An Analysis of Investor Types in Real Estate Capital Markets:
Their Behavior and Performance from 2000 to 2006

by

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SUMBITTED TO THE DEPARTMENT OF ARCHITECTURE IN PARTIAL
FULFILMENT OF THE REQUIREMENTS FOR THE DEGREE OF

MASTER OF SCIENCE IN REAL ESTATE DEVELOPMENT
AT THE
MASSACHUSETTS INSTITUTE OF TECHNOLOGY

SEPTEMBER, 2006

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ABSTRACT

This thesis explores the timing and returns of eight types of real estate investors between 2000 and 2006. The investor types considered are 1) private local, 2) private national, 3) institutional, 4) public REIT (Real Estate Investment Trust), 5) foreign, 6) user/other, 7) syndicator and 8) condo converter. Observing over 41,000 transactions and using the repeat sale method to calculate investor capital appreciation returns, this thesis finds that private local investors are the largest investor type—both in absolute number and transaction volume—suggesting that real estate is still a very local business. In addition, this thesis observes that REIT, foreign and private investors each exhibited leading behavior over other investors, especially institutions, in capital flows: they each tended to start trends in buying and selling at various times from 2000 to 2006. Moreover, it finds that REIT, foreign and private investors took turns in earning the highest cumulative capital appreciation returns from 2000 to 2006, and that private local investors tended to lead all other investors, especially institutional, in return trends. These findings are significant as they increase the understanding of investor behavior and performance in capital markets and may ultimately help increase market information and efficiency.

Thesis Supervisor: Henry O. Pollakowski
Title: Principle Research Associate

Acknowledgements

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Introduction

The purpose of this thesis is to explore the behavior and performance of eight types of real estate investors in order to broaden the general understanding of real estate capital markets and ultimately make information within these markets more efficient. The eight investor types considered are 1) private local, 2) private national, 3) institutional, 4) public REIT (Real Estate Investment Trust), 5) foreign 6) user/other, 7) syndicator and 8) condo converter. Examining data provided by Real Capital Analytics, a real estate investment analysis firm based in New York City, this thesis explores dynamic empirical evidence regarding capital flows and capital appreciation returns by investor type.

By compiling transaction information and creating a repeat sale index to calculate capital appreciation returns, this thesis finds that private local investors are the largest category of investors—in both absolute number and transaction dollar volume. REITs and foreign investors earned the highest cumulative returns from 2001 until mid-2004. Beginning in early 2004 private local investor returns climbed significantly, becoming the highest cumulative returns of all investors from mid 2004 until early 2006. In addition, this thesis observes that REITs tended to start trends in buying and selling properties from 2000 to 2003, while private local investors tended to start trends in 2004 and 2005. Moreover, private local investors exhibited a *lead-lag* relationship to other investor types, especially institutions, in capital appreciation returns. Such real estate investor type findings are quite novel and offer a foundation upon which to conduct further study.

Many journal articles and textbooks recognize the idiosyncrasies of real estate compared to other asset classes. First real estate is a relatively expensive asset with high transaction costs and, therefore, relatively long holding periods.[1] Real estate markets are decentralized, with many types of buyers and sellers operating in thousands of different locales. There is not a singular place, or exchange, where buyers and sellers come together to trade properties.

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[1] Collett , David; Lizieri, Colin and Ward, Charles, Timing and the Holding Periods of Institutional Real Estate, *Real Estate Economics* Bloomington: Summer 2003, Volume 31, Issue 2, p. 205-222.

Second, unlike securitized assets, real estate is a heterogeneous asset class, whose properties are unique. Since no two buildings can actually be located on the exact same land parcel, location is the most fundamental difference among properties. Size, type, construction-quality, tenant occupancy and many other factors are additional determinants of value. Some investors inevitably know more about specific properties than other investors, implying that real estate market information in general can be inefficient.

The fundamental problem with real estate market irregularities and inefficiencies does not lie in the properties themselves. They are assets, albeit unique, that possess value. The root of the problem lies in the fact that investors see value differently, if they have an opportunity to see value at all. (Many investors never even know that a property is available for sale, preventing them altogether from bidding on that property.) Therefore, in order to understand real estate capital markets more completely, it is very important to understand the different investors, since they are the ones ascribing value to properties. Because each and every investor is unique with regard to property and location preferences, risk tolerances, tax motivations and so on, it is essentially impossible to study each individual investor separately. Therefore, it is appropriate to group similar investors into several major categories—or types—and to study these types relative to one another.

By exploring the behavior and performance of different real estate investors, this paper seeks to offer more information on real estate markets. Who buys from whom, who competes with whom, and who is the largest investor type are all important matters in increasing market information. Knowing who earns the highest returns relative to others, and who leads others in investment trends also provides greater information about the overall nature of capital markets. At a broad level, more information leads to greater market efficiency, which leads to greater market transparency and participation. Greater efficiency also leads to a more accurate understanding of the opportunity cost of capital within real estate markets, and ultimately a more efficient allocation of capital across all assets classes.

The remainder of this thesis is organized into five sections: First, it gives a brief historical background on capital markets and reviews pertinent literature. Second, there

is a review and description of the two data sets compiled by Real Capital Analytics since mid-2000. Third, the paper discusses capital flows into and out of real estate, describing how much each investor type bought and sold since mid-2000. Fourth, it describes the repeat sale methodology for calculating returns, then evaluates and interprets these investor returns from 2001 to May 2006. Finally, it concludes with a summary of observations and recommendations for further study. The Appendix contains supporting information and additional charts.

1. Historical Background and Literature Review

Since 2000 real estate capital markets have blossomed with activity. At the beginning of the decade, vast amounts of capital flowed out of a lagging stock market and into real estate, driving property values up dramatically. In addition historically low interest rates fueled the market's expansion, as buyers were able to borrow money at very low interest rates. Real estate offers several advantages when compared to other types of assets, such as stocks and bonds. On a very basic level, real estate is "bricks and mortar," a tangible asset that investors can visit, see and touch. Compared to stocks, which are intangible securities whose values plunged in 2000, real estate is a concrete investment which is easy for many to see and understand. In addition, real estate offers returns generally uncorrelated with stocks and bonds, delivering extra diversity to investor portfolios. Modern Portfolio Theory (MPT) (Markowitz, 1952) supports investment across uncorrelated asset classes in order to mitigate risk and increase returns; real estate offers many opportunities for such diversity. The phenomenal rise of real estate since 2000 offers an interesting backdrop against which this thesis is written.

While the existing literature regarding investor behavior and performance is abundant, there are very few articles that comprehensively address the behavior and performance of all investor types relative to one another. The primary reason for this paucity in literature is the availability of supporting data. This study could not be done without the extensive transaction observations made by Real Capital Analytics (RCA).

Regarding institutional investor behavior, Armonat and Pfnuer (2004) argue that existing market information (which is anecdotally inefficient) restricts the application of

capital market models, such as MPT, in determining the appropriate amount of real estate to hold in large portfolios. Recognizing the inefficiencies and irregularities of the real estate asset class, and real estate's "special decision-making environment", they warn against treating real estate like securities, as this may cause inefficient use of capital across asset classes.[2] Institutional investors, in short, need more accurate information for investing in real estate.[3]

In addition, because many institutional investors such as pension funds and endowments are not subject to taxes, they are often considered the "marginal investor." According to Colwell and Webb (1980), the marginal investor (who is in the lowest tax bracket) sets the market value because they can pay the most for properties.[4] Perhaps the ability to pay the highest price partly explains why institutional investors in the RCA data set typically earn the lowest return.

Collett, Lizieri and Ward (2003) find that real estate investors have longer holding periods than they usually claim (less than eight years in the 1990s) because of high transaction costs and illiquidity. The authors find that larger properties usually have longer holding periods than smaller properties, because the market is "thinner" and the higher transaction costs must be amortized over longer periods.[5] This thesis shows evidence that institutional and foreign investors typically purchase the largest properties, while private local investors typically purchase the smallest properties. It follows then from authors' conclusion that institutions would often hold properties longer than private local investors because they invest in different property sizes. Furthermore, a study on property size and risk by Ziering and McIntosh (1999) concludes that the largest properties have the highest volatilities, causing them to under-perform relative to smaller properties during recovery periods and outperform during times of economic expansion.

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[2] Armonat, Stefan and Pfnuer, Andreas, <u>Asset Allocation versus Entrepreneurial Decisions in Real Estate Investment</u>, *Briefings in Real Estate Finance* London: Sep 2004, Volume 4, Issue 2, p. 131-146, quote in Section entitled "Alternative approaches to real estate investment parameter estimates."

[3] Armonat and Pfnuer, 2004.

[4] Colwell, Peter F., Webb, James R, <u>Typical Investors, Marginal Investors and Market Value</u>, Real Estate Appraiser and Analyst Chicago: Nov/Dec 1980, Vol. 46, Issue 6.

[5] Collett , David; Lizieri, Colin and Ward, Charles, <u>Timing and the Holding Periods of Institutional Real Estate</u>, *Real Estate Economics* Bloomington: Summer 2003, Volume 31, Issue 2, p. 205-222.

Their conclusion is that owners of the largest properties have a unique set of illiquidity issues and must sell or "harvest profits" at the right time.[6] Both of these studies suggest that property size determines—to some extent—investor behavior.

Private investors differ from other investor types in more ways than investment size. In two separate papers, Brown (2004 & 2005) suggests that private investors often combine ownership and control in property to affect their property returns positively. "A similar influence, absent a controlling interest, is not available in securities markets," he says.[7] Certain investors, he argues, "self select into a market in which they combine entrepreneurial labor with their capital resulting in a unique mix of determinism and probability"[8] This implies that the investor can influence the probability distribution of expected returns, skewing it positively to the right; hence, what Brown calls a "fat right tail phenomenon." Furthermore, recognizing some of the inefficiencies and irregularities in real estate, Brown (2004) goes on to pose the following:

> Knowing that they cannot easily diversity away site-specific risk, one wonders if private real estate investors seek out such risk in order to employ their abilities to maximize the possibilities inherent therein. For these investors, the burdens and inefficiencies of this market become opportunities.[9]

Often times the private investor is not compensated for the addition of labor or "sweat equity" that causes higher returns. In such instances Brown argues the following:

> That addition confounds the accurate computation of both return (the compensation of labor is mixed with the compensation for risk bearing) and risk. Entrepreneurial property owners appear to invest a substantial amount of their time. The cost of this time, if contributed by outside vendors, comes out in the operating statement. If included, this cost would reduce NOI and the returns.[10]

Private investors, therefore, must be careful to account for all their labor input when comparing real estate returns to other investment returns. Brown (2005) explores this subject further by using an investor behavior model that "discloses that real estate

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[6] Ziering, Barry and McIntosh, Willard, <u>Property Size and Risk: Why Bigger is not Always Better</u>, *Journal of Real Estate Portfolio Management* Boston: 1999, Volume 5, Issue 2, p. 105-112.
[7] Brown, Roger J,. <u>Risk and Private Real Estate Investments</u>, *Journal of Real Estate Portfolio Management* Boston: May-Aug 2004, Volume 10, Issue 2, p. 113-127, quote from Abstract.
[8] Brown, quote from Abstract.
[9] Brown, 2004, quote from Conclusion.
[10] Brown, 2004, quote from Conclusion.

investment decisions are a labor trade-off rather than a portfolio trade-off."[11]   While a simple labor model claims that people choose to spend their time on either work or recreation, Brown introduces a third element, real estate investing, as choice; then he studies the new complexity that real estate investing adds. He says, "One conclusion is a natural point in time where real estate investing is supplanted by investing in financial assets."[12]   Brown's articles are extremely insightful in explaining behavioral and performance differences among private, "entrepreneurial" investors.

REITs are another major investor type whose behavior and performance are unique because of their public ownership structure. Conner and Falzon (2004) argue that the most important difference between the public and private real estate markets is the significantly higher volatility of the public markets. These volatility differences explain some of the REITs' behavior and performance, especially in the short run.[13]   For example, arbitrage opportunities sometimes exist for REITs when their share prices trade at significant premiums over their underlying property values (or Net Asset Value— NAV). This permits them to raise large quantities of equity in the stock market and buy relatively undervalued real estate assets. Conner and Falzon point out that this arbitrage phenomenon began to occur in the second half of 2001, when most REIT stocks were trading at premiums to NAV. The premium disappeared a short time later, but then reappeared in most of 2003. This was the same time REITs were buying large quantities of property and earning exceedingly high returns in the RCA data sets.

This thesis draws upon the previous studies to explain some of the differences in timing and returns among investor types within the RCA data set. The following section describes this data in more detail.

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[11] Brown, Roger J, The Labor Component of Private Investor Real Estate Returns,
Journal of Real Estate Portfolio Management Boston: Sep-Dec 2005, Volume 11, Issue 3, p. 295-306, quote in Abstract.
[12] Brown, 2005, quote in Abstract.
[13] Conner, Philip and Falzon, Robert, Volatility Differences between the Public and Private Real Estate Markets, *Briefings in Real Estate Finance* London: Sep 2004, Volume 4, Issue 2, p. 107-117.

2. Review and Description of the RCA Data Sets

This thesis analyzes two separate but related data sets. The first, *The Overall Data Set*, is larger and used to evaluate overall trends in capital flows since 2000. Because of its size, this data set is deemed more comprehensive than the other data set for the purpose of observing trends in real estate capital markets. The second, *The Repeat Sale Data Set*, contains prior sale information that is used to create a repeat sales index. This index is helpful in analyzing the returns of each investor type. The two data sets and their respective limitations are briefly described below.

The Overall Data Set

RCA has collected information for 41,124 commercial real estate transactions in the United States since mid-2000. Each transaction is $5 million and greater, and the total aggregate value of these transactions through May 2006 is just over $1 trillion. See *Appendix A* for more information on the variables contained in the data set. RCA has classified approximately 85% of buyers and 77% of sellers in these transactions, enabling a detailed examination of investor behavior and performance. Buyers and sellers are grouped into one of six *major* categories, including private-local, private-national, foreign, institutional, REIT/public, and user/other. When a transaction involves a partnership of investors from different major categories, the institutional category trumps all—in terms of investor identification—then foreign, then REIT. For example, if an institutional and a private local investor partner up to buy a property, the buyer is labeled "institutional." See *Appendix A* for more information on investor classification.

In addition to the six major categories mentioned above, RCA has also added two *specialized* investor categories: syndicators and condo converters. If a deal is bought for condo conversion, the investor is classified as a "condo converter" regardless if the investor is private, REIT, foreign, or institutional. Syndicators are also comprised of all investor types, and receive special identification because of their unique ownership structure. Both of these categories have experienced tremendous growth and popularity in the latest real estate cycle, and creating separate classifications for them allows more accurate evaluation of investor trends. Therefore, the eight buyer categories are further defined as follows.

1) <u>Private local</u> investors are the largest category of investors and the one upon which this thesis focuses. They include private individuals, private investors, private developers and private trusts that operate within a small region of the country.

2) <u>Private national</u> investors are comprised of private firms, funds and individual investors which have a super-regional or national investment reach. They also include private Real Estate Investment Trusts (private REITs).

3) <u>REIT/public</u> represents publicly-traded (securitized) REITs and Real Estate Operating Companies (REOCs) which are typically more regional or national in scope. They offer all types of investors the opportunity to invest in real estate through entities which receive unique tax treatment.

4) <u>Foreign</u> investors are comprised of off-shore entities which invest in the United States; they are broken down into nine capital classifications: General, Australia, Canada, Europe, Germany, Middle East, Pacific Rim, South America and the United Kingdom. This thesis treats them all as one category.

5) <u>Institutional</u> investors are comprised of various real estate funds that manage money on behalf of others, including endowments, pension funds, banks, finance companies, and insurance companies. Many of these institutional investors are not subject to taxes.

6) <u>User/other</u> are corporations, retailers, governments and other entities which use the real estate for business or entity operations. It also consists of other buyers and sellers not captured in another investor category.

7) <u>Syndicators</u> include Tenancy-in-Common (or TIC) investment groups which are formed by many separate buyers to purchase real estate. Each buyer receives a title for his undivided interest in the real estate, thereby making this kind of transaction quite convenient for Section 1031 tax-deferred exchanges.[14] Because of this unique ownership structure, syndicators are seldom, if ever, sellers.

8) <u>Condo converters</u> are an outgrowth of the "condo craze" that has manifested itself in the last five years. While apartments are the most common property type to be bought and converted by these investors, office, industrial, hotels and even retail are also

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[14] Section 1031 tax-deferred exchanges are described later in *Section 3.*

targets for conversion. Because condos are resold to individual owners, the condo converters never sell the whole property at one time.

The number of observations in the data set grew each year, from 2000 to 2006, as illustrated in **Figure 1.**[15]

Figure 1

Transaction Count by Year
in The Overall Data Set
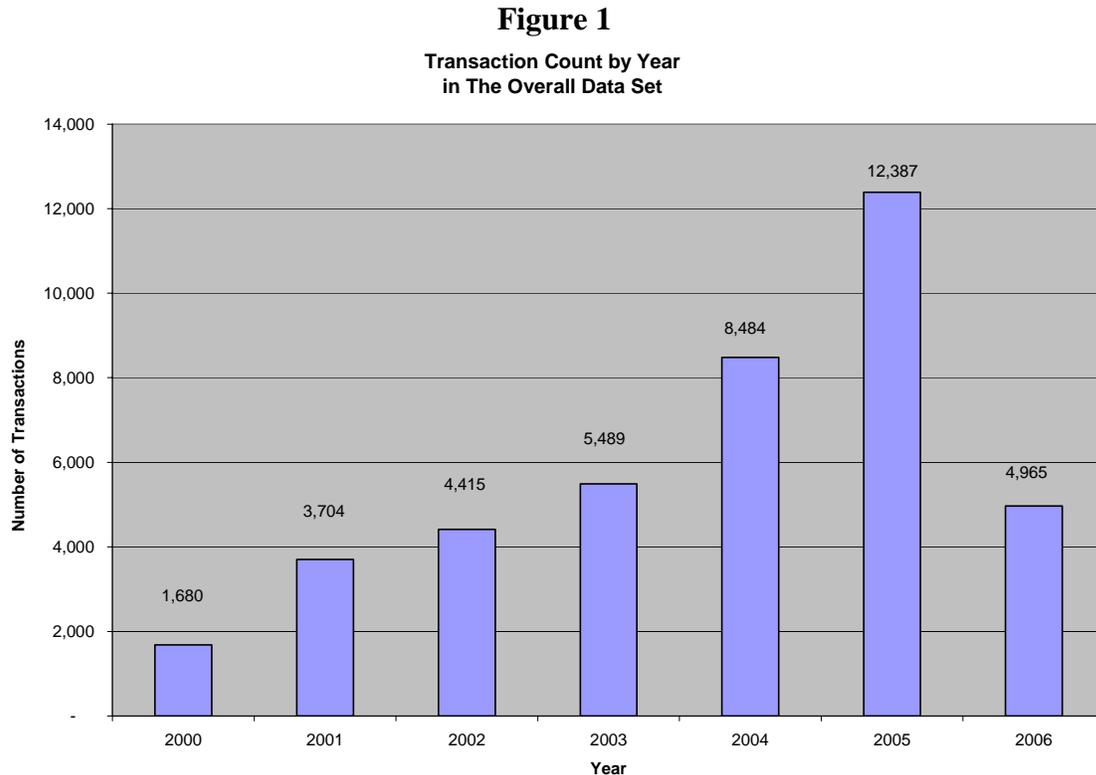
The Overall Data Set Limitations:

The data pose some limitations, despite the wealth of information. The first limitation is data history. Because these transactions only reach back to mid 2000, it is difficult to draw conclusions across time. Real estate cycles are approximately ten years, meaning that this data likely covers only part of one cycle. Moreover, the rise of real estate values in this latest cycle could be an aberration compared to all the previous cycles. While it would be "nice" to have data reaching across multiple cycles, it is realistically difficult to obtain such information. Quite simply, the technology used by RCA today to collect this information was not available in previous cycles.

The data also lack some variables useful for hedonic regression analysis. These are property characteristics which are extremely important in determining the price of

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[15] In 2000 data were collected from July through December. In 2006 data were collected through May 31st.

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property. Some that *are* included in the data set are square footage, age, property type, location and even occupancy rate (albeit in a limited capacity). Some that are *not* included are Class A, B, or C quality status; parking ratios and amenity information; and property type specific information, such as clear-height, sprinkler information, and number of dock-doors.

Another limitation is the lack of income returns. Approximately 13,424 (or 33%) of all transactions have cap rate information. The cap rate is a fraction equal to the property's Net Operating Income (net rent) divided by its purchase price; however, cap rates provide implied income in only the first year. They never provide income growth or duration. Because transaction information is often private and buildings are numerous, it is impossible to collect income returns for every property during every year.
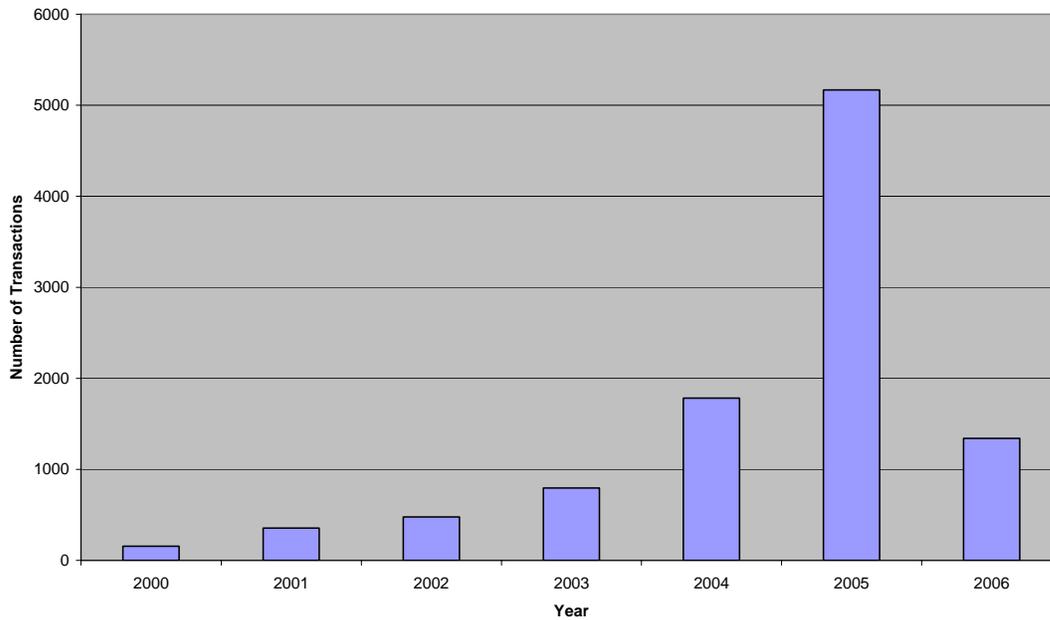
The Repeat Sale Data Set

The second data set—*The Repeat Sale Data Set*—contains 10,073 total transaction data points, many of which are also included in *The Overall Data Set.* Each data point contains the prior transaction price and date, the second transaction price and date, plus buyer and seller identification in the second transaction. (See *Appendix A* for a more detailed variable description.) The second transaction prices start at $1.2 million and go higher. With the exception of one property which was acquired in 1916, the earliest acquisition date is 1961.

Having each property's purchase price, sale price and holding period enables calculation of each property's periodic appreciation returns. Compiling all the properties' returns across a given time period creates a "repeat sale index" which can be used to evaluate investment returns (capital appreciation returns) for any given sample. There are many unknown characteristics that determine value for each property; a repeat sale index allows the observer to eliminate those characteristics altogether from consideration, because the *same* property is observed at two points in time. Despite some shortcomings (which are described later), the *ex post* nature of repeat sales information–as opposed to *ex ante*—makes it quite a reliable return metric.

Figure 2 illustrates the transaction count by year in the Repeat Sale Data Set.[16]

Figure 2

**Transaction Count By Year
in The Repeat Sale Data Set**

The Repeat Sale Data Set Limitations

      While there are relatively few limitations to this data set, the primary limitation is sample size: because the number of observations is relatively small, the repeat sale index may show biases. **Figure 2** illustrates that there is much more data since late 2004 than earlier, potentially causing biases, as well. In addition, like the *Overall Data Set*, another limitation is the lack income return information. This means that investor total returns are not observable. Despite these limitations, there are still many opportunities to make meaningful observations about investor returns in real estate capital markets.

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[16] In 2000 data were collected from July through December. In 2006 data were collected through May 31st of that year

3. Real Estate Capital Flows (as observed in *The Overall Data Set*)

As observed in the larger *Overall Data Set*, private local investors represent the largest category of investors in buying and selling properties. **Figure 3** illustrates the number of transactions as counted by buyer type and seller type, respectively.[17]
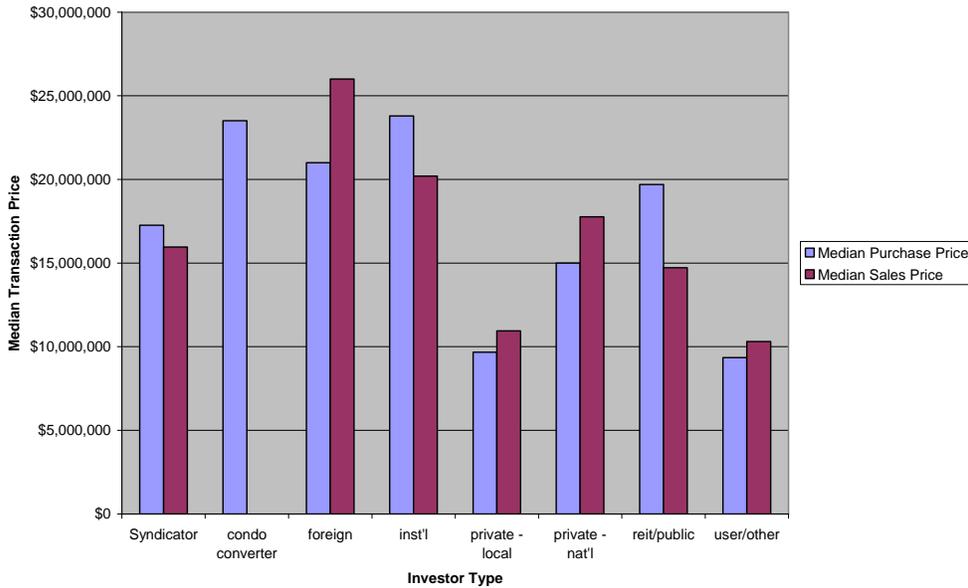
Figure 3

Transaction Count Across All Years by Buyer & Seller Type
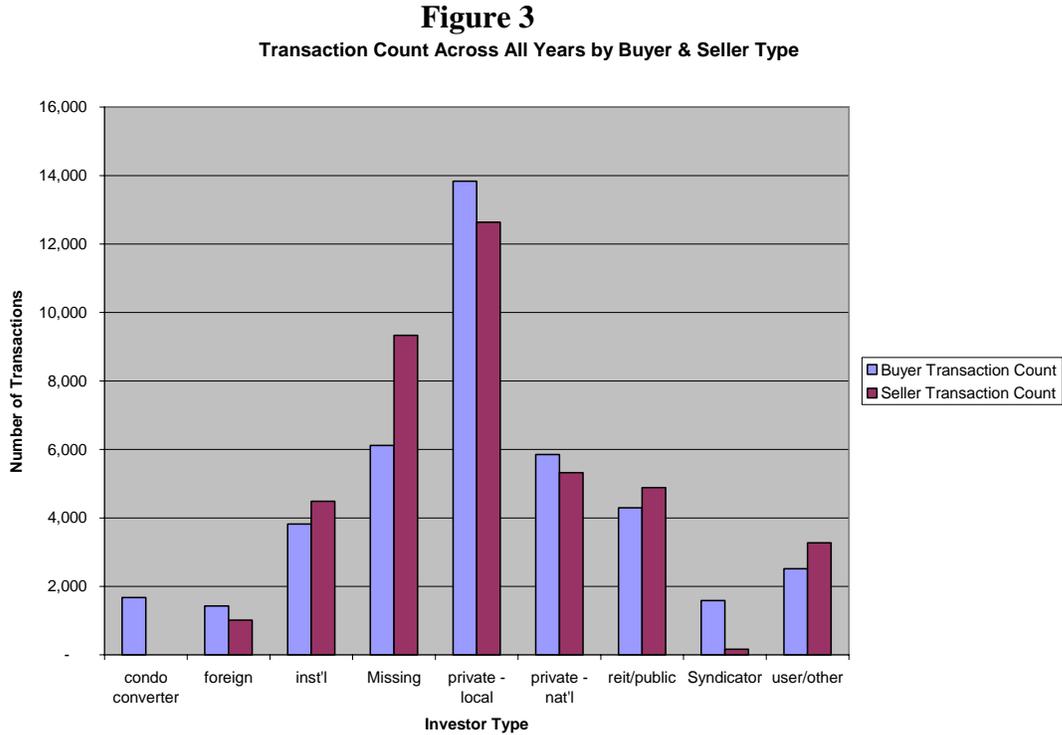
Given this information, it is reasonable to conclude that real estate is still a very "local" business, comprised of many private local investors who are relatively close to the transaction. As described above, these transactions often include joint ventures, whereby one investor type partners with another. Since institutional, foreign and REIT investors trump other investor partners in terms of investor identification, the number of transactions in which private local investors are involved is actually higher than these figures indicate.

The data also show that median transaction prices differ across investor types between mid-2000 and May 2006. Foreign, institutional and condo converters have the largest median transaction prices. Users and private local investors have the smallest median transaction prices. **Figure 4** illustrates median transaction prices by buyer and seller type, respectively.

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[17] This figure also includes transactions whose buyer and/or seller were missing. Figures A and B in Appendix B illustrate investor transaction count by year.

Figure 4
Median Transaction Price by Buyer & Seller Type

The mean (or average) transaction price is the smallest for private local investors and the largest for foreign and institutional investors, as illustrated by **Figure 5** below.[18]

Figure 5
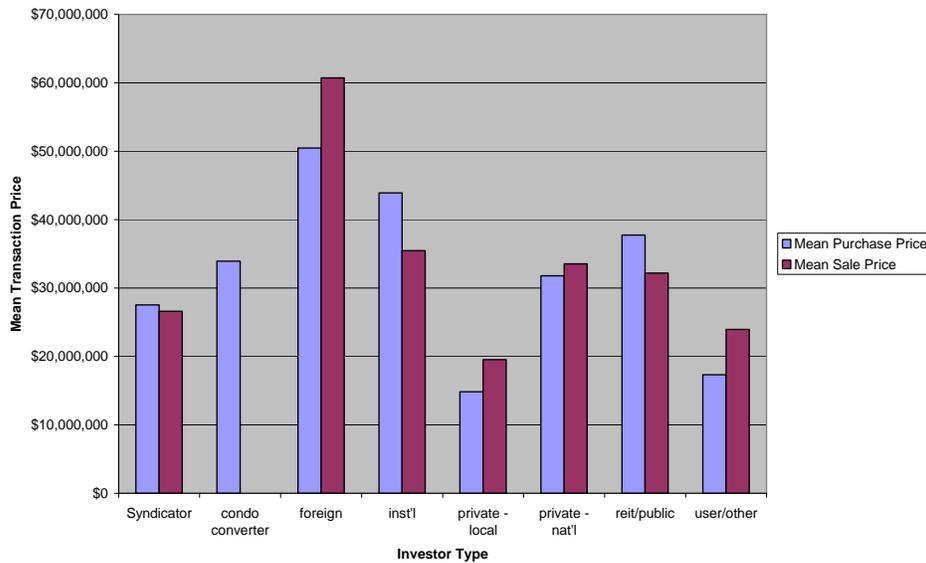**Mean Transaction Price by Buyer & Seller Type**

Figure 5 also shows that relatively large transactions cause the mean values to be higher than the median for each investor type.

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[18] When observed over time, the mean transaction prices among each investor type tends to grow between the years 2000 and 2006, as illustrated by Figures C & D in Appendix B

Transaction Dollar Volume

Even though the median and mean transaction prices for private local investors are the smallest of all investor types (with the minor exception of user/other), private local total transaction dollar volume is the highest of all investors. The sheer number of private local transactions explains this phenomenon. **Figure 6** illustrates the total buyer expenditures and total seller proceeds for each investor type from mid 2000 through May 2006. It also shows the net expenditures, equal to total buyer expenditures minus total seller proceeds. When negative, the net expenditures indicate that the total value of property sold exceeded the total value of the property bought.[19]

Figure 6

Total Transaction Dollar Volume by Investor Type
from mid-2000 thru May 2006
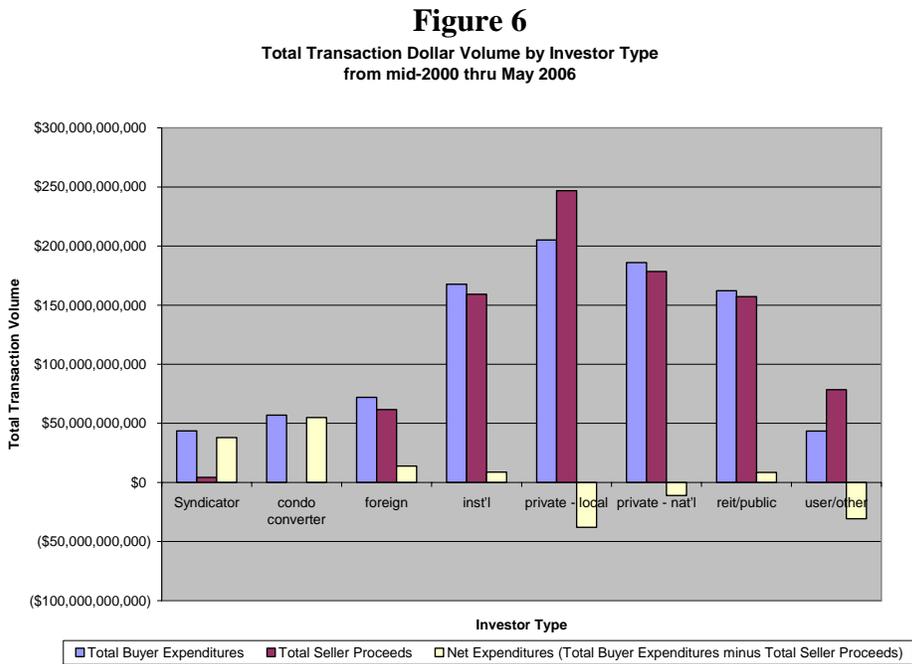
Figure 6 provides several interesting insights. First, it shows that private local investors were the greatest net sellers of real property—in absolute transaction dollar volume—between mid 2000 and May 2006. Second, users were also very large net sellers in the sample period, especially given their relative size in dollar volume. One possible explanation is that users were selling their properties as they endured the economic recession of the early 2000s and their revenues possibly lagged. Third, as

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[19] These figures exclude transactions whose buyer and/or seller type were missing, explaining why net transaction activity does not exactly equal zero.

mentioned earlier in the description of buyers, syndicators and condo converters are rarely, if ever, sellers.

The investing behavior of users, condo converters and syndicators exhibited in **Figure 6** deserves greater discussion. The chart illustrates that users often behave differently than the other "major" types of real estate investors.[20] This stands to reason. Users are not typically buying properties for their income stream, as is the case for most other investors. They are buying properties for a specific use, for operations. This means that users measure property value differently than other investors: if a property suits their operations extremely well, then they are willing to pay a higher price. Generally speaking, a user is willing to pay more for an empty building than other investors, because users can make immediate use of the building. Any other investor must hold an empty property until a tenant is identified. Given the uncertainty of finding a tenant, the investor usually buys at a discount; however, this generalization could change if the investor has a tenant in hand. Whatever the case, users generally behave differently than other types of investors.

Syndicators (TIC investors) also behave differently from the "major" real estate investors, in that they rarely sell the whole property. Instead, each individual investor sells his undivided interest to another individual investor, who then becomes part of the syndicate. The significant level of buying activity by syndicators can be partly explained by the rise in popularity of the "1031 exchange", a section in the tax code allowing an investor to sell one property and defer any ensuing capital gains taxes by investing the sales proceeds in "like-kind" property within six months. The "1031 exchange" also partly explains the rise in overall real estate investment activity among other investor types.

The property demand from condo converters was fueled in large part by historically low interest rates that enabled the end-user, the homeowner, to buy condo units relatively inexpensively. Condo converters are viewed differently from the "major" real estate investors, because they sub-divide and sell the acquired property, rather than hold it for rental income.

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[20] For purposes of this thesis, the major types of investors are private local, private national, institutional, foreign, public REIT and user/other.

Transaction Dollar Volume across Time

Figures 7 through **12** summarize total dollar volume by investor type in each year.[21] There are two types of investors worthy of noting: public REIT and private local. In the early years (mid-2000 through 2002), REIT investors were behaving in ways quite contrary to other investor types, excluding user/other, syndicators and condo converters. For example, in 2000 REITs were net sellers, while the others (private local, private national, foreign, and institutional) were net buyers.

Figure 7

Total Transaction Volume in Dollars across all Property Types
July to December 2000
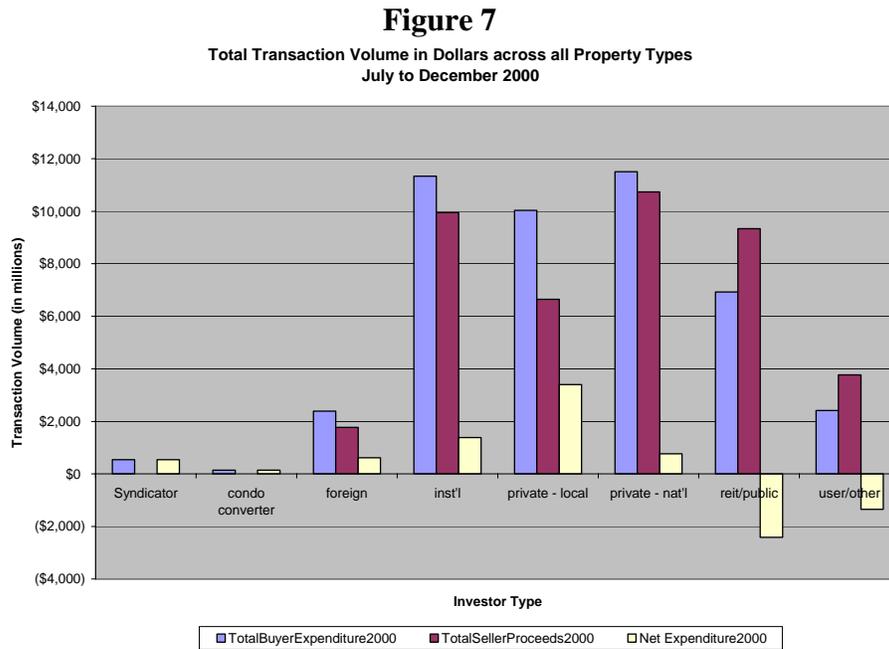
In 2001 REITs were still the largest net sellers, while foreign and private nationals became net sellers, too. Private local and institutional investors were relatively large net buyers of properties.

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[21] These figures exclude transactions whose buyer and/or seller type were missing, explaining why net transaction activity does not exactly equal zero.

Figure 8

Total Transaction Volume in Dollars across all Property Types in 2001
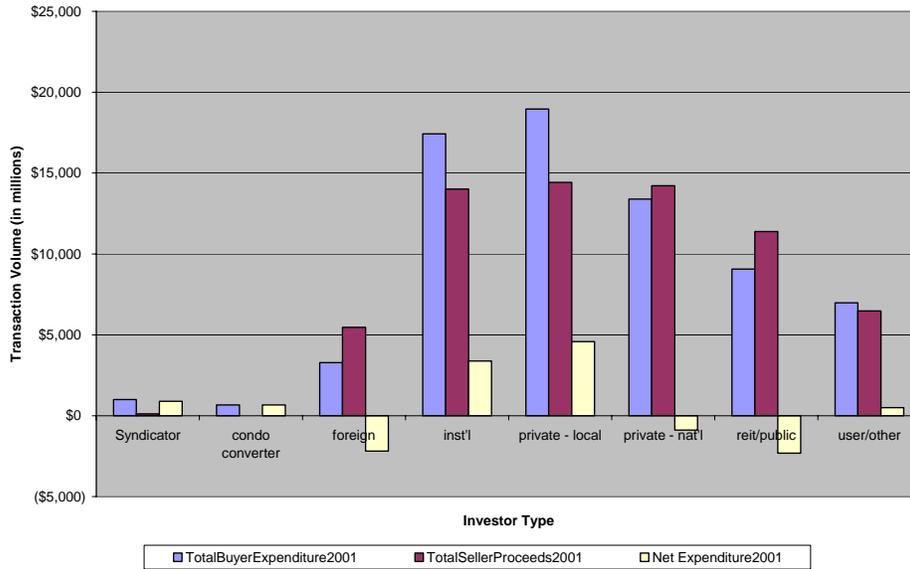
In 2002 REITs reversed their trends and became tremendous net buyers, as illustrated in **Figure 9**. With the small exception of private locals, the other investors were net sellers in 2002.[22]

Figure 9

Total Transaction Volume in Dollars across all Property Types in 2002

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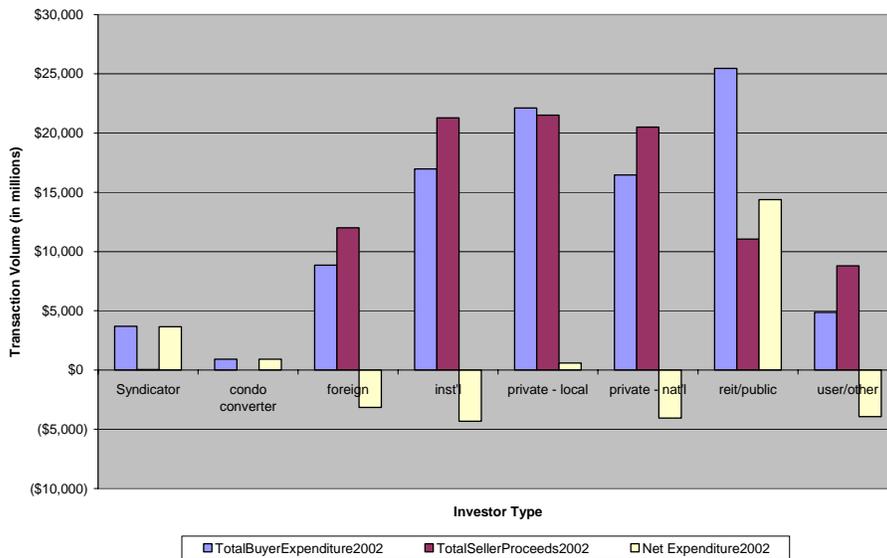
[22] Again, this excludes syndicators, condo converters and users/others

One possible explanation for REITs' voracious property demand during 2002 is the premium that many REIT shares were experiencing relative to property values. As described earlier, these arbitrage opportunities may have encouraged REITs to buy properties with equity raised in a relatively highly valued stock market. This marks the beginning of a four-year period when REITs were net buyers.

It was not until 2002 and 2003 that institutions finally "caught up" with the investment activity already exhibited by the other investors (see **Figure 10**). In that year, institutions were net sellers while most other investors were net buyers.

Figure 10

Total Transaction Volume in Dollars across all Property Types in 2003
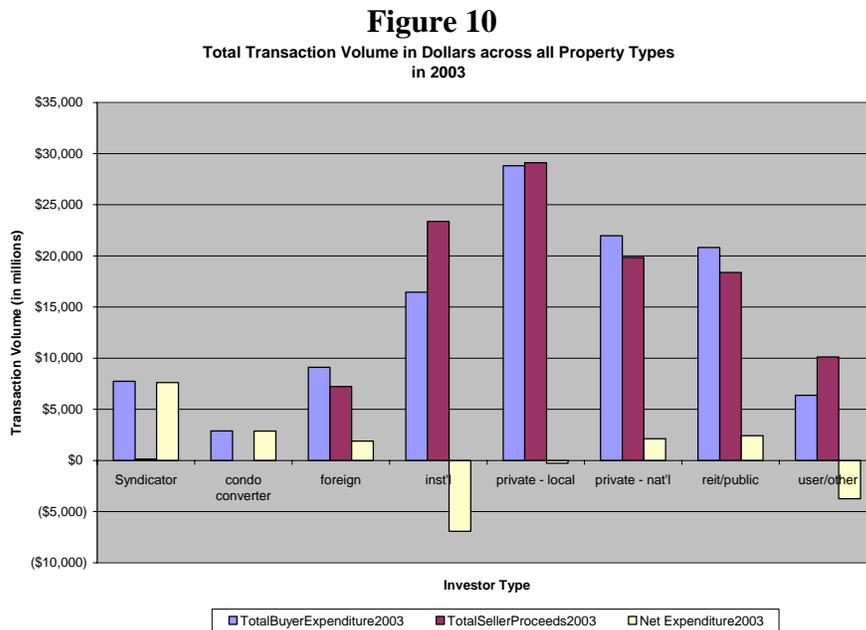
In 2004 private local, private national and institutional investors were net sellers, while REITs and foreign investors were still net buyers. In terms of absolute dollars, private local investors were the largest net sellers. For the next three years private local investors were net sellers.

Figure 11

Total Transaction Volume in Dollars across all Property Types in 2004

Figure 11
Total Transaction Volume in Dollars across all Property Types in 2004
(chart: Investor Type vs. Transaction Volume (in millions))
Legend: TotalBuyerExpenditure2004, TotalSellerProceeds2004, Net Expenditure2004
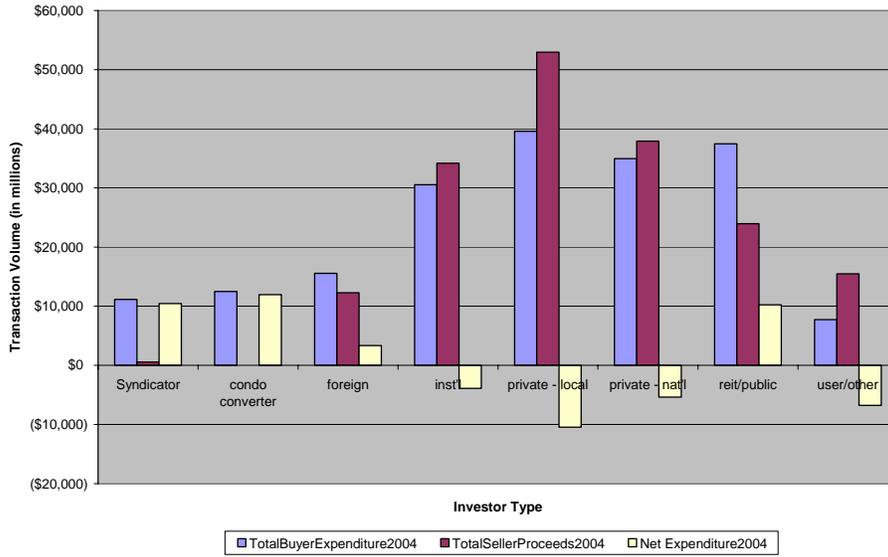
In 2005 that same trend continued, and private locals became the biggest net sellers by an even larger margin. In that year institutions became net buyers again.

Figure 12

Total Transaction Volume in Dollars across all Property Types in 2005

(chart: Investor Type vs. Transaction Volume (in millions))
Legend: TotalBuyerExpenditure2005, TotalSellerProceeds2005, Net Expenditure2005
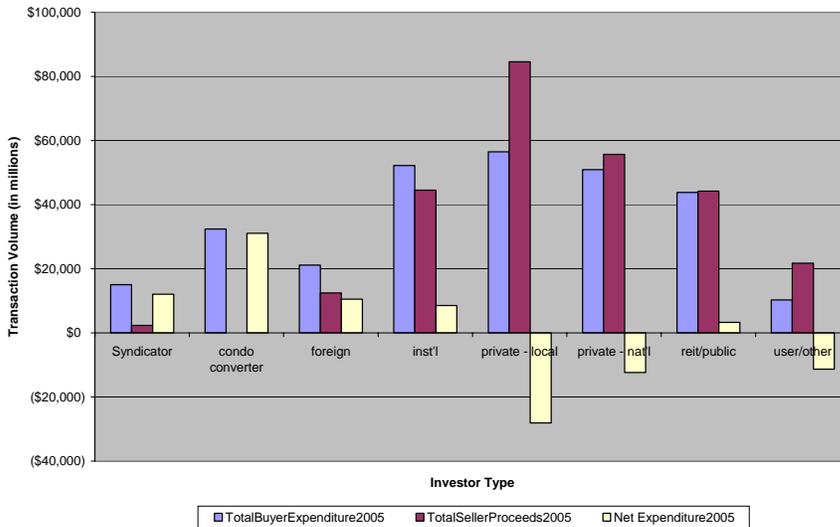
In 2006, REITs became the largest net sellers by a large margin. Private local investors were the only other net sellers during that time.[23] It is also interesting to note that foreign

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[23] This, again, excludes users.

investors were net buyers of real estate from 2003 until May 2006. Relatively strong foreign currencies could explain some of this foreign investor behavior. Attractive US real estate markets could also explain their strong demand.

Figure 13

Total Transaction Volume in Dollars across all Property Types
January through May 2006

At a very high level, these differences in capital movement among investor types illustrate some *lead-lag* phenomena; however, it is difficult prove this conclusively given the 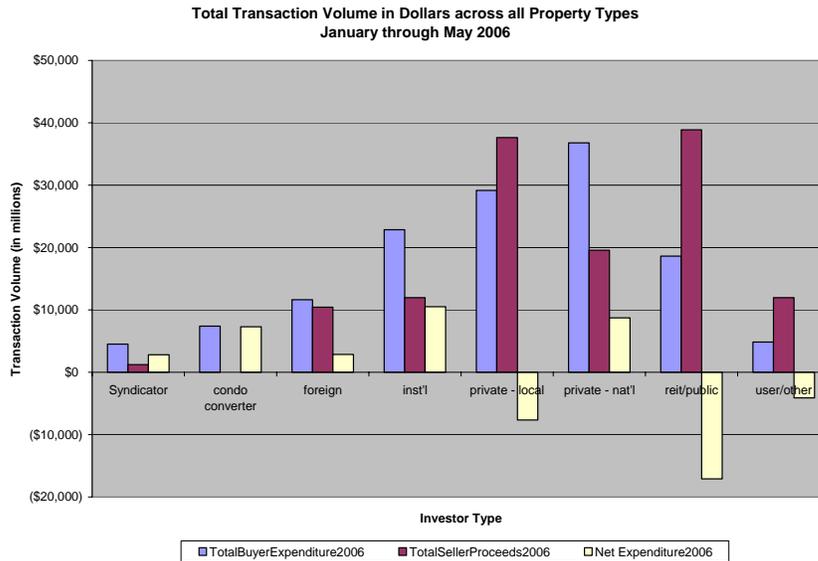short time period and various exogenous forces affecting each investor type. "Lead-lag" refers to the relationship that two or more investor types have across time. Specifically, it refers to a situation in which one investor type acts in a certain way, and then, some time later, another investor type acts in a similar way. In other words, 'investor one' leads 'investor two', and 'investor two' lags 'investor one.' For example, REITs were the only net sellers of properties in 2000.[24] Then foreign and private national investors joined REITs as being net sellers in 2001. In 2002 REITs led others again as being massive net buyers of property when hardly any other investors were net buyers. In 2004 and 2005, the "leaders" changed, and private locals and private nationals were the first investors to become and remain net sellers those two years. Conversely, institutions often lagged and were the last to follow suit in buying or selling properties.

If these capital flows do not illustrate *lead-lag* phenomena, they show, at a very minimum, that investors behave in different ways. Their timing into and out of

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[24] Again, this analysis excludes users, syndicators and condo converters.

investments is often driven by exogenous forces, such as the arbitrage opportunities in the stock market enjoyed by REITs, or favorable foreign currency markets for some foreign investors. These exogenous forces may affect investor types differently, and they often explain 'contrarian' investor behavior.

Coincidentally, according to the Repeat Sale Index results described later, REITs earned among the highest returns of all investors between 2000 and 2003. Moreover, private locals and then private nationals earned the highest returns between 2004 and May 2006. The repeat sale index provides a richer and more accurate examination of investor performance, and *Section 4—Evaluation of Investor Returns* devotes more explanation to the methodology and results. However, further study is required to understand the complete relationship between capital flows and property returns.

Transaction Dollar Volume by Property Type

Figures 14 and 15 illustrate the transaction volume in dollars broken down by property type. **Figure 14** shows the total amount each investor purchased between mid-2000 and May 2006, while **Figure 15** illustrates the total amount each investor sold during those years.[25]

These figures illustrate that office was the most commonly traded property type in terms of total dollar volume. In fact, with the notable exception of condo converters (who, logically, buy mostly apartments), every investor type bought more office than any other property type. **Figure 14** also illustrates that private locals bought a large volume of apartment property, and REITs bought a relatively large volume of retail property.

Observing what investors sold (in **Figure 15**) during this time indicates that all investors, with the exception of private locals, sold more office property than any other type in terms of transaction dollar volume. Institutional investors sold relatively high quantities of office compared to the rest of their portfolios and compared to other investors. Private locals sold more apartment properties—in dollar volume—than any other property type and also sold a relatively large amount of retail property.

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[25] Figures 14 & 15 eliminate hotel, mixed and development property types because data for these property types were not collected—or were not consistent enough—each and every year. Hotels, mixed and developments, not always considered "core" property types, represent just 2,190 (or 5%) of all transactions. Missing buyer and seller information has also been eliminated from these figures for ease of evaluation.

Figure 14
Buyer Expenditures in Total Dollars by Property Type
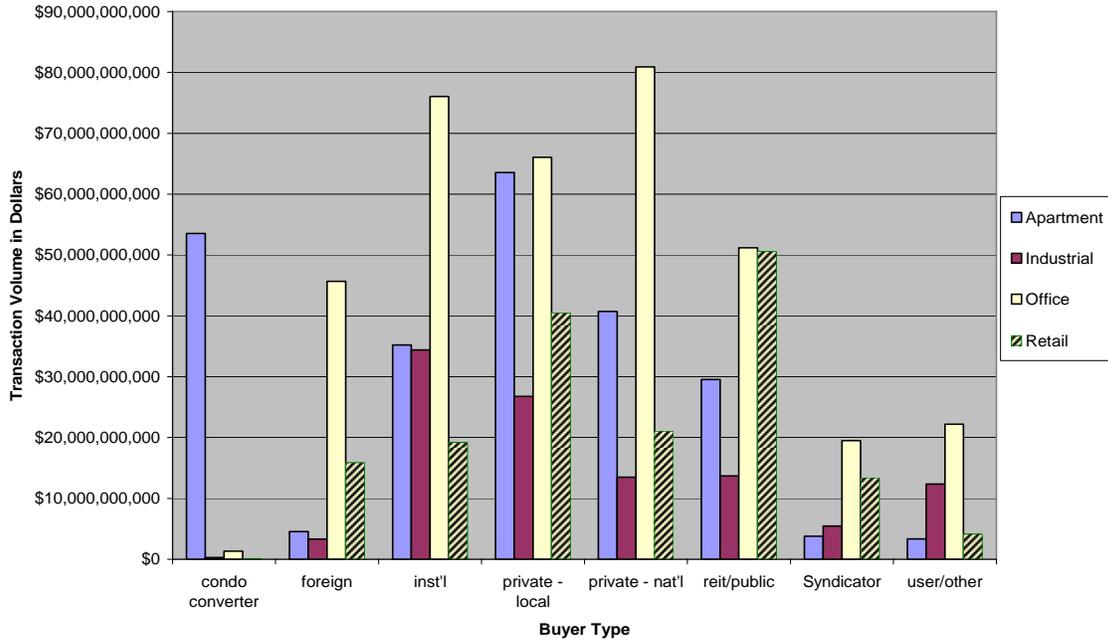
Figure 15
Seller Proceeds in Total Dollars by Property Type
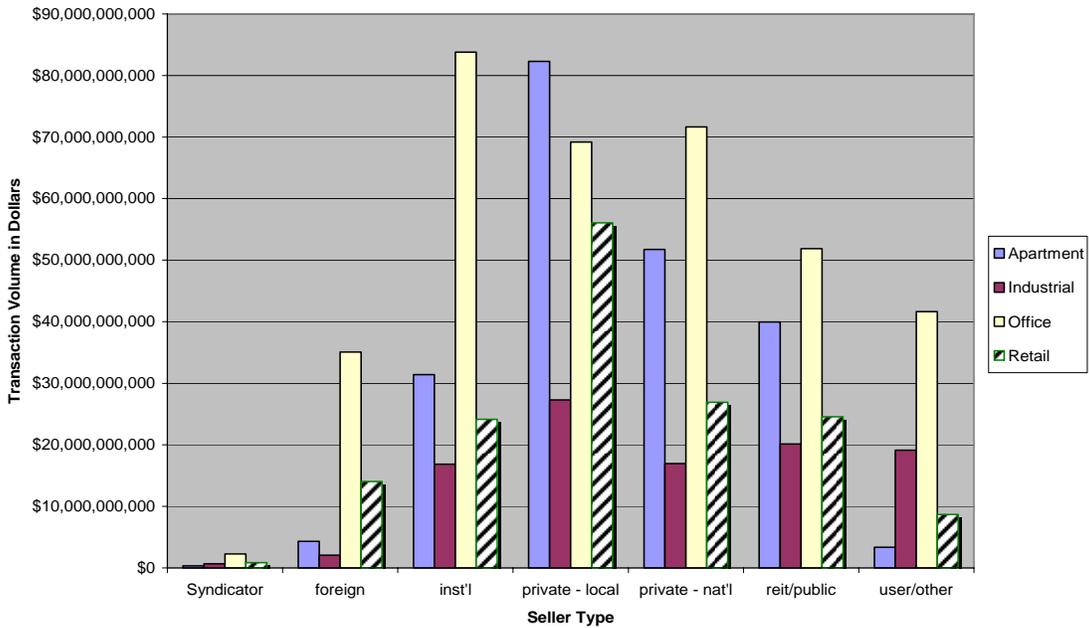
Figures E through L in *Appendix C* illustrate buyer expenditures and seller proceeds by year and by property type.[26] There are several notable periods of activity in

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[26] Figures E through L in Appendix C exclude transactions whose buyer and/or seller were missing. They also exclude hotel, mixed and development property types because this data was not collected across all seven years.

these figures. First, condo converter demand for apartments spiked in 2005, illustrating just how explosive that market became (see **Figure E**). Second, institutional investors bought a relatively large quantity of industrial property in 2001 and 2005 (see **Figure F**). Incidentally, industrial values dipped in 2001-2, but were rising in 2005. Third, REITs bought a tremendous amount of retail property in 2002, 2003 and 2004 (see **Figure H**), as retail values were experiencing a steady rise. Fourth, REITs were heavy sellers of industrial property in late 2000 (just before the dip in value) and early 2006 (after values had climbed), while private locals were large sellers of industrial in 2005 (see **Figure J**). Fifth, foreign investors were heavy sellers of retail property in 2002 and heavy buyers of retail in 2005 (see **Figure L** and **Figure H**), while private local investors were heavy sellers of retail in 2003 and 2004 (see **Figure L**). These are interesting observations when made alongside the repeat sale index results. This is done below in the Section entitled *Direct Comparison of Capital Appreciation Returns to Capital Flows*. Broadly speaking, REITs, foreign and private locals each earned the highest returns at various points during the sample period, while institutions earned the lowest cumulative returns.

Buyer/Seller Combinations – Who buys from whom

Evaluating who buys from whom provides additional insight to investor behavior and the competition among buyers within real estate capital markets. **Figure 16** illustrates these buyer/seller combinations between 2000 and 2006.[27] The figure is divided horizontally into eight sections, each section representing a buyer type. The top section, labeled "user/other is buyer," illustrates the transaction counts when "user/other" investors bought properties. Within this section, each of the seven horizontal bars represents the transaction counts between users and the respective seller types.[28] The top bar, for example, labeled "user/other buys from user/other", illustrates there were about 600 transactions in this data set in which a user/other bought from a user/other.

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[27] Figure 16 excludes transactions when the buyer and/or seller types were "missing", reducing the number of observations from 41,124 to 28,785. Figures M and N in Appendix D are matrices showing the buyer/seller combination count. Figure M includes "missing" investors, while Figure N excludes "missing" investors.

[28] Condo converters are not sellers.

Figure 16
Buyer/Seller Combination Count between mid 2000 and May 2006
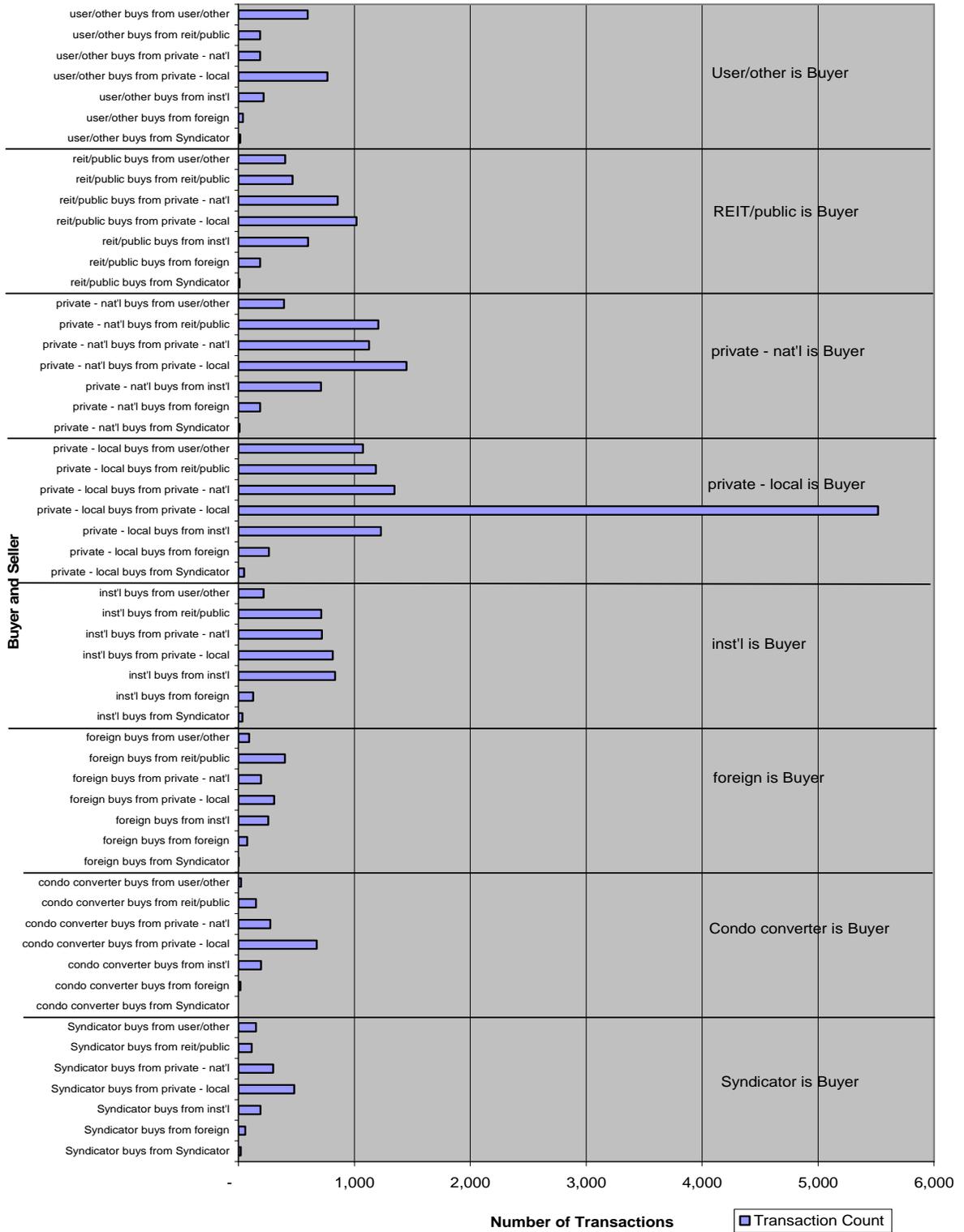
Several interesting observations can be made from **Figure 16.** First, the longest bar illustrates there were approximately 5,500 transactions in which private local investors bought from private local investors. This was the most frequent buyer/seller combination by a very large margin. Moreover, private local investors were very active buyers from institutional, REIT, user/other and private national sellers. The conclusion is that the real estate business is still a very local business, as over 19% of the 28,785 transactions represented in **Figure 16** were between private local buyers and sellers. This is a significant proportion of transactions, given that there are seven other investor types evaluated. All in all, private local investors were buyers in 10,672 transactions, or 37% of all transactions in this sample.

Private local investors were also very active sellers in this data set. With the exception of institutional and foreign investors, every investor type bought the most properties from private local sellers. The overall second most frequent buyer/seller combination was private nationals buying from private locals, a combination that occurred approximately 1,450 times. In fact, private local investors were sellers in 11,035 transactions, representing 38% of all transactions in this sample. These observations demonstrate that private local investors are not only active buyers, but also active sellers; also real estate transactions are often "private" in nature.

Figure 16 also shows that four investor types—REITs, private local, private national, and institutional—bought and sold properties more often from each other than any other investor types. This is apparent by the relatively large "clusters" of horizontal bars in these respective sections. Take, for example, the section labeled "private nat'l is buyer." The four investor types from whom private national investors most frequently bought properties were REITs, private local, private national and institutional investors. This same "cluster" of trading activity occurred for REITs, private local and institutional investors, as well. This information suggests that these four investor types were most often competing against one another for properties.

It is also interesting to note that institutional investors bought from other institutions a few more times than they bought from private local investors, providing some insight to the market for "institutional-quality" properties. Typically, institutional-quality properties are relatively large, well-maintained and well-located properties with

credit-worthy tenants. While buyers and sellers in the "institutional" market are often both institutional investors, **Figure 16** illustrates that foreign, private local, private national and REIT investors all substantially trade in the institutional property market.

Foreign investors bought relatively large quantities of property from REIT, private local and institutional investors. In particular, foreign investors bought considerably more properties from institutions than they sold to institutions. As illustrated in **Figures 4 and 5** earlier, the median and mean transaction prices for foreign investors are approximately the same as, or higher than, those of institutions. Because of this high median transaction price and their trading volume with institutions, it is reasonable to conclude that foreign investors are also very active players in the "institutional" real estate market.

Figures O through U in *Appendix D* illustrate this break-down by year. Every year private local investors were active buyers and sellers. In addition, private nationals showed relatively high buyer and seller activity through the years.

4. Evaluation of Investor Returns (as observed in the *Repeat Sale Data Set*)

When evaluating investor returns, the period-by-period total return components are income and growth. Assuming that one period equals one year and that income is received periodically, total return equals income plus growth, or: $r = y + g$. Income (y) equals the amount of rent (NOI) the property generates as a percentage of the acquisition price. This is commonly called the cap rate. Growth (g) is equal to the percentage growth in the property value over the period. It is also sometimes called capital return, capital gain, price-change component or capital appreciation.[29]

Consider a simple example: an investor buys a property using all cash for $1,000,000, and this property generates an NOI of $70,000 in year one. Assume, for simplicity, that this rent is collected in one lump sum payment at the end the year. The cap rate is, therefore, 7%. Imagine that the property value grows 5% during that year. At the end of the first year, the investor collects the rent and sells the property for $1,050,000. Assuming he has not made any additional improvements to the property, the total periodic return equals income plus growth:

$$r = y + g$$
$$r = 7\% + 5\%$$
$$r = 12\%$$

While actual returns may be different than this (because rent is usually collected monthly), the basic principle for calculating total periodic return holds true.

When evaluating investor return within the *Repeat Sale Data Set*, it is not possible to calculate the total return for investors, because the data set does not have income return for every property. Some of the data points have cap rate information, but the cap rate only describes income in year one. It does not provide information on growth in the income component, nor how long the income will last. If, for example, the lease terminates after year one, but the investor continues to hold the property, his return quickly falls.

Despite the lack of income information, the *Repeat Sale Data Set* does contain important information relative to growth in property value: all 10,073 data points contain

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[29] Geltner, David M. and Miller, Norman G., <u>Commercial Real Estate Analysis and Investments</u>, Southwestern, Thomas Learning, 2001, pages 183 to 186.

a prior sale price and date, allowing the observer to calculate growth, or property price appreciation. This metric provides a reasonably reliable picture of growth (g), a valuable component of total return.

Income (y) is typically more stable than growth (g). It stands to reason that properties typically keep a relatively constant rental stream because lease terms generally span many years. Even if a tenant moves out, landlords can backfill the vacant space with new tenants relatively quickly. Property values are typically more volatile than income because values are subject to market forces. With changes in capital markets, property supply and property demand, values can fluctuate considerably.

If income is relatively stable, and property values are relatively volatile, then eliminating income returns from evaluation is tantamount to isolating the more differentiating return component: growth. In short, growth demonstrates an investor's skill at knowing when to sell a property—as well as when to buy—in order to maximize returns. Therefore, evaluating growth provides very important insight into investor behavior and performance.

Repeat Sale Index Description and Methodology

In order to study growth in property value, a repeat sale index is used. Theoretically, a repeat sale index works because it measures price appreciation for a property of constant quality. With property characteristics relatively constant during the holding period, this permits observation of price appreciation (or growth). Modest property improvements during the holding period are acceptable because the index is not necessarily estimating the "true" price change, but a change in value from the investor's point of view. Major changes during the holding period, however, will seriously bias the results. For example, if significant capital improvements, such as a new roof, building expansion, or even a major lease, were made to a property, but the costs were not reflected in the acquisition price, this would skew the property appreciation returns too high. The data are not complete enough to account for such capital improvements; therefore, in order to eliminate potentially skewed results, this thesis employs several methodologies to minimize the number of such "improved" properties.

The first method to minimize skewed returns is to eliminate any properties which are held for a short period of time. These properties are often known as "flips" because investors buy them, make improvements, and then flip them for unusually high "returns" when compared to the initial price. For purposes of this thesis, all properties held less than 24 months have been eliminated. Research conducted by the Massachusetts Institute of Technology (MIT) Center for Real Estate has concluded that 24 months is a suitable holding period to eliminate such flips.

The second method to minimize skewed returns is to eliminate properties with extremely high annual returns, as they are more likely to have received capital improvements during the holding period. For purposes of this thesis, all properties that realized 50% or greater annual appreciation rates have been eliminated from the sample. Again, the same research by the Center for Real Estate has deemed this elimination reasonable for constructing repeat sale indices.

A third method to minimize skewed returns is to eliminate properties whose first transaction (or prior sale) occurred before 1988. This minimizes the chance of including a property which has received capital improvements because of its age.

Finally, while the index is structured to reflect overall property values within a sample, one underlying problem with estimating an index of commercial property values is that the index is composed of numerous unique properties, whose holding periods vary individually. When each observation's error term has a different variance, "the error term is said to exhibit heteroskedasticity (or non constant variance)."[30] The repeat sale index used in this thesis addresses these problems by weighting sales pairs. Using the Weighted Least Squares (WLS) statistical method, weights are applied using a number that minimizes that property's deviation from a predicted value.[31]

The period frequency in a repeat sale index can be any amount of time, but is usually measured in years, quarters or months. In order to achieve significant results using monthly periods, there should be approximately 200 or more observations in the sample. Otherwise the returns could exhibit noise, or purely random error. When the

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[30] Wooldridge, Jeffrey M., Introductory Econometrics, A Modern Approach, 2nd Edition, Thomson South-western, 2003, page 54.
[31] S&P/Case-Shiller ® Metro Area Home Price Indices, page 4, posted on the Chicago Mercantile Exchange website (www.cme.com)

sample size is too small, the period frequency must be quarterly (or higher) to have reasonably accurate results. There are typically sufficient observations in the *Repeat Sale Data Set* to permit a monthly index.

Given the sample size, the return series captures significant noise. Ridge Regression is an accepted econometric technique for removing noise while still preserving the index's underlying volatility. Research conducted by the Center for Real Estate concludes that a ridge factor of $k = 15$ is an appropriate ridge level in a repeat sale index with a sample size such as used here. Please see *Appendix E* for a more detailed description of this technique and the effect of different k values.

This repeat sale index evaluates returns based upon the seller type in the second transaction—not the buyer type. The reason is that the seller in the second transaction is the same investor as the buyer in the first transaction. Therefore, the index calculates the "round trip" investor returns, and these are the returns used to evaluate the performance for each investor type. It is also important to recognize that these returns are calculated at the "property level," without regard to financial leverage. Given that investors take on varying levels of leverage (and therefore varying levels of risk and return), evaluating capital appreciation at the property level eliminates from consideration this additional layer of risk and return.

Repeat Sale Index Results and Interpretations

Figure 17 illustrates the returns of all investors in the RCA data set, compared against the MIT Transaction Based Index (TBI). The TBI is a quarterly index based upon real estate transactions made by institutional investors who are members of the National Council of Real Estate Investment Fiduciaries (NCREIF).[32]

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[32] The TBI is a quarterly index, while the other indices are monthly, making the two more difficult to compare. In this thesis, the TBI's quarterly returns have been interpolated to monthly returns on a linear basis; however, the TBI is still inherently less volatile.

Figure 17

Repeat Sale Index of Returns by Investor Type
By Seller Type with Maximum Return of 50% per Annum and Min. Holding Period of 2 Years
January 2001 - May 2006
(WLS Model w/ K=15d)
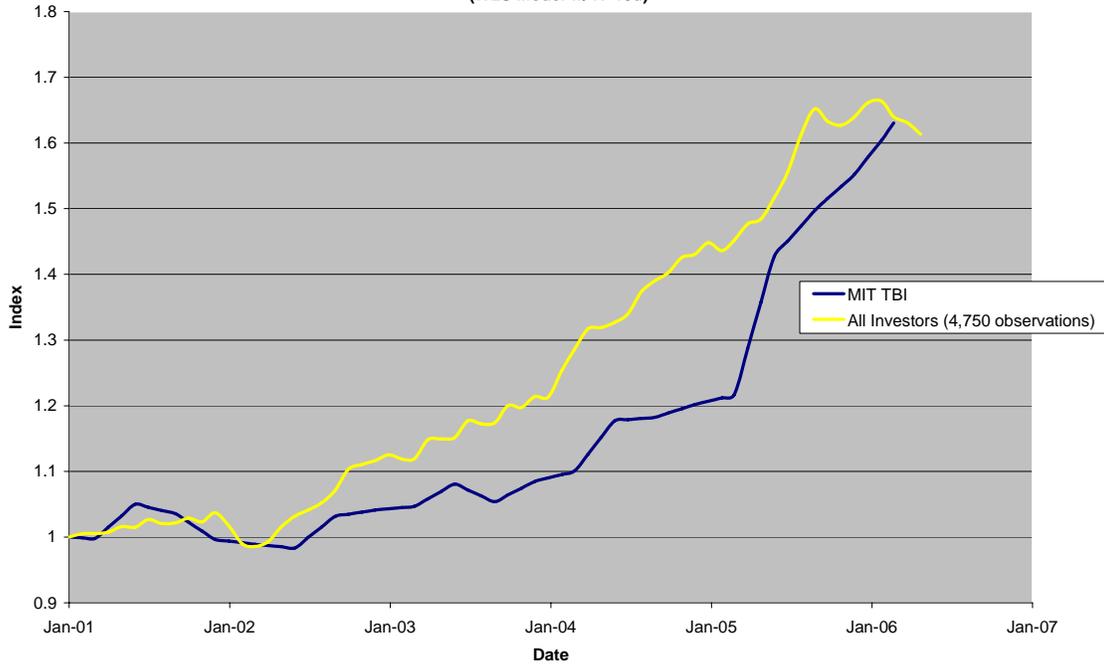
With the indices beginning in January 2001, the two tracked closely together until January 2003, when the RCA 'All Investors' index began to show greater cumulative returns through 2005. From early 2005 until early 2006, the MIT TBI showed rapid appreciation, nearly catching the RCA index as of March 2006.[33] The figure illustrates that institutional investors (as represented by the MIT TBI) during most of the sample period earned lower cumulative returns (they took on less risk) than the overall market (as represented by All Investors). However, by early 2006, both indices showed similar cumulative returns. It is important to note that the timing of RCA's data collection makes the last three months of these indices subject to error. Data is not always promptly received.

Figure 18 parses the RCA index returns by investor type and shows their respective returns. It does not include syndicators or users.[34]

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[33] The MIT TBI is available through March 2006, while the RCA index is available through May 2006.

[34] Figure 18 eliminates Syndicators (with 45 observations), Users/others (with 340 observations) and those transactions whose seller is "missing." The reason syndicators are eliminated is that they rarely, if ever, sell property, making the number of observations too small to be meaningful. Users/others are eliminated because, as described earlier, they determine value differently than other types of investors. See **Figure W** in *Appendix F* for an illustration of the user/other and syndicator indices as compared to other investors.

Figure 18
Repeat Sale Index of Returns by Investor Type
By Seller Type with Maximum Return of 50% per Annum and Min. Holding Period of 2 Years
January 2001 - May 2006
WLS Model w/ K=15

Legend:
- Private - local (2,470 Obs)
- Private - Nat'l (698 Obs)
- Inst'l (660 Obs)
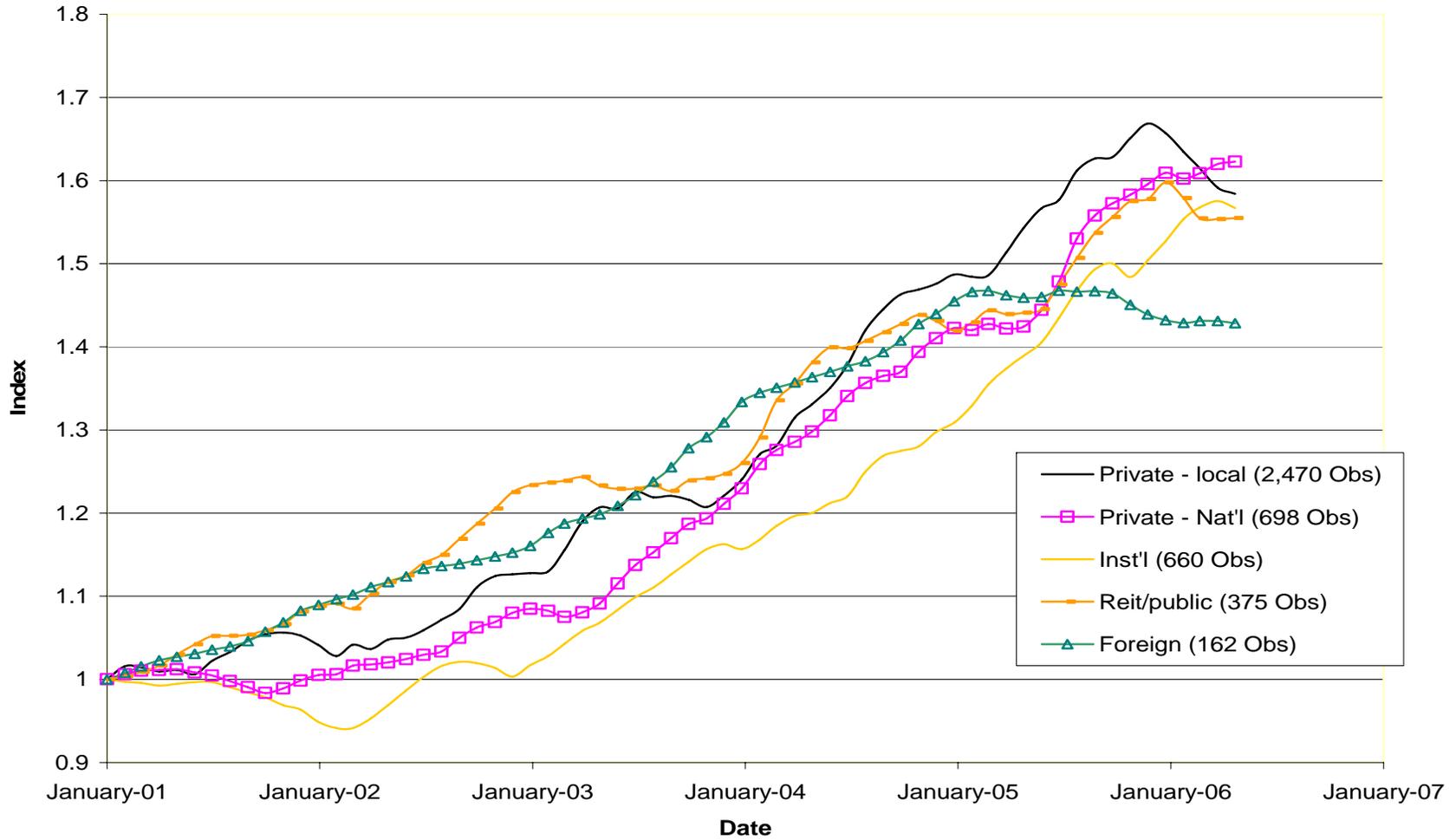- Reit/public (375 Obs)
- Foreign (162 Obs)

Figure 18 highlights several interesting facts. First, REITs and foreign investors earned the highest cumulative returns through early 2004. On several occasions, REITs exhibited a period of high returns followed by a period of flat returns. For example REITs dominated through much of 2001 and late 2002, before their returns flattened in most of 2003. Then their returns were high in early 2004 before tapering off again in late 2004 and early 2005. They exhibited one last strong climb in 2005. Foreign investors dominated in late 2003 and early 2004, before their returns flattened. These trends are partly explained by the unique capital flows described earlier in the *Transaction Dollar Volume by Property Type* section: REITs and foreign investors were buying and selling the right property types at the right times, especially in these earlier years. (See **Figures E** through **L** in *Appendix C*.) In addition some REITs may have benefited from arbitrage opportunities in the securities market, as described earlier.

Second, private local returns appear to be the most volatile of all investor type returns examined, and their cumulative returns were strong throughout the entire sample period. Private local investors began earning higher returns in early 2004, and from mid 2004 to early 2006 had the highest cumulative returns of all investors in the sample period. This represents the longest continuous period of time that a single investor type earned the highest cumulative returns. One possible explanation is that private local investors sold a large amount of retail property in 2003 and 2004, a time when that property type performed exceedingly well. Another overarching explanation is related to Brown's (2004 & 2005) conclusions that private investors can combine entrepreneurial labor and capital to influence property returns. Private local investors also take advantage of local market inefficiencies, using their unique market knowledge to earn relatively high returns.[35]

Third, institutions earned the lowest cumulative returns of any investor from January 2001 until mid 2005. This represents the longest continuous period that one investor type earned the lowest cumulative returns, and can be partly explained by the flat and falling returns throughout 2001 and early 2002. Institutional investors bought a relatively large amount of industrial property in 2001, about the time that industrial

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[35] Note that the last three months of the indices are subject to error because of the timing of data collection. Therefore, it is difficult to make conclusive observations regarding the performance of private national investors in early 2006.

property values began to drop. This might explain some of their poor performance in 2001. After this early dip in returns, however, institutional investors began to earn relatively stable returns throughout the remainder of the sample period. By early 2006, institutional investors had earned similar cumulative returns to REIT, private national and private local investors. Institutional investors are often viewed as the lowest risk investors. For example, pension funds typically have relatively low risk tolerance because they must meet certain future financial obligations, such as retirement payouts. In addition, as marginal investors, institutions usually can afford to pay the highest prices; this translates to lower returns. In short, lower risk equals lower return, and higher risk equals higher return. This "low risk-low return" performance with very little volatility is borne out by the repeat sale index, as illustrated in **Figure 18**.
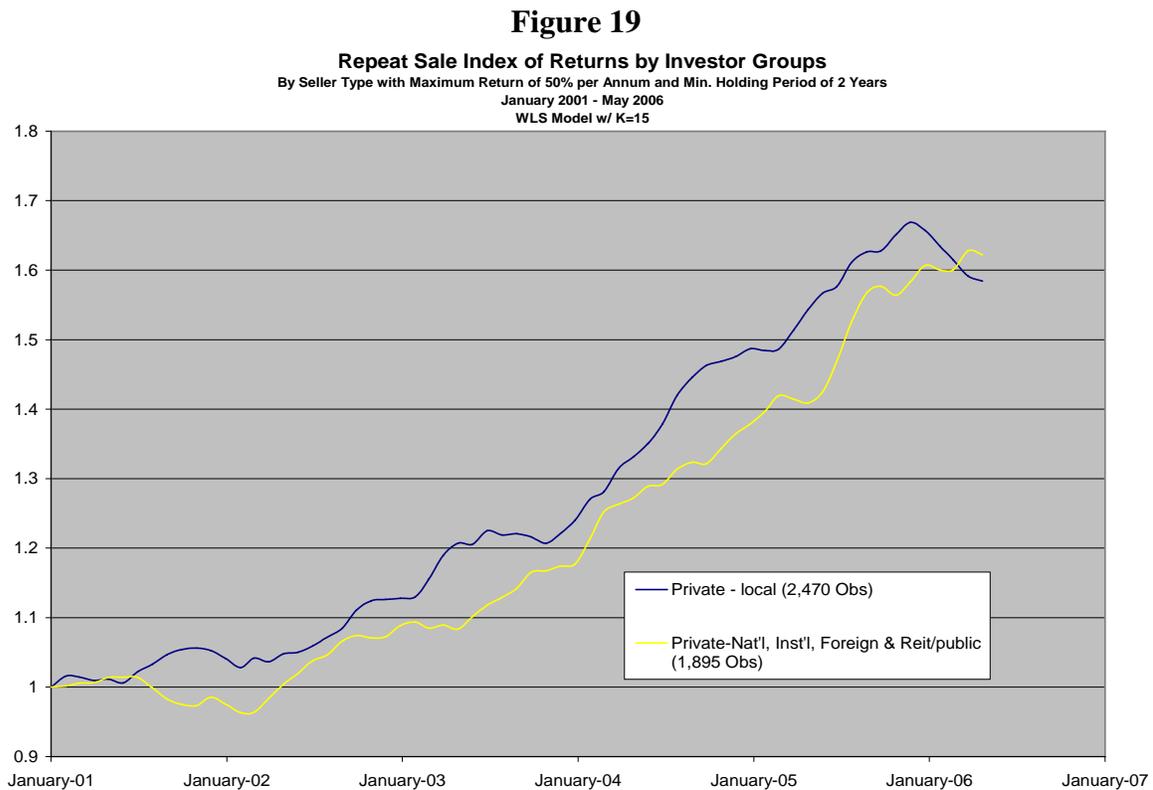
Fourth, after a period of excellent and steady performance by foreign investors, their returns tapered off considerably from mid 2004 to May 2006. This could be the result of relatively few (162) observations; however, foreign investor capital flows may provide better explanation. First, in 2001 and 2002, foreign investors were net sellers of real estate, harvesting profits when the markets were taking off. Their high returns through those years are apparent in **Figure 18**. However, from 2003 until May 2006, foreign investors were net buyers of property every year, implying that 1) they did not harvest as many profits as before and 2) they were buying increasingly more expensive properties, as property values continued to rise. Strong foreign currency rates relative to the dollar partly explain the growth in foreign demand. Such was the case for investors purchasing with Australian dollars and Euros. Both these currencies grew in strength relative to the dollar during the sample period, causing a rise in property demand. Additionally, a study by Louargand and Gately (2004) suggests that the United States real estate market is very attractive to foreign investors because 40% of the world's institutional-quality real estate is here.[36] Earlier observations in this thesis indicate that foreign investors are very active buyers of institutional-quality properties. In addition Louargand and Gately explain that US real estate offers foreign investors relatively high

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[36] Louargand, Marc and Gately, Michael, Outlook 2004: The Paradox of Real Estate Capital Markets and Space Markets, *Briefings in Real Estate Finance* London: March 2004, Volume 3, Issue 4, p. 365-374.

returns across 60 major markets that provide tremendous economic and geographic diversity.[37]

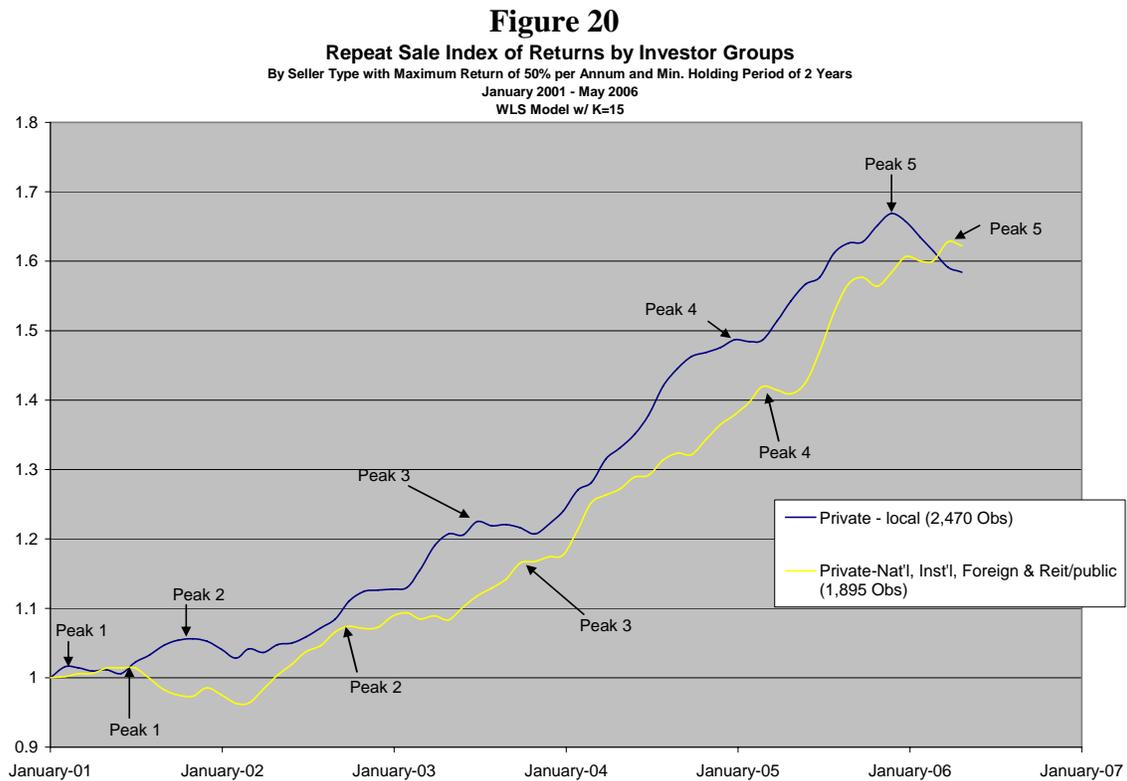*Returns: Private Local vs. Other Investors*

Of the five investor types in **Figure 18**, private locals are a class unto themselves by virtue of their restricted geographical nature. The others (private national, public REITs, institutional and foreign) can be grouped together because of their more extensive geographical reaches. **Figure 19** compares the returns of these two groups.

Figure 19

Repeat Sale Index of Returns by Investor Groups
By Seller Type with Maximum Return of 50% per Annum and Min. Holding Period of 2 Years
January 2001 - May 2006
WLS Model w/ K=15

Several points can be made. First, the number of observations for each group is similar and significant; private locals have 2,470 observations and the others, 1,895. Second, private local investors earned higher cumulative returns than the other group, with two exceptions: once, briefly, in 2001, and again in early 2006. It is easy to see how the poor performance by institutions in 2001 affected the entire group's performance during that same time. The lower cumulative returns speak, in part, to the nature of the risk being born by each investor group. Private national, public REIT, institutional and

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[37] Louargand and Gately, 2004.

foreign investors have a greater tendency to invest in a fiduciary capacity than private locals. Investing on behalf of others typically means more investment restrictions and a lower risk-tolerance. Conversely, private locals usually have fewer restrictions because they invest their "own" money; hence, typically a higher risk tolerance. Third, there appears to be a *lead-lag* relationship in return trends between these two groups. The private local returns lead and the others lag. **Figure 20** illustrates this final point with more clarity.
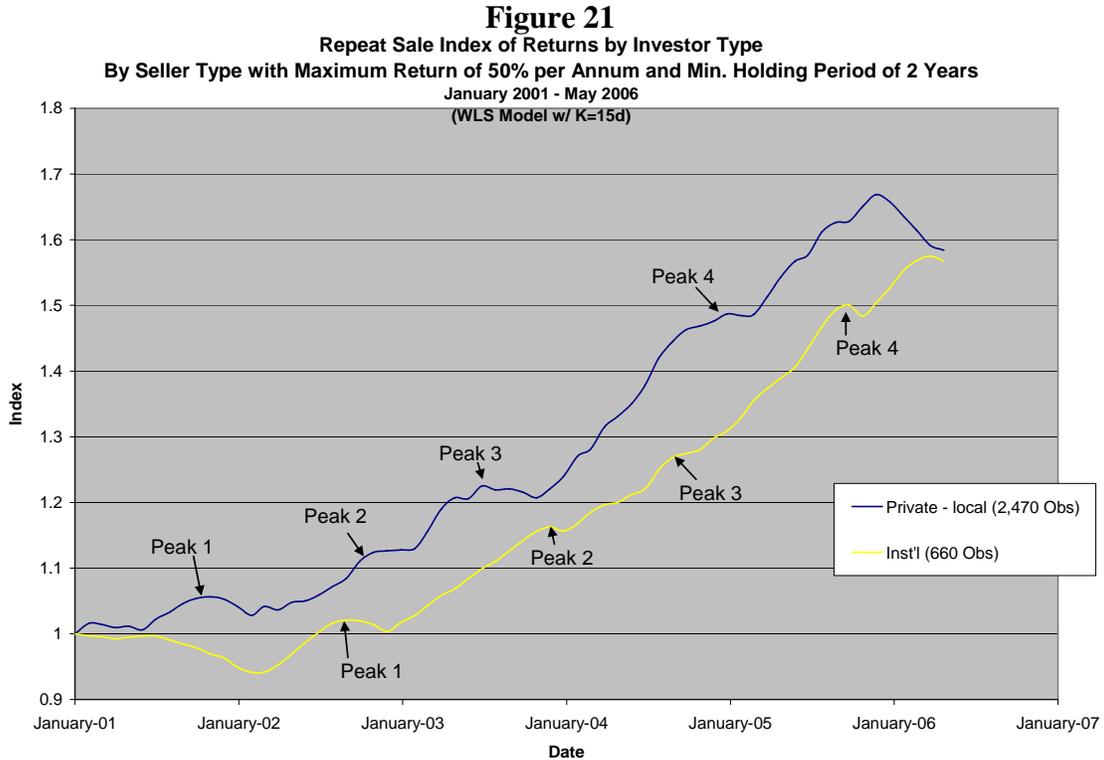
Figure 20
Repeat Sale Index of Returns by Investor Groups
By Seller Type with Maximum Return of 50% per Annum and Min. Holding Period of 2 Years
January 2001 - May 2006
WLS Model w/ K=15

The corresponding peaks are labeled for clarification. 'Peak 1' along the private local line leads 'Peak 1' along the other line by approximately six months. 'Peak 2' along the private local line leads 'Peak 2' for the others by nearly one year. The lead time drops to approximately three months at 'Peak 3', and for the remainder of the peaks and valleys, private locals lead the others by no more than three or four months.

Figure 20 also illustrates that the nature of returns in earlier years (2001 and 2002) was different than the nature of returns in later years (2003 to May 2006). There were several differences: First, the lead-lag relationship was longer in the earlier years and shorter in later years, as just described. Second, the peaks and valleys of returns for

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private local investors were more "compact" in the early years than those of the other investors. The other investors' returns appear to be "smoothed" over longer stretches of time, while the private local returns appear to move more over shorter periods of time. In short, private local returns appear more volatile than others' returns in the early years. Third, in the later years, the returns for the other investors track much more closely to those of private locals. In fact, others' returns appear to be just as volatile as—and sometimes more volatile than—those of private locals.

There are likely many explanations for this apparent *lead-lag* relationship. First, perhaps private local investors are swifter to recognize information asymmetries because of geographical advantages: they are usually most familiar with local market forces and individual property characteristics. Second, the difference in investor risk profiles may explain these results. If private local investors are more "risk tolerant" than other investor types, then perhaps they are willing to risk being the first to invest in—or sell—a certain type of property. Conversely, more "risk averse" investors often wait until a property type has established itself before investing. Third, private investors typically are more nimble in their decision-making process, whereas institutions and REITs must obtain authorization to buy or sell from multiple layers of management. Fourth, different tax motivations may cause investors to move at different speeds; perhaps a 1031 exchange makes a private local investor move more quickly than an institution or REIT who receives different tax treatment. It is likely that all of these reasons—and others— explain the *lead–lag* relationship. However, more research must be done to establish whether this lead-lag relationship actually occurs over longer time periods and whether private locals are typically the leaders in return trends.

Figure 21 explores the *lead-lag* relationship between two specific investor groups: private locals and institutions. It illustrates a more apparent *lead-lag* relationship between these two investor types than **Figure 20** illustrates.

Figure 21
Repeat Sale Index of Returns by Investor Type
By Seller Type with Maximum Return of 50% per Annum and Min. Holding Period of 2 Years
January 2001 - May 2006
(WLS Model w/ K=15d)

The private local returns appear to lead the institutional returns by up to 12 months, depending on the year. Given the number of observations in this data set, it is difficult to determine which peaks along the private local index exactly correspond to those along the institutional index. The peaks labeled above are merely best guesses, but even the small vacillations in the private local index seem to appear later in the institutional index. Additionally, cumulative private local returns are not only greater, but also more volatile than the institutional returns. This speaks to the nature of the risk that each investor group takes on. The more apparent *lead-lag* relationship between these two groups can be partly explained by the fact that institutional investors are more strictly "fiduciary," whereas REITs, foreign (and certainly private) investors typically have more entrepreneurial tendencies.

This final point regarding entrepreneurial tendencies deserves greater attention. This thesis has already addressed the entrepreneurial tendencies exhibited by some private investors. REITs and foreign investors often exhibit this same behavior. Many REITs are well established in specific markets, giving them keen market knowledge and an informational edge over others. In addition, as developers, REITs often seek "growth"

opportunities, or chances to add great value to real estate. With respect to foreign investors, not all are "fiduciary" in nature; many are entrepreneurial individuals, corporations and opportunity funds seeking higher risks. Sometimes they partner with private locals who know the markets intimately.

It appears that investors who have entrepreneurial tendencies, or greater inclination to create new value, typically earn higher returns than those seen as more "fiduciary", ie. institutional investors. An incentive to add value might include re-tenanting a building, making capital improvements, or taking advantage of special market knowledge. While every effort has been made to eliminate properties that have been "improved", it is not possible to eliminate the underlying traces of entrepreneurial behavior. Because entrepreneurial investors tend to take on additional risk, it follows that their returns would be higher than others who take on less risk.

Returns: Institutional Comparisons

Given that the MIT TBI is composed of only institutions, it is interesting to compare this index to the Repeat Sale index of institutional investors.[38] **Figure 22** illustrates that these returns were fairly close to one another throughout time, with one exception: during 2004 the TBI cumulative returns fell below the other index; however, very high returns in early 2005 enabled the TBI cumulative returns to surpass those of Institutions by mid 2005.

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[38] The Institutional index is monthly, and the TBI is quarterly, with interpolated monthly returns.

Figure 22

Repeat Sale Index of Returns by Investor Groups
By Seller Type with Maximum Return of 50% per Annum and Min. Holding Period of 2 Years
January 2001 - May 2006

WLS Model w/ K=15
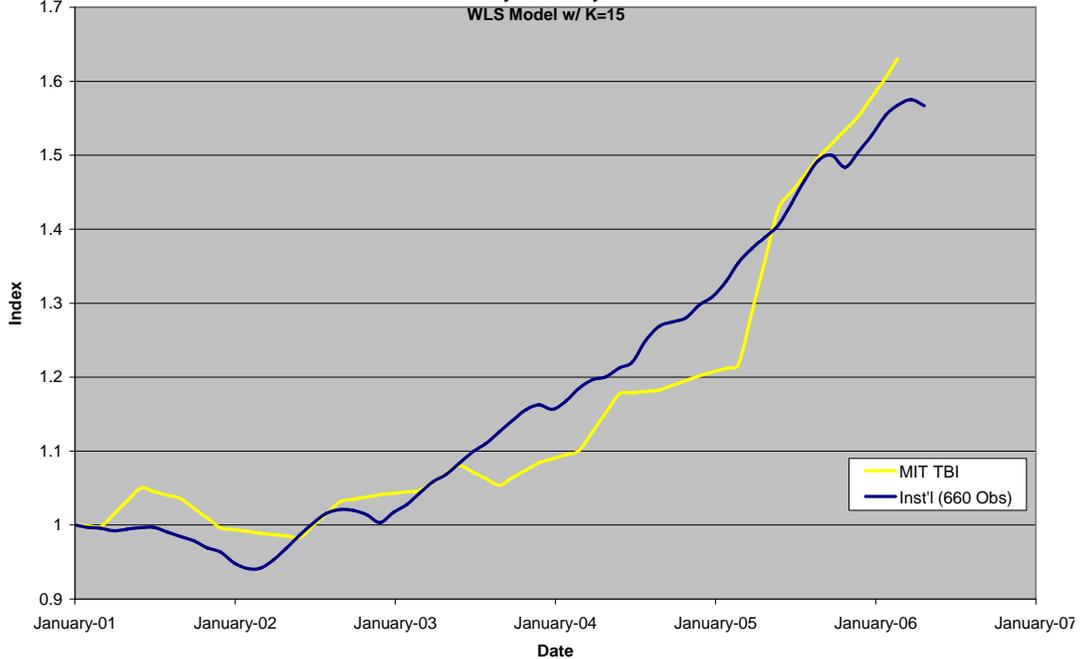
Though the TBI measures returns only through March 2006, while the others measure returns through May 2006, both cumulative returns terminate at about the same point.

Returns: REITs

Given the excellent performance of REITs through 2004, it is interesting to compare the returns of this investor to all other types. **Figure 23** illustrates that REITs earned higher returns early, but were surpassed in 2005 by all the other investors. There is no apparent lead-lag relationship for REITs and other investors in **Figure 23**.
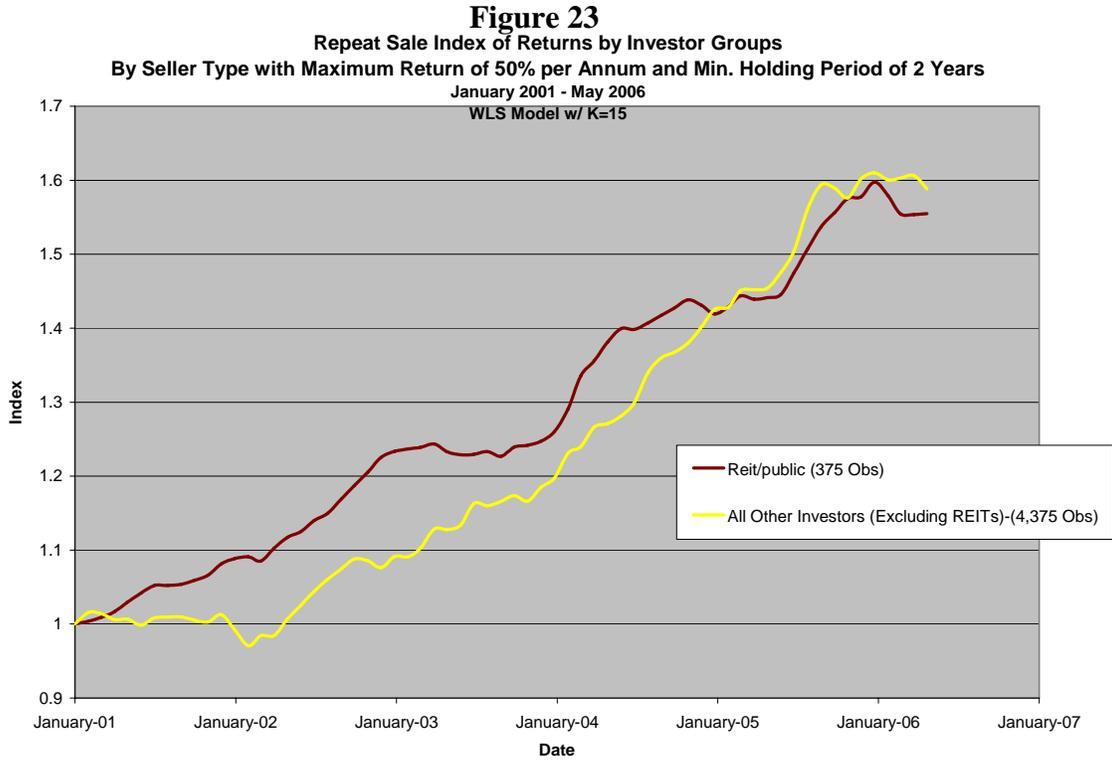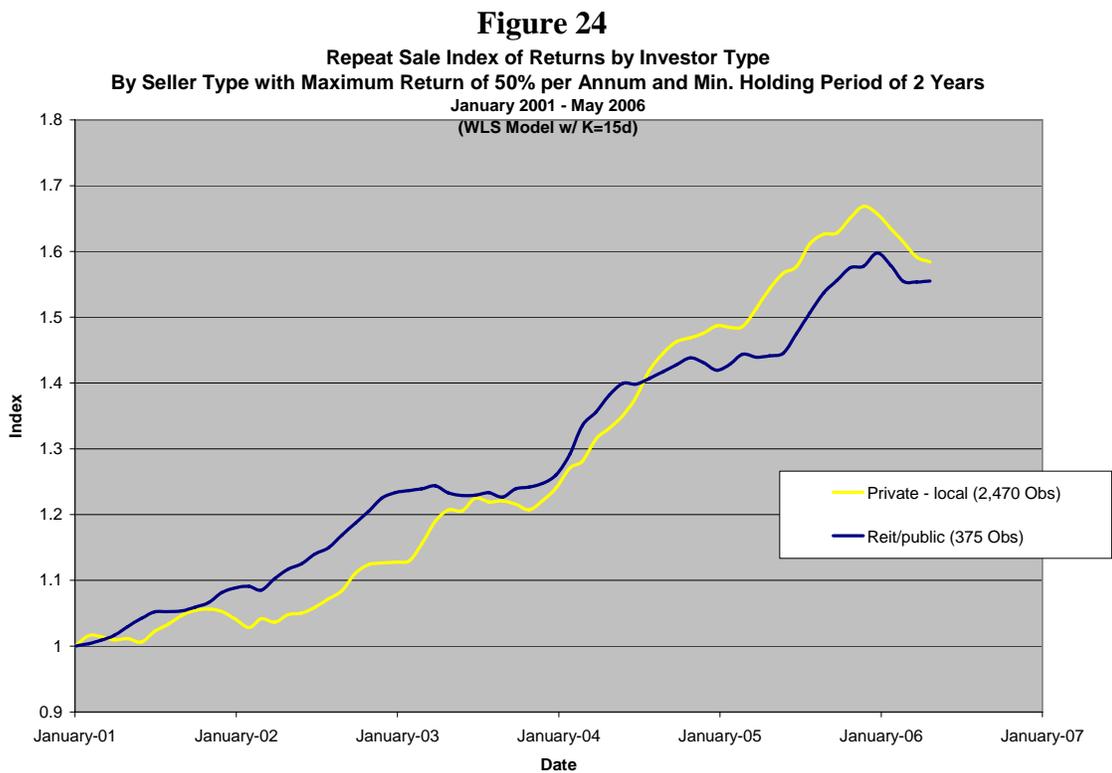
Figure 23

Repeat Sale Index of Returns by Investor Groups
By Seller Type with Maximum Return of 50% per Annum and Min. Holding Period of 2 Years

January 2001 - May 2006

WLS Model w/ K=15

Figure 24 illustrates that REITs earned greater cumulative returns than private local investors until mid-2004, at which time private local returns began to a steady rise. One

Figure 24

Repeat Sale Index of Returns by Investor Type
By Seller Type with Maximum Return of 50% per Annum and Min. Holding Period of 2 Years

January 2001 - May 2006

(WLS Model w/ K=15d)

might argue that REITs led private local investors in return trends until mid-2004, at which time private local investors began to lead REITs; however, given the short time period and the "switch" in leads, it is difficult to declare that one absolutely leads the other. It is safe to conclude, however, that REIT and private local cumulative returns tracked rather closely to one another the entire time, terminating at a very similar point.

Direct Comparison of Capital Appreciation Returns to Capital Flows

Earlier observations in this thesis touch on the relationship between capital flows and capital appreciation returns by investor type. For example, when REIT and foreign investors were leaders in buying or selling real estate, they also tended to earn the highest returns. Likewise, when private locals led in buying and selling, they tended to earn the highest returns. Because return indices are based on seller type, it follows that sale proceeds have great impact on returns. In general, higher sales activity led to positive return performance during the rising real estate market from 2000 to 2006. However, buyer expenditures also had impact on returns if investors bought properties at the right time or at a good price.
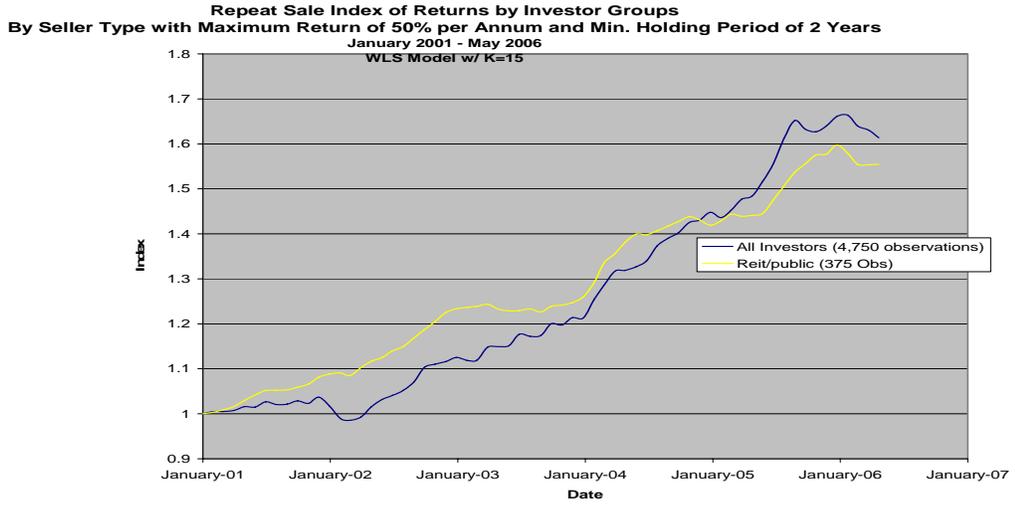
The following figures (**Figures 25 through 31)** illustrate these relationships between capital flows and capital appreciation returns for each investor, year by year. **Figure 25**, for example, shows the REIT return index against a benchmark, the index of returns for all investors.[39] Below that chart on the same page is another chart showing REIT yearly seller proceeds in dollar volume by core property type. Below that is a similar chart showing buyer expenditures for REITs.[40] The years are aligned accordingly so that one can easily observe the temporal relationship between REIT capital flows and REIT returns. For instance, relatively constant sales for REITs in 2000 to 2003 corresponded with strong returns. Strong REIT buying activity in 2002 likely tempered returns in 2003, but lifted returns in later years. This same chart formation has been done for each investor type.

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[39] The REIT Return Index is correlated to the All Investor Index because REIT investors are included in the All Investor index. Likewise, other investor return indices, especially that of Private Locals, will also be correlated to the All Investor Index.
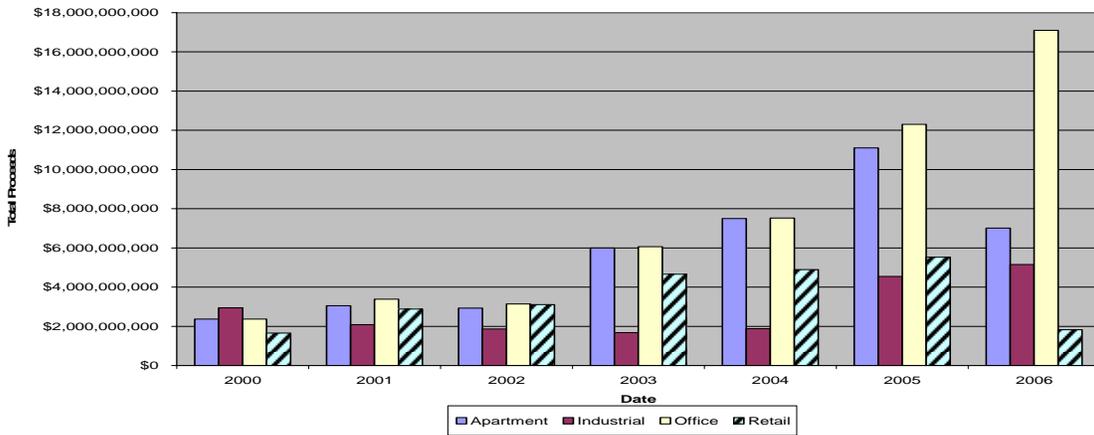
[40] While capital flow observations are taken from the *Overall Data Set* and return indices are built on the *Repeat Sale Data Set*, these charts still provide insight to their relationship.

Figure 25

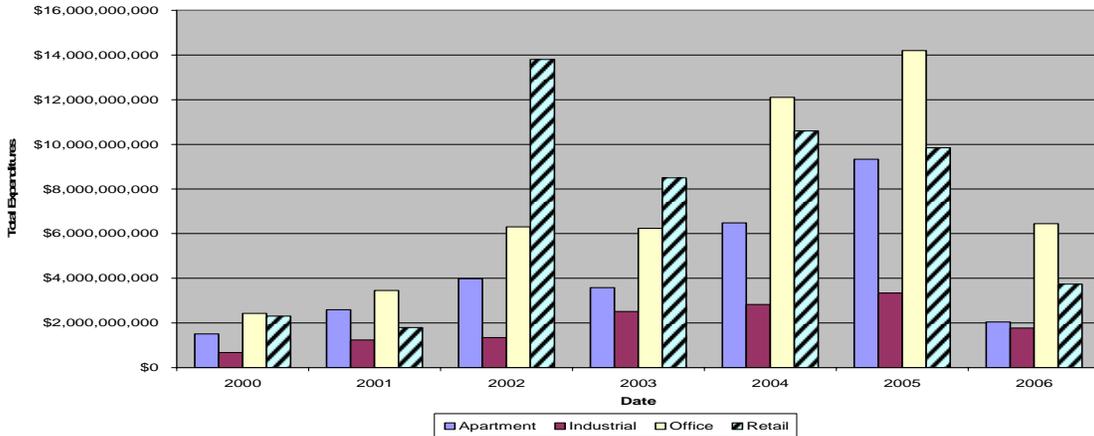## Public REIT Investor Returns and Capital Flows

Repeat Sale Index of Returns by Investor Groups
By Seller Type with Maximum Return of 50% per Annum and Min. Holding Period of 2 Years
January 2001 - May 2006
WLS Model w/ K=15

Legend:
- All Investors (4,750 observations)
- Reit/public (375 Obs)

Seller Proceeds - Public REITs

Legend: Apartment | Industrial | Office | Retail

Buyer Expenditures - Public REIT

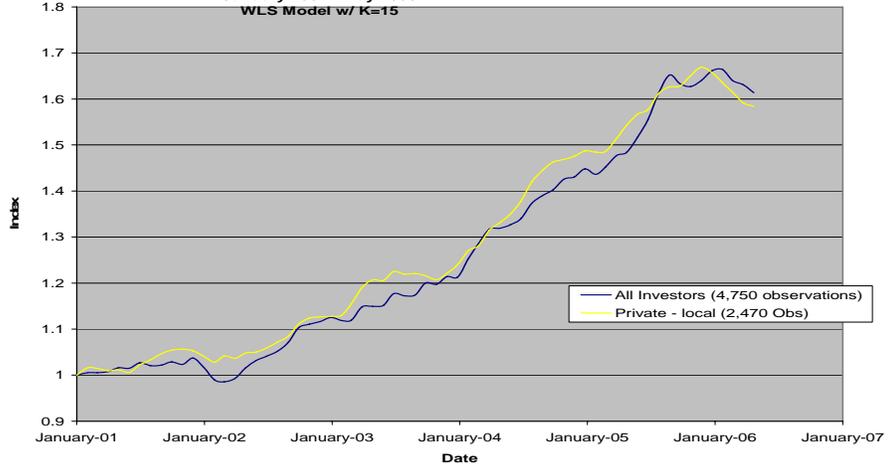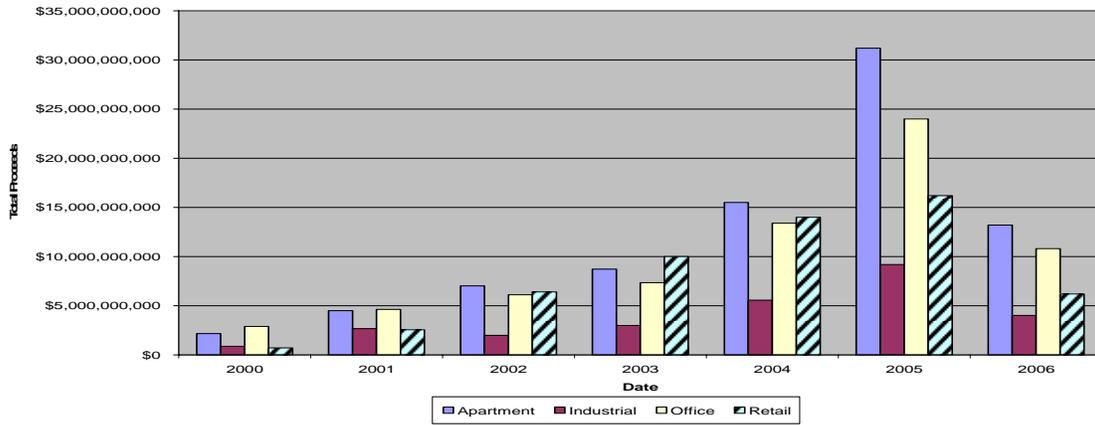Legend: Apartment | Industrial | Office | Retail

47

Figure 26

Private Local Investor Returns and Capital Flows

Repeat Sale Index of Returns by Investor Groups
By Seller Type with Maximum Return of 50% per Annum and Min. Holding Period of 2 Years
January 2001 - May 2006
WLS Model w/ K=15

Seller Proceeds - Private Local
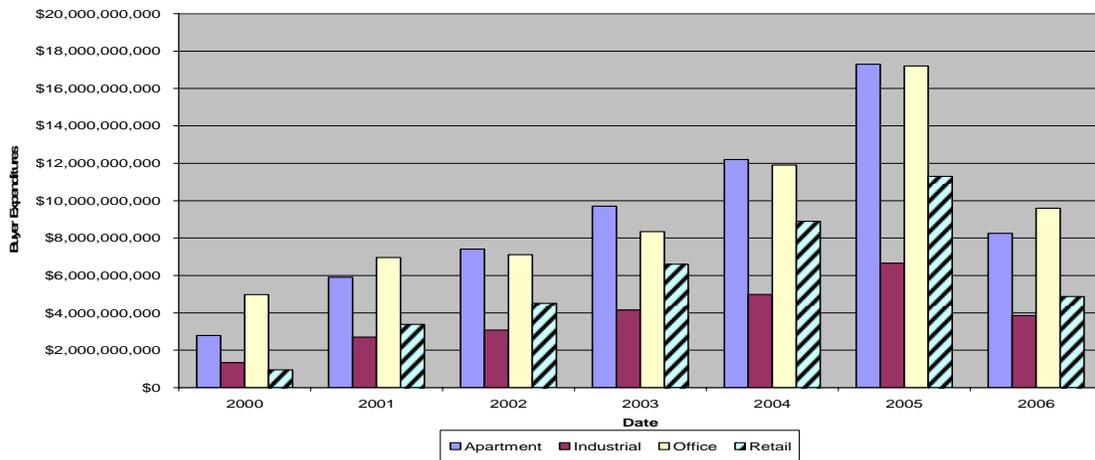

Buyer Expenditures - Private Local

Figure 27

Institutional Investor Returns and Capital Flows

Repeat Sale Index of Returns by Investor Groups
By Seller Type with Maximum Return of 50% per Annum and Min. Holding Period of 2 Years
January 2001 - May 2006
WLS Model w/ K=15

Seller Proceeds - Institutional

Buyer Expenditures - Institutional

49
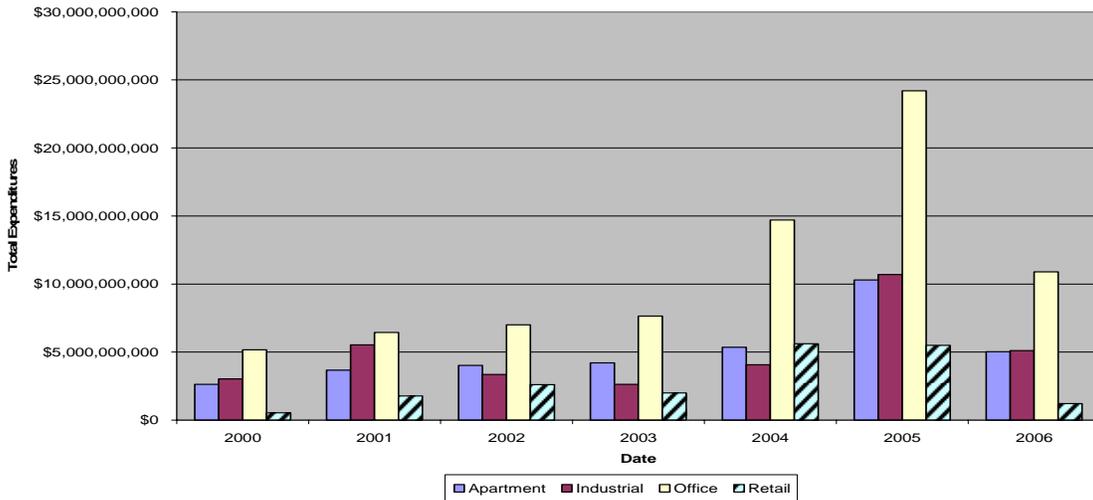
Figure 28

Private National Investor Returns and Capital Flows

Repeat Sale Index of Returns by Investor Groups
By Seller Type with Maximum Return of 50% per Annum and Min. Holding Period of 2 Years
January 2001 - May 2006
WLS Model w/ K=15
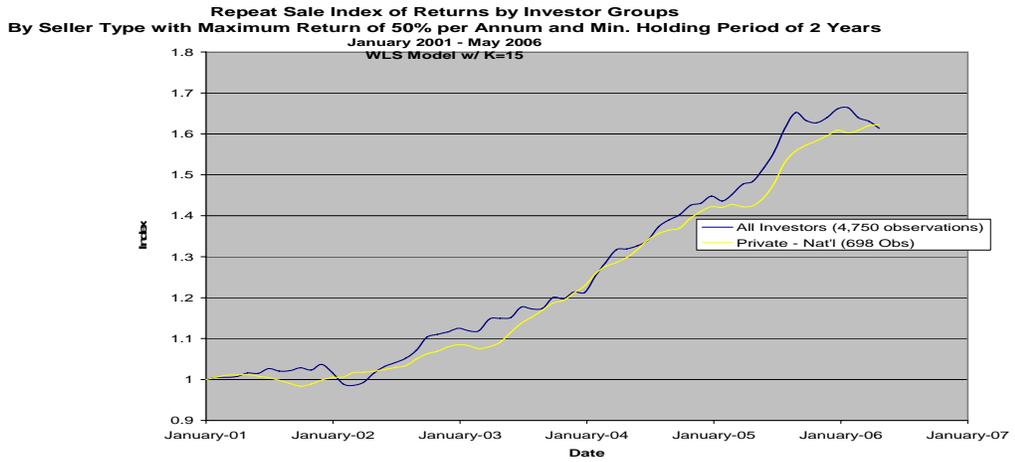
Seller Proceeds - Private National
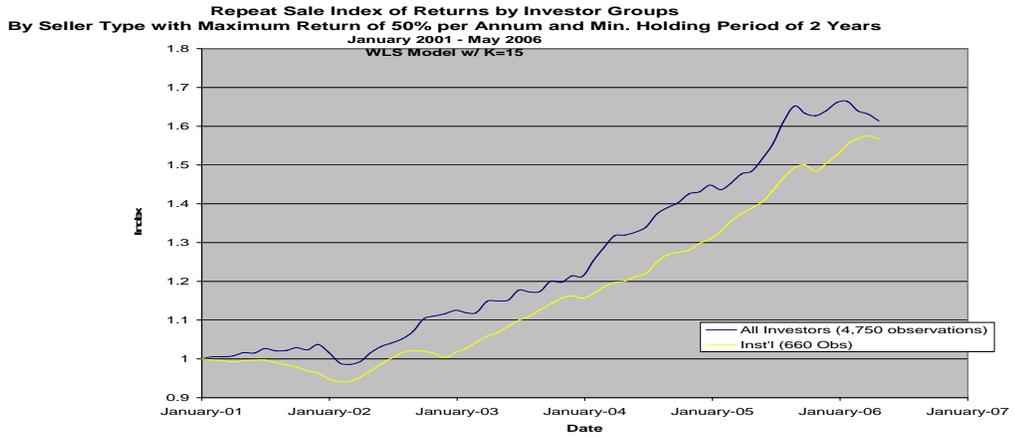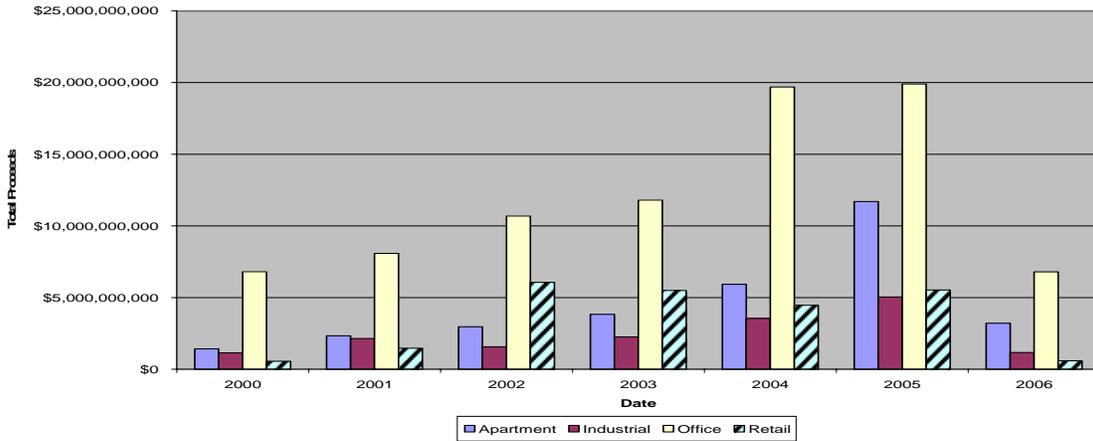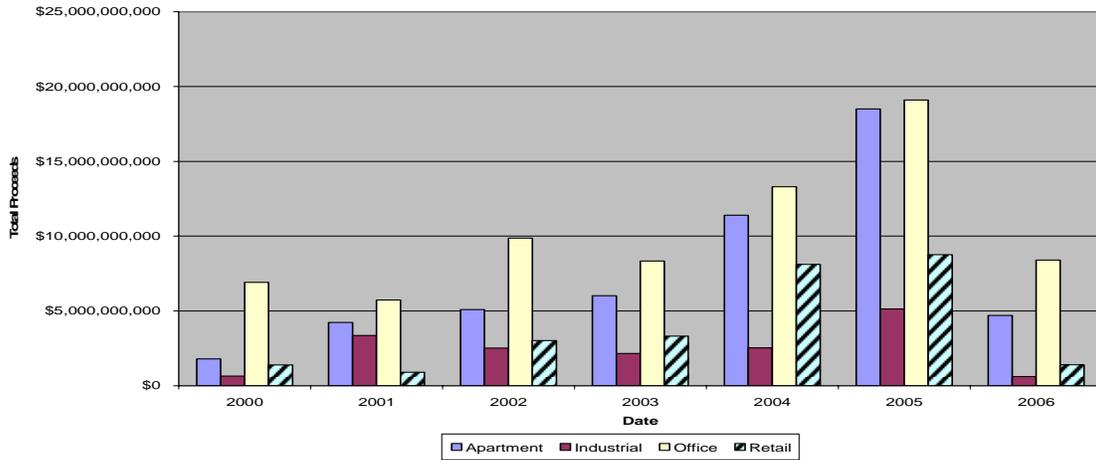

Buyer Expenditures - Private National

50
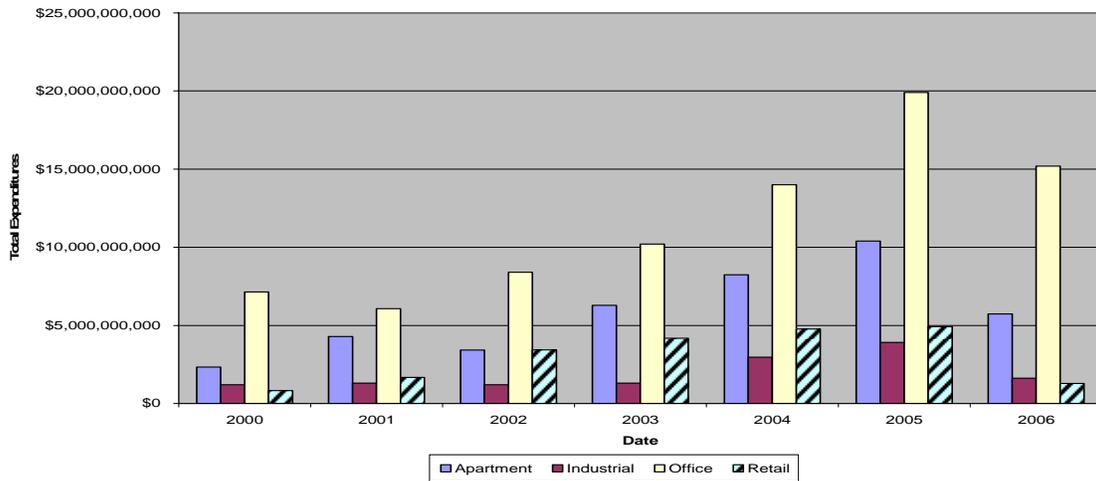
Figure 29

Foreign Investor Returns and Capital Flows

**Repeat Sale Index of Returns by Investor Groups
By Seller Type with Maximum Return of 50% per Annum and Min. Holding Period of 2 Years**
January 2001 - May 2006
WLS Model w/ K=15
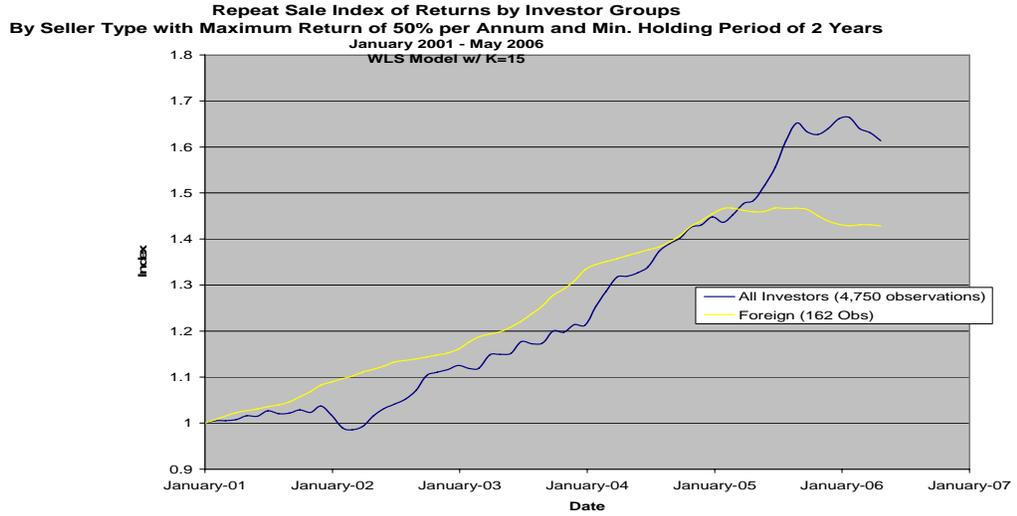
Seller Proceeds - Foreign
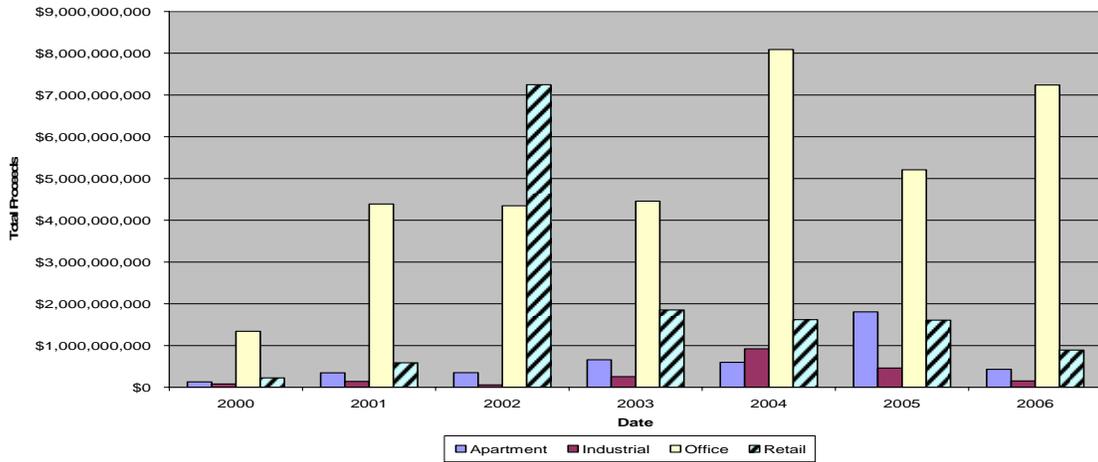
Buyer Expenditures - Foreign

51
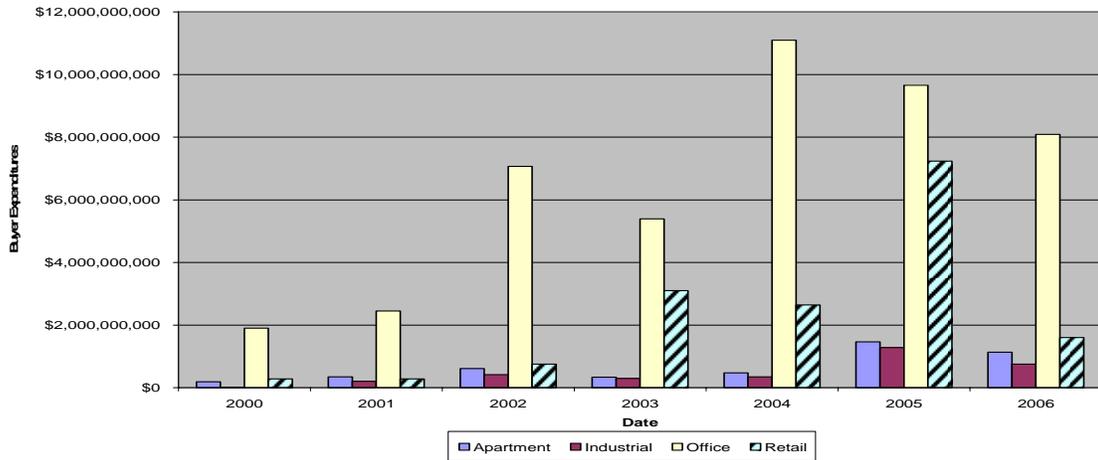
Figure 30

User/other Investor Returns and Capital Flows

Repeat Sale Index of Returns by Investor Groups
By Seller Type with Maximum Return of 50% per Annum and Min. Holding Period of 2 Years
January 2001 - May 2006
WLS Model w/ K=15

Seller Proceeds - User/other

Buyer Expenditures - User/other

52
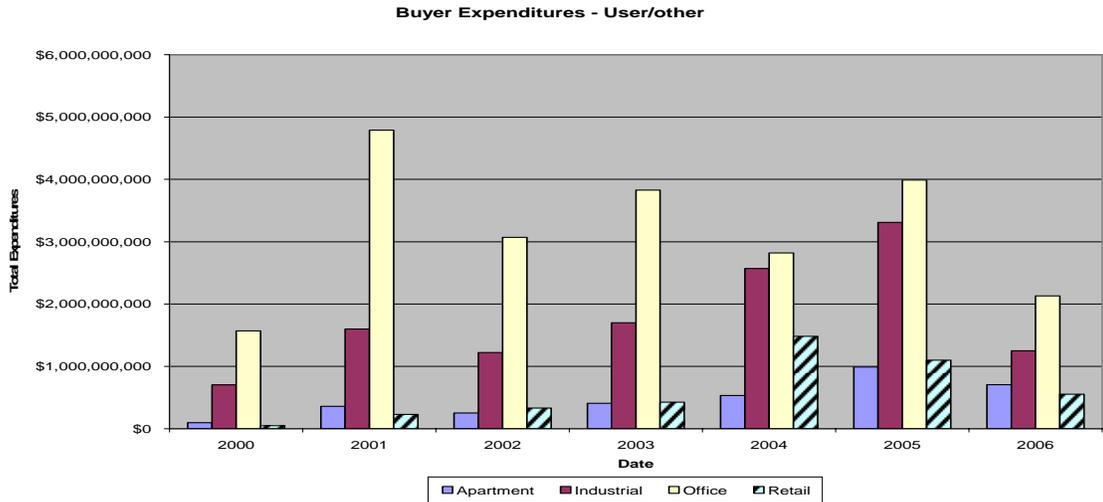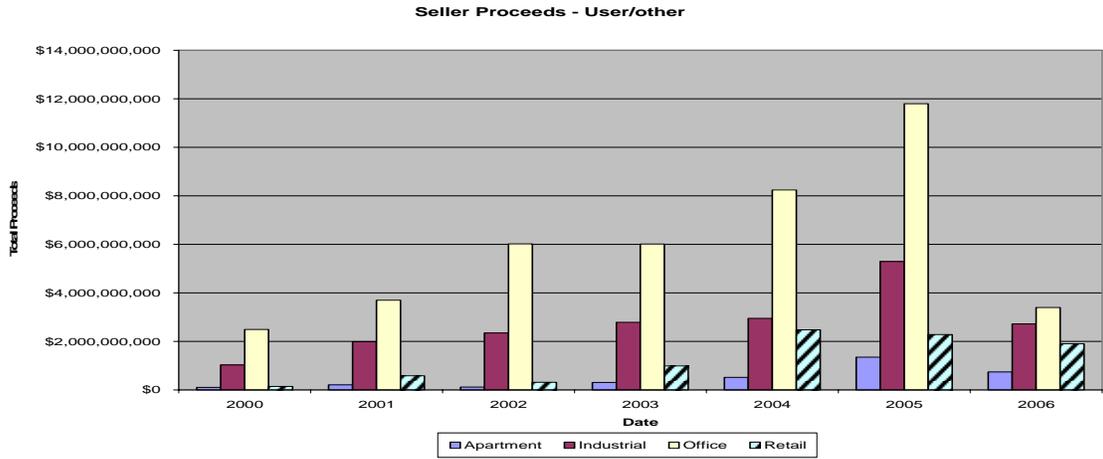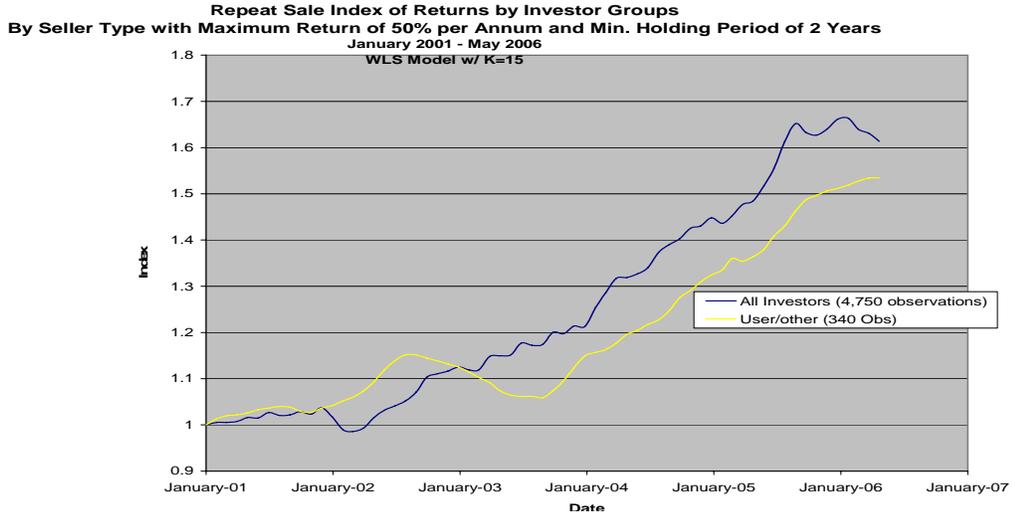
Figure 31

Syndicator Investor Returns and Capital Flows

Repeat Sale Index of Returns by Investor Groups
By Seller Type with Maximum Return of 50% per Annum and Min. Holding Period of 2 Years
January 2001 - May 2006
WLS Model w/ K=15

Legend:
— All Investors (4,750 observations)
— Syndicator (45 Obs)
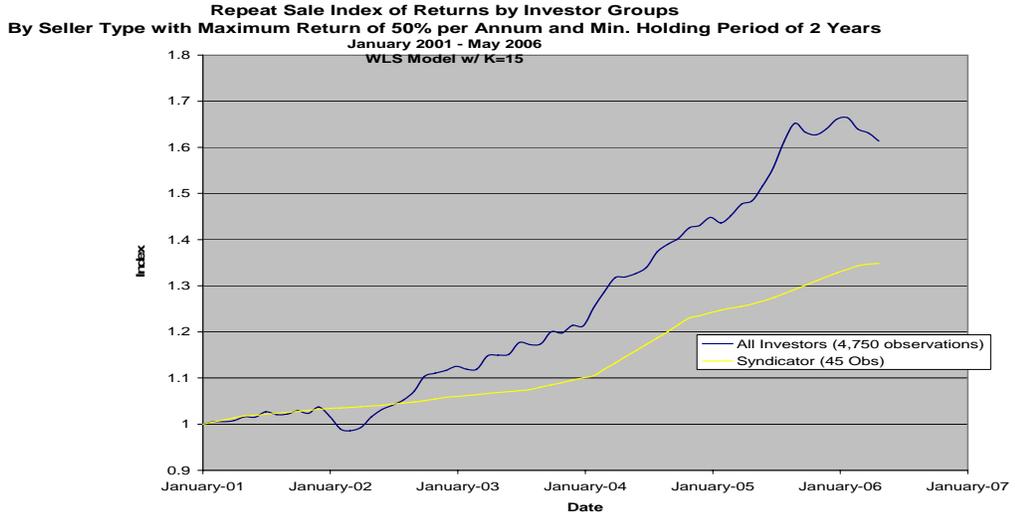
Seller Proceeds - Syndicators

Legend: ☐ Apartment ☐ Industrial ☐ Office ☒ Retail
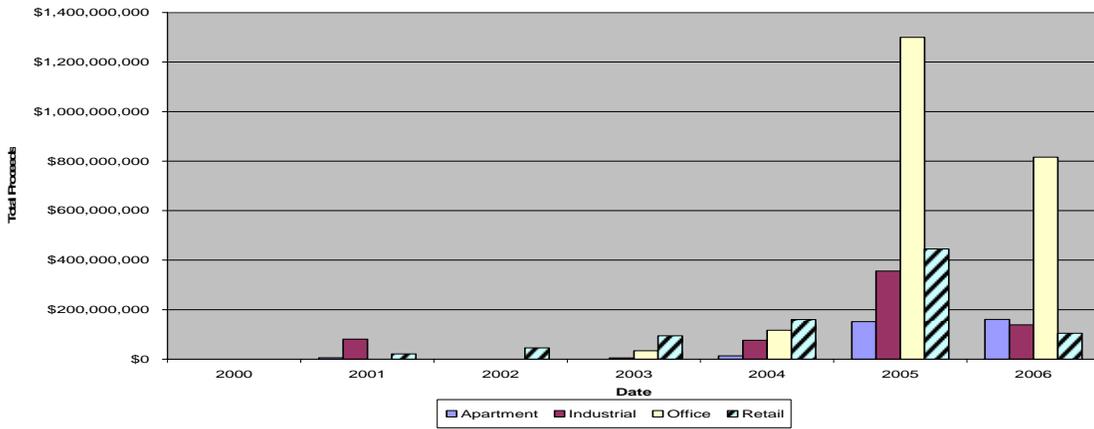
Buyer Expenditures - Syndicators

Legend: ☐ Apartment ☐ Industrial ☐ Office ☒ Retail

53
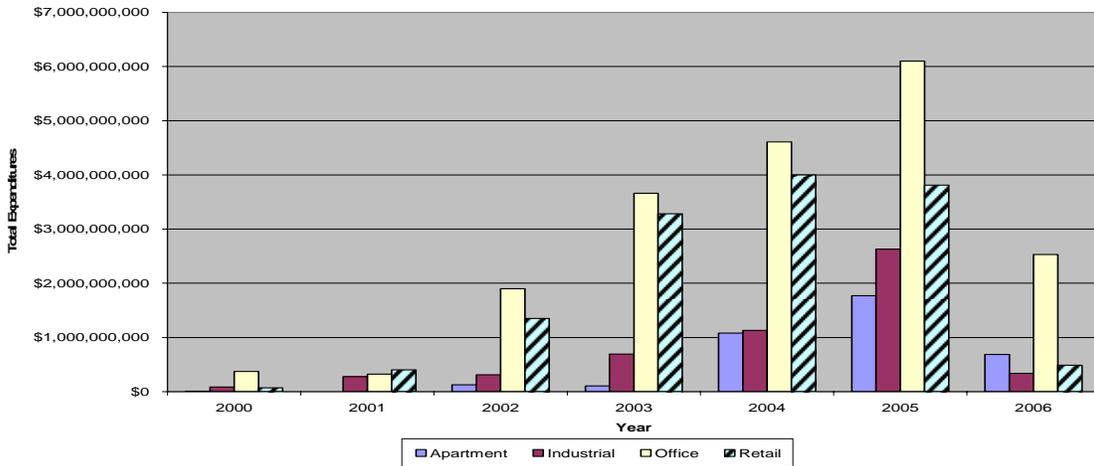
5. Conclusion

The purpose of this thesis is to explore the behavior and performance of various investor types, thereby enlarging the existing body of knowledge in capital markets. It is important because it deepens the understanding of the opportunity cost of capital in real estate, and ultimately may help increase market information and efficiency. More efficient markets lead to greater transparency and participation, which generally benefits investors. The paper evaluates capital flows and capital appreciation returns for each investor type, from private local to institutional, and presents a number of conclusions which add to the understanding of investor behavior and performance.

First, within the *Overall Data Set* of property transactions between 2000 and 2006, private local investors are the largest investor type, both in absolute number and in transaction dollar volume. Even though private local investors have the smallest median and mean transaction prices, their sheer number explains such large transaction volume. Between 2000 and 2006 private local investors were buyers in 37% of the total sample transactions and sellers in 38%.[41] Despite the growing presence of institutional, REIT and foreign investors—which are typically regional or national in geographic scope and have much larger median and mean transaction prices—the real estate market is still very local in nature. Inefficiencies in market information and uniqueness in property characteristics permit private local investors—in aggregate—to be significant market participants.

Second, private local, private national, REITs and institutions are the four largest categories of investors. They trade properties more among themselves than with any other investor types. This implies that they are competing with one another quite frequently when buying properties. Even though many private local investors tend to buy and sell smaller properties, a significant contingent of private locals invest in larger, "institutional-quality" real estate. Private national, foreign and institutional investors also buy and sell frequently in the "institutional" market.

Third, REIT, foreign and private investors each exhibited leadership at different times with respect to buying and selling real estate. Between 2000 and 2001, REIT and foreign investors were net sellers before most other investor types became net sellers. In 2002 REITs were extremely large net buyers when all other investor types were net

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[41] These figures exclude transactions whose buyer and/or seller were "missing."

sellers.[42]   Private local and private national investors exhibited similar leadership, becoming the first and largest net sellers of properties in both 2004 and 2005. In almost all years, institutional investors lagged behind other investors in buying and selling properties. Given the short sample period, it is difficult to prove conclusively these *lead-lag* relationships in capital flow. Exogenous economic forces could very well explain the "leading" or "contrarian" behavior of some investors. For example, some REIT stocks trading at *premia* to NAV may have affected REIT behavior, while strengthening foreign currency markets may have driven foreign investor behavior.

Fourth, condo converters, syndicators and users are unique types of real estate investors. Condo converters and syndicators are mainly buyers of real estate rather than sellers. While condo converters are composed of all types of investors, they are a separate category because they sell—rather than hold for rental income—the acquired properties. Their property acquisitions surged since 2000 in large part due to historically low interest rates. Demand from syndicators rose because their ownership structure is a favorable vehicle for 1031 tax deferred exchanges, and it allows many investors to band together to purchase attractive, large properties. Lastly, users are unique investors whose determination of building value lies not in rental income generation, but in suitability for entity operations.

Fifth, in order to evaluate investor returns, a repeat sale index was employed to calculate capital appreciation (growth) in properties. While this method lacks the rental income component of total return, it isolates the differentiating component: *growth*. REITs, foreign and private investors all took turns earning the highest cumulative growth returns during the sample period. REITs and foreign investors earned the greatest cumulative returns from mid 2000 to early 2004, benefiting in part from favorable security and currency markets, respectively. Private local investors earned very high returns in 2004, surpassing REITs and foreign investors in cumulative returns from mid 2004 to May 2006. Private locals benefited from unique market knowledge, entrepreneurial labor and nimble decision-making. Institutional investors consistently earned the lowest cumulative investor returns, excluding syndicators and users, but these returns were also the least

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[42] These statements regarding the timing of capital flow trends exclude users, syndicators and condo converters.

volatile. The institutional performance illustrates their tendencies to assume the lowest risk of all investor types. These investor returns appear to be loosely correlated with capital flows: when REIT, foreign and private local investors each led, respectively, in capital flows, the leader also tended to have the highest investor returns. However, further study must be done over longer time periods to determine the precise relationship between capital flows and investor returns.

Finally, private local investors exhibited the greatest tendency to lead other investors in terms of return performance. When private local returns climbed during the sample period, it was not uncommon to see other investors' returns climb in the same fashion three to 12 months later. While REITs and foreign investors were occasionally exceptions to this *lead-lag* phenomenon, institutional investors were usually lagging other investors. In particular, private local and institutional investors exhibited a relatively strong *lead-lag* relationship with respect to return trends.

Recommendations for Further Study

Further study is recommended in several areas. First, investor returns relative to transaction size is important. Recent observations by RCA (within a similar data set) showed that property cap rates become lower as transaction prices rise, up to a point— between $40 and $50 million—above which cap rates edge back up. While cap rates are a different return metric than growth, these observations demonstrate that property size might influence property return. Ziering and McIntosh (1999) find supporting evidence of this relationship. If different investor types are prone to buy and sell at different price points, property size—and not just investor type—might have a significant impact on returns. Initial tests were conducted in this thesis to compare returns within certain price bands; this would allow observation of the different investor type behavior and performance for transactions in the same price range. However, the resulting indices showed too many irregularities, likely because there were not enough observations contained within the *Repeat Sale Data Set*.

Another recommended area of study is volatility of growth returns across investor types. Because certain investors typically earn higher returns than others, it would be interesting to determine if these investors are fairly compensated for the additional risk they

take on, based on empirical evidence. Understanding such risks would broaden the knowledge base in real estate capital markets.

Finally, this thesis is limited to the years 2000 to 2006. In order to make broader, more meaningful observations about capital flows, returns and *lead-lag* relationships, it is important to study transactions that span greater lengths of time—preferably across real estate cycles. It is recommended that this study be conducted again in five to ten years to observe any changes in results.

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Email from Bob White, president of RCA, dated June 6, 2006.

Appendix A

In addition to transaction price and date, both the *Overall Data Set* and the *Repeat Sale Data Set* contain other variables (although not necessarily complete for each transaction), including, but not limited to, property name, address, metropolitan statistical area, square footage, property type (eg. office, industrial, apartment, retail, hotel, mixed, development), number of floors, major tenants, percent occupancy, year built, year annexed, prior sales price, prior sales date, buyer type and seller type. In addition to these variables, the *Overall Data Set* also contains cap rate information, lender, loan amount, and loan-to-value ratio for many of the properties.

The names of the buyer and seller are provided when known. Buyers and sellers are categorized at three separate levels. First, each investor receives a "capital classification," a very narrowly defined investment category. Next each investor is grouped into one of six major categories, including private-local, private-national, foreign, institutional, REIT/public, and user/other.   (Within each major category there are many capital classifications.) When there are multiple investors involved in a transaction, RCA associates "buyer 1" and "buyer 2" using specific terms such as "joint venture", "aka" (also known as), "obo" (on behalf of) to distinguish the relationship."[43] The third level of classification is "buyerinvcomposition" and "sellerinvcomposition", which best classifies the entire deal when more than one party is involved. According to RCA President, Bob White:

> "Institutional trumps all, then foreign, then REIT. For example a deal where a REIT teams with a local private developer, the deal is labeled [sic] a REIT deal. The purpose of the acquisition is also incorporated. For example, if the deal is bought for condo conversion, …[RCA] classif[ies] the buyer as a 'condo converter' regardless if they are private, foreign etc. [The] [s]ame goes for occupancy.   If Metlife buys a building to use as their op[erations] center, they would be classified as a User, but if they bought it as an investment, they would be classed as an Institution."[44]

Because the third and final level of classification best captures the investor composition, it is the classification used in this thesis to categorize buyers and sellers.

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[43] The methodology to categorize buyers and sellers was explained by Bob White, president of RCA, by email, dated June 6, 2006. This explanation summarizes that email.
[44] Bob White, president of RCA, quoted in an email dated June 6, 2006.

Figures A and B illustrate that transaction counts by buyer and seller types, respectively, tended to grow between 2000 and 2006. These figures have excluded the "missing" investor types.

Figure A
Transaction Count by Buyer Type & Year
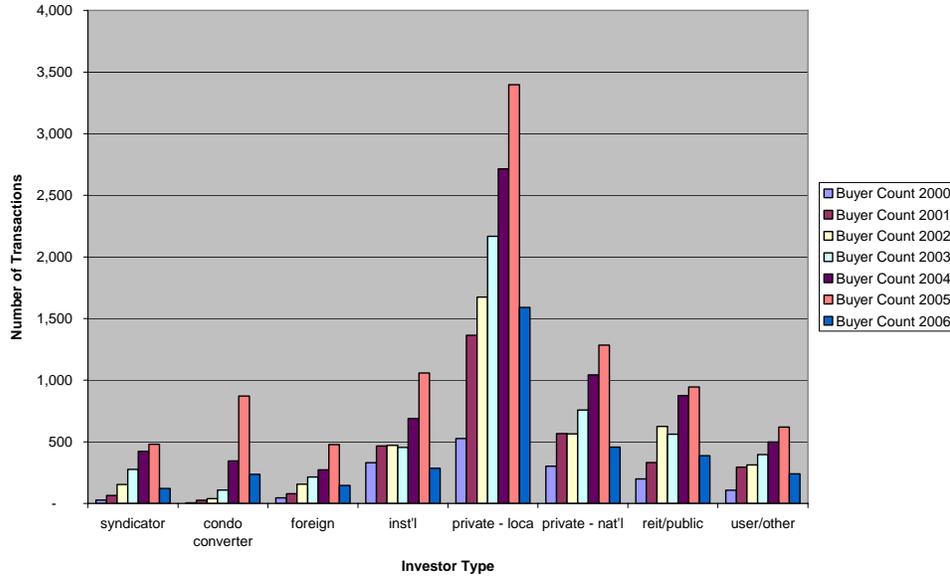
Figure B
Transaction Count by Seller Type & Year
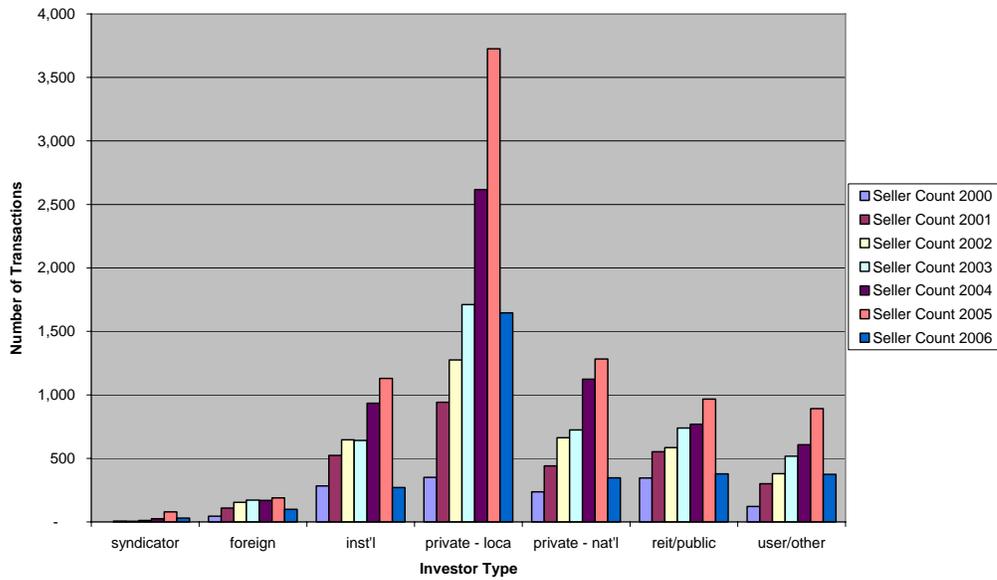
Appendix B (continued)

Figures C & D illustrate that the mean transaction prices among each investor type tended to grow between the years 2000 and 2006. These figures include "missing" data, illustrating that these transactions, whose buyers or sellers were unidentified, are relatively small in mean transaction price.

Figure C
Mean Purchase Price by Buyer Type

62

Figure D

Mean Sale Price by Seller Type
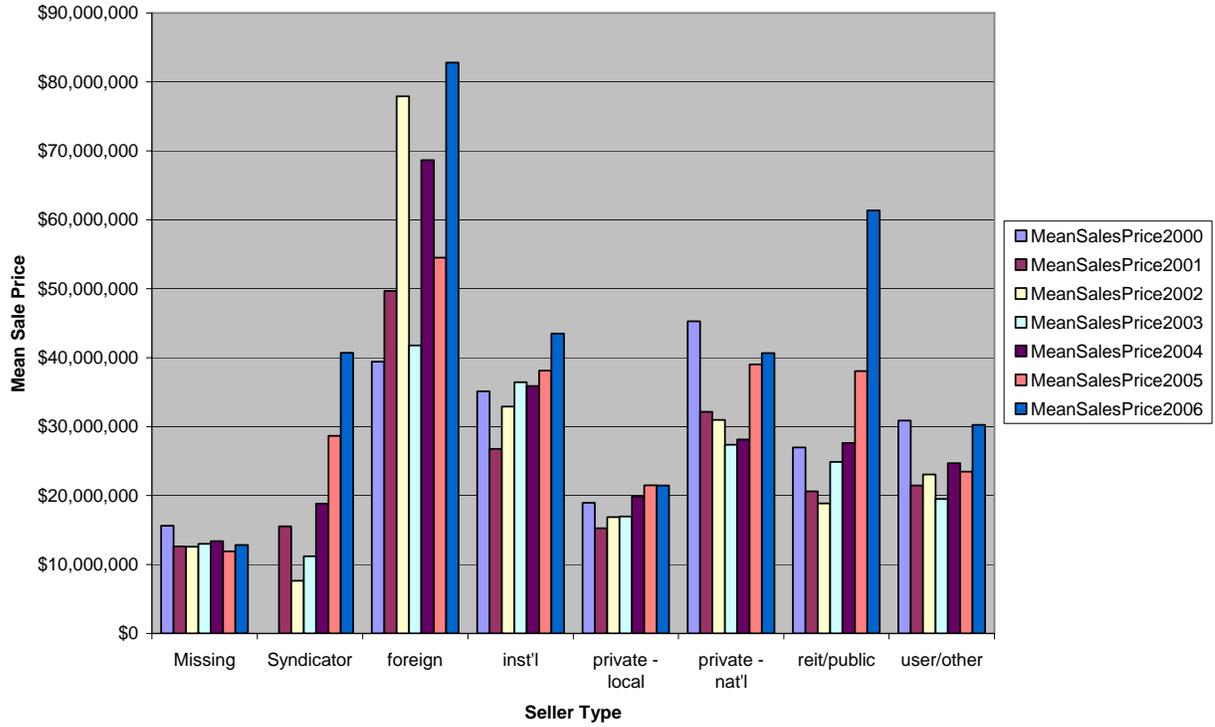
Figure E

Buyer Expenditures on Apartment Property by Year
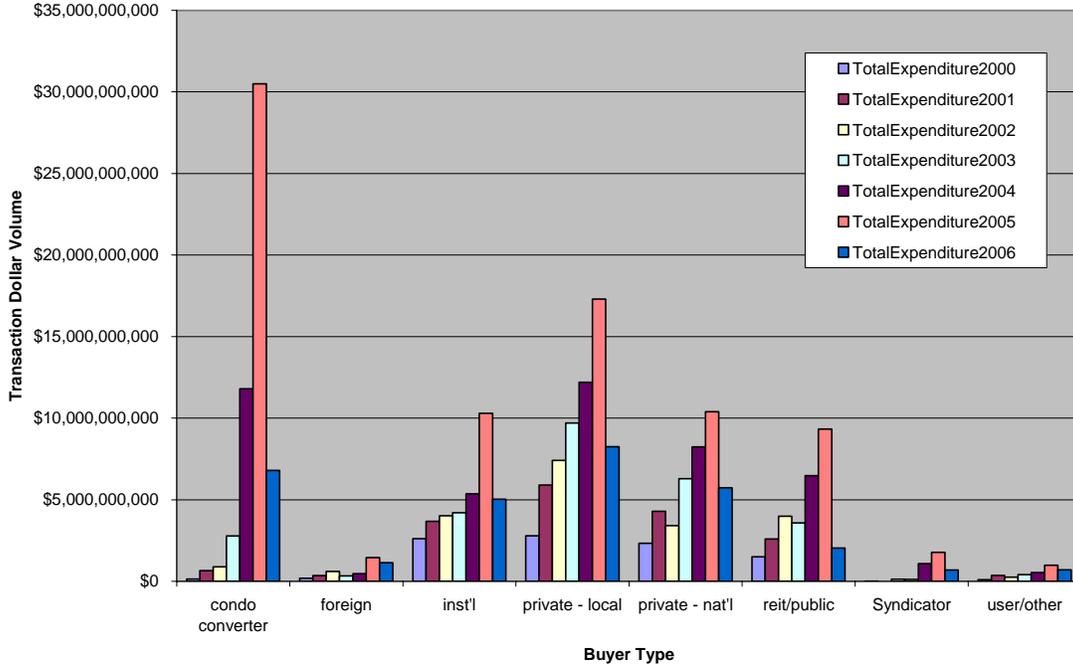
Figure F

Buyer Expenditures on Industrial Property by Year
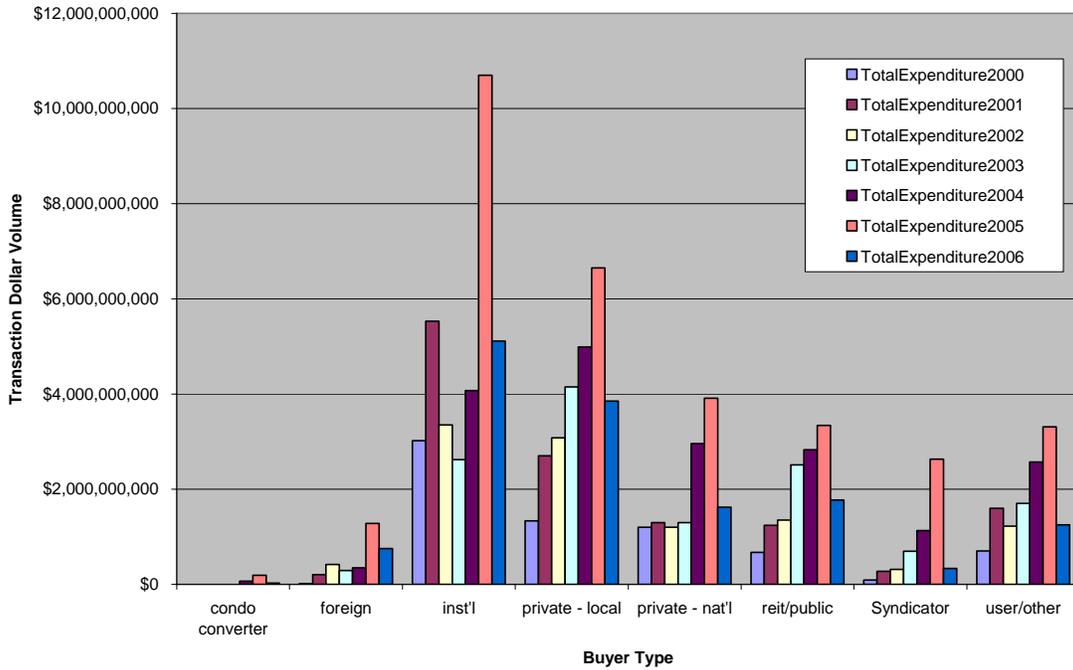
Figure G

Buyer Expenditures on Office Property by Year
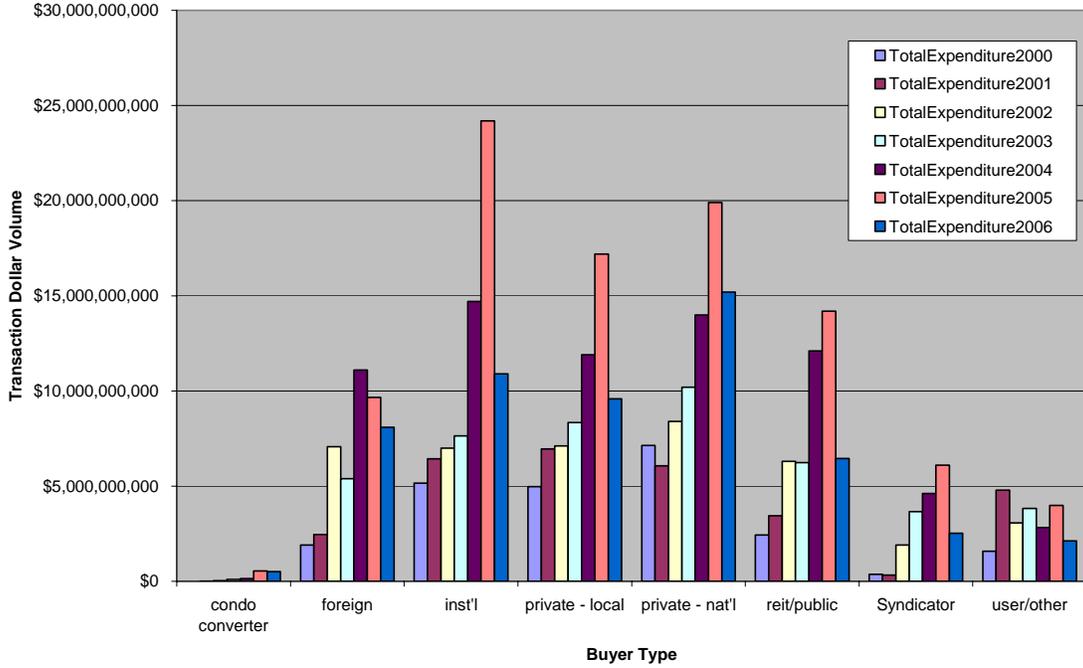
Figure H

Buyer Expenditures on Retail Property by Year
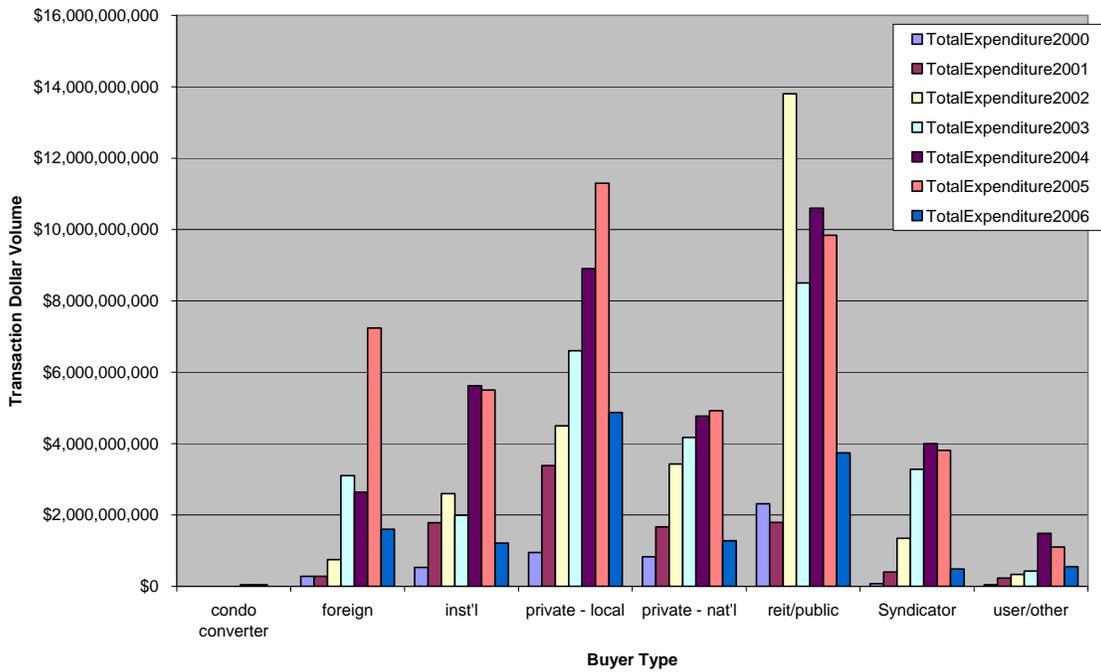
Figure I

Seller Proceeds for Apartment Property by Year
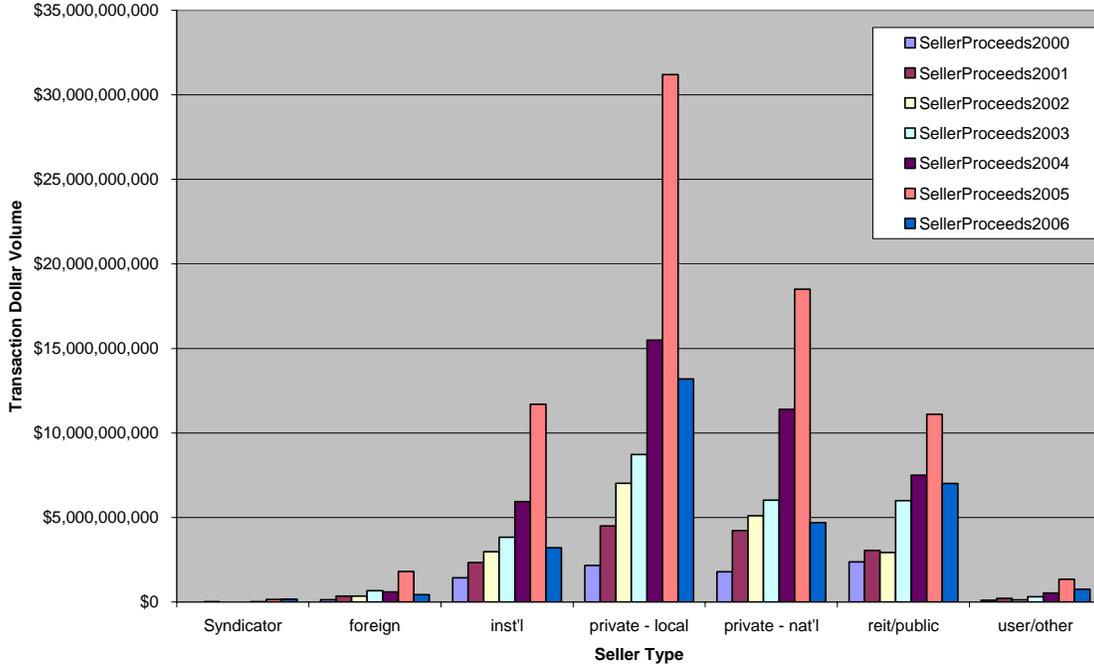
Figure J

Seller Proceeds for Industrial Property by Year
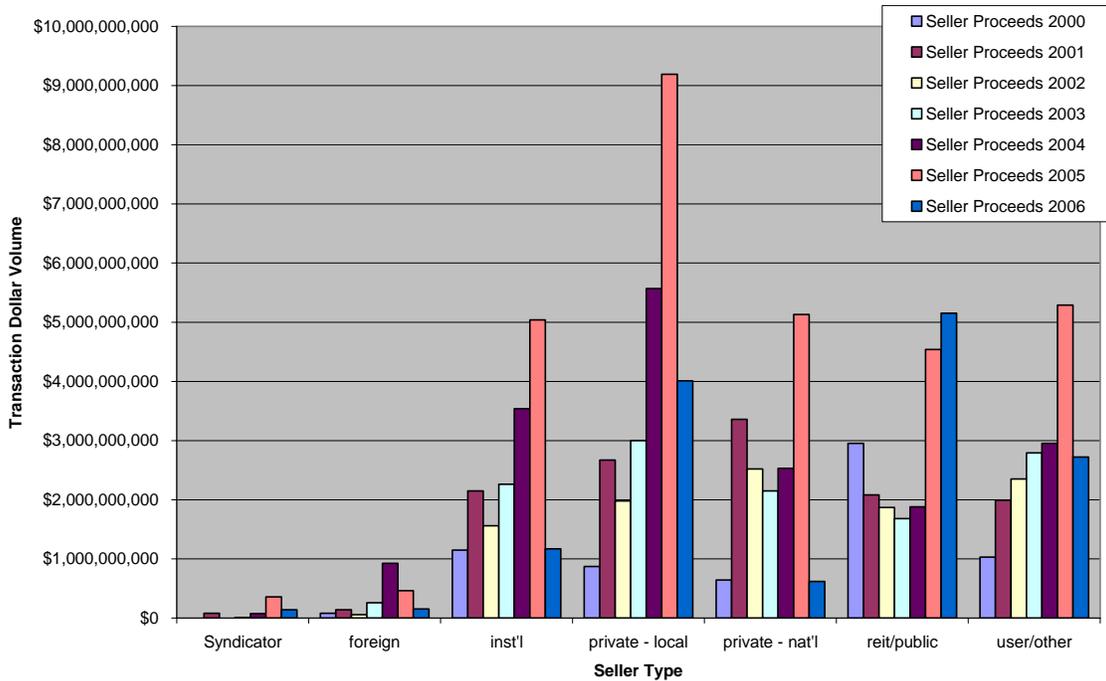
Figure K

Seller Proceeds for Office Property by Year
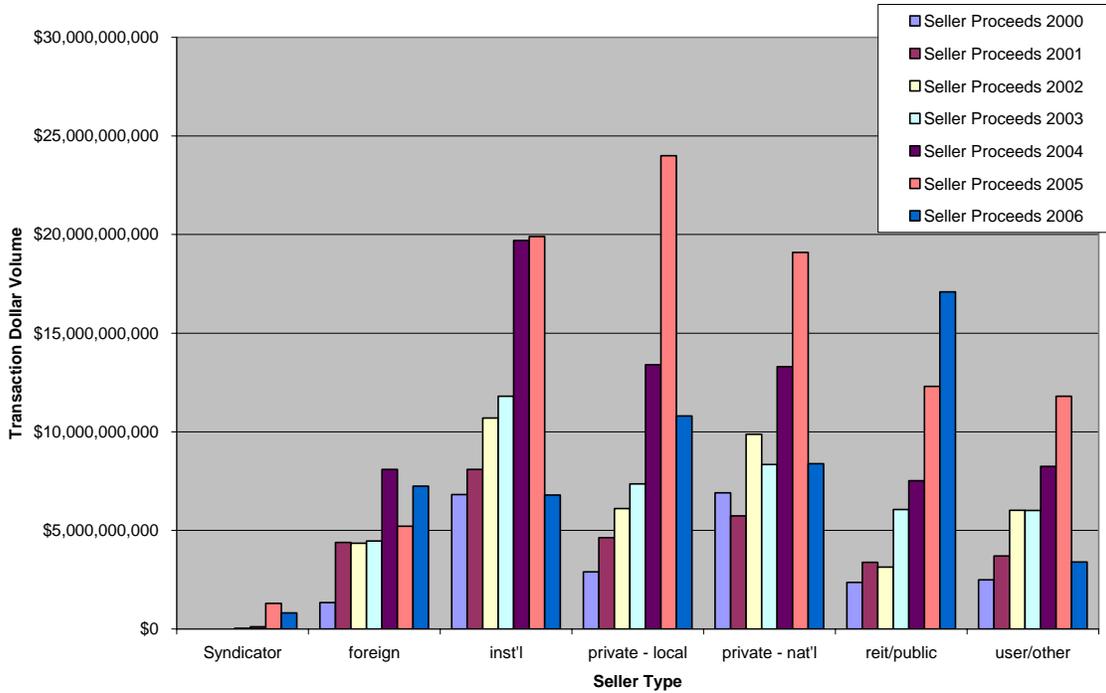
Figure L

Seller Proceeds for Retail Property by Year
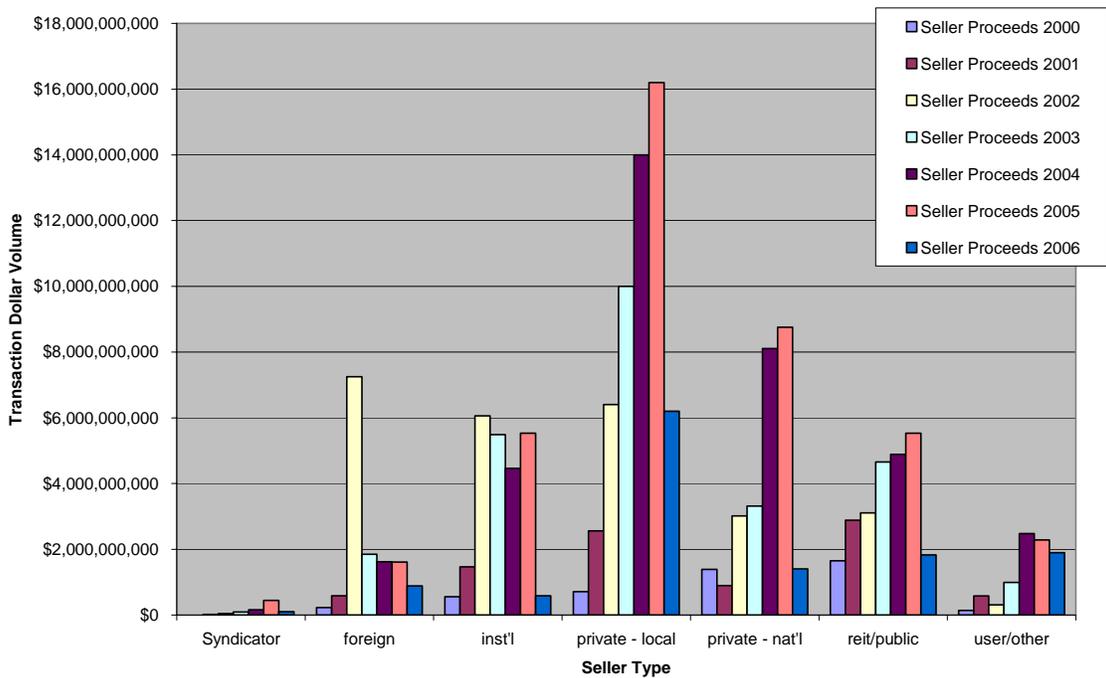
Appendix D

Figure M
Buyer-Seller Combination Transaction Count ("missing" included)
Between mid 2000 and May 2006

| Buyer Types | Seller Types | | | | | | | | |
	foreign	inst'l	Missing	private - local	private - nat'l	reit/public	Syndicator	user/other	Grand Total
condo converter	19	196	331	676	277	152	2	23	1676
foreign	77	257	88	309	196	402	5	92	1426
inst'l	127	834	360	813	720	715	35	218	3822
Missing	54	250	3115	1603	311	453	15	318	6119
private - local	264	1230	3163	5517	1348	1187	50	1076	13835
private - nat'l	188	712	766	1451	1126	1206	10	393	5852
reit/public	188	601	750	1019	856	468	10	403	4295
Syndicator	59	191	264	482	300	116	21	153	1586
user/other	40	219	498	768	187	188	16	597	2513
Grand Total	1016	4490	9335	12638	5321	4887	164	3273	41124

Figure N
Buyer-Seller Combination Transaction Count ("missing" excluded)
Between mid 2000 and May 2006

| Sum of Transaction_Count | Seller Type | | | | | | | |
Buyer Type	foreign	inst'l	private - local	private - nat'l	reit/public	Syndicator	user/other	Grand Total
condo converter	19	196	676	277	152	2	23	1345
foreign	77	257	309	196	402	5	92	1338
inst'l	127	834	813	720	715	35	218	3462
private - local	264	1230	5517	1348	1187	50	1076	10672
private - nat'l	188	712	1451	1126	1206	10	393	5086
reit/public	188	601	1019	856	468	10	403	3545
Syndicator	59	191	482	300	116	21	153	1322
user/other	40	219	768	187	188	16	597	2015
Grand Total	962	4240	11035	5010	4434	149	2955	28785

Figure O

Transaction Count in 2nd half of 2000

Figure P

Transaction Count in 2001

Figure Q

Transaction Count in 2002

Figure R

Transaction Count in 2003

Figure S

Transaction Count in 2004

Figure T

Transaction Count in 2005

Figure U

Transaction Count through May 2006

Buyer & Seller Type (y-axis)

Number of Transactions (x-axis)

User/other is Buyer
- user/other buys from user/other
- user/other buys from reit/public
- user/other buys from private - nat'l
- user/other buys from private - local
- user/other buys from inst'l
- user/other buys from foreign
- user/other buys from Syndicator

REIT/public is Buyer
- reit/public buys from user/other
- reit/public buys from reit/public
- reit/public buys from private - nat'l
- reit/public buys from private - local
- reit/public buys from inst'l
- reit/public buys from foreign
- reit/public buys from Syndicator

private - nat'l is Buyer
- private - nat'l buys from user/other
- private - nat'l buys from reit/public
- private - nat'l buys from private - nat'l
- private - nat'l buys from private - local
- private - nat'l buys from inst'l
- private - nat'l buys from foreign
- private - nat'l buys from Syndicator

private - local is Buyer
- private - local buys from user/other
- private - local buys from reit/public
- private - local buys from private - nat'l
- private - local buys from private - local
- private - local buys from inst'l
- private - local buys from foreign
- private - local buys from Syndicator

inst'l is Buyer
- inst'l buys from user/other
- inst'l buys from reit/public
- inst'l buys from private - nat'l
- inst'l buys from private - local
- inst'l buys from inst'l
- inst'l buys from foreign
- inst'l buys from Syndicator

foreign is Buyer
- foreign buys from user/other
- foreign buys from reit/public
- foreign buys from private - nat'l
- foreign buys from private - local
- foreign buys from inst'l
- foreign buys from foreign
- foreign buys from Syndicator

Condo converter is Buyer
- condo converter buys from user/other
- condo converter buys from reit/public
- condo converter buys from private - nat'l
- condo converter buys from private - local
- condo converter buys from inst'l
- condo converter buys from foreign
- condo converter buys from Syndicator

Syndicator is Buyer
- Syndicator buys from user/other
- Syndicator buys from reit/public
- Syndicator buys from private - nat'l
- Syndicator buys from private - local
- Syndicator buys from inst'l
- Syndicator buys from foreign
- Syndicator buys from Syndicator

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Description of Ridge Regression Technique

The following description of the Ridge Regression Technique is quoted directly from a paper by Fisher, Geltner and Pollakowski at the MIT Center for Real Estate. It is entitled *A Quarterly Transactions-Based Index of Institutional Real Estate Investment Performance and Movements in Supply and Demand.* Exhibits 2 & 4, located at the end of the quote, are also taken from this article. Even though the TBI has quarterly frequency, and the indices in this thesis have a monthly frequency, the same principles apply:

"To address the noise problem at the quarterly frequency, we employ an extension of the Bayesian noise filtering technique developed by Goetzmann (1992), Gatzlaff and Geltner (1998) and Geltner and Goetzann (2000). This technique involves the use of a ridge regression as a Method of Moments estimator. The estimator minimizes the squared errors of the predicted values (property prices) subject to moment restrictions in the results. The moment restrictions, characterizing the return time series statistics of the resulting estimated index, are based on *a priori* information about the nature of the results that should obtain [sic]. In the present case, the moment restrictions are employed as a "noise filter". The ridge procedure eliminates noise in the estimated index without inducing a temporal lag in the index returns. In the present context the moment restrictions are defined to produce a quarterly index whose annual end-of-year return time-series characteristics approach those of the manifestly noise-free annual index which we have just presented in Exhibits 2 and 4, which was estimated at the annual frequency, classically, without the Bayesian filter.

"The ridge regression procedure works mechanically by adding "synthetic data" to the estimation database. Specifically, we add one "observation" for each of the 91 quarters. As noted, the synthetic data is based on the annual frequency version of the price model. The effect of the synthetic data is to "pull" the quarterly results toward the smoother (presumably noise-free) annual results. The strength of this "pull" which dampens random noise is inversely related to the number of actual price observations in the real data for each period of time. The ridge effect is adjusted by means a parameter, labeled "*k*", which governs the strength of the synthetic data in the estimation process. Each of the 91 rows of synthetic data is multiplied by *k*. The higher the k, the greater the influence the added observations have on the regression results.

"For each quarter, a row of synthetic data is constructed as follows. The LHS dependent variable price observations are taken directly from the annual frequency transaction index depicted in Exhibit 4, with quarterly values linearly interpolated between the annual end-of-the-year levels. The RHS synthetic A_{it} composite hedonic variable values are similarly constructed from the NPI appreciation index shown in Exhibit 4, only lagged two

quarters. Each row of synthetic data corresponds to one quarter of calendar time, and therefore has one time dummy variable equal to unity, corresponding to the quarter represented by the row. Thus, the time dummies in the synthetic data make a diagonal square matrix of ones. (The constant and time-invariant dummy variables are also included in the ridge at their population mean levels.)

"As noted, all the vales in each row of synthetic data are multiplied by the ridge parameter k, which is adjusted until the resulting estimated index conforms to the moment restrictions noted above, which indicate a lack of noise. In the present case, we have used three criteria in deciding when the moment restrictions are met. The first two criteria are quantitative moment comparisons between the quarterly index and the index estimated at the annual frequency shown in Exhibit 4. First, we compare the annual volatility of the quarterly index (based on its end-of-year returns) to that of the annual index. Second, we compare the annual first-order autocorrelation of the two indices (again basing this on end-of-year returns for the quarterly index). Our third criterion is qualitative. We look at the resulting annualized (based on ends of years) quarterly index and compare it visually to the annual index shown in Exhibit 4. We select the lowest value of k for which all three of these criteria show a close similarity between the annualized quarterly index and the noise-free (and ridge-free) annual index shown in Exhibit 4.[45] We use $k = 5$ in our model estimation."[46]

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[45] The same procedure is applied separately to each of the property sector sub-indices.
[46] Fisher , Jeff; Geltner, David; and Pollakowski, Henry, <u>A Quarterly Transactions-Based Index of Institutional Real Estate Investment Performance and Movements in Supply and Demand</u>, MIT Center for Real Estate, January 2006. pages 27-29.

Exhibit 2: Annual Frequency Selection-Corrected Hedonic Price Model (Eqn.10), regressing log of sale price onto log of appraised value (lagged 2 qtrs), weighted annual time-dummies, and other variables as described in the text…

Annual Frequnecy Heckman Second Step (OLS)

	Coefficient	Std. Err.	t
aptgard_dum	0.017	0.018	0.910
apthigh_dum	0.033	0.029	1.150
regionalma~m	0.093	0.032	2.910
retailmall~m	-0.069	0.028	-2.450
retailsing~m	0.026	0.033	0.800
warehouse_~m	-0.006	0.024	-0.250
indrd_dum	-0.020	0.017	-1.160
indflex_dum	-0.009	0.029	-0.290
offcbd_dum	-0.006	0.015	-0.420
offsub_dum	-0.011	0.010	-1.150
LogHedonic	1.011	0.018	55.940
Other City	-0.046	0.015	-3.060
IL-Chicago	-0.042	0.017	-2.410
TX-Dallas	-0.059	0.021	-2.880
DC-Washington	-0.003	0.018	-0.170
GA-Atlanta	-0.044	0.020	-2.180
CA-Orange County	-0.002	0.021	-0.100
CA-San Jose	-0.026	0.024	-1.090
AZ-Phoenix	-0.021	0.021	-0.990
TX-Houston	-0.015	0.022	-0.660
MN-Minneapolis	-0.047	0.022	-2.090
WA-Seattle	-0.002	0.022	-0.090
CO-Denver	-0.044	0.022	-1.960
MA-Boston	-0.034	0.022	-1.510
CA-Oakland	0.001	0.027	0.040
PA-Philadelphia	-0.025	0.024	-1.040
CA-San Diego	0.006	0.024	0.260
MO-Saint Louis	-0.054	0.027	-2.010
MD-Baltimore	-0.003	0.025	-0.120
year_1984	-0.086	0.053	-1.640
year_1985	-0.042	0.043	-0.980
year_1986	-0.055	0.045	-1.240
year_1987	-0.084	0.045	-1.870
year_1988	-0.111	0.045	-2.490
year_1989	-0.168	0.043	-3.890
year_1990	-0.168	0.044	-3.800
year_1991	-0.161	0.049	-3.260
year_1992	-0.136	0.043	-3.160
year_1993	-0.026	0.042	-0.630
year_1994	-0.046	0.042	-1.100
year_1995	-0.039	0.041	-0.950
year_1996	-0.037	0.049	-0.760
year_1997	0.049	0.048	1.030
year_1998	0.022	0.052	0.440
year_1999	-0.049	0.044	-1.100
year_2000	-0.050	0.047	-1.060
year_2001	-0.086	0.043	-1.990
year_2002	-0.053	0.047	-1.140
year_2003	-0.030	0.044	-0.670
year_2004	-0.005	0.050	-0.090
year_2005	0.135	0.061	2.200
InvMills	0.013	0.057	0.230
_cons	0.026	0.077	0.340
Adjusted R^2	0.940		
N	4422		

CA-Los Angeles is used as the omitted case for city dummies

Source: Fisher, Geltner & Pollakowski (2006)

Exhibit 4: Representative Property Transaction Based Index (Annual Frequency Estimation) vs NPI:

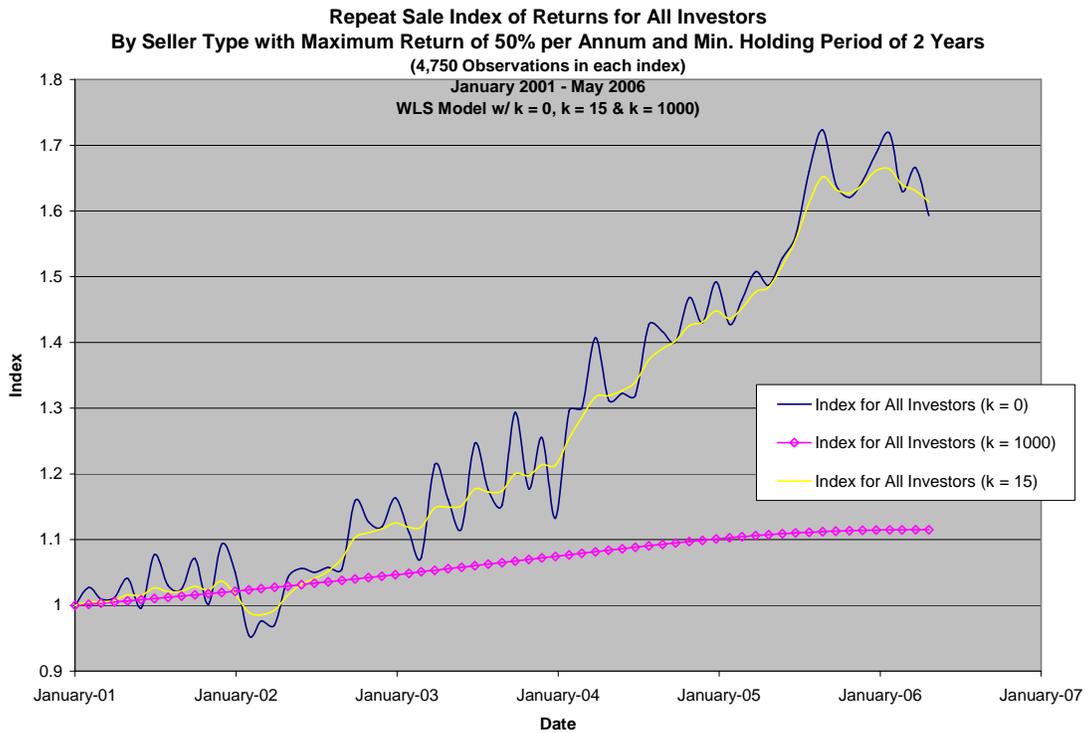Representative Property Transaction Price Index: Annual Frequency Estimation
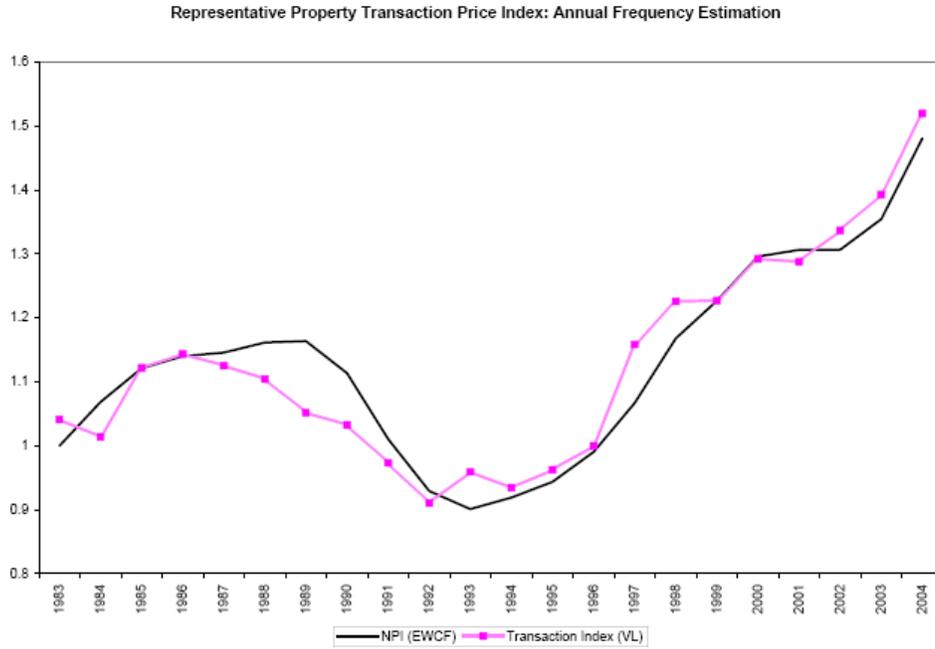
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Source: Fisher, Geltner & Pollakowski (2006)

Appendix E (continued)

Figure V illustrates the effect that different *k* values have on the index results. When *k* = 0, the index shows tremendous noise, or random error, in property values. When *k* = 1000, the index shows hardly any movement whatsoever in property values. When *k* = 15, the index shows a more realistic level of the underlying volatility in property values.

Figure V

Repeat Sale Index of Returns for All Investors
By Seller Type with Maximum Return of 50% per Annum and Min. Holding Period of 2 Years
(4,750 Observations in each index)
January 2001 - May 2006
WLS Model w/ k = 0, k = 15 & k = 1000)

Appendix F
Figure W

Repeat Sale Index of Returns by Investor Type
By Seller Type with Maximum Return of 50% per Annum and Min. Holding Period of 2 Years
January 2001 - May 2006
(WLS Model w/ K=15d)

Legend:
- Private - local (2,470 Obs)
- Private - Nat'l (698 Obs)
- Inst'l (660 Obs)
- Reit/public (375 Obs)
- User/other (340 Obs)
- Syndicator (45 Obs)
- Foreign (162 Obs)

Y-axis: Index
X-axis: Date