retail (Column (5)). Regarding the coefficients on $ForeignBuyer_{i,p,b}$, $INVACC_{p,b,t}$, and $ForeignBuyer_{i,p,b} \times INVACC_{p,b,t}$, only for industrial and office properties do we find the qualitatively the same results as in the baseline. In contrast, for other types of properties including apartments, we find consistent but mostly insignificant coefficients on the variables that we have been interested in. The above results indicate that the information asymmetry, if any, is more likely to exist in the types of properties whose value is difficult to measure (e.g. properties for business use) than in the types of properties whose structures are standardized and their values are relatively easy to measure (e.g. residential properties).

4.4. Estimations with additional explanatory variables

In this subsection, we examine how the baseline results in Table 3 change when we introduce additional variables. In the previous baseline analysis, we employed buyer capital type dummies, buyer country-year dummies, and property host country-year dummies without specifying the mechanisms how these dummies affect the transaction prices of real estate. In order to be more specific about the mechanisms, we add two sets of variables in the equation 1 in the baseline estimation. The first one is about the buyer's strategy of the realty investment: whether the buyer

measure the investment experience of one country and construct *INVACC*, while it is difficult to do so when there are only a limited number of years in the early period of the sample.

regards that the investment is low-risk and low-return (*Core=1*) or otherwise (*Core=0*), the buyer intends to improve the value of the property and regards the investment as medium-to-high risk and medium-to-high return (*ValueAdded=1*) or otherwise (*ValueAdded=0*), or the buyer intends to occupy the property by him/herself (*Occ=1*) or otherwise (*Occ=0*). In our estimation, we drop *Occ* from independent variables and include only *Core* and *ValueAdded* so that we can measure the impacts associated with *Core* and *ValueAdded* by using *Occ* as the baseline case.[8] The second one measures the buyer's investment opportunity both in his/her home country (*Buyer_YoY_Return*) and in the host country (*Host_YoY_Return*). Note that the sample size decreases substantially since these additional explanatory variables are available for a limited number of observations. For example, we employ *Buyer_YoY_Return* constructed from the housing price index for a limited number of countries by the Federal Reserve Bank of Dallas.

Table 7 shows the results, in which there are a few notable findings. First, the signs of coefficients on $ForeignBuyer_{i,p,b}$, $INVACC_{p,b,t}$, and $dum\_forbuyer_{i,p,b} \times INVACC_{p,b,t}$ are the same as those in the baseline results, although the coefficient on $INVACC_{p,b,t}$ becomes statistically insignificant. Second, there is a significant impact of buyer's investment strategy on the real estate prices. It turns out to be the case a buyer employs the value-added strategy when the transaction price becomes the highest. Third, investment opportunities in buyers' home country but not those in the host country have a significant positive impact on the transaction prices. This indicates that these buyers are less financially constrained in purchasing expensive real estate properties.

[8] The data contains "*Others*" as the other category for investment motive. As we do not have any precise information on this category, we drop the observations having "*Others* = 1".

4.5. Estimations of property returns

In Tables 3 to 7, we used the transaction price as the dependent variable for our empirical analysis. However, even if a foreign investor pays higher prices, the higher price would not be necessarily problematic in terms of the investment performance if these investors sell the property at higher prices. In order to evaluate the performance of the foreign investors, we need to measure how realty prices have changed after their purchase.

For this purpose, we construct the year-on-year return based on the quarterly housing price index in each host country, which is publicized by Federal Reserve Bank of Dallas.[9] As the new dependent variables, we construct four return variables for the period of one year starting from 1, 2, 3, and 4 quarter(s) after the data point of each observation and ending 5, 6, 7, and 8 quarters after the data point, respectively. In this sense, we use the return of the country-level housing price index to represent the investment return for each observation.[10] As the right-hand side variables, we use the same set of independent variables as in equation (1).

Table 8 shows the results and each column corresponds to an annual realty investment return with different starting periods. First, as the baseline results indicate, the estimated coefficient for $ForeignBuyer_{i,p,b}$ shows a negative sign while that of the interaction term between $ForeignBuyer_{i,p,b}$ and $INVACC_{p,b,t}$ is positive. This pattern is consistent with the implication we obtain from the baseline estimation using the transaction price as the dependent variable. Second, the impact of these two variables becomes larger as we use the return away from the time of the investment. This impact means that the obtained information through investment experience helps foreign investors to improve long-term investment returns.

[9] http://www.dallasfed.org/institute/houseprice/index.cfm.
[10] Alternatively, we may be able to employ the repeat sales sample to explicitly measure the return dynamics associated with the cases of foreign buyers and domestic buyers over the course of investment history.

5. Conclusion

In this paper, we study how investors' geographical locations are related to the prices they pay for their realty investments. We use more than 30,000 observations that cover the realty investment transactions in eight host countries. Further, we control for a comprehensive list of property and transaction characteristics. We find, first, that foreign investors pay substantially higher prices than domestic investors even after taking into account the controls. Second, this price difference becomes smaller as the buyers' exposure to realty investments in the host countries becomes higher. Third, consistent with these results, the investment returns of foreign investors are systematically lower than that of domestic investors and this return difference becomes smaller as the buyers' exposure experience becomes higher. These results show that the overpricing of foreign investors exists when investors are less informed about local property markets and lessens with the accumulation of investment experience.

Finally, we highlight the potential avenues for future research. First, the present study does not explicitly examine the spillover effect associated with the overpricing of foreign investors but only studies the relation between the transaction price and the investors' location. Given we have detailed information associated with the property address as well as the timing of each transaction, we can study the spillover effect with a careful consideration for the causal identification. Second, another important direction might be to examine investors' choice over multiple investment locations. We believe all of these potential extensions could provide further insights for a better understanding of the pricing implication of international real estate transaction.

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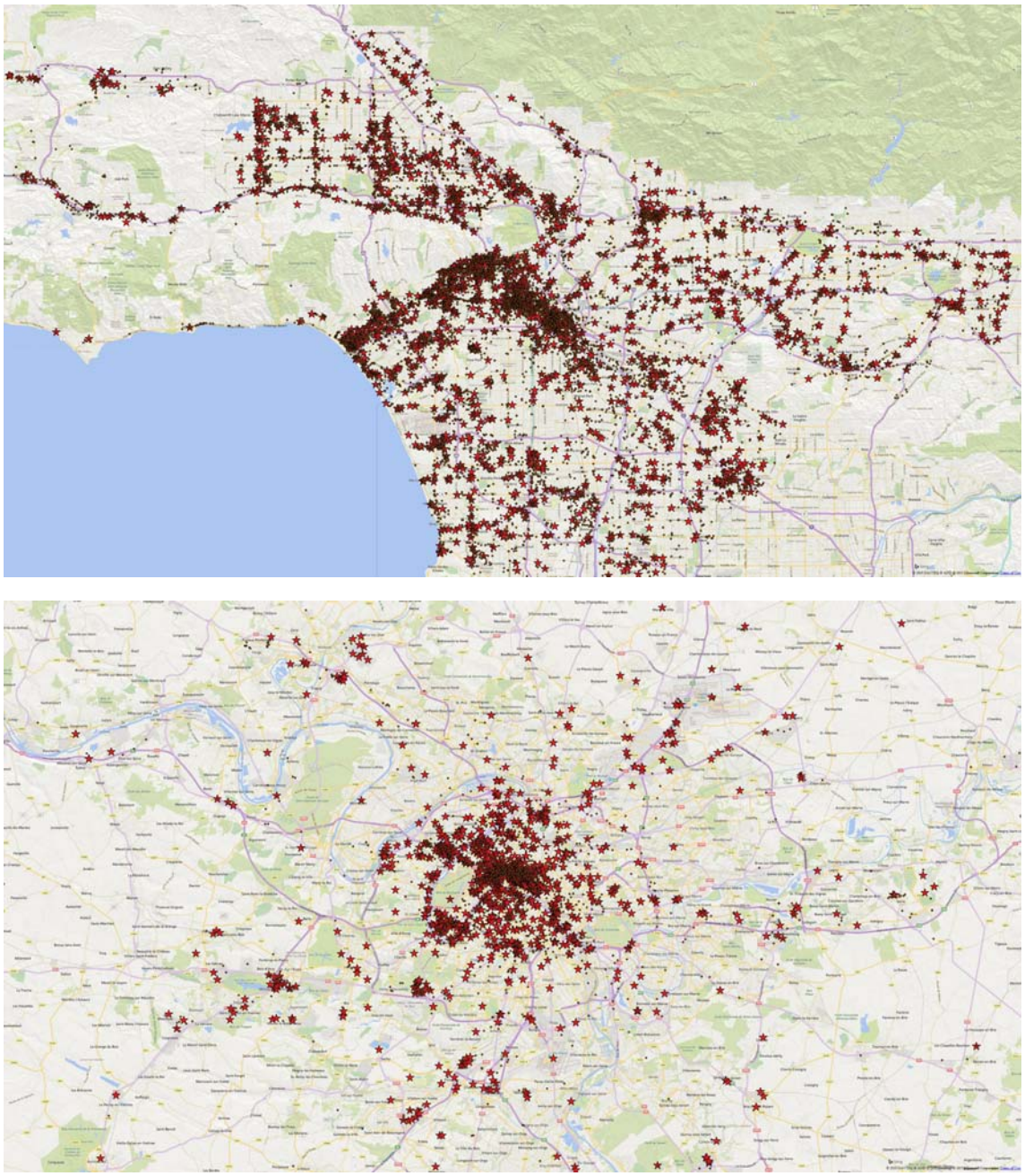
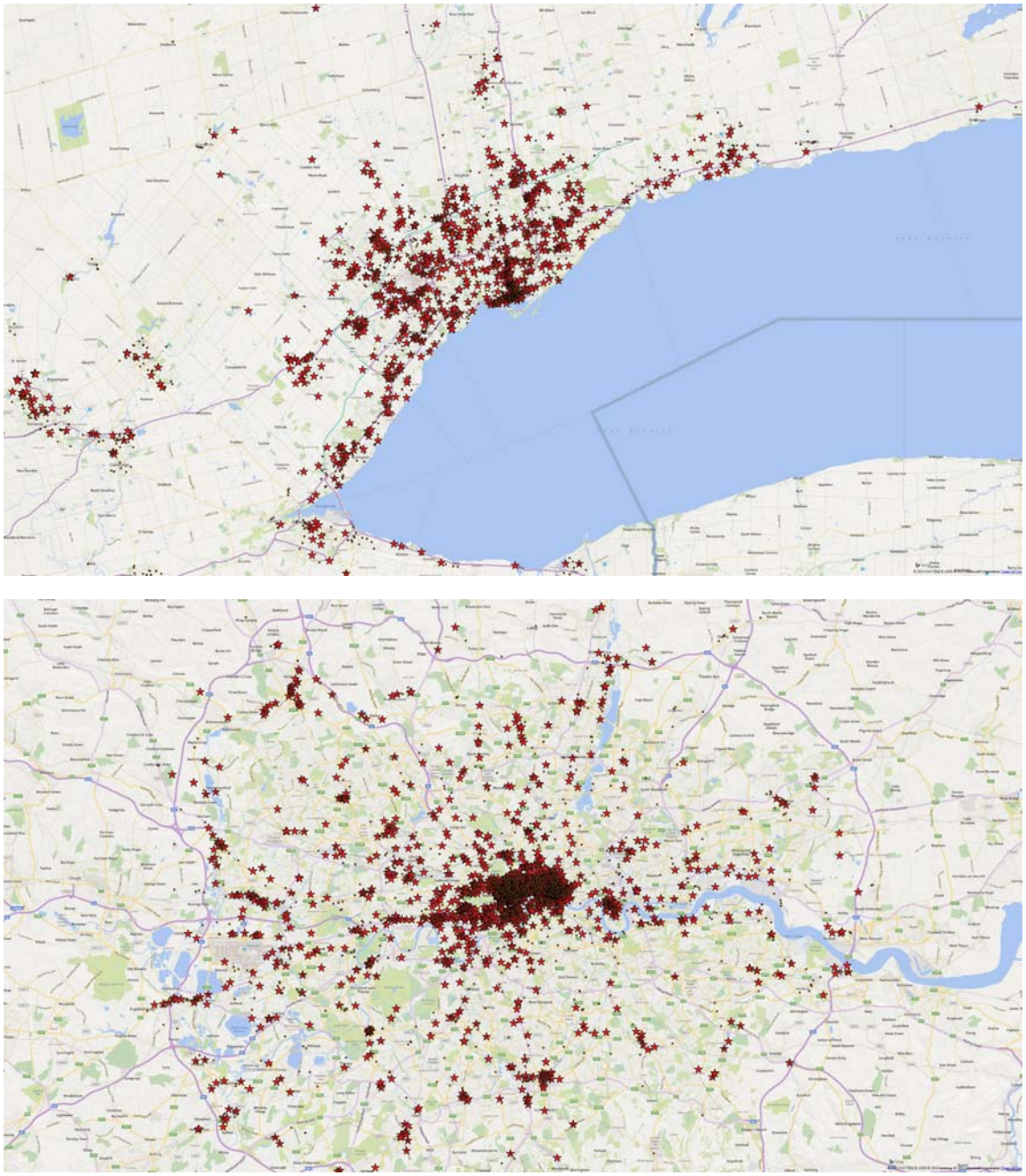
Tables and Figure

Figure 1 (i): Property location (foreign investor & domestic investor) in Los Angeles and Paris



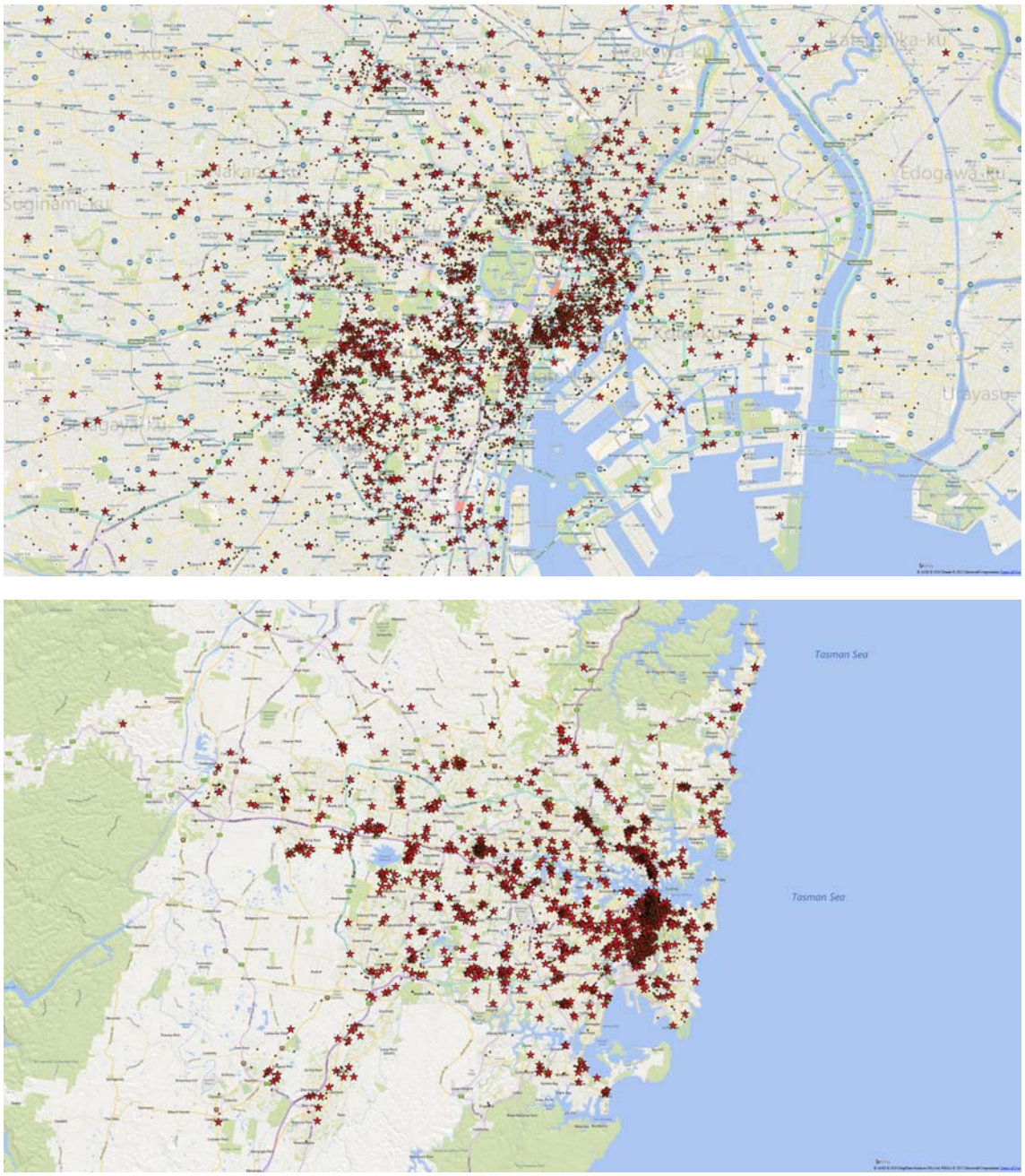
Note: The figure shows the locations of properties bought by foreign investors (star) and domestic investors (dot) in Los Angeles (upper panel) and Paris (lower panel).

Figure 1 (ii): Property location (foreign investor & domestic investor) in Toronto and London



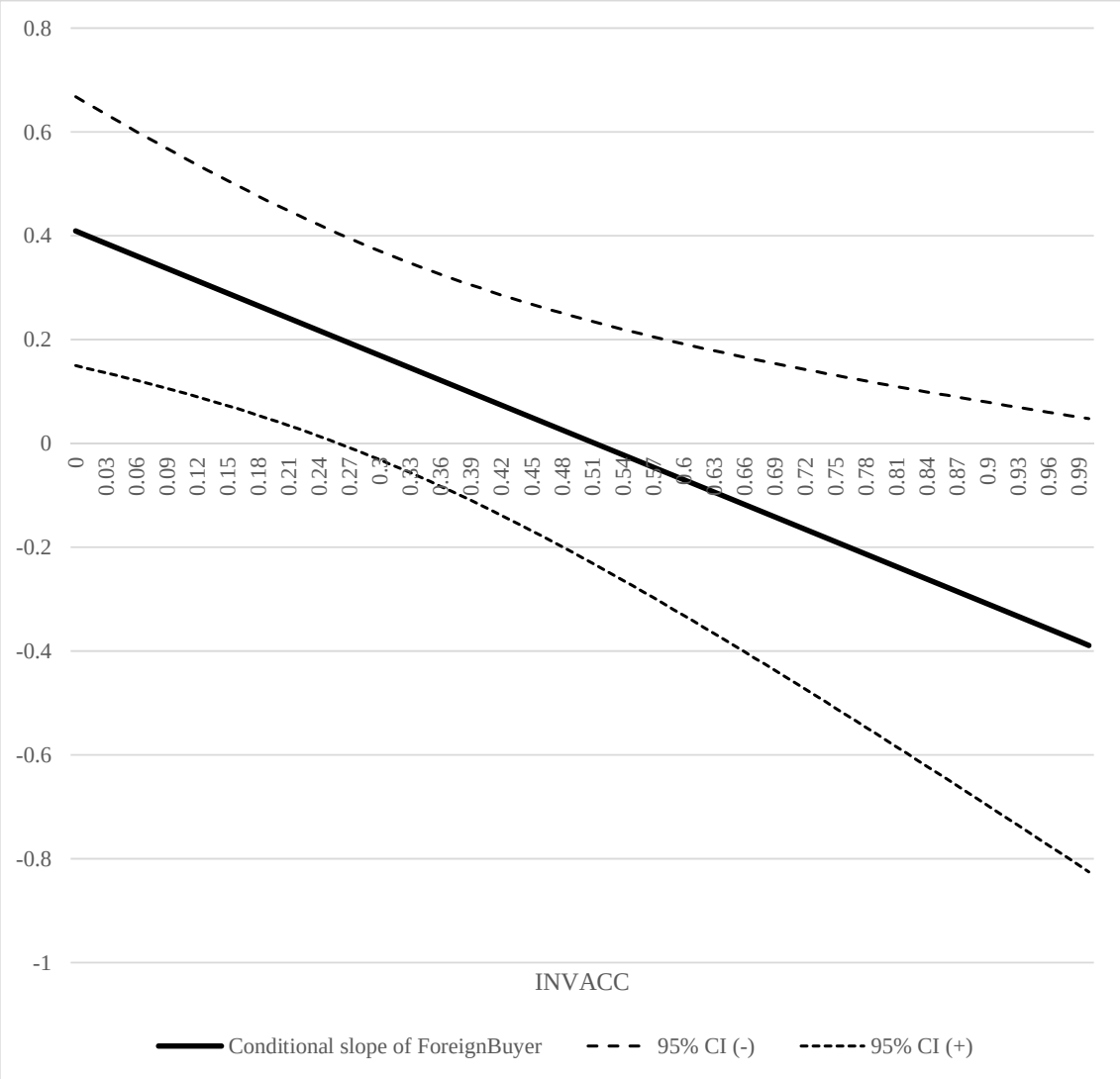
Note: The figure shows the locations of properties bought by foreign investors (star) and domestic investors (dot) in Toronto (upper panel) and London (lower panel).

Figure 1 (iii): Property location (foreign investor & domestic investor) in Tokyo and Sydney



Note: The figure shows the locations of properties bought by foreign investors (star) and domestic investors (dot) in Tokyo (upper panel) and Sydney (lower panel).

Figure 2: Marginal effect associated with *ForeignBuyer* (baseline)

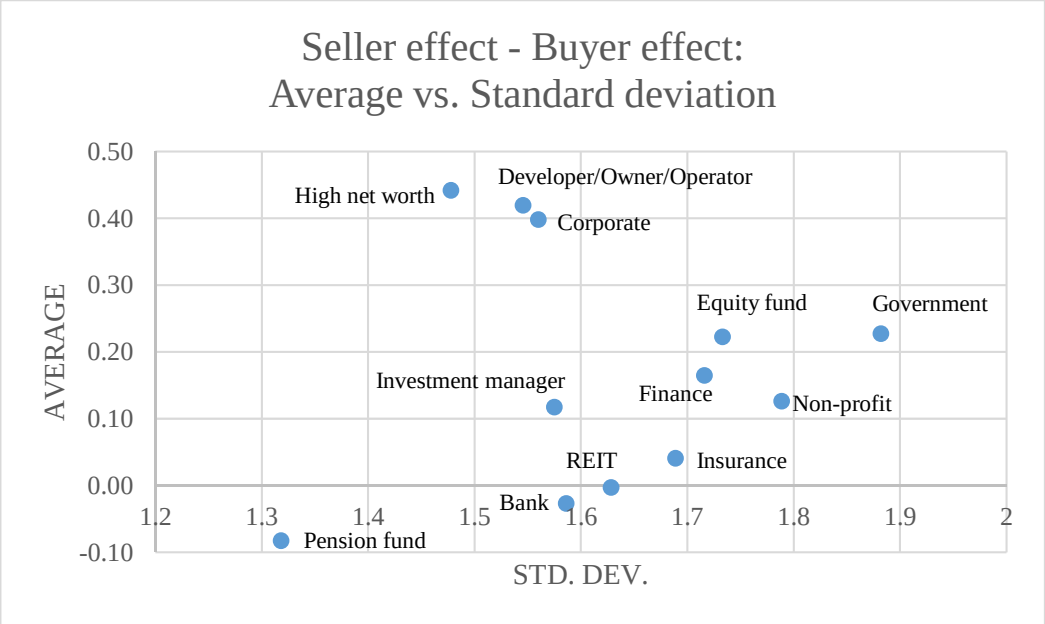


Note: The figure shows the marginal effect associated with *ForeignBuyer* conditional on the level of *INVACC*. The estimated coefficients are taken from the second column in Table 3 Column (2).

Figure 3: Difference between time-variant seller effect and buyer effect:
Equity fund vs. Pension fund

Note: The figure shows the difference between (i) estimated time-variant effects associated with seller cap type and (ii) estimated time-variant effects associated with buyer cap type in the case of equity fund and pension fund. The estimated coefficients are taken from Table 3 Column (4).

Figure 4: Average and standard deviation for
the difference between time-variant seller effect and buyer effect



Note: The figure shows the average and standard deviation of the differences between (i) estimated time-variant effects associated with seller cap type and (ii) estimated time-variant effects associated with buyer cap type. The estimated coefficients are taken from the second column in Table 3 Column (4).

Table 1: Tabulation of transaction-level data

Panel (a): Property type

Category	Freq.	Percent	Cum.
Apartment	10,352	35.83	35.83
Dev Site	50	0.17	36
Hotel	655	2.27	38.27
Industrial	5,537	19.16	57.43
Office	7,021	24.3	81.73
Other	120	0.42	82.15
Retail	4,966	17.19	99.34
Seniors Housing & Care	192	0.66	100
Total	28,893	100	

Panel (b): Year

Category	Freq.	Percent	Cum.
2005	1,719	5.95	5.95
2006	2,308	7.99	13.94
2007	2,817	9.75	23.69
2008	1,867	6.46	30.15
2009	1,164	4.03	34.18
2010	1,832	6.34	40.52
2011	2,282	7.9	48.42
2012	3,283	11.36	59.78
2013	3,771	13.05	72.83
2014	4,409	15.26	88.09
2015	3,441	11.91	100
Total	28,893	100	

Panel (c): Property location country

Category	Freq.	Percent	Cum.
Australia	568	1.97	1.97
Canada	393	1.36	3.33
France	180	0.62	3.95
Hong Kong	62	0.21	4.16
Japan	6,162	21.33	25.49
Netherlands	26	0.09	25.58
United Kingdom	274	0.95	26.53
United States	21,228	73.47	100
Total	28,893	100	

Table 1: Tabulation of transaction-level data (continued from the previous page)

Panel (d): Buyer capital type

Category	Freq.	Percent	Cum.
<unknown>	533	1.84	1.84
Bank	191	0.66	2.51
Cooperative	1	0	2.51
Corporate	1,563	5.41	7.92
Developer/Owner/Operator	16,819	58.21	66.13
Educational	112	0.39	66.52
Equity Fund	1,611	5.58	72.09
Finance	281	0.97	73.07
Government	151	0.52	73.59
High Net Worth	548	1.9	75.49
Insurance	192	0.66	76.15
Investment Manager	1,322	4.58	80.73
Listed Funds	35	0.12	80.85
Non Traded REIT	389	1.35	82.19
Non-Profit	131	0.45	82.65
Open-Ended Fund	103	0.36	83
Other	23	0.08	83.08
Other/Unknown	2	0.01	83.09
Pension Fund	106	0.37	83.46
REIT	3,613	12.5	95.96
Religious	34	0.12	96.08
REOC	1,066	3.69	99.77
Sovereign Wealth Fund	67	0.23	100
Total	28,893	100	

Table 1: Tabulation of transaction-level data (continued from the previous page)

Panel (e): Seller capital type

Category	Freq.	Percent	Cum.
<unknown>	710	2.46	2.46
Bank	726	2.51	4.97
CMBS	1	0	4.97
Cooperative	2	0.01	4.98
Corporate	2,040	7.06	12.04
Developer/Owner/Operator	16,813	58.19	70.23
Educational	40	0.14	70.37
Endowment	3	0.01	70.38
Equity Fund	1,395	4.83	75.21
Finance	602	2.08	77.29
Government	157	0.54	77.84
High Net Worth	669	2.32	80.15
Insurance	245	0.85	81
Investment Manager	1,766	6.11	87.11
Listed Funds	36	0.12	87.24
Non Traded REIT	120	0.42	87.65
Non-Profit	113	0.39	88.04
Open-Ended Fund	116	0.4	88.44
Other	13	0.04	88.49
Pension Fund	120	0.42	88.9
REIT	1,723	5.96	94.87
Religious	61	0.21	95.08
REOC	1,400	4.85	99.92
Sovereign Wealth Fund	22	0.08	100
Total	28,893	100	

Note: Each table accounts for the distribution of the property type, transaction year, property location country, buyer capital type, and seller capital type, all of which we control for by using the categorical dummy variables in the empirical analysis. In the empirical analysis, we also control for the categorical dummy variables accounting for buyer country and seller country.

Table 2: Summary statistics

Variable	Definition of variables	Obs	Mean	Std. Dev.	Min	Max
LN_PriceUSD	Log of transaction price measured in USD	28893	16.03	1.21	0.00	21.41
INVACC	The ratio of (i) the accumulated investment amounts from buyer country to property location country until the previous month to (ii) the accumulated investment amounts from buyer country until the previous month	28893	0.78	0.18	0.00	1.00
ForeignBuyer	Dummy variable taking value of 1 if buyer country is different from property location country	28893	0.05	0.21	0	1
LN_Floor	Log of the property size measured by square feet	28893	10.54	1.20	-0.87	19.02
LN_Land	Log of the land size measured by acres	28893	-0.45	1.83	-13.09	13.76
Age	Property age measured as the difference between the year corresponding to each data point and recorded developed year	28893	42.78	31.83	-5	360
Occ	Dummy variable taking value of 1 if the purpose of the investment is recorded as "Occupied" (i.e., own use)	28892	0.05	0.22	0	1
ValueAdded	Dummy variable taking value of 1 if the purpose of the investment is recorded as "Value-Added"	28892	0.19	0.39	0	1
Core	Dummy variable taking value of 1 if the purpose of the investment is recorded as "Core investment"	28892	0.45	0.50	0	1
Buyer_YoY_Return	The return measured as the growth rate of housing price index in buyer's country from 5 quarter prior to the current period to the previous quarter to the current period (i.e., 4 quarters = one year)	28011	0.02	0.05	-0.12	0.19
Host_YoY_Return	The return measured as the growth rate of housing price index in host country from 5 quarter prior to the current period to the previous quarter to the current period (i.e., 4 quarters = one year), which measured as the relative size to the same return measured for all the country	28633	18.59	279.83	-6021	1981
INV_OTHERS	Log of the flow investment amounts from all the countries other than the buyer country to property location country during the current month measured in USD	28893	19.82	0.97	13	23

Note: The table shows the summary statistics of the variables used in our empirical analysis.

Table 3: Baseline estimation

Dependent var = LN_PriceUSD	(1)		(2)		(3)		(4)	
	Coef.	Robust Std. Err.	Coef.	Robust Std. Err.	Coef.	Robust Std. Err.	Coef.	Robust Std. Err.
<Independent Variables>								
ForeignBuyer	0.122	0.038 ***	0.409	0.122 ***	0.110	0.038 ***	0.163	0.042 ***
INVACC			0.325	0.145 **				
ForeignBuyer×INVACC			-0.798	0.260 ***			-0.835	0.246 ***
LN_Floor	0.701	0.007 ***	0.701	0.007 ***	0.697	0.007 ***	0.696	0.008 ***
LN_Land	-0.040	0.004 ***	-0.040	0.004 ***	-0.036	0.004 ***	-0.037	0.004 ***
Age	-0.001	0.000 ***	-0.001	0.000 ***	-0.001	0.000 ***	-0.001	0.000 ***
INV_OTHERS	0.016	0.005 ***	0.014	0.005 ***				
<Fixed-effect>								
Property type	yes		yes					
Year	yes		yes					
Property host country	yes		yes					
Buyer country	yes		yes					
Seller country	yes		yes					
Buyer capital type	yes		yes					
Seller capital type	yes		yes					
Property type×Year					yes		yes	
Property host country×Year					yes		yes	
Buyer country×Year					yes		yes	
Seller country×Year					yes		yes	
Buyer capital type×Year					yes		yes	
Seller capital type×Year					yes		yes	
Constant term	yes		yes		yes		yes	
No. Obs.	28934		28893		29397		29090	
R-squared	0.70		0.70		0.73		0.73	
Root MSE	0.6623		0.6621		0.6389		0.6393	

Note: The dependent variable is the natural logarithm of the property price measured in US dollars. The definitions of the independent variables are provided in Table 2. The column labeled "Robust Std. Err." shows the heteroskedasticity robust standard error. The ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

Table 4: Robustness check

Dependent var = LN_PriceUSD	(1)		(2)		(3)		(4)	
	Matched samples based on geographical distance				Repeat sales samples with property-level fixed-effect			
	Distance<500m		Distance<100m					
	Coef.	Robust Std. Err.	Coef.	Robust Std. Err.	Coef.	Robust Std. Err.	Coef.	Robust Std. Err.
<Independent Variables>								
ForeignBuyer	0.377	0.133 ***	0.645	0.237 ***	0.040	0.044	0.734	0.219 ***
INVACC	0.308	0.158 *	0.666	0.283 **			0.842	0.262 ***
ForeignBuyer×INVACC	-0.881	0.268 ***	-0.863	0.355 **			-1.037	0.292 ***
LN_Floor	0.711	0.009 ***	0.773	0.013 ***				
LN_Land	-0.036	0.005 ***	-0.043	0.011 ***				
Age	-0.001	0.000 ***	0.000	0.000	-0.003	0.001 ***	-0.003	0.001 ***
INV_OTHERS	0.014	0.006 **	0.000	0.011	0.046	0.016 ***	0.030	0.017 *
<Fixed-effect>								
Property type	yes		yes		yes		yes	
Year	yes		yes		yes		yes	
Property host country	yes		yes		yes		yes	
Buyer country	yes		yes		yes		yes	
Seller country	yes		yes		yes		yes	
Buyer capital type	yes		yes		yes		yes	
Seller capital type	yes		yes		yes		yes	
Property					yes		yes	
Constant term	yes		yes		yes		yes	
No. Obs.	20605		5435		4586		4549	
R-squared	0.72		0.77		0.19		0.20	
Root MSE	0.6674		0.6647		n.a.		n.a.	

Note: The dependent variable is the natural logarithm of the property price measured in US dollars. The definitions of the independent variables are provided in Table 2. The column labeled "Robust Std. Err." shows the heteroskedasticity robust standard error. The ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

Table 5: Estimation for different sample years

Dependent var = LN_PriceUSD	(1) Year<=2010		(2) Year>=2011		(3) Year<=2008		(4) Year>=2009	
	Coef.	Robust Std. Err.	Coef.	Robust Std. Err.	Coef.	Robust Std. Err.	Coef.	Robust Std. Err.
<Independent Variables>								
ForeignBuyer	0.449	0.161 ***	1.478	0.353 ***	0.026	0.176	1.418	0.290 ***
INVACC	0.346	0.187 *	1.750	0.434 ***	-0.126	0.207	1.525	0.353 ***
ForeignBuyer×INVACC	-1.190	0.370 ***	-1.163	0.489 **	-0.442	0.348	-2.201	0.477 ***
LN_Floor	0.720	0.010 ***	0.694	0.010 ***	0.745	0.011 ***	0.688	0.009 ***
LN_Land	-0.039	0.007 ***	-0.040	0.005 ***	-0.049	0.009 ***	-0.039	0.005 ***
Age	-0.003	0.000 ***	0.000	0.000	-0.003	0.000 ***	0.000	0.000
INV_OTHERS	0.017	0.009 *	0.005	0.007	0.022	0.011 **	0.007	0.006
<Fixed-effect>								
Property type	yes		yes		yes		yes	
Year	yes		yes		yes		yes	
Property host country	yes		yes		yes		yes	
Buyer country	yes		yes		yes		yes	
Seller country	yes		yes		yes		yes	
Buyer capital type	yes		yes		yes		yes	
Seller capital type	yes		yes		yes		yes	
Constant term	yes		yes		yes		yes	
No. Obs.	11707		17186		8711		20182	
R-squared	0.73		0.70		0.75		0.69	
Root MSE	0.6259		0.6715		0.5940		0.6799	

Note: The dependent variable is the natural logarithm of the property price measured in US dollars. The definitions of the independent variables are provided in Table 2. The column labeled "Robust Std. Err." shows the heteroskedasticity robust standard error. The ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

Table 6: Estimation for different property types

Dependent var = LN_PriceUSD	(1) Apartment		(2) Hotel		(3) Industrial		(4) Office		(5) Retail	
	Coef.	Robust Std. Err.	Coef.	Robust Std. Err.	Coef.	Robust Std. Err.	Coef.	Robust Std. Err.	Coef.	Robust Std. Err.
<Independent Variables>										
ForeignBuyer	0.274	0.283	2.867	1.539 *	0.506	0.180 ***	0.849	0.219 ***	0.465	0.497
INVACC	0.114	0.322	2.835	1.912	0.490	0.221 **	1.023	0.256 ***	0.231	0.628
ForeignBuyer×INVACC	-1.191	1.147	-2.961	2.312	-4.071	0.737 ***	-0.865	0.322 ***	-0.107	0.982
LN_Floor	0.690	0.019 ***	0.771	0.039 ***	0.562	0.013 ***	0.853	0.011 ***	0.584	0.015 ***
LN_Land	0.018	0.008 **	-0.047	0.029	-0.016	0.007 **	-0.065	0.008 ***	-0.033	0.009 ***
Age	-0.005	0.000 ***	0.001	0.001	0.003	0.000 ***	0.000	0.000	0.000	0.000
INV_OTHERS	0.007	0.008	0.041	0.046	0.010	0.012	0.018	0.010 *	0.003	0.015
<Fixed-effect>										
Year	yes		yes		yes		yes		yes	
Property location country	yes		yes		yes		yes		yes	
Buyer country	yes		yes		yes		yes		yes	
Seller country	yes		yes		yes		yes		yes	
Buyer capital group	yes		yes		yes		yes		yes	
Seller capital group	yes		yes		yes		yes		yes	
Buyer capital type	yes		yes		yes		yes		yes	
Seller capital type	yes		yes		yes		yes		yes	
Constant term	yes		yes		yes		yes		yes	
No. Obs.	10352		655		5537		7021		1966	
R-squared	0.65		0.76		0.60		0.77		0.66	
Root MSE	0.5652		0.6618		0.6044		0.6554		0.6977	

Note: The dependent variable is the natural logarithm of the property price measured in US dollars. The definitions of the independent variables are provided in Table 2. The column labeled "Robust Std. Err." shows the heteroskedasticity robust standard error. The ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

Table 7: Additional independent variables

Dependent var = LN_PriceUSD	Coef.	Robust Std. Err.	
<Independent Variables>			
ForeignBuyer	0.291	0.142	**
INVACC	0.168	0.154	
ForeignBuyer×INVACC	-1.786	0.590	***
LN_Floor	0.715	0.010	***
LN_Land	-0.051	0.005	***
Age	-0.001	0.000	***
INV_OTHERS	-0.003	0.007	
ValueAdded	0.116	0.037	***
Core	0.055	0.034	
Buyer_YoY_Return	1.836	0.218	***
Host_YoY_Return	0.000	0.000	
<Fixed-effect>			
Property type	yes		
Year	yes		
Property host country	yes		
Seller country	yes		
Buyer capital type	yes		
Seller capital type	yes		
Constant term	yes		
No. Obs.	19276		
R-squared	0.70		
Root MSE	0.6771		

Note: The dependent variable is the natural logarithm of the property price measured in US dollars. The definitions of the independent variables are provided in Table 2. The column labeled "Robust Std. Err." shows the heteroskedasticity robust standard error. The ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

Table 8: Estimation of property returns

Dependent var = YoY return measured for quarter frequency	QTR_RETURN (1 to 5quarter)		QTR_RETURN (2 to 6quarter)		QTR_RETURN (3 to 7quarter)		QTR_RETURN (4 to 8quarter)	
	Coef.	Robust Std. Err.	Coef.	Robust Std. Err.	Coef.	Robust Std. Err.	Coef.	Robust Std. Err.
<Independent Variables>								
ForeignBuyer×INVACC	0.060	0.015 ***	0.106	0.014 ***	0.153	0.016 ***	0.191	0.017 ***
INVACC	-0.061	0.011 ***	-0.107	0.010 ***	-0.153	0.011 ***	-0.191	0.013 ***
ForeignBuyer	-0.054	0.009 ***	-0.088	0.008 ***	-0.119	0.009 ***	-0.147	0.011 ***
LN_Floor	0.000	0.000 ***	-0.001	0.000 ***	0.000	0.000 ***	-0.001	0.000 ***
LN_Land	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Age	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
INV_OTHERS	0.004	0.000 ***	0.003	0.000 ***	0.001	0.000 ***	0.000	0.000
host_YoY return (t-1, ⋯, t-8)	(Suppressed)		(Suppressed)		(Suppressed)		(Suppressed)	
_cons	0.048	0.011 ***	0.101	0.009 ***	0.156	0.014 ***	0.236	0.015 ***
<Fixed-effect>								
Property type	yes		yes		yes		yes	
Year	yes		yes		yes		yes	
Property location country	yes		yes		yes		yes	
Buyer country	yes		yes		yes		yes	
Seller country	yes		yes		yes		yes	
Buyer capital group	yes		yes		yes		yes	
Seller capital group	yes		yes		yes		yes	
Buyer capital type	yes		yes		yes		yes	
Seller capital type	yes		yes		yes		yes	
Constant term	yes		yes		yes		yes	
No. Obs.	22048		20991		19880		18850	
R-squared	0.81		0.82		0.81		0.81	
Root MSE	0.0197		0.0191		0.0197		0.0195	

Note: The dependent variable is the year-on-year return of the quarterly-level housing price index associated with the country where the property locates. For example, QTR_RETURN (1 to 5quarter) corresponds to the return of the housing price index from (a) the quarter that includes the month right after the period (i.e., month) when each property is bought to (b) that of five quarters later. Table 2 provides the definitions of the independent variables. The column labeled "Robust Std. Err." shows the heteroskedasticity robust standard error. The ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.