Securitisation and the Commercial Property Cycle

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1. Introduction

The financial crisis of 2007–2009 was triggered by declining housing prices and propagated by securitisation. Combined with high mortgage loan balances, falling housing prices in the United States caused immediate and widespread household financial distress. This distress subsequently fed through to the residential mortgage-backed securities (RMBS) market, as most relevant mortgage debt had been placed into loan pools. Securities were subsequently issued against the promised cash flows. When RMBS prices fell sharply, it came to light that holdings of RMBS were concentrated in systemically important financial institutions and that repo financing of the highly rated securities had created complex interconnected debt-funding chains (Gorton 2009). Concentrated risk and systemic linkages resulted in large-scale bank distress and failure.

Declining valuations of RMBS were exacerbated by information problems. Mortgages in a loan pool typically numbered in the thousands, often with complicated mortgage designs and no mechanisms in place to generate timely, low-cost and high-quality information on the economic performance of the underlying housing mortgage collateral. Furthermore, at issuance the vast majority of RMBS were rated AAA, implying security values that were supposedly insensitive to underlying credit quality. However, the large negative shock to housing prices caused investors to reconsider the information sensitivity of their securities, with the realisation that they really had little ability to assess the credit quality of the underlying collateral and hence determine a current market value (Gorton 2009; Gorton and Ordoñez 2012).

Flaws in the design of the structured RMBS market may not only have added to financial system instability during the crisis, they may have also have contributed to housing market imbalances beforehand. In the years leading up to the financial meltdown, housing prices in the United States deviated positively from their long-term trend for a very long period (starting in 1996 and lasting for approximately 10 years) and by a very large amount (by 50 per cent or more in many markets). During that time it was widely recognised that housing production was running well ahead of estimated demand – particularly in markets such as Las Vegas, Miami and Phoenix (Ellis 2008). A better-functioning RMBS market might have provided investors and developers with more

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timely and less biased signals of market conditions, and dampened some of the excesses in the mortgage and housing markets.

In addition to these information problems, other alleged design flaws in RMBS included: capital requirements that, together with compliant rating agencies (Partnoy 2009), increased demand for highly rated securities; agency problems up and down the securities production chain (Riddiough 2011); and inattention on the part of security investors (Gennaioli, Shleifer and Vishny 2010). In this paper we focus on the issues of information production and price discovery, where *attention* to the information is also relevant. We posit that lack of attention, combined with insufficient information production and a lack of transparency, explain why the RMBS market failed to alert investors and other market participants as to the true state of the housing market.[1]

To address the issue, we appeal to the experience of a related sector. Namely, we study securitised equity interests in commercial property, known broadly as the listed real estate investment trust (or REIT) market. The latest commercial property cycle in the United States has been nowhere near as long and protracted as that of the housing cycle. In fact, the US REIT market has, in aggregate, recovered to its pre-crisis price levels while housing markets are still near the bottom. We conjecture REITs may have had something to do with that. With a REIT 'transmission channel' in mind, we believe that developing a deeper understanding of the REIT market experience might assist in understanding what went wrong in the RMBS/structured securities market. We furthermore will suggest potential policy solutions in terms of how structural features of REIT markets – both good and bad – can be used to organise the securities production process more effectively going forward.

Publicly traded equity REITs are listed, tax-exempt firms that hold equity interests on a pool of commercial real estate assets. Offsetting the benefits of tax exemption are certain rules that govern the financial and operating policies of the firm, including a requirement to pay out a high percentage of income as dividends. REITs are similar to RMBS in the sense that pay-offs to claimholders depend on the performance of a pool of underlying assets. But REIT assets are directly tied to real estate ownership interests, whereas the underlying assets in a RMBS are mortgages that themselves reference the underlying real estate. Another difference is that many REITs are going concerns, and therefore dynamically manage the pool of underlying assets in an attempt to add value for their stakeholders over time.[2]

In undertaking our analysis we bring together a wide range of financial as well as real economic data from a variety of sources. A contribution of this paper is the extent to which we draw from disparate data sources to analyse financial and real economic characteristics of commercial property markets in 14 economies. Sample time periods differ depending on the economy covered, and the data category. The United States is the case that gets the most in-depth treatment, with some

1 There is a recent literature that argues for price opacity as opposed to transparency in secondary market trading (Pagano and Volpin 2008; Dang, Gorton and Holmström 2011; Gorton and Ordoñez 2012). The basic idea is that lemons problems cause secondary markets to break down when certain traders are perceived to be informationally advantaged. When information acquisition costs are high, it may be best for all traders to be 'equally ignorant'. If traders form beliefs consistent with equal ignorance, trade will occur (albeit with some noise) and welfare can improve. But the conditions required for 'equal ignorance' seem difficult to satisfy in practice, suggesting that this equilibrium is extremely fragile. Consequently we take a polar opposite tack and argue that 'sunlight is the best disinfectant', with better information production and a sufficiently transparent market microstructure providing a better approach to enhance trading efficiency.

2 In contrast, most types of RMBS are static and closed, in the sense that an asset pool is assembled at the time of security issuance and that pool does not change except to the extent that mortgage loans go to term, prepay or default.

data going back to the 1980s. Appendix A presents data descriptions, definitions, time periods and sources by category and economy. These data allow us to undertake a comprehensive review of commercial property construction cycles (with a focus on office construction) as well as the development and characteristics of REIT markets in the United States and globally.

We analyse and compare the recent boom and bust in both housing and commercial property markets in the United States in Section 2. Although the summary characteristics of these property markets resemble each other in some ways, we find that the commercial property market downturn occurred later than that in the residential property market. There have also been very significant differences in market performance since early 2009. Specifically, commercial property markets in the United States have in aggregate more or less fully recovered to their pre-crisis pricing levels, whereas residential property markets have recovered only marginally from the troughs of the cycle.

We find that large and persistent differences in new construction during the growth years of the early and mid 2000s help to explain these performance differentials. Although it is well known that far too many housing units were produced in the United States over this period, it is less well known that commercial property markets did *not* experience a construction boom. Commercial property supply, in fact, stayed in balance throughout the biggest real estate bubble in the United States since the 1920s. In contrast, US housing is still dealing with inventory overhang problems long after those in commercial property have dissipated.

After considering several other potential explanations for the muted supply response on the commercial property side, we hypothesise that REITs played a central role. The development of REITs from a global perspective, with a focus on cross-country differences, is reviewed in Section 3. The logic underlying our conjecture is the mirror of our description of what was missing in the private-label RMBS market. Specifically, our conjecture is that commercial property investors and other US REIT market participants discovered prices quickly and without substantial bias. These firms are covered by industry analysts, rating agencies, and 'talking heads' that convey bad as well as good information about the state of commercial property markets. Exchange-traded shares also induce significant volatility into listed share prices, which may give market participants pause when contemplating resource allocation decisions that affect the supply of extremely durable commercial space in local markets. We also note that our conjecture depends on the fact that the REIT market did not reach maturity until the 1990s, which can help to explain why the supply response was different this time around.

To test our 'civilising influence' hypothesis we use the market share of assets held by REITs as a proxy for the general effects of transparency, information production and attention. After reviewing office supply dynamics around the world in Section 4, in the following section we estimate a reduced form model of construction supply for the United States as well as for a number of other economies with relatively large REIT markets. In the US case we find fairly strong and robust evidence that REITs exerted a price-independent moderating effect on the supply response. Although we document that the supply response across most commercial property markets around the globe has moderated in the last 10 to 15 years, we only find weak evidence of a similar REIT-market penetration effect in other economies. Part of the difference is likely to be due to the paucity of data available outside the United States.

Based on our cross-country analysis, we believe an additional reason for the differing results is structural differences in how REIT and commercial property markets operate. For example, in many commercial property markets around the world, it is true that the best assets are held privately by the most experienced and well-connected owner-managers. This is not the case in the United States, where the best human and physical capital is disproportionately concentrated in the listed REIT market. Moreover, the structure of non-US REITs is often relatively opaque, with external management and complicated business models. US REITs in contrast are primarily internally managed and have simple business models focused on investing in one property type (such as office or retail) only.

In summary, we conclude that financial plumbing matters with respect to the realised costs and benefits of securitisation. We show that substantial differences exist in the detailed structure of REIT markets around the world. And counter to the current fashion, we hold up US securitisation *vis-à-vis* commercial property equity interests as a model of a well-structured market that has helped allocate scarce resources efficiently. We make this claim about a sector that predictably boomed and busted every 15 years or so prior to the introduction of a viable and credible securitised equity market.

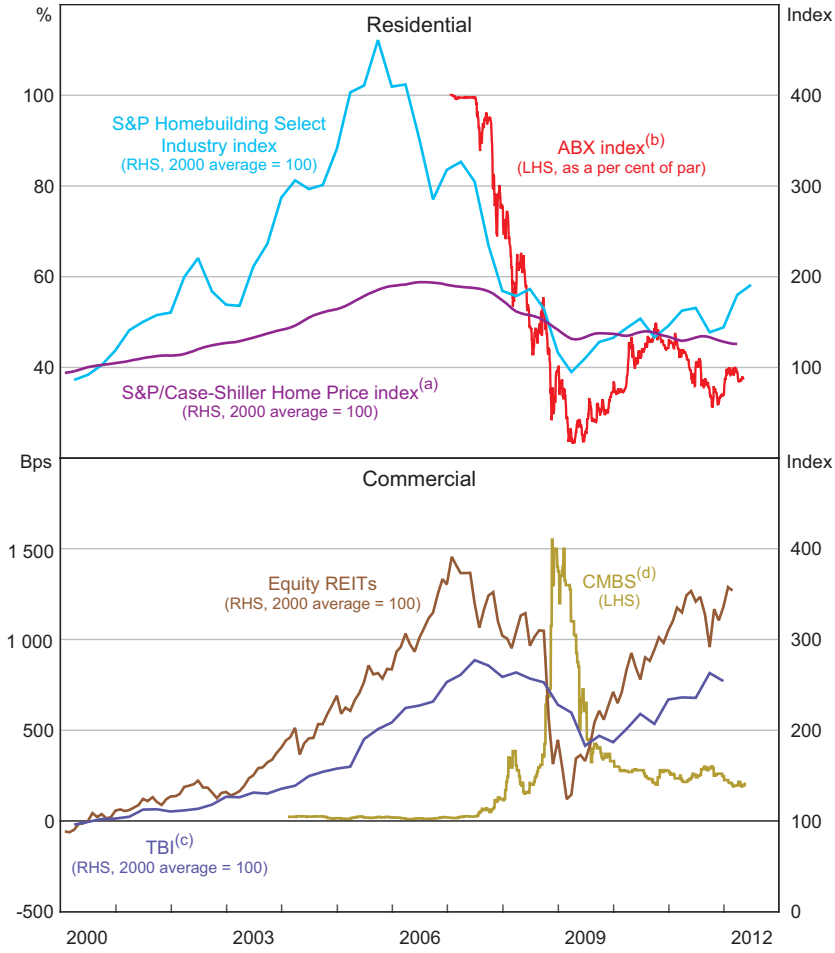
2 The US Real Estate Experience

2.1 A parallel bubble in residential and commercial property markets?

There is general agreement that the United States experienced a bubble in many prominent residential real estate markets in the five-plus years leading up to the financial market meltdown of 2007–2009. The bubble period was characterised by rapid increases in housing prices, together with substantial increases in the supply of homes. This boom was followed by a bust, characterised by steeply declining housing prices and persistent weakness in most housing markets around the country.

Although many analysts have focused their attention on problems associated with housing and the housing finance system, some have argued that there was a parallel bubble in commercial property markets in the United States (Ellis and Naughtin 2010; Levitin and Wachter 2012). The top panel of Figure 1 displays three price series pertaining to residential markets in the United States: an index of home builder share price performance; the aggregated Case-Shiller index of home prices; and a truncated index of credit default swap (CDS) prices on AAA-rated subprime RMBS (the so-called ABX index). The bottom panel displays a comparable set of price indices for commercial property in the United States: an index of REIT share prices; the transaction-based index of commercial property prices; and credit spreads on AAA-rated commercial mortgage-backed securities (CMBS).

Figure 1: United States – Property Markets



Notes: (a) Composite 20 cities
(b) ABX.HE.AAA.07-1
(c) Transaction based index, all properties total return – MIT Center for Real Estate Transaction-based Index up to 2011:Q1 and then NCREIF Transaction Based Index
(d) Commercial mortgage-backed securities, 5-year AAA-rated securities spreads to LIBOR

Sources: Bloomberg; JPMorgan Chase; MIT Center for Real Estate; National Association of Real Estate Investment Trusts (NAREIT); National Council of Real Estate Investment Fiduciaries (NCREIF); Thomson Reuters

An initial examination of the two sets of time series data suggests a similar boom-bust pattern in the housing and commercial property markets. For example, the home builder series shows that prices more than quadrupled from 2000 to late 2005, which was followed by a price decline of more than 75 per cent, with prices bottoming in early 2009. A similar pattern can be seen with commercial REIT index prices. The movements in the ABX and CMBS series are particularly dramatic. Residential ABX prices on AAA-rated bonds declined from a par value of 100 in early 2007 to just over 20 per cent of par in early 2009 (implying a required yield in excess of 40 per cent),

while AAA-rated CMBS credit spreads increased from about 30 basis points (0.3 per cent) to more than 1 500 basis points (15 per cent) over the same time frame.

A closer and more complete examination of these data, however, reveal significant differences. First, note that the home builder price index peaks in late 2005 and that Case-Shiller home prices peak around the middle of 2006. With hindsight we now know that these early peaks on the housing side signalled big troubles to come in the broader financial markets. This is more than a year before the commercial property market peaks, which shows these two markets were not as closely synchronised as some have suggested. It also means that the downward slide in commercial property prices was particularly sharp, as both markets hit a bottom in early 2009.

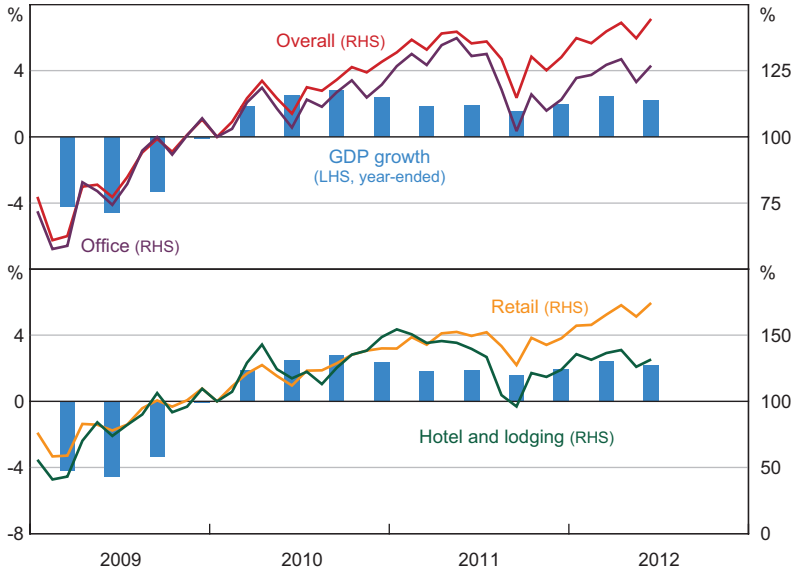
There is a second, more crucial difference between US housing and commercial property markets. Case-Shiller home prices have remained at their lows, while home builder and ABX price indices show what can best be described as a tepid recovery. In contrast, commercial property prices are seen to have almost fully recovered to their pre-crisis highs. Thus, while price declines were sharp on the commercial side of the property market, housing price declines have been more protracted and ultimately more severe. Most importantly, most housing markets are still not out of the woods, whereas many commercial property markets have moved well beyond crisis.

In the next sub-section we will begin to try to explain these differences, but at this point we would like to briefly comment on the nature of price bubbles. First, finding consensus on what constitutes a pricing bubble remains elusive, and there are some that maintain that there is no such thing. That said, there does seem to be fair agreement that there was a bubble in US housing markets (some markets more than others). This consensus has formed not because of the magnitude of housing price declines, but rather because housing prices have yet to start recovering four whole years after the full-scale financial market meltdown occurred. Assessments that there was a bubble on the commercial side, though made by several very well-respected economists, have been much less frequent. This seems to be because commercial property markets began to recover shortly after their early 2009 trough and have in a large part recovered to their pre-crisis levels. While we do not necessarily rule out the possibility that a bubble occurred in commercial property markets, we argue the bubble (if it happened) was something different and less severe than that which occurred in the housing markets.

2.2 What explains the post-crisis differences between housing and commercial property markets?

In our discussions with economists and industry professionals, we have heard a number of different rationales as to why commercial property markets have vastly outperformed housing markets since early 2009. Many of the proposed explanations have focused on differences in demand-side fundamentals in the two markets. Certainly rental housing, which constitutes the multi-family housing sector of commercial property markets, has benefited from a dysfunctional and highly uncertain housing market. But other important commercial property sectors, most notably office and retail, have also seen share prices rise in an economy with stubbornly high rates of unemployment and considerable softness in consumer spending (Figure 2). Even hotel property prices, which historically have had a close relationship to GDP growth due to their very short (daily) rental terms, have experienced sharp price increases while GDP growth has stagnated.

Figure 2: United States – REIT Prices and Output Growth



Note: REITs prices deflated by CPI inflation, January 2010 = 100
Sources: Thomson Reuters; national sources

We have also heard arguments that US commercial property, particularly higher-quality income-producing property in desirable locations, has benefited as investors seek investment safe havens during these times of accommodative monetary policy and general economic uncertainty. There is also a related argument that commercial property has benefited from a general shortage of low-risk, high-quality collateral availability, as commercial property offers durable assets with stable cash flow.[3] The latter argument begs the question as to why commercial property has done well relative to housing, since commercial property experienced the same kind of volatility and price declines that housing did from 2006 to early 2009. The safe-haven argument in our opinion has merit, but cannot by itself explain the very large differences in price performance between housing and commercial property since early 2009.

Another argument we have heard explains the differences in recent performance in terms of the relative ease of short selling commercial property through the REIT market relative to housing. For several reasons we believe that short selling can provide at best only a partial explanation. First, if true, we would not have expected to see the big increase in commercial property prices that some describe as a bubble prior to the onset of the financial crisis. Second, exchange-traded home builder shares have been around for a long time and can be shorted. More importantly, housing could be effectively and efficiently shorted through the development of CDS derivative indices on prime and subprime RMBS. Although these markets did not develop until the early to mid 2000s, they did provide investors the opportunity to short housing (as John Paulson did among others,

3 The general argument that some US assets have benefited from the demand of foreign investors because they are perceived to be safe has been made by Caballero and Krishnamurthy (2009), as well as Bernanke *et al* (2011). Discussion specifically about demand for AAA-rated MBS securities can be found in Diamond and Rajan (2009). Anecdotal discussion on the strength of prime commercial property as an investment class can be found in Palmer (2011).

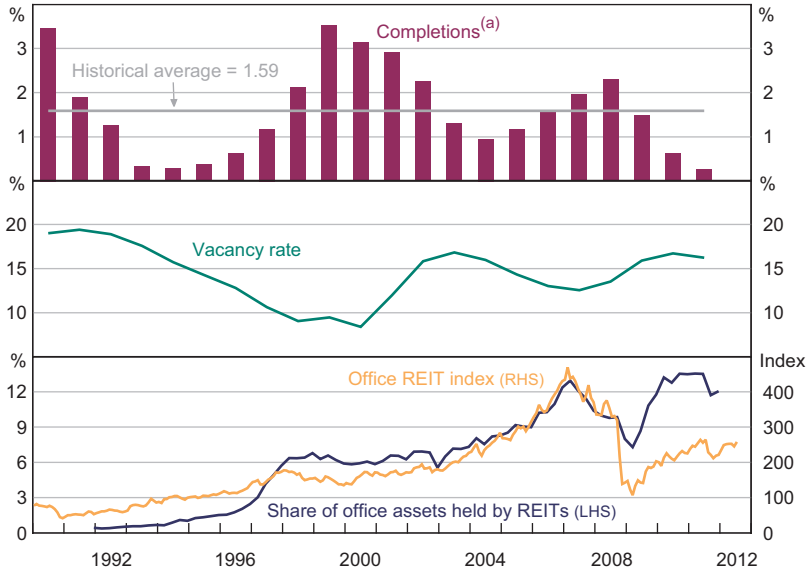
as famously described in Lewis (2010)). Shorting housing through CDS markets is indeed part of the reason why the peak and subsequent downturn in housing security prices happened well ahead of the analogous turning point in commercial property prices.

What about supply-side rationales for the post-crisis performance differentials? We believe that a focus on the supply side provides the key to understanding this issue. Benchmarking appropriate supply flows on the housing side is complex, however, as they depend on factors such as household formation, regulation and second home demand in addition to fundamental variables such as movements in mortgage rates and household income. There is no dispute among researchers, however, that there has been, and currently is, excess housing supply nationally, and that excess supply varies significantly across states. For example, Arizona, California, Florida and Nevada are typically cited as having experienced the biggest housing market boom and bust cycles. According to Wheaton (2012), these states house about 20 per cent of the population of the United States, but accounted for 30 per cent of the housing starts and mortgage loans in the United States in 2005, over 40 per cent of the second and investment homes in 2005, and 50 per cent of the foreclosures in 2009.

One simple way to express the housing oversupply problem is as follows. Over the last 40 years, annual construction has averaged close to 300 000 more units than new households. This incremental supply presumably reflects a steady state in second home growth and demolitions (or some other aspect of aggregate demand for housing). From 1998 to 2008 excess supply averaged approximately 600 000 units per year, implying an excess stock of about 3 million housing units in 2008. Since 2008 some of this excess stock has been absorbed, but estimates are that there is still 1.0 to 1.5 million too many housing units in the United States. As noted by Wheaton and Nechayev (2008) and Wheaton (2012), an overhang of foreclosed homes, declining rates of home ownership, and uncertainty as to policy direction make it unclear just how long it will take to absorb the remaining units (see also Blomquist (2012) on the effects of the shadow inventory of housing in the United States).

This is in contrast to commercial property markets, where new completions of office space as a percentage of the existing stock was about 3.5 per cent in 1990 (Figure 3, top panel). The 1990 start date occurs after the bust in commercial property prices, when the high rates of completion were due to construction lags. Going back to the mid to late 1980s, completions were around 9 per cent of stock. Notably, the skylines of many major US cities were reshaped in the late 1980s, including those of Atlanta, Boston, Dallas, Denver and Los Angeles. We observe completions falling almost to zero in 1994–1996, and increasing again in the late 1990s to early 2000s to peak at just above 3 per cent. Finally, a subdued supply cycle occurs during the mid 2000s, peaking at about 2 per cent in 2008. It is worth noting that similar analysis of other commercial property types, such as retail, multi-family and warehouse, shows similar, and often lower, levels of construction activity.

Figure 3: United States – Real Office Property Market



Note: (a) As a per cent of its total stock, beginning of the period
Sources: CBRE; SNL Financial; Thomson Reuters; authors' calculations

Excluding 1990 on the basis that it reflects residual construction momentum from the go-go years of the mid 1980s, we see that from 1991 to 2011 new office construction averaged around 1.5 per cent of the existing stock, with local peaks in 1999 and 2008 at 3.5 and 2.3 per cent, respectively. It has been estimated that office space depreciates by 1.5 to 2.0 per cent per year (Fisher *et al* 2005), implying that over the most recent 21-year period, the supply of office products has remained in balance. Crucially, during the frothiest part of the housing price and construction boom from 2002 to 2008, there was no analogous boom on the commercial property side of the market. Rather, office property construction activity from 2002 to 2008 was quite modest, in the 1 to 2 per cent range.

Large and persistent differences in the supply response to a dual asset price boom therefore helps explain performance differentials since early 2009. Housing is still dealing with inventory overhang problems, while commercial property markets were appropriately (or some would argue, under-) supplied. This then begs the question of why all the supply was in housing, but not in commercial property. On the housing side, many commentators have focused on mortgage-market capital flows, ineffective and distortionary bank regulation and accommodative housing policy as underlying causal factors for the boom. But capital flows and bank regulation affected commercial property markets as well, suggesting that housing policy may have been particularly important in distorting that market.

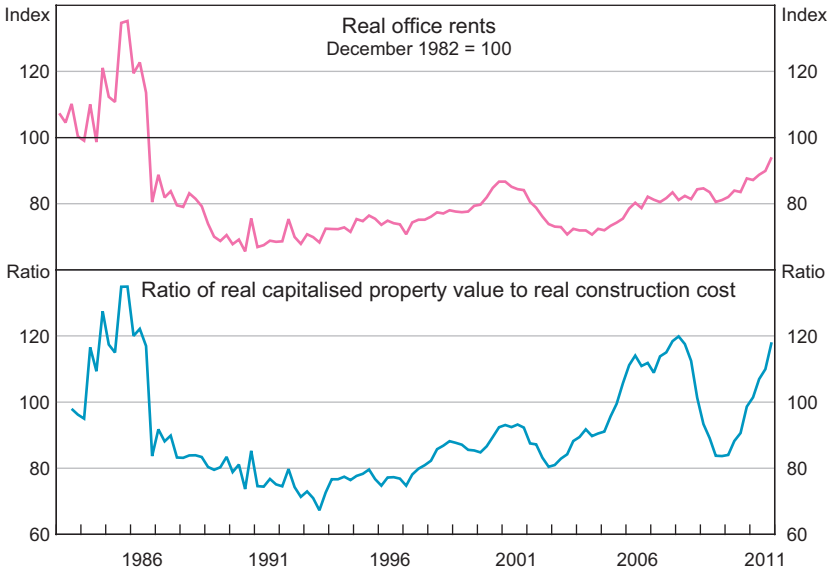
The focus in our view should not be on explaining the supply response on the housing side, which was not surprising given surging housing prices and tsunami-like capital flows that occurred in RMBS markets, but rather on why the commercial supply side was so muted in the face of similar

asset price and capital flow increases. Based on our discussions with real estate economists and industry specialists, we can offer three explanations.

One rationale we have heard from several sources is that the severe bust that occurred in the late 1980s and early 1990s was still fresh in the collective memories of market participants (see also Zhu (2002)). This explanation has some merit, but begs the question of why things were different this time when in the past commercial property markets in the US predictably blew up every 15 years or so.

A second rationale we have heard is that the financial crisis saved the commercial property market as it was just gearing up for a real estate development party. The argument, in other words, is that commercial property rents never recovered to their mid 1980s levels, implying that land was simply not ripe for significant new development during the mid 2000s. This argument can be assessed by comparing asset prices for existing buildings to the cost of construction. The top panel of Figure 4 shows that real office rents (net operating income) peaked in the mid 1980s, declining precipitously thereafter. In fact, real rents have never recovered to their mid 1980s values. This lends considerable support to the 'not ripe for development' argument. But the values seen in the bottom panel of Figure 4 show the ratio of office property values to cost approached those of the mid 1980s, when national completions as a percentage of stock in the late 1980s exceeded 8 per cent. By contrast, completions remained below 2.5 per cent of the existing stock throughout the mid to late 2000s.

Figure 4: United States – Real Office Property Rents and Construction Costs
Deflated by CPI inflation



Sources: Marshall & Swift; NCREIF; national sources

Although the 'not ripe for development' story is undoubtedly an important reason why commercial property development has remained in check, we believe that, given the very low realised rates of development achieved during the frothiest financing market in decades, something more is going on. This causes us to consider a third rationale that is unique to this paper. Our conjecture relies on the existence of the REIT market as a moderating influence on supply response in the face of high asset prices. In this market, investors and other market participants discover prices quickly and without substantial bias. Firms are transparent, and are covered by industry analysts as well as rating agencies in a fashion that conveys information about current commercial property market conditions. Exchange-traded shares induce significant volatility into listed share prices, which may give market participants pause when contemplating resource allocation decisions that affect the supply of extremely durable commercial space in local markets.

We will examine the US REIT market and this conjecture in more detail in Section 3. Our conjecture also depends on the fact that this market did not become viable and credible until the 1990s, which can explain why this time was different in terms of the muted supply response. We maintain that similarly 'viable and credible' information sources did not exist on the housing side. The home builder index was not widely followed, and neither did the broader investment and policymaking community pay close attention to what the newly developed ABX-CDS markets were saying about housing and the broader economy until it was too late.

3. Development, Structure and Performance of the US and other REIT Markets

In this section, as background, we provide historical and institutional detail that is relevant to understanding the development of the REIT markets, both in the United States and in the other major REIT markets around the world. We provide this information in order to explain the key characteristics of REITs, the degree to which REIT markets differ from one another, and how it is that REITs might have had a moderating influence on the allocation of real investment capital in some cases.

3.1 The US REIT market

3.1.1 History and development

REITs were created in the United States in 1960 as a way for individuals to invest in commercial property and as a new channel for income-producing property owners and developers to access capital. REITs are trusts, and as such do not pay taxes at the entity level as long as certain requirements are met. The most important rules are that: (i) the REIT distributes most (currently at least 90 per cent) of its net income to shareholders; (ii) it operates as a mono-line company in terms of owning only equity or debt interests in real property; (iii) the ownership of traded shares in the company cannot exceed concentration thresholds; and (iv) the firm does not operate as a broker-dealer in terms of buying and then selling real estate interests too frequently.

The REIT market grew very slowly during the 1960s, and was effectively ignored by most commercial property market participants. Commercial property in the United States was almost exclusively held by small local operators over this period. Financing sources were primarily

insurance companies and commercial banks. Commercial property markets predictably boomed and busted every 15 years or so. For example, the 1950s was a boom period that witnessed substantial increases in supply. This was followed by a bust in the early to mid 1960s, which was then followed by another burst of growth in the late 1960s and early 1970s, followed by a crash in the mid 1970s. Mortgage REITs (REITs that hold secured debt interests in commercial property) contributed to the boom and bust of the 1970s by supplying cheap and easy construction finance as closely held subsidiaries of development firms or commercial banks.

The bust of the 1970s gave the entire REIT sector a black eye, creating suspicion that the REIT structure was flawed, and that advisers and other agents associated with REITs were conflicted and incompetent (or worse). From that time until the early 1990s, REITs were a backwater with almost no growth or visibility in the commercial property investment community. For example, United States equity REITs, which are REITs that hold ownership interests in income-producing property (and are the focus of our analysis), had a total equity market capitalisation of only US$10 billion in 1990. This represented a market share of less than 1 per cent in the 'investable' US commercial property market, estimated to be more than US$2 trillion in aggregate.

Details associated with the savings and loan (S&L) debacle of the 1980s are well documented.[4] The important aspects of the episode for our purposes are that problems were concentrated with relatively small banks, some larger insurance companies, and privately owned commercial property firms. As a result of getting branded as shady operators in the 1970s, equity REITs (hereafter simply REITs) did not have much access to capital markets and consequently did not participate in the boom of the 1980s. Wall Street was also not very focused on commercial real estate securitisation at that time. Thus, REITs and Wall Street generally sidestepped problems associated with the S&L debacle.

In contrast, private property owners experienced 'equal opportunity' financial distress, in the sense that private owners, large and small, competent and incompetent, had serious financial issues to contend with. Assistance would not be forthcoming from traditional financing sources, as they were completely sidelined, dealing with problems of their own. In sum, by the late 1980s there were serious liquidity problems in a sector that needed to recapitalise in the worst way.

Wall Street responded by taking an off-the-shelf investment vehicle – the REIT – and using it to securitise real estate ownership interests. The reorganised firm could then access the broader capital markets – a new source of liquidity that was relatively unaffected by the S&L debacle – in order to recapitalise.[5] The linchpin to this scheme was that a newly formed REIT with access to capital could snap up distressed assets at fire sale prices from owners that had no such access to capital. Having access to liquidity when the rest of the sector had none implied significant growth opportunities, which lowered the cost of equity capital and increased initial public offering (IPO) proceeds. So great were the growth opportunities that IPO proceeds were generally enough to satisfy existing debt obligations, with money left over to fund new investment.

4 For an insightful as well as entertaining analysis of the S&L crisis from a Wall Street perspective, see Lewis (1989).

5 Wall Street not only brought liquidity to the cash-starved commercial property sector through REITs, but also through the securitisation of debt interests *vis-à-vis* CMBS. Wall Street benefited immensely by buying cheap mortgage assets, pooling the debt, and then carving up the cash flows into various security interests with issuance proceeds that far exceeded the cost of buying the mortgage loans. Wall Street also charged very high up-front fees in the early days of the CMBS market. REITs were immensely profitable for Wall Street firms due to the large number of sponsored IPO's as well as the constant need for these firms to do follow-on equity offerings to fund new investment.

Nonetheless, potential investors were wary of REITs due to previously discussed reputational problems. This caused investment banking firms to focus their efforts on only taking public the better-managed firms that owned higher-quality assets. This fact is critically important, as it laid the foundation for a sector that was credible, in the sense of having some of the best available talent to manage these firms, with a balance sheet that typically contained better-quality assets in better locations. As will be discussed later in this paper, it is not always the case that the best talent and assets are part of the REIT sector in other countries.

Two other factors were important in terms of incentivising distressed owners to contribute their best assets to a REIT investment vehicle. One was that REIT rules were changed in 1986 to allow for internal management. This in effect made REITs viable going concerns, whereas the previous structure that allowed only external management made them more like a static pooled asset fund. The second is that tax rules were relaxed so that privately owned assets with a low accounting cost basis could be contributed to a REIT without immediately incurring a capital gains tax liability. Firms that used this structure are referred to as 'Umbrella Partnership' REITs, or UPREITs.

3.1.2 Structure and performance

This series of events created a REIT IPO boom in the United States that lasted from 1991 to the mid 1990s. Equity capitalisation of the sector increased more than tenfold during this five-year period, going from US$10 billion to over US$100 billion. Some of the most important and best-performing REITs that operate today went public in this time window. Publicly traded REITs have, over the past 20 years, easily outperformed the S&P 500 (with a β of less than unity). US REITs have also outperformed indices of privately owned commercial property by about 3 per cent per year on a leverage-adjusted basis.[6] Today total REIT equity market capitalisation is approximately US$500 billion, representing approximately 15 per cent of the total investable commercial property available in the United States (Table 1). Despite this relatively low market share, REITs exert a disproportionate influence on US commercial property markets, partly because a disproportionate amount of the talent and better quality assets reside in the REIT sector.

6 For a comparison of private versus publicly held asset investment performance between 1980 and 1998, see Riddiough, Moriarty and Yeatman (2005). More recently, according to the table of the 'Historical Compound Annual Net Total Returns of REITS and Private Equity Real Estate' (http://www.reit.com/DataAndResearch/ResearchResources.aspx), the total return on equity REITs over the last 10 years has been 9.88 per cent, while that of unlevered core properties (NPI) has been 6.96 per cent. For a study documenting that most real value in REITs was created for US investors during the new REIT era that began around 1992, see Ott, Riddiough and Yi (2005).

Table 1: Major REIT Markets – Market Characteristics
(*continued next page*)

	North America		Europe				
	US	CA	BE	DE	FR	GB	NL
Mkt cap –US$b	446.8	38.1	7.8	1.9	71.7	44.1	12.0
% of global REIT mkt	54.8	4.7	1.0	0.2	8.8	5.4	1.5
% of country mkt	3.0	2.1	3.0	0.1	3.6	1.4	2.5
IPO vol (2001–2010)	21.3	2.0	0.2		1.6	0.9	
Returns – %							
REITs (2002–2007)	13.2	11.3	7.1		43.0		16.0
Net of mkt	3.5	–3.1	–6.7		31.2		9.0
Net of pr co[(a)]	–14.1	–9.0	1.7		17.8		4.4
REITs (2007–2012)	–3.0	2.2	–4.5	–20.5	–8.6	–15.0	–13.8
Net of mkt	–1.0	5.9	5.1	–12.4	2.9	–11.3	–1.5
Net of pr co[(a)]	–0.1	7.2	0.6	–9.2	11.7	6.5	0.8
REITs (peak to trough)	–75.6	–58.9	–42.4	–88.3	–68.2	–81.5	–69.2
Volatility – %							
REITs (2002–2007)	2.3	2.0	1.4	8.7	3.6		2.0
Mkt	1.8	1.6	2.1	2.3	2.2		2.4
Pr co[(a)]	2.9	2.0	1.0	2.5	1.6		1.7
REITs (2007–2012)	5.2	3.3	2.6	7.7	3.6	4.6	4.4
Mkt	3.3	3.2	3.6	3.6	3.6	3.3	3.8
Pr co[(a)]	7.2	4.6	1.7	2.7	4.5	4.8	5.1
Correlation[(b)]							
REITs (2002–2007)	0.55	0.32	0.18	0.11	0.14	na	0.34
REITs (2007–2012)	0.83	0.62	0.55	0.34	0.77	0.71	0.73
Pr co (2007–2012)[(a)]	0.78	0.69	0.33	0.59	0.59	0.62	0.47
Beta[(c)]							
REITs (2002–2007)	0.67	0.54	0.12	0.57	0.24	na	0.32
REITs (2007–2012)	1.32	0.69	0.45	1.17	0.88	1.08	0.88
Pr co (2007–2012)[(a)]	1.74	0.94	0.28	0.56	0.96	1.10	0.74
Mkt share of office REITs (2011)[(d)] – %	12.1	na	9.1	2.3	2.7	5.8	5.8

Table 1: Major REIT Markets – Market Characteristics
(*continued*)

	Asia-Pacific						
	AU	HK[e]	JP	KR	MY[e]	SG[e]	TH[e]
Mkt cap – US$b	80.4	16.8	42.1	0.3	4.0	32.1	0.6
% of global REIT mkt	9.9	2.1	5.2	0.0	0.5	3.9	0.1
% of country mkt	6.5	1.1	1.2	0.0	1.1	6.1	
IPO vol (2001–2010)	5.8	4.8	15.5	0.7	1.3	5.6	1.9
Returns – %							
REITs (2002–2007)	8.9	29.2	20.1	12.0		34.0	1.2
Net of mkt	–5.2	–1.3	8.6	–5.3		7.8	–10.1
Net of pr co[a]	–1.9	–7.5	–7.8			–19.1	–2.0
REITs (2007–2012)	–17.1	8.7	–16.2	–2.0	20.3	–9.3	0.5
Net of mkt	–9.1	11.4	–1.1	–3.6	9.1	–5.8	–8.2
Net of pr co[a]	0.4	13.9	2.3		4.4	1.5	–3.9
REITs (peak to trough)	–77.1	–38.5	–71.0	–43.7		–73.8	–14.0
Volatility – %							
REITs (2002–2007)	1.6	3.0	1.8	6.1		2.4	1.5
Mkt	1.3	1.8	2.3	3.2		1.7	2.9
Pr co[a]	1.6	2.5	4.1			2.5	4.7
REITs (2007–2012)	4.3	3.3	4.5	6.9	1.8	4.1	1.4
Mkt	3.0	3.7	3.2	3.8	1.5	3.1	3.7
Pr co[a]	4.3	5.1	5.6		2.9	4.1	6.0
Correlation[b]							
REITs (2002–2007)	0.56	0.28	0.23	0.39	na	0.55	0.11
REITs (2007–2012)	0.66	0.47	0.63	0.29	0.32	0.70	0.16
Pr co (2007–2012)[a]	0.67	0.92	0.82	na	0.73	0.87	0.68
Beta[c]							
REITs (2002–2007)	0.53	0.36	0.16	0.85	na	0.80	0.12
REITs (2007–2012)	0.91	0.42	0.94	0.77	0.51	1.03	0.03
Pr co (2007–2012)[a]	0.93	1.17	1.46	na	1.26	1.15	1.21
Mkt share of office REITs (2011)[d] – %	18.9	2.3	3.4	na	na	na	na

Notes: See Glossary for a listing of country codes
(a) Comparable index for listed property developers
(b) Correlations of daily logarithmic changes of the price indices
(c) Beta estimates of simple regression of return on various assets classes on return on market
(d) Share of office space held by office REITs
(e) Due to availability of the data, sample periods for Hong Kong SAR, Malaysia, Singapore and Thailand start on 25 November 2005, 7 July 2010, 28 July 2005 and 19 November 2003, respectively

Sources: Bloomberg; CBRE; EPRA (2011); Thomson Reuters; authors' calculations

Of all the operating and financing restrictions placed on REITs, including those listed in Table 2, which collates aspects of the institutional framework of REITs globally, the dividend payout requirement is probably the most important. This restriction causes firms to distribute a high percentage of available cash flow (typically more than 60 per cent and often more than 70 per cent) as dividends to shareholders. Consequently, REITs can be characterised as cash constrained relative to industrial corporations that do not have any formal obligation to distribute available cash flow to shareholders. The payout requirement causes high-growth REITs to return to the capital markets on a frequent basis to raise money for investment purposes. Doing so imposes a discipline on management, in the sense that there is relatively little free cash flow available to fund new investment (Jensen 1986). Rather, managers of active firms must go out on roadshows with their investment bankers in order to convince outside investors to contribute capital to their firm.

Another important aspect of being publicly traded is that access to equity capital markets allows REITs to operate at lower leverage levels than private firms. Private firms often have difficulty in sourcing reasonably priced outside equity capital, and instead typically rely on mortgage debt with loan-to-value ratios exceeding 70 per cent. In contrast, most REITs operate with leverage ratios of less than 50 per cent. Less leverage had beneficial effects during the financial crisis, as there were only a small number of REIT bankruptcies (two or three) in a sector with well over 100 listed firms. Less leverage and financial distress among REITs undoubtedly contributed to the swift rebound in REIT prices after early 2009, whereas widespread financial distress is still haunting housing markets around the United States.

What are some of the other factors leading to the disproportionate influence of the REIT sector on commercial property markets? As publicly traded firms, there are more formal governance mechanisms in place, quarterly financial reporting, analyst calls and reports, any number of commentators featured in the media, and a general level of transparency that imposes a discipline on management. And perhaps most important of all is the price discovery that occurs through exchange-traded share prices. This information, which can also create a great deal of share price volatility, is a public good that is made available to all market participants. When market participants pay attention to these price signals and incorporate them into their day-to-day investment and financing decisions, they can, we conjecture, have a moderating influence on boom-bust tendencies in markets. For example, if new office construction is announced for Washington DC, and share prices of REITs that hold office property in Washington DC react negatively, this sends a signal to construction lenders and other market participants that the additional supply of office space may negatively affect rents going forward. This in turn may constrain additional construction lending. In contrast, private ownership markets only provide information with a time lag, implying that capital misallocations can persist for longer periods of time and result in boom-bust outcomes.

Table 2: Major REIT Markets – Size and Institutional Framework

	North America		Europe				
	US	CA	BE	DE	FR	GB	NL
Year first listed	1961	1994	1995	2007	2003	2007	1969
No of REITs	179	35	14	4	43	18	7
Mkt cap – US$b	446.8	38.1	7.8	1.9	71.7	44.1	12.0
Required real estate holdings – %	75	95	None	75	80	75	90
Required dividend payout – %	90	100	80	90	85	90	100
Leverage constraint – %	None	None	65	55	None	None	60
Management structure	Mostly internal	Mostly internal	Mostly internal	Internal	Internal	Mostly internal	Internal
Institutional holdings (2010) – %	67.4	29.7	31.0	7.9	26.9	96.2	na
	Asia-Pacific						
	AU	HK	JP	KR	MY	SG	TH
Year first listed	1971	2005	2001	2002	2005	2002	2003
No of REITs	57	8	34	4	14	24	6
Mkt cap – US$b	80.4	16.8	42.1	0.3	4.0	32.1	0.6
Required real estate holdings – %	Any	100	75	70	75	70	75
Required dividend payout – %	100	90	90	90	90	90	90
Leverage constraint – %	None	45	55–60	66	50	60–70	10
Management structure	Both	Mostly external	External	Both	External	External	External
Institutional holdings (2010) – %	33.4	39.4	65.2	29.1	16.9	44.4	24.8

Note: See Glossary for a listing of country codes
Sources: Bloomberg; Chan, Chen and Wang (2012); EPRA (2011); Ooi and Har (2010); authors' calculations

3.2 Other REIT markets around the world

While the US experience is in many ways unique, other economies have gone to great lengths – particularly over the last decade – to develop their REIT markets. Table 2 compares the institutional framework of major REIT markets in North America, Europe and the Asia-Pacific.

3.2.1 Institutional characteristics

Age. The REIT experience in other economies is short-lived compared to that of the United States, with the exception of the Netherlands and Australia, where the first REITs were listed in 1969 and 1971, respectively. In the rest of Asia and the Pacific, REITs are a recent arrival: Hong Kong, Japanese, Malaysian, Singaporean and Thai REITs were first established between 2001 and 2005. In Europe, legislation enabled REITs in France in 2003, and as recently as 2007 in the United Kingdom and Germany.

Legal requirements. Certain legal requirements of REITs, such as restrictions on leverage, as well as enforcement of high dividend payout requirements, are generally shared across the Asian economies and are as strict or, if anything, stricter than those in Europe and the United States. For instance Hong Kong, Japan, Korea, Malaysia, Singapore and Thailand all have dividend payout requirements of at least 90 per cent in order to receive favourable tax treatment. The minimum is similar to that applied in the United States and European countries, though in the case of Australia the typical distribution is 100 per cent. Singapore, Hong Kong, Japan and Korea have roughly similar limits on leverage, though in the case of Singapore, there is room for increasing REIT leverage if credit ratings are obtained. In Japan, however, limits on leverage are more a question of traditional corporate practice (most Japanese REITs (J-REITs) specify 55–60 per cent in their articles of incorporation). In Europe, the French regime does not have a leverage restriction, while the UK regime has an interest coverage test. By contrast, in the United States, there is no statutory or regulatory leverage limit for REITs.

Other requirements, such as the share that must be invested in real estate to receive tax benefits are fairly similar across jurisdictions.

Management structure. As discussed above, many US REITS came under internal management when regulations were changed in 1986, although in a comprehensive sample of listed US equity REIT filings between 1987 and 2009 analysed by Deng, Hu and Srinivasan (2011), 20 per cent were still externally managed. One clear institutional distinction in Asia is the tendency to manage assets through an external adviser structure. However, as can be seen in Table 2, Europe is similar to the United States in having the internal adviser management structure. Only Australia among the listed Asia-Pacific economies has significant internal management, in large part due to the introduction of stapled REITS, where the asset management is carried out by an entity within the overall REIT structure.

The academic literature, which focuses mainly on the US experience, suggests that external adviser arrangements suffer agency costs because of conflicts of interest between the adviser and the shareholders. However, there may yet be countervailing benefits to the external REIT structure. Deng *et al* (2011) document more favourable loan contract terms and less stringent collateral requirements and covenants among externally managed REITs, which suggests that these REITs are viewed as significantly less informationally opaque than internally managed REITs. Given the prevalence of the externally managed REIT structure in Asia, it appears that, in the case of these economies, the benefits of external advisers outweigh the agency costs.

Institutional holdings. A distinctive feature of US REITs relative to their continental European and Canadian counterparts is their high level of institutional holdings. With the exception of the United Kingdom, institutional REIT holdings in Europe are relatively low: French and Belgian REITs

have institutional ownership of 15–20 per cent, while Germany's are less than 10 per cent. The percentage of institutional holdings in REITs in many Asian economies is quite high, ranging from 30 per cent in Korea to 40 per cent in Hong Kong and Singapore to around 60 per cent in Japan.

Are these differences in institutional features associated with the pricing performance of REITs at issuance? One of the stylised facts of the REIT literature is that the IPOs of REITs in Europe and the United States have been significantly more underpriced than those in the Asia-Pacific. One reason offered for this is that European and US REITs are internally managed and more operational in nature, while Asian REITs are externally managed and fund-like in nature (Chan *et al* 2012). However, there does not appear to be a relationship between the degree of underpricing of REIT IPOs and institutional holdings of REITs.

3.2.2 Market characteristics

Market capitalisation and IPO volumes. The United States dominates the international REIT landscape, with nearly 180 listed REITs amounting to US$447 billion, or more than half of total global REIT market capitalisation. Far behind that, yet well above any other economy, Australia has 57 listed REITs with US$80 billion market capitalisation, occupying 10 per cent of total REIT market capitalisation. The markets in Europe are still slightly bigger than those in emerging Asia, with French and UK REITs (43 and 18 each) respectively accounting for 9 per cent and 5 per cent of total market capitalisation. There are 34, 24 and 8 REITs in Japan, Singapore and Hong Kong, respectively, roughly accounting for 5, 4 and 2 per cent of total REIT market capitalisation.

Despite the rapid growth of Asian REIT markets in the 2000s, the United States has still maintained dominance in the flow of new capital coming into REITs via IPOs. Between 2001 and 2010, the United States had 80 REIT IPOs for a total value of around US$21 billion, Japan had 42 for a total value of US$15 billion, Singapore had 21 for a total value of US$6 billion, Australia had 38 for a total value of nearly US$6 billion and Hong Kong had 7 for a value of US$5 billion (Table 2; Chan *et al* 2012). In France, the numbers were far lower, with 16 IPOs with a value of US$1.5 billion, while in the United Kingdom 10 REITs went public for US$1 billion, and in Belgium 7 REITs raised US$300 million. Clearly, the US market remains the biggest, and in terms of new IPO flow, the Asian markets have overtaken many European markets in size.

Returns. Table 1 reports the return performance based on the national REIT indices for the major REIT markets in North America, Europe and the Asia-Pacific. We examine the past decade of returns in two periods between mid 2002 (when the J-REIT index first became available) and 2012. Up until mid 2007, REIT markets globally were quite robust, as were financial markets generally; from 2007 to 2012, REITs performed nowhere near as well, due both to the global financial crisis and the bust in real estate markets.

Most REIT markets performed extremely well in the first period, and illustrated a great deal of co-movement, peaking in mid 2007. For example, from 2002 to 2007, the J-REIT index rose by more than 20 per cent on an annualised basis, while returns in the US market were a robust 13 per cent. The Australian market was more subdued with annualised returns of 9 per cent. A few European markets also saw remarkable returns, with France at 43 per cent. We also see exceptional performance in the truncated (from 2005) cases of Hong Kong and Singapore, of

around 30 per cent annualised return. In the cases mentioned above, REITs outperformed their respective national stock market indices, with the exceptions of Australia and Hong Kong.

However, during the global financial crisis subsequent to mid 2007, national REIT indices were extremely weak. In Australia, Germany, Japan, the Netherlands, Singapore and the United Kingdom, negative annual return rates ranged between –9 and –21 per cent – declines that were well in excess of those of the respective broader market indices. In addition to the United States, as previously discussed, two other important exceptions were Canada and Hong Kong, where the recovery in real estate values after the short-lived crisis led to an annualised increase in the value of REITS over the period of almost 2 per cent and 9 per cent, respectively.

Volatility of REIT, broader market and developer returns. In addition to return, investors are also concerned with the risk of an asset class. It comes as little surprise that the standard deviation of weekly returns, or volatility, was strikingly higher for REITs after mid 2007 across almost all of the sample economies (Table 1).

One of the stylised facts based on the empirical literature on REITs over the past few decades, at least for those in Australia, Japan and the United States, is that the volatility of REIT share prices tends to be lower than that of the overall market (see Newell (2010) for Australia; Sawada (2008) for Japan and Chan, Erickson and Wang (2003) for the United States). To check whether that has still been the case over a period of generally increasing volatility, we examine the weekly standard deviation of returns for various national indices, including the REIT index.

In fact, it appears that over the past 10 years REITs have generally experienced higher volatility than the major benchmark equity indices. REIT indices for Australia, Canada, France, Germany, Japan, Korea, Malaysia, Singapore, the United Kingdom and the United States have all been significantly more volatile than the benchmark market indices. In the cases of Australian and US REITs, this is in contrast to the behaviour documented in previous studies. The only exceptions are Belgium, Hong Kong and Thailand. For Japanese and Dutch jurisdictions, the higher volatility of REIT returns is a post-crisis (2007 to 2012) phenomenon, since these REIT indices show lower volatility than their respective national indices when the earlier period (2002 to 2007) is examined in isolation.

That said, the volatility of national REIT indices is less than the comparable indices for listed property market developers in around half of the comparisons in Table 1. For example, while in Australia the volatility of REITs and listed developed developers is roughly equal, REIT indices are significantly less volatile than listed property market developer indices in Japan, Thailand and the United States. For a number of European countries (for example, France and the Netherlands), as well as Hong Kong, REIT indices showed greater volatility than property developer indices ahead of the crisis, but then became relatively less volatile after mid 2007.

Correlation and market betas. Commercial real estate is thought to have attractive portfolio diversification qualities because it has a relatively low correlation with stocks and bonds. But these correlations have increased in recent years, at least in part due to the systemic nature of the financial crisis. With this in mind, we examine the degree to which REITs across the globe are correlated with broader market indices, in particular around the onset of the financial crisis.[7] We

7 For recent work documenting the time-varying correlation of REIT returns and stock returns in the US context, see Fei, Ding and Deng (2010) and Case, Yang and Yildirim (2012).

also consider the correlation between REITs indices and those of listed property developers, a less regulated sector that is presumably less transparent and contains greater idiosyncratic risk.

Table 1 reports the correlation between the REIT price index and a benchmark equity price index for each economy, with the returns divided into two periods as before. One fact that immediately stands out is that the correlation coefficients between the REITs and market indices went up for almost all economies after 2007. In the pre-crisis period, some economies, such as Belgium and France, had extremely low correlations of around 15–20 per cent, which soared to 55 per cent and 77 per cent, respectively, following 2007.

Neither the marked increase nor the high correlation of REIT indices with the equity market are limited to a single region. After the United States, which has a correlation of 83 per cent in the latter period, the next six highest correlation coefficients include three for Europe and three for Asia and the Pacific.

Relative to listed property market developers, REITs in Asia show less correlation with the broader market, suggesting attractive diversification benefits to investors seeking property market exposure. In fact, this was the case without exception among Asian economies. Economies where the correlation of the REIT with the market is significantly lower than the correlation of listed property developers' index with the market included Hong Kong, Japan, Malaysia, Singapore and Thailand.[8] However, the two biggest REIT markets of Australia and the United States did not follow this pattern, with roughly equal correlations. In Europe, the correlations between REIT indices and the broader market were generally greater than those between listed property developers and the broader market indices.

Overall, it appears that while REITs do have some diversification benefits, they were greatly diminished during the financial crisis. This in turn suggests that the conclusions drawn from the declines in correlation that were documented in earlier periods (for instance, in Australia, the correlation was 0.24 between 1994 and 2006, compared with 0.71 between 1985 and 1992 (Newell 2010)) were perhaps overstated. The time-varying results are consistent with the increased sensitivity of REITs to small cap equity returns during market downturns documented in Clayton and MacKinnon (2001). At the same time, REITs sometimes show lower correlations compared with listed property developers – this is particularly the case for the Asian REIT markets in our sample.

Table 1 also reports the REIT market beta – the coefficient estimated when excess returns of the national REIT index are regressed on a constant plus excess returns to the national equity market index – and compares this to the market beta of listed property development companies. REIT betas are, in general, less than those of listed property developers. Interestingly, this is clearly the case for all of the Asian markets, Canada and the United States. For instance, while the market betas for Hong Kong, Japan, Malaysia and Thailand REITs are all well below one, the comparable betas for listed property development companies are all above one. By contrast, the market betas for some of the European listed property development companies are below those for the REITs, suggesting that European REITs may be operating with higher leverage than listed property developers, consistent with a recent report by an industry adviser (Kirby 2012). Just as they had

8 The lower sensitivity of Thai REITs to the broader market returns compared with those of Hong Kong and Singapore recalls Zhu's (2006) results for a sample of Asian economies, where those with less flexible housing markets showed less sensitivity of house prices to broader market conditions.

with the correlation coefficients, Australian REITs showed market betas which are quite similar to those for listed property developers.

REIT office market share. Finally, we see in Table 1 that there is considerable cross-country variation in the degree of the office market securitisation via REITs. In this respect Australia stands out, with the latest estimate of around 19 per cent of its office market securitised via REITs – though that number is well below the share of 32 per cent before the global financial crisis. The United States is the second most securitised office market via REITs, with around 12 per cent of the office market accounted for by REITs. Some European countries make up a third group close behind the United States – with Belgium, the Netherlands and the United Kingdom estimated to have between 5 and 9 per cent of their office market securitised by REITs. Hong Kong and Japan join Germany and France in a group of economies with relatively less securitised office markets.

4. Office Supply Dynamics around the World: An Overview

In this section, we complement our earlier discussion of US office supply by examining the dynamics of office supply in selected European and Asian economies using data purchased from CBRE, alongside the price of prime office properties as suggested by REITs. We also use these data to construct a time series of REIT office market share.

Seven of the thirteen sample economies have construction data going back to the early 1990s. In the case of Japan the data go back to the late 1990s. For the remaining five economies, three of which are from Asia (Hong Kong, Korea and Thailand), construction data go back less than 10 years. In all of the sample economies, with the exception of Australia and the United States, neither the REIT index data nor the market share data go back beyond 2000. In five economies these data do not exist before 2005. In the case of the REIT indices, these constraints reflect the relative youth of the REIT markets.

The completion data suggest that, at least for those countries for which we have 20 or more years of data, the commercial property cycle has been much more subdued over the past 15 years. In the United States, as discussed previously, the peaks of net new supply of commercial office property over the past 20 years – 3.5 per cent in 1999 and 2.3 per cent in 2008 – were well below the peaks of the 1980s when completions occasionally exceeded 10 per cent of stock. In Australia, Canada, France, Singapore and the United Kingdom, net new supply offered in the early 1990s clearly exceed the peaks of later cycles, and the troughs in net new supply that followed were lower and longer lasting than those seen later. The Tokyo data from CBRE do not predate 1998, but from government data we know that annual investment in private sector (non-manufacturing) building construction between 1990 and 1992 exceeded that of 2002 and 2003 – the peak of Tokyo office construction over the past decade – by a factor of nearly three.

Vacancy rates tell the same story. As noted in Ellis and Naughtin (2010), vacancy rates can stay elevated well beyond the end of an economic downturn. This is because of the lags in commercial property construction and the time it takes for excess supply to be absorbed by the market. Vacancy rates in Australia, Canada, France, the United Kingdom and the United States remained high for a long period after the 1980s boom, hitting a peak over the past 21 years in the early to mid 1990s (see Figures 3, 5, 6 and 7 for the United States, Australia, Japan and France, and Appendix B for Canada and the United Kingdom).

Office construction cycles appear to be correlated across the country samples, but only imperfectly. Focusing on the last 10 years and the larger sample, there is some tendency for construction to peak around the financial crisis, but not exclusively so. The office construction completions of Hong Kong, Korea, Singapore and the United States all peaked in 2007–2008, while those in Canada and France peaked in 2009. However, in the same decade Australia, Germany, Japan (Tokyo) and the United Kingdom peaked well before the financial crisis in 2003–2004.

By contrast, the price of prime office real estate, as captured by REIT indices, is much more highly correlated across economies. All of the office REIT indices in the sample topped out around mid 2007, and most bottomed out in early 2009. The fall was sharp just about everywhere, with REIT markets collapsing by between approximately 60 per cent and 75 per cent in eight cases, and by more than that in two others. What has differed somewhat, however, has been the extent of the recovery from the collapse, with a minority of economies recovering significantly more than the others. While Germany and Singapore have gained back around half of the losses, Canada close to 100 per cent, and Hong Kong more than 100 per cent, all the other REIT markets in the sample (other than the United States) have stagnated since the collapse, gaining back only a small fraction or none of the losses.

Figures 3, 5, 6 and 7, and those in Appendix B also make clear that the penetration of REITs has not increased steadily. In the case of the United States, Australia, Japan, France, the Netherlands and the United Kingdom, REIT penetration declined during the sharp fall in prime office valuations after mid 2007. This suggests the valuation of assets securitised by REITs had fallen more than other office assets during the sell-off period. Such a pattern was not invariably the case, however: in Belgium and Germany, REIT share penetration measures rose even when REIT indices were declining in the late 2000s; and in Hong Kong, the degree of REIT penetration seems to have been inversely related to office real estate pricing.

5. Testing the REIT Market Penetration Conjecture

In this section we provide a formal empirical test of our conjecture that in the United States the presence of the REIT sector may have influenced commercial property construction activity. We also apply the test to a selected small sample of other economies with the largest REIT markets outside of the United States.

The baseline model we have in mind reflects the intuition expressed in our analysis of how the value of income-producing real estate compares with the cost of construction. In this model the propensity to develop new property increases when built property value increases relative to construction cost.[9] The standard reduced-form supply relationship is as follows (DiPasquale and Wheaton 1996):

$$S = f(P,C)$$

where S denotes the supply of new space, P is the value of built income-producing property and C is construction cost. In this model asset price, P, is a sufficient statistic that summarises relevant space and financial market conditions, such as the vacancy rate, relevant government policies,

9 An alternative formulation would be to examine the ratio of price to net asset value of REIT markets, that is, Tobin's Q. Since REIT markets were not fully developed in each jurisdiction under review, we consider this, more general, formulation, where construction costs are presumed to proxy for replacement value.

the expected growth rate in cash flows and the risk-adjusted discount rate applied to valuing expected future cash flows.

We augment the standard model in an attempt to identify the conjectured REIT market effect. Recall that we argued that a central reason why the REIT market tempered oversupply tendencies, while analogous markets on the housing side did not, is that commercial property market participants consider information contained in REIT share prices to be informative and therefore relevant when making investment and financing decisions. That is, we hypothesise that the mere existence of REIT share prices alone is not sufficient to moderate construction activity. Rather, we conjecture that an additional necessary condition is that market participants actually pay attention to the information content of prices and consider them to be relevant.

With this logic in mind, we propose to include REIT market penetration M – the degree to which the office market has been securitised via REITS – as a proxy for relevance of REITs to the broader market. REIT market share is calculated as the value of commercial property held by REITs relative to the total value of all commercial property. The augmented specification is therefore:

$$S = f(P,C,M)$$

After controlling for built-property prices and construction cost, the expected relationship between REIT market share and supply depends on whether we are in boom or bust periods. By this we mean that REIT market share, as a proxy for attention and relevance, is hypothesised to mitigate construction boom tendencies by reducing supply responses when asset prices rise. By contrast, when asset prices decline, the REIT market share effect is expected to be positive; that is it ameliorates the declines in supply that would otherwise occur in response to asset prices and construction costs.

5.1 Specification and specification tests

As a starting point we recognise that there are various types of income-producing property. These property types respond differently to movements in macroeconomic variables that determine the demand for space. For example, the demand for office space is most responsive to white-collar employment, while the demand for apartment space depends on factors such as home ownership rates, demographics and immigration. Because of this we will focus most of our attention for the rest of this paper on the office property market. The office sector is perhaps the most important commercial property type, in that it is large and has historically shown a propensity to boom and bust more than other property types (in the United States and elsewhere).[10] Even more critically for our immediate purposes, there are simply better and more complete data available on office property across economies.

The regressions are run using quarterly data to 2011:Q4, and begin at different points depending on the economy and specification. The dependent variable in our analysis is the change in the log of new completions of office space, as obtained from CBRE, measured in thousands of square feet. (Tables 3 and 4 indicate regression specifications; Appendix A contains a description of the variables and their sources.)

10 At the same time, office property investment tends to show less correlation with the broader economy than other forms of commercial property, show sluggishness of market adjustment, and be driven by longer-term investment oscillations (Wheaton 1999; Sivitanides, Torto and Wheaton 2003).

Reduced form explanatory variables are derived as follows. We use two alternative measures of the value of built income-producing property, *P*. The first comes from NCREIF, which provides an index of privately held office values. Because this measure relies in part upon appraised values in lieu of asset sales, it is known to suffer from appraisal-lagging and price-smoothing problems. Nevertheless, the index values are considered to be accurate barometers of office prices in the United States. The second measure is based on share prices of REITs that hold office property. REIT prices do not suffer from appraisal problems, but do potentially suffer from bias (and lower R^2 values) given that share prices reflect going concern values that differ from the net value of assets. Bias and noise may also result from share price movements based on capital market dynamics that are unrelated to commercial property market fundamentals. Nominal indexed office prices are converted into real values using the relevant CPI.

Construction costs come from Marshall & Swift's index of nominal unit construction costs, and are a simple average of eastern, central and western regions' costs for fireproof steel-frame buildings. These nominal average cost numbers are again converted to real costs using the CPI.

We develop three measures of REIT market penetration. The first is the sum of the book value of debt and preferred stock plus the market capitalisation of equity for listed REITs, all as a percentage of the investment value of the total stock of office space at its reported market value. Because this first measure uses REIT share prices, it will be correlated with the REIT price variable used to measure commercial asset values. This leads us to develop two other measures of REIT market share that depend on asset book value. The second measure is the net property investment of listed REITs at book value as a percentage of the investment value of the total stock of office space at its reported market value. The third measure is total real estate investment (see Appendix A) of listed REITs at book value as a percentage of the investment value of the total stock of office space at its reported market value. The REIT real estate investment data are obtained from quarterly financial statement filings accessed through SNL Financial. The investment value of the total stock of office space data is obtained from CBRE and is the multiple of the estimated total stock of office space in square feet in a given quarter and the average capitalised value of net office rents per square foot.

Finally, in order to consider the conjectured pricing effects of the REIT market on new supply, we create two dummy variables that are interacted with the REIT market share variable. One dummy variable equals 1 if in the current quarter the REIT price index exceeds that of the previous quarter, *Strong*, and the other dummy variable equals 1 if in the current quarter the REIT price index is less than that of the previous quarter, *Weak*.

For model estimation purposes, all variables are expressed as first differences except for the REIT market share variable, which is in levels because using first differences would change the economic meaning of market penetration as a measure of REITs' relevance and their ability to capture the attention of commercial property market participants. Asset price and construction cost variables are expressed as log differences. However, in the case of Australia, France and Japan, levels specifications are undertaken for the dependent and explanatory variables as the series are stationary and pass unit-root tests.

We also potentially include up to eight quarters of lags for all explanatory variables in recognition that it takes time to plan and build new office space. When lags are included, we present the sum

of the current value plus all lagged quarters, inclusive of all intermediate quarters.[11] The number of lags for any given variable is determined by maximising the adjusted R^2 jointly across all variables in the regression. To enhance comparability, the sum total of the current and lagged values is then divided by the number of lags plus one to produce an average quarterly value. Lastly we include a first-order autoregressive process in the specification of the error term to correct for residual serial correlation.

5.2 Estimation results for the United States

Estimation results for the United States are reported in Table 3. In column (1) of the table, we report estimates from the benchmark model that includes only asset price and construction cost as explanatory variables. Columns (2), (3) and (4) report specifications that include the three different REIT market penetration variables, described previously. As further robustness checks, daily volatility in asset prices of the previous quarter is included as an explanatory variable in column (5), and results using NCREIF asset price data instead of REIT price data are reported in column (6).

The benchmark model results reported in column (1) have variable coefficients of the expected signs and the coefficient on the asset price variable is statistically significant. The insignificance of the construction cost variable is similar to findings of other studies estimating commercial property supply equations in reduced form (see, for example, Holland, Ott and Riddiough (2000)). This result is often attributed to the aggregation in the Marshall & Swift index of construction cost. The number of quarterly lags in the price variable, *P*, is 7, which confirms that one to two year lags exist in property development (see also Ott *et al* (2008)). The estimates also imply that there is negative serial correlation in the error term if the correction is not applied. The Durbin-Watson statistics suggest that the models are not inappropriately specified in terms of their time series properties.

Now consider the comparative regression results reported in columns (2), (3) and (4), which incorporate REIT market share as a variable using the three different metrics discussed above. The results are generally consistent across the alternative measures, in that asset price and construction cost retain their signs and statistical (in)significance when compared with the benchmark model. Critically, we also see that the REIT market share coefficient is significant in rising markets. Given the negative sign on that coefficient, the economic interpretation is that REITs exert a significant moderating influence on the supply response in rising markets, and the strength of this moderating influence increases with market share. The positive coefficients on the REIT market share variable in falling markets are also consistent with a moderating influence on declines in construction supply, though those coefficients are not statistically significant.

11 For example, if five lags are included, the sum is composed of all lags up to the maximum of the fifth lag, plus the current value, for a total that includes six values.

Table 3: Regression Models for Construction Completions – United States

Sample period is 1994:Q1–2011:Q4 (72 observations)

	Models with REIT prices										Model with NCREIF index[a] (6)	
			Market share									
	Benchmark (1)		Definition 1 (2)		Definition 2 (3)		Definition 3 (4)		Volatility[a] (5)			
	Coeff	Lag	Coeff	Lag	Coeff	Lag	Coeff	Lag	Coeff	Lag	Coeff	Lag
Constant	0.177** (0.083)		0.234** (0.099)		0.249** (0.102)		0.254** (0.101)		0.247** (0.103)		0.278*** (0.095)	
Sum of current and lagged ...												
ΔREIT_price	1.226** (0.164)	7	1.650** (0.655)	7	1.484** (0.686)	7	1.445** (0.694)	7	1.600** (0.741)	7		
ΔNCREIF index											3.838*** (1.212)	7
Δ*C* (constr cost)	−1.574 (2.265)	0	−1.088 (2.118)	0	−1.099 (2.096)	0	−1.126 (2.086)	0	−1.346 (2.116)	0	−2.379 (1.982)	0
mkt share x *Strong*			−0.026*** (0.009)	4	−0.038*** (0.013)	4	−0.035*** (0.011)	4	−0.038*** (0.013)	4	−0.029*** (0.011)	4
mkt share x *Weak*			0.018 (0.017)	4	0.019 (0.023)	4	0.017 (0.021)	4	0.012 (0.022)	4	0.014 (0.020)	4
Trading volatility of previous quarter									0.003 (0.006)			
ρ	−0.325*** (0.115)		−0.376*** (0.113)		−0.382*** (0.112)		−0.385*** (0.112)		−0.401*** (0.112)		−0.451*** (0.110)	
R^2	0.26		0.34		0.35		0.35		0.36		0.40	
Adjusted R^2	0.19		0.26		0.27		0.27		0.26		0.33	
s e of regression	0.32		0.30		0.30		0.30		0.30		0.29	
Durbin-Watson	1.96		2.04		2.06		2.07		2.10		2.17	

Notes: The dependent variable is the change in log square feet of construction completions for office. The regressors are change in the log REIT price index, change in the log NCREIF index, change in construction cost and the level of the three market shares as defined previously. The coefficients of seasonal dummies are not shown. Coefficient standard errors are in parentheses. *, ** and *** indicate statistical significance at at the 1, 5 and 10 per cent levels, respectively. ρ is the estimate of the coefficient of first-order autocorrelation in the error term.
(a) Market share is definition 3.

Given the relationship of the market share variable to REIT prices, it is conceivable that the significance of this variable is because it is picking up some non-linearity in the price effect. For example, it may be that agents that affect supply outcomes are reacting to the volatility in asset prices, along the lines of the impact of total uncertainty on commercial real estate investment documented in Holland *et al* (2000). As an additional robustness check, we add price volatility – calculated as the standard deviation of REIT index prices based on trailing daily returns realised during the previous quarter – to the specification in column (5). We find, however, that uncertainty has no statistical effect on supply outcomes; rather, its inclusion further strengthens the significance of the REIT market share variable. This suggests that something other than asset price volatility may be behind the REIT market share result.

As discussed above, the NCREIF data offer an alternative price index of office properties. Using this price variable does not change the main results (column (6)).

In summary, the results suggest that the conjectured REIT market share effect was operative over the sample period, in that the commercial property supply response in periods of high asset price returns was increasingly moderated as the share of assets held by REITs increased. The results are consistent with the view that increasing attention was paid to a sector with firms run by well-respected managers that owned higher quality assets, and that this attention had a moderating effect on the office construction supply cycle.

5.3 Estimation results for other countries

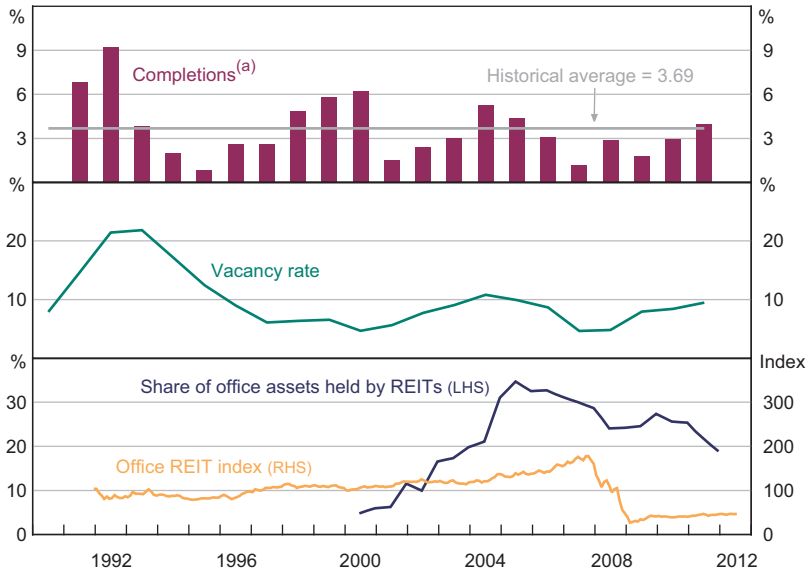
We also test the REIT market penetration conjecture for Australia, Japan and France by regressing new (office) construction completions on controls for office prices and construction cost, followed by the REIT market share variables. Before presenting the results, we briefly review the situation in each country.

Australia. The data for Australia go further back than for most other economies in the sample, to the tail end of the commercial property boom in the early 1990s. Construction completions in Sydney at that time were greater than the peaks of the two cycles that followed over the next two decades.

Australia is one of the oldest of non-US REIT markets and REITs there have had relatively significant penetration into the office market for a long time. Figure 5 demonstrates that the degree of securitisation of office markets via REITs increased markedly in the first half of the 2000s, rising from around 5 per cent in 2000 to over 35 per cent in 2005.

Indeed, Chan *et al* (2012) document a surge in Australian REITs coming to the market over that period, with 25 REIT IPOs amounting to US$3.3 billion. At the same time, there was a dramatic increase in so-called 'stapled' REITS, whereby the stock of the REIT was connected to the stock of the company that manages it. This effectively allows for an internal management structure that can take more property development risk, compared with the traditional limited property trust model in Australia that had involved external managers. According to Newell (2010), between 2004 and 2007, 'stapled' REITs grew from 29 per cent to over 75 per cent of the total capitalisation of Australian REITs.

Figure 5: Australia – Real Office Property Market
Sydney



Note: (a) As a per cent of its total stock, beginning of the period
Sources: Bloomberg; CBRE; SNL Financial; Thomson Reuters; authors' calculations

As was true across most economies, prices of prime properties as embedded in REITs fell from mid 2007, but the earlier rise in Australia had not been as dramatic. Between 2000 and 2007, the REIT index grew by around 70 per cent, a far cry from the many multiples of growth evident over the period in Canada, France, Japan, Singapore or even the United States. However, the collapse from June 2007 to March 2009 of around 75 per cent was among the sharpest of all the REIT markets under consideration in this study, and was much larger than the 50 per cent decline in the national stock market index over the same time period. At the same time, the share of properties securitised via REITs declined from above 30 per cent to around 20 per cent, largely reflecting the decline in the value of properties held by REITs relative to other more illiquid properties. By contrast, based on the movement of the ratio of construction completions to stock, the office construction cycle was not hit too hard by the decline in REIT prices for, by 2011, the completions ratio had snuck back over the 20-year average.

When we estimate the model of new construction completions for Australia, we find that the base case model with asset prices and construction fits fairly well – despite the regression having three fewer years of observations than in the United States. Nearly 30 per cent of the new construction is explained by the lagged asset price and construction cost variables (Table 4). Both explanatory variables have the right sign, and construction costs are significant. In the second reported specification, the asset price variable also becomes statistically significant.

The hypothesis that changes in the market share of securitised assets via REITs may have ameliorated the construction cycle is less strongly supported by the Australian data. Though the variables of the market share in boom versus bust periods have the signs that would be expected,

Table 4: Regression Models for Construction Completions – Other Countries

	Australia				Japan				France			
	Benchmark (1)		With share (2)		Benchmark (3)		With share (4)		Benchmark (5)		With share (6)	
	Coeff	Lag	Coeff	Lag	Coeff	Lag	Coeff	Lag	Coeff	Lag	Coeff	Lag
Constant	3.656***		2.962***		4.969*		4.776**		5.051***		5.087***	
	(0.267)		(1.008)		(0.159)		(0.214)		(0.186)		(0.327)	
Sum of current and lagged ...												
ΔREIT_price	3.188	3	10.032**	8	0.63	1	9.959**	5	0.378	1	2.685**	1
	(2.120)		(4.781)		(1.005)		(2.683)		(0.685)		(1.235)	
Δ*C* (constr cost)	−38.339**	1	−18.447	0	−3.806	6	−1.029	1	−0.548	0	−5.469	0
	(15.102)		(11.309)		(3.465)		(1.074)		(6.081)		(6.528)	
mkt share x *Strong*[(a)]			−0.032	8			−0.243*	6			−0.014	1
			(0.031)				(0.127)				(0.144)	
mkt share x *Weak*[(a)]			0.107	8			0.452**	6			0.183	1
			(0.076)				(0.181)				(0.158)	
ρ	0.640***		0.501***				−0.45**		0.797***		0.817***	
	(0.108)		(0.172)				(0.181)		(0.072)		(0.076)	
R^2	0.36		0.45		0.23		0.51		0.64		0.69	
Adjusted R^2	0.29		0.29		0.11		0.34		0.61		0.64	
s e of regression	0.65		0.57		0.48		0.36		0.31		0.31	
Durbin-Watson	1.55		1.64		1.64		1.79		1.84		1.85	
Sample (obs)	1997:Q2–2011:Q4 (59)		2002:Q3–2011:Q4 (38)		2002:Q2–2011:Q4 (39)		2003:Q4–2011:Q4 (33)		1993:Q3–2011:Q4 (74)		1997:Q2–2011:Q4 (59)	

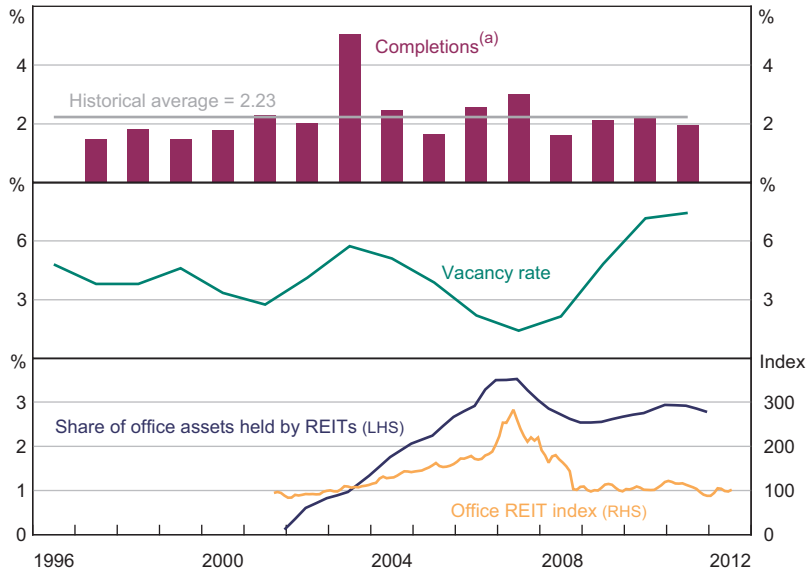
Notes: The dependent variable is the change in log square feet of construction completions for office. The coefficients of seasonal dummies are not shown. Coefficient standard errors are in parentheses. *, ** and *** indicate statistical significance at at the 1, 5 and 10 per cent levels, respectively. ρ is the estimate of the coefficient of first-order autocorrelation in the error term.
(a) Market share is definition 1.

they are not statistically significant, and the explanatory power of specifications including the market share variables is barely improved over simple base case specifications. This is in contrast to the United States, where the addition of market share variables adds significant explanatory power.

Japan. Though not reported in Figure 6, data on construction starts for Japan begin around 1996, just after the commercial property peak in Tokyo (as identified by Shimizu and Nishimura (2007)). The J-REIT market began in late 2001 and the index is available from 2002. Thus, we have roughly 10 years of data after the introduction of REITs.

The early period of office REITs corresponds to both relatively robust construction and rapid appreciation of REIT assets. After four years of relative stagnation from 1996, completions as a share of total stock picked up to well over 4 per cent in 2003, more than twice the period average (Figure 6). Though completions were more subdued subsequently, they did remain generally above average through to 2007, hitting the second highest share of new construction completions over the period in that year.

Figure 6: Japan – Real Office Property Market
Tokyo, 23 wards



Note: (a) As a per cent of its total stock, beginning of the period
Sources: Bloomberg; CBRE; SNL Financial; Thomson Reuters; authors' calculations

Similarly, REIT markets were quite strong in Japan over the period from their introduction in 2001 until 2007, with the index value rising from around 100 in the early 2000s to over 250 by mid 2007. From the IPOs of two J-REITs in September 2001, the total market size had increased to 41 J-REITs by March 2007. Total market capitalisation was more than 20 times the original size. By 2007, J-REITs had also grown to about one-third of the total market capitalisation of real estate related companies listed on Section 1 of the Tokyo Stock Exchange. As can be seen in the bottom panel

of Figure 6, we estimate that the amount of all commercial real estate (offices) securitised by REITs had grown to around 3.5 per cent of all securitisable office property at that time.

Price discovery appears to have improved considerably after the listing of J-REITs. According to a study group, real estate appraisal and end-of-period income and expenditures became common for all properties owned by J-REITs, which led to a large growth of information and data availability on commercial property (J-REIT Product Property Study Group 2007). This is consistent with the view that since the introduction of REITs in Asia more generally, liquidity and efficiency of the real estate markets have increased (Ooi, Newell and Sing 2006).

From mid 2007, however, the J-REITs market took a brutal tumble, with the index falling from a peak of around 285 in mid 2007 to around 150 by March 2008, and then to around 100 by March 2009 in the wake of the failure of Lehmann Brothers. The percentage fall in both cases, 47 per cent in the first and 43 per cent in the second period, was significantly greater than the falls endured by the Japanese equity market index of 30 per cent and 36 per cent, respectively. The recovery in the REIT index since early 2009 has been relatively modest by comparison. Concurrent with the J-REIT crash, there has also been some consolidation on the real side: office construction spending since 2007 has been subdued and below the period average for each year between 2008 and 2011, though the decline in spending since the collapse in REIT values was much less pronounced than that seen in REIT valuations.

Nonetheless, in October 2010, the Bank of Japan took the unprecedented initiative of announcing quantitative easing measures that included the purchase of the J-REITs. The total amount of J-REITs to be purchased was 110 billion yen, a relatively small amount compared with other assets being purchased, but this still gained considerable attention in the market.[12] In April 2012, the amount for J-REIT purchases was raised to 120 billion yen.

The justification for the action was to reduce risk premiums in financial markets. Indeed, the view of a number of analysts was that J-REITs were undervalued compared with other REITs, with price-to-net-asset values of 0.87 at the time of the intervention. To ensure that Bank of Japan purchases did not distort normal market functioning, the maximum amount of each J-REIT to be purchased was not to exceed 5 per cent of the total amount on issue. Purchases of J-REITs were promised to be roughly proportionate to the total market value of each J-REIT issued.

The announcement of Bank of Japan purchases in early October generated a recovery of around 3 per cent in J-REIT prices; in fact, by the end of the year, J-REITs had risen by nearly 20 per cent in value. Bank of Japan support was certainly good for J-REIT stocks, though it had much less impact on the wider equity market. As for land prices, they fell by about 2 per cent in Tokyo in 2011, much less than the 5 to 7 per cent drop seen in 2010. The extent to which the Bank of Japan action contributed either to this deceleration or the lack of a dramatic fall in construction spending over the period is not clear.[13]

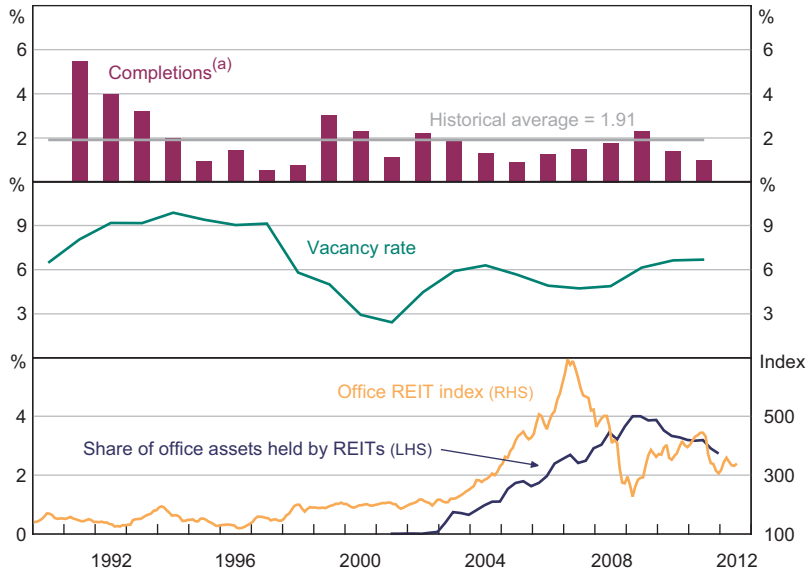
12 The Bank of Japan had also promised to purchase 1.6 trillion yen worth of Tokyo Stock Exchange index-linked exchange-traded funds (ETFs), 2.9 trillion yen of corporate bonds, 2.1 trillion yen of commercial paper, and 33.5 trillion yen of government bonds and notes. In April 2012, the amount for ETFs was raised by an additional 200 billion yen.

13 What is clear is that the Bank of Japan has thus far reported unrealised gains on its holdings of J-REITs, according to its publicly released earning reports. The Bank of Japan booked a 200 million yen unrealised gain on its holdings between April 2011 and March 2012, more than making up for the 100 million yen in losses a year earlier.

The estimates for the regression model of construction supply for Japan, where there are even fewer observations to work with than Australia (39 over the 10-year period from 2002), also present mixed results (Table 4). In the benchmark specification, while the signs on the asset price and construction cost coefficients are as expected, neither is statistically significant. However, the price variable gains statistical significance when the market share variables are added. And in tests of the market penetration conjecture, the market share of REITs does appear to be associated with subdued construction spending when office prices are rising, as well as increased spending when asset prices are falling. This is consistent with the view that the development of REIT securitisation – in spite of the sharp rise and fall in valuations – may have contributed to a stabilisation of office market supply.

France. Finally, we also estimate the model for France, the third largest REIT market in the world at US$72 billion, although the regime was introduced relatively recently in 2003. The degree of penetration of REITs increased steadily to around 4 per cent by 2010 (Figure 7). As for many other countries, commercial office supply cycles over the past two decades have peaked at much lower levels than during the late 1980s or early 1990s booms. Office prices as captured by the REIT index spiked as did many others in mid 2007, though construction completions as a percentage of the total stock continued to increase, peaking in 2009.

Figure 7: France – Real Office Property Market
Paris



Note: (a) As a per cent of its total stock, beginning of the period
Sources: Bloomberg; CBRE; Thomson Reuters; authors' calculations

Despite seemingly regular cyclical patterns in supply, the baseline regression model does not fit so well for France. Although the coefficients on asset prices and construction cost are the right sign, they are not statistically significant. The fit improves marginally when the market share variables are included, and the coefficient on asset prices become statistically significant. While the signs

for the degree of REIT penetration coefficients are consistent with the stabilisation of construction supply, the statistical insignificance of the coefficients deters strong statistical inference.

6. Conclusion

Conventional wisdom changes when the facts change. And facts associated with the recent financial market crisis implicate securitised real estate as a central cause of the crisis, particularly the mortgage-related securities produced in the United States. As a result, real estate-related securitisation is rather out of fashion at the moment.

In the face of current fashion, this paper asks the question of whether there are economic goods that can be generated by the securitisation of real estate interests. To address this question we consider the securitisation of commercial property equity interests through the so-called listed REIT market. Pulling together data from a large number of sources, we analyse commercial property construction and REIT markets from North America, Europe, Asia and the Pacific. We conduct several detailed case studies, with a particularly in-depth focus on the United States.

Our principal finding is that the US REIT market provides an excellent example of how a well-structured real estate securitisation market can generate positive spillover benefits to the economy at large by moderating construction boom and bust tendencies. The contrast between commercial property and housing markets leads us to conclude that financial market plumbing matters to the success of securitisation. The outperformance of US CMBS relative to private-label RMBS is another case in point.[14]

These results argue for the further development of CDS markets on RMBS. Well-functioning markets in such instruments can provide speculators the opportunity to short housing at low cost, and home owners and lenders the opportunity to better manage housing and mortgage loan risks (see, for example, Fabozzi, Shiller and Tunaru (2009)). To be sure, the financial crisis has taught us that market design should be carefully considered to ensure sufficient information production and price discovery as well as maintain incentives for creditors to properly screen and monitor borrowers (An, Deng and Gabriel 2011; Bolton and Oehmke 2011).

The impact of REIT markets on construction supply does not appear to be as strong in other economies. While these more tentative findings may in part be due to the relative youth of the non-US REIT markets and the resulting paucity of data, discussions with industry specialists suggest to us the deeper causes are due to structural differences. In the United States, many high-quality assets and management teams are located within the REIT sector, and US REITs have relatively straightforward business models that enhance transparency. Further documenting structural variation and assigning causation remains a topic for future research.

14 The CMBS market collapsed at the same time as the private-label RMBS, but since has re-emerged whereas the private-label RMBS market has not. Performance differences between CMBS and private-label RMBS in terms of default rates have also been stark. Analogous to the REIT market experience in commercial property, structural differences explain a lot. Unlike the private-label RMBS market, the CMBS market stuck to simple mortgage designs and first mortgage positions in the asset capital structure. It also had a dedicated special servicer whose only function was to address financially distressed loans. There was no robo-signing on the CMBS side of the business. And perhaps most importantly, for most of the CMBS market's history, a small dedicated group of 'B-piece buyers' existed that closely scrutinised the risk characteristics of the security structure and underlying collateral asset pool. This scrutiny both complemented and substituted for due diligence performed by credit rating agencies.

Appendix A: Data Description

Real estate price series

For the United States there are two price series: housing and commercial. For the housing index we use the Case-Shiller index of home prices (Figure 1). For commercial property prices there are several sources and series. The first is from NCREIF (National Council of Real Estate Investment Fiduciaries), which reports a price series for commercial (office) property (used in Table 3's regression analysis) and a nominal rents series (used in Figure 4). Nominal rents are converted to real rents using the CPI. Real rents are then capitalised to produce a property value series using the current (four-quarter moving average) estimated capitalisation rate. Another series used for commercial property is the index of real estate investment trust (REIT) share prices (used in Figure 1 and Table 3's regression analysis; see next data item for more details). Finally, a transaction-based index of commercial property prices from MIT and NCREIF is used for illustrative purposes in Figure 1.

REIT indices price and return

The time series of REIT returns in the various jurisdictions and the total return price index are collected for the various economies from different property price indices (Table A1).

Commercial property prices

The index for office property prices used in Figure 4 is sourced from NCREIF via Datastream. The series is available from 1990:Q1 to 2011:Q4. It is used to calculate the real capitalised property value of a very large pool of individual commercial real estate properties acquired in the private market for investment purposes only. All properties in the NPI have been acquired, at least in part, on behalf of tax-exempt institutional investors – the great majority being pensions funds. As such, all properties are held in a fiduciary environment.

Listed developer equity index series

Share prices of listed property development firms are used both as a proxy for real estate valuation and performance, and to assess the qualities of REITs as an investment class. For the United States, an index of home builder share price performance is examined in Figure 1, and a property market developer index is used in Figure 2. A distinction is also made between the equity indices of various sectors of commercial property: office, retail, and hotel properties (all used in Figure 2). For the remainder of the sample economies, general property market development indices are examined.

Other market series

Other market series are used as indicators of housing or commercial property market conditions in the United States – a credit default swap (CDS) index on AAA-rated subprime mortgage-backed securities, and credit spreads of AAA-rated commercial mortgage-backed securities to LIBOR (both used in Figure 1). Both of these are taken from JPMorgan Chase. National equity price

indices are used to assess REIT diversification properties as well as assess REITs' general sensitivity to market conditions.

Office supply and supply/vacancy rates for major cities

For each of the cities (economies) under investigation, the total stock of office real estate outstanding (area), as well as completions and vacancies are available (Table A2). Total stock represents the total completed space (occupied and vacant) in the private and public sector at the survey date, recorded as the net rentable area in thousands of square feet. Total stock should include all types of buildings regardless of quality, age and ownership (i.e. both leased and owner-occupied). The total stock includes purpose-built, space converted from other uses and independent space forming part of a mixed-use development.

Development completions represent the total net rentable area of completed floor space in thousands of square feet. This includes new and significantly refurbished (stripped back to shell and core) floor space that has reached practical completion and is occupied, ready for occupation or an occupancy permit, where required, has been issued during the survey period. The status of the building will have been changed from space 'under construction' to 'development completion' during the quarter. Vacancy rates are the total net rentable floor space in existing properties, which is physically vacant and being actively marketed at the survey date.

Using these supply data as input, time series of completion and vacancy rates in the office market in the various localities are then calculated as the share of completions over existing stock, and the share of vacancies over total existing stock, respectively. The ratio of completions over existing stock is a flow indicator of new supply coming on line, while vacancy rates can be viewed as an indicator of inadequate demand related to the existing stock of space.

Degree of securitisation of commercial real estate (office)

The market share of REITs is measured as asset capitalisation of listed REITs on each stock exchange as a per cent of investable office stock at the current market price.[15] Asset capitalisation is measured in three different ways. The first one is calculated as the sum of the current value of stock market capitalisation, the book value of debt and preferred stock. The second one takes net property investment at book value, while the third one takes total real estate investment (which also includes investments in associated companies, total mortgage-backed investments, and net mortgages and notes). REITs that can be identified as 'office REITs', and for which there is no indication of investing outside the cities of the sample, are focused on. Since not all the office REITs specialise only in office-related real estate, to calculate the degree of asset capitalisation in REITs that is accounted for by office assets, the asset capitalisation for each REIT is multiplied by the share of revenue in that REIT that is based on office business. The country aggregate is then the sum of each individual REITs' office assets. The US REIT stock market capitalisation and debt and preferred stock values are taken from SNL Financial (used in Figure 3 and Table 3's regression analysis). Similar estimates are taken and/or calculated for the other economies from Bloomberg. For the other major cities in the sample, the degree of securitisation is then calculated by dividing

15 We are aware of the existence of a significant number of private REITs in a number of jurisdictions (particularly Japan), but we are focusing on listed exchange-traded REITs in this paper, since we view transparency and information production to be greater in the case of listed REITs.

the asset market capitalisation of the REIT by the product of the average office stock value of each city and the total office stock area as related (used in Figure 5 for Australia; Figure 6 for Japan; Figure 7 for France; Table 4's regression analysis; and Figure B1 for Hong Kong SAR; Belgium; Germany; Netherlands; and the United Kingdom).

Construction costs

An index of construction costs – when possible for a category of non-residential buildings – are taken from national statistics, with a private vendor as the source for the United States (Table A3).

Table A1: Property Indices – Data Definitions, Time Periods and Sources

Used in Figures 3, 5–7, B1 and Tables 1, 3–4 (*continued next page*)

REITs – all property type				
Economy	Definition	Unit	Time period	Source
United States	FTSE, NAREIT US Real Estate Index, equity REITs index	2 Jan 1973 = 100	2002:M1–2011:M12	NAREIT
Australia	S&P/ASX 200 A-REIT index	31 Mar 2000 = 1 231.333	2002:M1–2011:M12	Bloomberg
Japan	Tokyo Stock Exchange REIT index	31 Mar 2003 = 1 000	2003:M3–2011:M12	Bloomberg
France	Datastream REIT index	8 Jul 1988 = 100	2002:M1–2011:M12	Thomson Reuters
Canada	Datastream REIT index	5 Jan 1994 = 100	2002:M1–2011:M12	Thomson Reuters
Hong Kong SAR	Datastream REIT index	25 Nov 2005 = 100	2005:M11–2011:M12	Thomson Reuters
South Korea	Calculated[(a)]	21 May 2001 = 100	2002:M1–2011:M12	Bloomberg; authors' calculations
Singapore	FTSE Straits Times RE Invest Trust index	2 Sep 2002 = 333.86	2002:M9–2011:M12	Bloomberg
Thailand	Calculated[(b)]	19 Nov 2003 = 100	2003:M11–2011:M12	Bloomberg; authors' calculations
Belgium	Datastream REIT index	16 Dec 1994 = 100	2002:M1–2011:M12	Thomson Reuters
Germany	Datastream REIT index	19 Dec 1988 =100	2002:M1–2011:M12	Thomson Reuters
Netherlands	Datastream REIT index	1 Jan 1973 = 100	2002:M1–2011:M12	Thomson Reuters
United Kingdom	Datastream REIT index	5 Jan 1965 = 100	2002:M1–2011:M12	Thomson Reuters

Table A1: Property Indices – Data Data Definitions, Time Periods and Sources

Used in Figures 3, 5–7, B1 and Tables 1, 3–4 (*continued*)

REITs – office indices				
Economy	Definition	Unit	Time period	Source
United States	Datastream office REIT index	18 Aug 1988 = 100	2002:M1–2011:M12	Thomson Reuters
Australia	Datastream office REIT index	6 Dec 1991 = 100	2002:M1–2011:M12	Thomson Reuters
Japan	Datastream office REIT index	10 Sep 2001 = 100	2002:M1–2011:M12	Thomson Reuters
France	Datastream office REIT index	4 Jan 1988 = 100	2002:M1–2011:M12	Thomson Reuters
Canada	Datastream office REIT index	26 Dec 1997 = 100	2002:M1–2011:M12	Thomson Reuters
Hong Kong SAR	Datastream office REIT index	24 May 2006 = 100	2006:M5–2011:M12	Thomson Reuters
Singapore	Datastream office REIT index	19 Nov 2002 = 100	2002:M11–2011:M12	Thomson Reuters
Belgium	Datastream office REIT index	16 Dec 1994 = 100	2002:M1–2011:M12	Thomson Reuters
Germany	Datastream office REIT index	2 Apr 2007 = 100	2007:M4–2011:M12	Thomson Reuters
Netherlands	Datastream office REIT index	31 Aug 1989 = 100	2002:M1–2011:M12	Thomson Reuters
United Kingdom	Datastream office REIT index	5 Jan 1965 = 100	2002:M1–2011:M12	Thomson Reuters

Notes: (a) Korea Real Estate Investment Trust Co, KOCREF REIT VIII, KR2 Development REIT Co Ltd and Golden Narae Real Estate Development Trusts Co Ltd; sum of the market capitalisations divided by the sum of the number of shares
(b) TICON Property Fund, Millionaire Property Fund, MFC Nichada Thani Property Fund and Bangkok Commercial Property Fund; sum of the market capitalisations divided by the sum of the number of shares

Table A2: Construction Supply Data – Data Definitions, Time Periods and Sources

Used in Figures 3, 5–7, B1 and Tables 3–4 (*continued next page*)

	Total stock		
Economy (city)	Annual period	Quarter period	Source
United States	1990–2011	1990:Q1–2011:Q4	CBRE
Australia (Sydney)	1990–2011	1990:H1–2011:H2	CBRE
Japan (Tokyo, 23 wards)	1996–2011	1996:Q4–2011:Q4	CBRE
France (Paris)	1990–2011	1997:Q4–2011:Q4	CBRE
Canada (Toronto)	1990–2010	1990:Q1–2011:Q3	CBRE
Hong Kong SAR	2005–2011	2005:Q1–2011:Q4	CBRE
South Korea (Seoul)	2005–2011	2005:Q1–2011:Q4	CBRE
Singapore	1988–2011	1988:Q1–2011:Q4	Urban Redevelopment Authority
Thailand (Bangkok)	2005–2011	2005:Q1–2011:Q4	CBRE
Belgium (Brussels)	1990–2011	2000:Q4–2011:Q4	CBRE
Germany (Frankfurt)	1998–2011	1998:Q4–2011:Q4	CBRE
Netherlands (Amsterdam)	2009–2011	2007:Q4–2011:Q4	CBRE
United Kingdom (Central London)	1990–2011	1994:Q4–2011:Q4	CBRE
	Development completions		
Economy (city)	Annual period	Quarter period	Source
United States	1990–2011	1990:Q1–2011:Q4	CBRE
Australia (Sydney)	1990–2011	1990:H1–2011:H2	CBRE
Japan (Tokyo, 23 wards)	1996–2011	1996:Q4–2011:Q4	CBRE
France (Paris)	1990–2011	2008:Q4–2011:Q4	CBRE
Canada (Toronto)	1990–2010	1990:Q1–2011:Q3	CBRE
Hong Kong SAR	2005–2011	2005:Q1–2011:Q4	CBRE
South Korea (Seoul)	2005–2011	2005:Q1–2011:Q4	CBRE
Singapore[(a)]	1991–2010	1991:Q1–2011:Q3	Urban Redevelopment Authority
Thailand (Bangkok)	2005–2011	2005:Q1–2011:Q4	CBRE
Belgium (Brussels)	1990–2011	2001:Q4–2011:Q4	CBRE
Germany (Frankfurt)	2003–2011	2003:Q1–2011:Q4	CBRE
Netherlands (Amsterdam)	2009–2011	2009:Q1–2011:Q4	CBRE
United Kingdom (Central London)	1990–2011	1990:Q1–2011:Q4	CBRE

Table A2: Construction Supply Data – Data Definitions, Time Periods and Sources

Used in Figures 1–3, 5–7, B1 and Tables 3–4 (*continued*)

	Vacancy rate		
Economy (city)	Annual period	Quarter period	Source
United States	1990–2011	1990:Q1–2011:Q4	CBRE
Australia (Sydney)	1990–2011	1990:H1–2011:H2	CBRE
Japan (Tokyo, 23 wards)	1996–2011	1996:Q4–2011:Q4	CBRE
France (Paris)	1990–2011	2008:Q4–2011:Q4	CBRE
Canada (Toronto)	1990–2010	1990:Q1–2011:Q3	CBRE
Hong Kong SAR	2005–2011	2005:Q1–2011:Q4	CBRE
South Korea (Seoul)	2005–2011	2005:Q1–2011:Q4	CBRE
Singapore	1988–2011	1988:Q1–2011:Q4	Urban Redevelopment Authority
Thailand (Bangkok)	2005–2011	2005:Q1–2011:Q4	CBRE
Belgium (Brussels)[(b)]	1990–2011	2001:Q2–2011:Q4	CBRE
Germany (Frankfurt)	2003–2011	2003:Q1–2011:Q4	CBRE
Netherlands (Amsterdam)	2009–2011	2009:Q1–2011:Q4	CBRE
United Kingdom (Central London)	1990–2011	1990:Q1–2011:Q4	CBRE

Notes: (a) Private and public sector office space under construction
(b) Availability rather than vacancy from 2008. The availability rate represents the total net rentable floor space in existing properties, which is being actively marketed, either for lease, sublease, and assignment or for sale for owner occupation as at the end of the survey period.

Table A3: Construction Cost – Data Definitions, Time Periods and Sources
Used in Tables 3–4

Economy	Definition	Unit	Time period	Source
United States	Class A fireproof steel frame building, average of eastern, central and western regions	1926 = 100	1991:Q4–2011:Q4	Marshall & Swift
Australia	Producer price index of non-residential building construction	Sep 1998–Jun 1999 = 100	1996:Q3–2011:Q4	Australian Bureau of Statistics
Japan	Japan building construction started, estimated costs – office	Per square metre	1991:Q4–2011:Q4	Ministry of Land, Infrastructure, Transport and Tourism
France	Construction cost index, residential buildings, except residences for communities	2005 = 100	1993:Q1–2011:Q4	Eurostat

Appendix B: Real Office Property Markets

Figure B1: Real Office Property Markets
(*continued next page*)

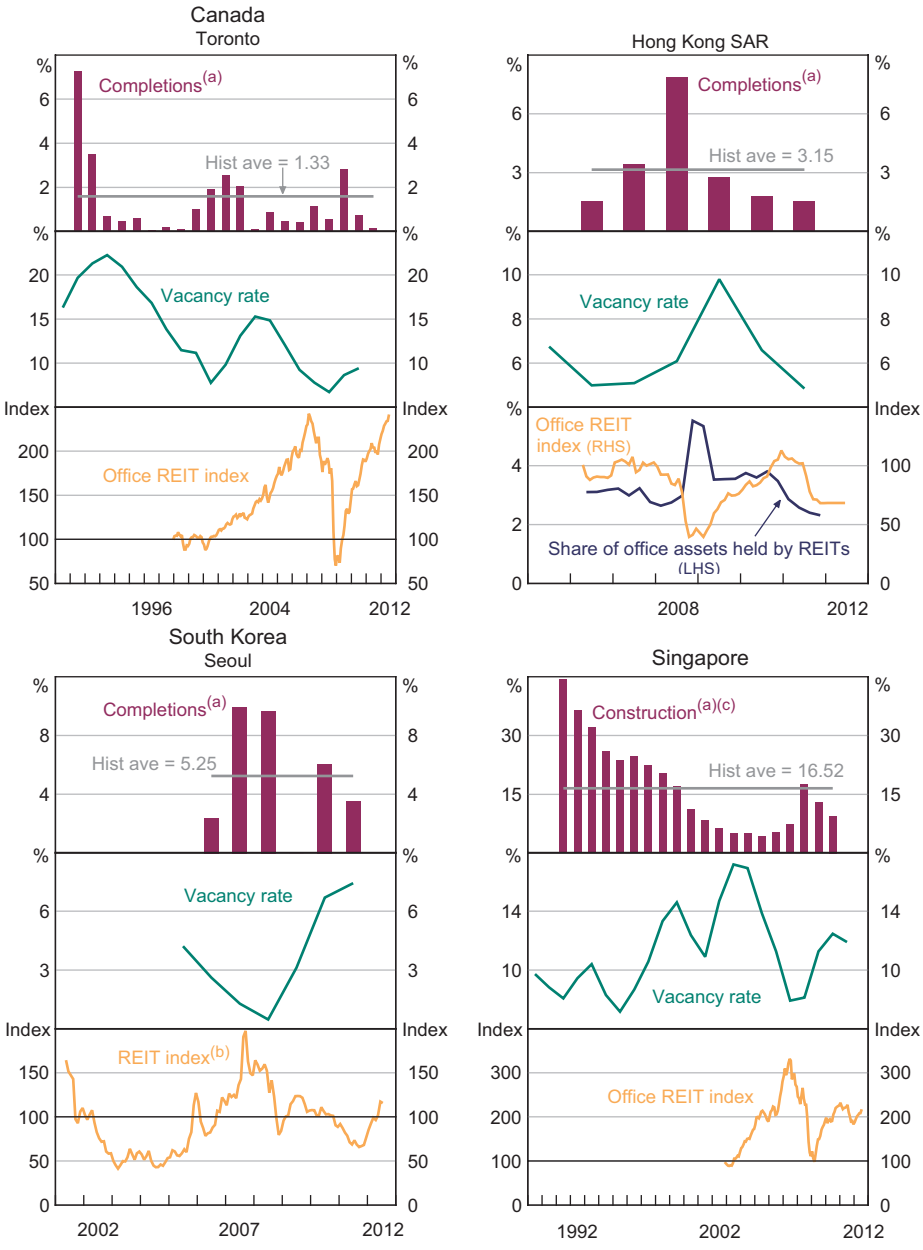


Figure B1: Real Office Property Markets
(*continued next page*)

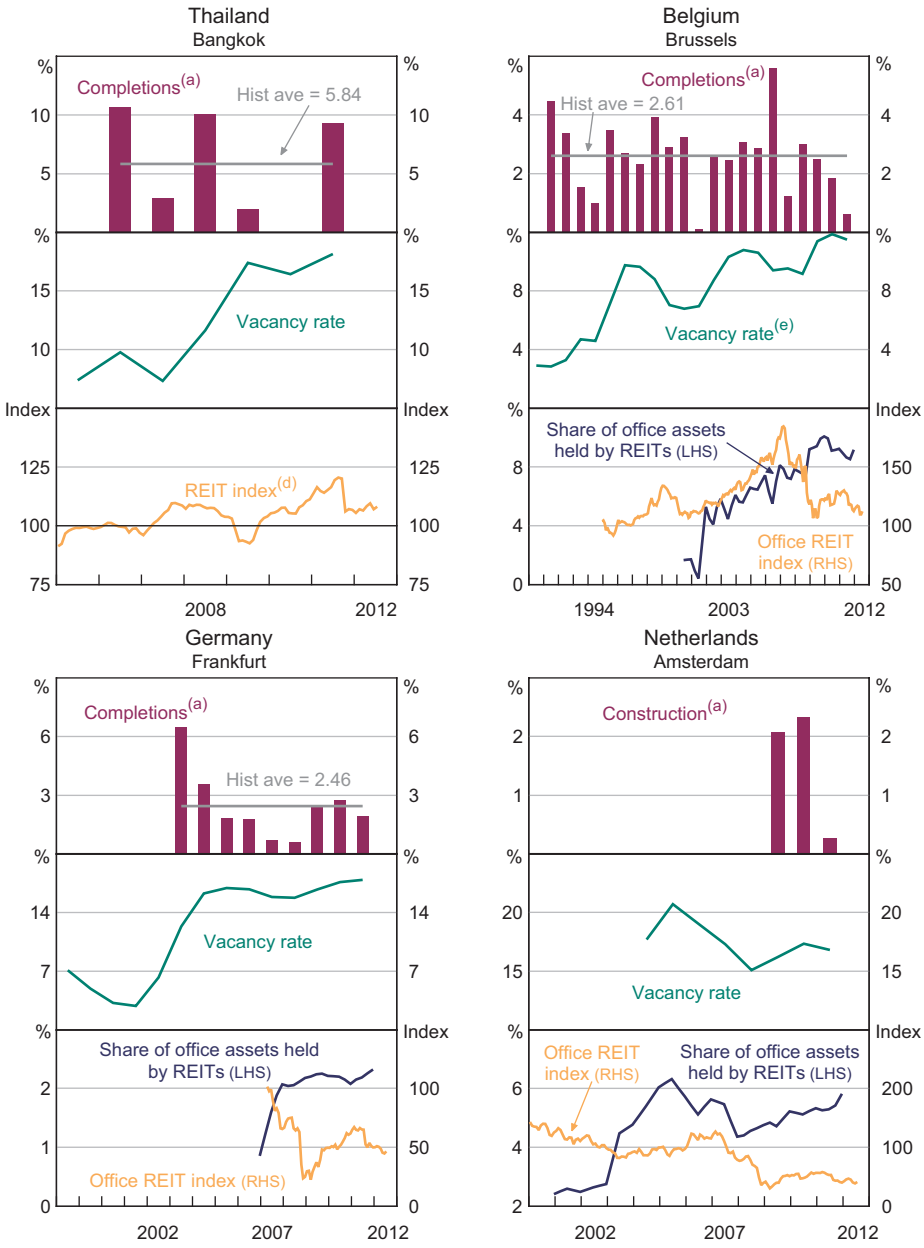
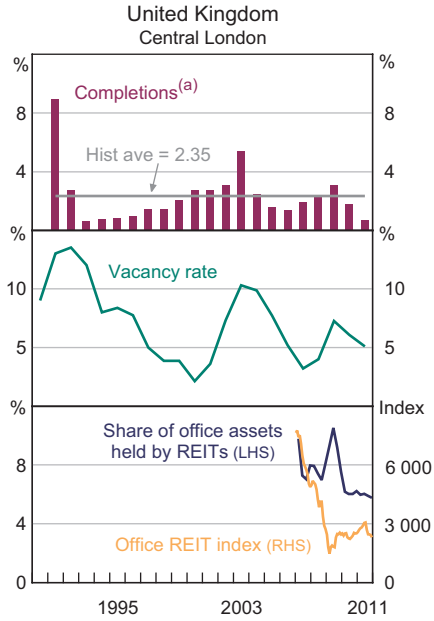


Figure B1: Real Office Property Markets
(*continued*)



Notes: (a) As a per cent of its total stock, beginning of the period
(b) Korea Real Estate Investment Trust Co, KOCREF REIT VIII, KR2 Development REIT Co Ltd and Golden Narae Real Estate Development Trusts Co Ltd; sum of the market capitalisations divided by the sum of the number of shares
(c) Private and public sector office space under construction
(d) TICON Property Fund, Millionaire Property Fund, MFC Nichada Thani Property Fund and Bangkok Commercial Property Fund; sum of the market capitalisations divided by the sum of the number of shares
(e) Availability rather than vacancy from 2008

Sources: Bloomberg; CBRE; Thomson Reuters; Urban Redevelopment Authority; authors' calculations

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