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Recent experiences in the US residential mortgage and mortgage-backed securities (MBS) markets have caused many market participants, analysts, and policymakers to be skeptical that any social good can result from securitization. To assess whether securitization is capable of working, we appeal to the generalizable experience of a related sector. Namely, we study securitized equity interests in commercial property, known broadly as the listed equity real estate investment trust (REIT) market. We maintain that developing a deeper understanding of the REIT market experience can aid in understanding what went wrong in the MBS/structured securities market. It furthermore can suggest potential policy solutions in terms of determining how structural features can be introduced and modified to better organize the securities production process going forward.

We begin by identifying significant differences in the investment performance of housing versus commercial property since early 2009. Specifically, we observe that 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. More specifically, although it is well known that far too many housing units were produced in the United States over the period, it is less well known that commercial property markets did *not* experience a construction boom; rather, commercial markets stayed in balance throughout the biggest real estate bubble in the United States since the 1920s.

We hypothesize that REITs played a central role in moderating the supply response. In particular, we note that, through the REIT market, commercial property investors and other U.S. REIT market participants discover 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 current 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.

There are also important structural factors, which in aggregate differentiate the U.S. REIT market from other REIT markets around the globe. The vast majority of U.S. equity REITs are internally managed. Many of these REITs are run by experienced,

talented managers that invest in good to high-quality assets, lending credibility to the sector. The REITs themselves are going concerns that hold a portfolio of assets in which management reputation and consistency over time are critical to continued affordable access to capital markets. Restrictive payout requirements reinforce this going concern effect, in that growing firms must return to the capital markets on a regular basis to raise money from outside investors that have many other investment opportunities. In contrast to private commercial property investors, REITs are moderately levered. All together, transparency, price discovery, and structural factors work to defeat distortions originating from self-interested short-termist agents who might otherwise use time lags and noise in information production to prolong booms that turn into prolonged busts.

To test our “civilizing influence” hypothesis, we calculate the market share of assets held by REITs as a measure for the general effects of *attention* paid by key market participants to transparent firms for which valuable information is generated through exchange-traded share prices and related data production activities. We then estimate a reduced form model of construction supply for the United States, as well as for several other countries 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 supply response. Although we document that supply response across most commercial property markets around the world has also moderated in the last 10 to 15 years (with the exception of Japan), we find only weak evidence of a similar REIT market penetration effect in other countries.

We believe that inconsistent results are due in large part to structural differences in how REIT and commercial property markets operate at the country level. This leads us to conclude that financial plumbing matters with respect to the realized costs and benefits of securitization. Moreover, and counter to the current fashion, we hold up US securitization 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” securitized equity market.

## HYPOTHESIS DEVELOPMENT: TEMPERED SUPPLY RESPONSE AND THE REIT MARKET EFFECT

### Tempered Supply Response

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 2007–2008. The bubble period was characterized by rapid increases in house prices, together with substantial increases in the supply of homes. This boom was followed by a bust, characterized by steeply declining house prices and persistent weakness in most housing markets around the country.

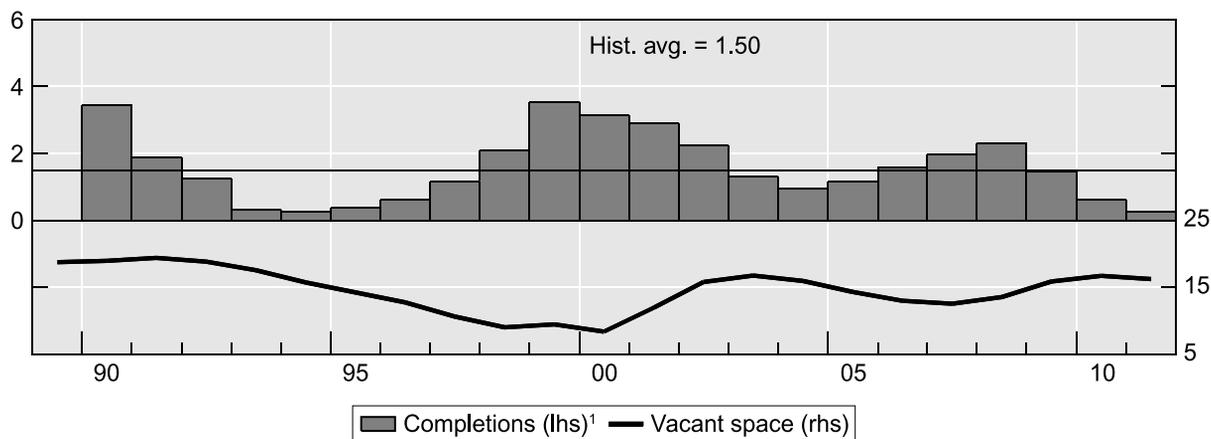
Despite what can be described as the biggest property market boom and bust since at least the 1920s and 1930s, the commercial side of the market remained remarkably unaffected in terms of supply response. And, although there was a boom and bust in commercial property asset prices that resembled the housing price boom and bust, commercial property prices have since fully recovered to their pre-crisis highs, while housing price declines have been more protracted and ultimately more severe.<sup>1</sup>

To illustrate the tempered supply response on the commercial side of the market, we will focus specifically on the US office market.<sup>2</sup> Exhibit 1 displays completions as a percentage of the existing stock, along with the vacancy rate in office space. The time series starts in 1990, showing completions equal to about 5% of the existing stock in that year. The 1990 start date occurs after the bust in commercial property prices, where the high rates of completion were due to construction lags. Going back to the mid-to-late 1980s, completions were around 9% of stock. After 1990 we observe completions falling almost to zero in 1994–1996, increasing again in the late 1990s/early 2000s to peak at just above 3%. Finally, a subdued supply cycle occurs during the middle 2000s, peaking at about 2% in 2008.

Excluding 1990 as reflecting residual construction momentum from the go-go years of the mid-1980s, in summary we see that from 1991 to 2011, new office construction as a percentage of existing stock averaged 1.5%, with local peaks in 1999 and 2008, at 3.5 and 2.3%, respectively. It has been estimated that office space economically depreciates at a rate of 1.5% to 2.0% per

## EXHIBIT 1

### United States: Office Property Completions and Vacancy Rates



<sup>1</sup>As a percentage of its total stock, beginning of the period.  
Source: CB Richard Ellis Group; authors' calculations.

year (Fisher et al. [2005]), implying that over the most recent 21-year period, the supply of office product has remained roughly in balance. Crucially, during the frothiest part of the house price and construction boom of 2002 to 2008, we see no evidence of a savings and loan-style development bonanza on the commercial property side of the market. Rather, office property construction activity from 2002 to 2008 was quite modest, at around the 1% to 2% range.

What explains the tempered commercial property supply response? Although demand-side explanations have been offered to rationalize the outcome, we believe that a focus on the supply side of the market is where the real (in)action is.<sup>3</sup> One supply-side explanation is that commercial property rents never recovered to the middle 1980s levels, implying that land simply was not ripe for significant new development during the mid-2000s. This argument can be assessed by comparing built asset prices to the cost of construction. In Exhibit 2, we display the time series of real national office rents obtained from NCREIF data as well as the ratio of national (real) office property values to real construction cost.

The exhibit 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, which lends considerable support to the “not ripe for development” argument. But the values seen in the right-hand panel of Exhibit 2 show that the ratio of office property values

to cost during the mid-2000s did rise to levels last seen in the 1980s, when national office completions as a percentage of stock in the late 1980s exceeded 8%.<sup>4</sup> By contrast, as shown in Exhibit 1, completions remained below 2.5% of the existing stock throughout the mid- and late 2000s.

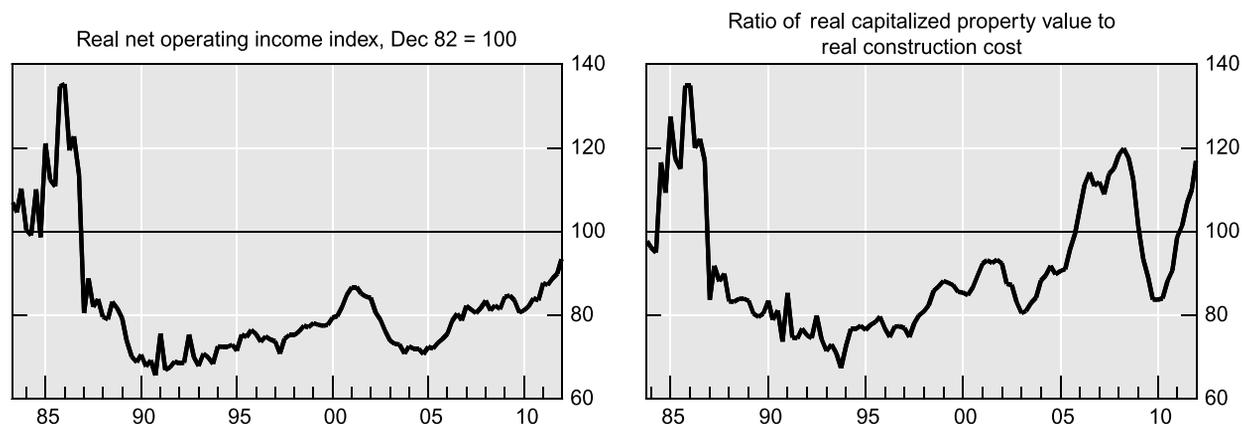
### The REIT Market Effect

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 realized rates of development achieved during the frothiest real estate and financing markets in decades, something more must have been going on. This causes us to consider an alternative hypothesis that is unique to this article.<sup>5</sup>

Our hypothesis posits that the REIT market has had 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. REITs are relatively simple in terms of their structure and business focus; are relatively transparent, with formal governance mechanisms and reporting requirements in place; and 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.

## EXHIBIT 2

### Real Office Property Rents and the Ratio of Property Values to Construction Costs<sup>a</sup>



<sup>a</sup>Deflated by CPI inflation.

Source: Marshall Valuation Service; NCREIF; national data.

The fact that these firms are going concerns—many of which are operated by experienced, talented managers and that own good- to high-quality assets with shares traded on public exchanges—has several important implications for how information production affects resource allocation in commercial property markets in the United States. First and foremost, debt and equity capital providers as well as other agents such as brokers and privately owned property investors will look to the REIT market for information about the individual firms and the properties they own, as well as the relative health of the entire commercial property sector. For example, when new office construction is announced and occurs in Washington D.C., and share prices of REITs that hold office property in Washington D.C. react negatively to this information, it sends a signal to construction lenders and other market participants that further supply of office space may negatively impact rents going forward. This in turn may constrain additional construction lending. In contrast, private ownership markets generally provide information with a greater time lag, implying that capital misallocations can persist for longer periods of time and result in boom–bust outcomes.

There are other important benefits to the REIT structure. The production of real-time information through price discovery and daily monitoring by industry analysts crucially mitigates distortions originating from self-interested agents who might otherwise use time lags and noise in information production to prolong booms

by promoting continued investment. Exchange-traded shares can also exhibit significant price volatility, which may give market participants pause when contemplating resource allocation decisions that affect the supply of extremely durable commercial space in local markets.

In addition, REITs are going concerns that hold a portfolio of assets in which management reputation and time consistency (consistently delivering on promises made at some point in the past) are critical to continued affordable access to capital markets. In other words, investment and financing decisions are not one-shot games with REITs. In contrast, in transactions undertaken by private firms, traditional private equity investment and mortgage financing decisions assume much more of a one-shot profile. Payout requirements imposed on REITs reinforce this going-concern effect. Specifically, REITs distribute a high percentage of available cash flow (typically more than 60%, and often more than 70%) as dividends to shareholders. These substantial payouts, in turn, cause 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, requiring managers of active firms to go out on road shows with their investment bankers in order to convince outside investors to contribute capital to their firm.

REITs also operate at lower leverage levels than private firms. Private firms often find it difficult to source reasonably priced outside equity capital and

instead typically rely on mortgage debt with debt-to-value ratios exceeding 70%. The majority of REITs, on the other hand, operate at less than 50% leverage ratios. Less leverage had beneficial effects during the financial crisis (lending further credibility to the sector), 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 borrower financial distress continued to haunt housing markets around the United States well after the crisis.

Finally, it is important to emphasize that our conjecture depends on the fact that this market did not become “viable and credible” until the 1990s—with the associated increase in attention paid by key property market participants—which can explain why this time was different in terms of the muted supply response. We maintain that a similar “viable and credible” information source did not exist on the housing side, where potentially relevant publicly available price indexes were not widely followed by market participants.

### Testing for the REIT Market Effect

Exchange-traded share prices are 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 asset markets.

In this section, we provide a formal empirical test of our conjecture that, in the United States, the REIT sector influenced commercial property construction activity. The baseline model we have in mind reflects the intuition expressed previously that the propensity to develop new property increases when built property value increases relative to construction cost. The standard reduced–form supply relationship is as follows (see 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 summarizes relevant space and financial market conditions, such as vacancy rate, relevant government policies, 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 the REIT market tempered oversupply tendencies, while analogous markets on the housing side did not, is that the relevant commercial property market participants consider information contained in REIT share prices to be informative, therefore relevant, when making resource allocation decisions that ultimately affect the stock of space. That is, we hypothesize 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 logical framework in mind, we propose REIT market penetration—the degree to which the office market has been securitized vis-à-vis 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 time series of market share of office property held by REITs, together with the index of office REIT prices, is displayed in Exhibit 3.

The augmented specification is therefore,

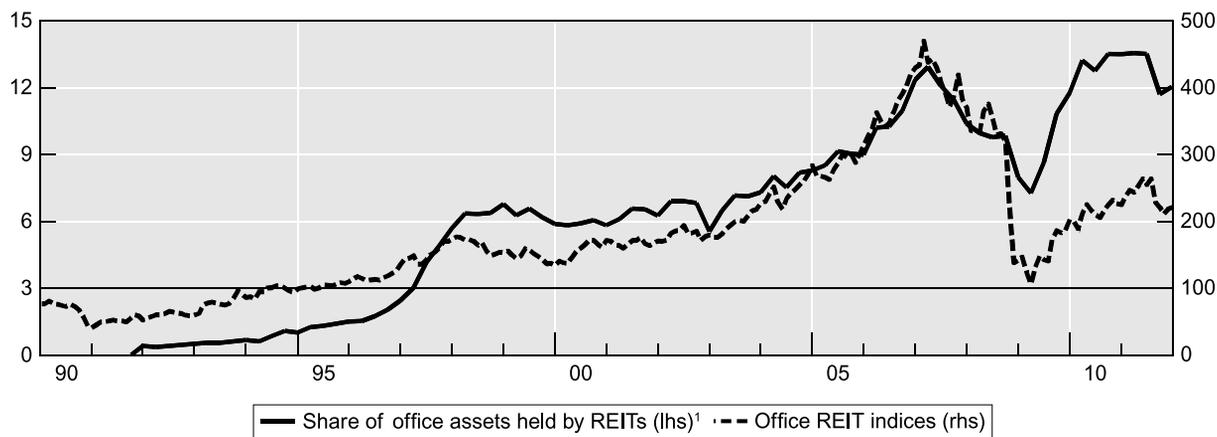
$$S = f(P, C, M)$$

where  $M$  denotes REIT market share.

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

## EXHIBIT 3

### United States Office REIT Property Market Penetration



<sup>1</sup>Defined as the sum of the book value of debt and preferred stock plus the market capitalization of equity for listed REITs as a percentage of the investment value of the total stock of office space at its reported market value.

Source: CB Richard Ellis Group; Datastream; SNL Financial; authors' calculations.

#### Data and Model Specification Tests

Regressions are run using quarterly data from Q4 1991 through Q4 2011.<sup>6</sup> The dependent variable in our analysis is the change in the log of new completions of office space, as obtained from the CB Richard Ellis Group, measured in thousands of square feet.

Reduced-form explanatory variables are derived as follows: Commercial property asset price,  $P$ , is based on share prices of REITs that hold office property. Relative to a commonly used alternative measure of commercial property prices, the NCREIF index, REIT prices do not suffer from appraisal lagging and smoothing problems. Construction cost comes from Marshall Swift's index of nominal unit construction costs and is a simple average of Eastern, Central, and Western U.S. costs for fireproof steel frame buildings. These nominal average cost numbers are again converted to real costs, using CPI. For estimation purposes, we take differences in the logarithm of both property price and construction cost.

Three measures of office REIT market penetration are developed. The first measure is the sum of the book value of debt and preferred stock, plus the market capitalization of equity for listed office 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 correlate

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 net real estate 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 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 the CB Richard Ellis Group. This investment value measure is the multiple of the estimated total stock of office space in square feet in a given quarter and the average capitalized value of net office rents per square foot. To estimate the model, REIT market share is in levels, because using first differences would change the economic meaning of market penetration as a measure of critical mass relating to relevance and capturing the attention of commercial property market participants.

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 office REIT market share variable. One dummy variable equals 1 if in the current quarter the REIT price index

(from Bloomberg Financial) exceeds that of the previous quarter, and the other dummy variable equals 1 if in the current quarter the REIT price index is less than that of the previous quarter.

We potentially include up to eight quarters of lags for all RHS variables, in recognition that it takes time to plan and build new office space. When lags are included, we take the sum of the current value plus all lagged quarters, inclusive of all intermediate quarters.<sup>7</sup> The number of lags for any given variable is determined by maximizing 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 an AR(1) process in the specification to correct for residual serial correlation in the error term.

### Estimation Results

Estimation results are reported in Exhibit 4. In Column 1, we report estimates from the benchmark

## EXHIBIT 4 Regression Models for Construction Completions (United States)

	Models with REIT Prices							
	(1) Benchmark		(2) Share Def. 1		(3) Share Def. 2		(4) Share Def. 3	
	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)	
Sum of current & lagged $\Delta$ REIT_price	1.226** (0.614)	7	1.650** (0.655)	7	1.484** (0.686)	7	1.445** (0.694)	7
Sum of current & lagged $\Delta$ K (constr. Cost)	-1.574 (2.265)	0	-1.088 (2.118)	0	-1.099 (2.096)	0	-1.126 (2.086)	0
Sum of current & lagged market share $\times$ StrongD1			-0.026*** (0.009)	4				
Sum of current & lagged market share $\times$ WeakD1			0.018 (0.017)	4				
Sum of current & lagged market share $\times$ StrongD2					-0.038*** (0.013)	4		
Sum of current & lagged market share $\times$ WeakD2					0.019 (0.023)	4		
Sum of current & lagged market share $\times$ StrongD3							-0.035*** (0.011)	4
Sum of current & lagged market share $\times$ WeakD3							0.017 (0.021)	4
$\rho$	-0.325*** (0.115)		-0.376*** (0.113)		-0.382*** (0.112)		-0.385*** (0.112)	
$R^2$	0.26		0.34		0.35		0.35	
Adjusted $R^2$	0.19		0.26		0.27		0.27	
S.e. of regression	0.32		0.30		0.30		0.30	
Durbin-Watson	1.96		2.04		2.06		2.07	
Sample (observation)	Q1 94–Q4 11 (72)		Q1 94–Q4 11 (72)		Q1 94–Q4 11 (72)		Q1 94–Q4 11 (72)	

Note: 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 construction cost, and the level of the three market penetrations, which are defined as i) the sum of the book value of debt and preferred stock plus the market capitalization of equity for listed REITs, ii) the net property investment of listed REITs at book value, and iii) total real estate investment of listed REITs at book value; each of them calculated as a percentage of the investment value of the total stock of office space at its reported market value. When lags of regressors are included, the average value calculated by taking the average of current value and all lagged quarters, inclusive of all intermediate quarters, is used. The coefficients of seasonal dummies are not shown. Coefficient standard errors are in parentheses.  $\rho$  is the estimate of the coefficient of first-order autocorrelation in the error term.

\*\*\* indicates statistical significance at the 1.0 percent level and \*\* indicates statistical significance at the 5.0 percent level.

model that includes only asset price and construction cost as RHS variables. Columns 2, 3, and 4 report specifications that include the REIT market penetration variable, which differ from each other depending on how the numerator of the variable is calculated (as described previously).<sup>8</sup>

Consider first the benchmark model results reported in Column 1. This model delivers decent results, in that variable coefficient signs are as expected and the asset price variable coefficient 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, e.g., Holland et al. [2000]) and is often attributed to aggregation in the Marshall and Swift index of construction cost. The number of (endogenously determined) 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 AR(1) error correction term is negative and significant in both regressions, and 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 Equations (2), (3), and (4), which incorporates REIT market share as a variable using the three different metrics discussed above. Results are generally consistent across the alternative measures, in that asset price and construction cost retain their signs and statistical (in)significance when compared to the benchmark model. Critically, we also see that REIT market share coefficient is significant in up-markets. Given the negative sign on that coefficient, the economic interpretation is that REITs exert a significant moderating influence on supply response in rising markets, where the strength of the moderating influence is increasing in market share. The positive coefficients on the REIT market share variable in falling markets is also consistent with a moderating influence on declines in construction supply, though those coefficients are not statistically significant.<sup>9</sup>

Note that the coefficient on the asset price variable increases (in a statistically significant way) when REIT market share is included in the model specification. We interpret this to imply that the benchmark model has an omitted variable problem, in that the asset price variable coefficient is biased downward to reflect that another factor (which we argue is a REIT market-penetration

effect) is dampening the usual asset price–construction impulse response.

In summary, the results suggest that the conjectured REIT market share effect is operative, in that, over the sample period, 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 well-managed firms that owned higher-quality assets, and that this attention had a moderating effect on the office construction supply cycle.

### Robustness Checks

We conduct similar tests of the conjectured REIT effect using data from three other countries with relatively large REIT markets for which there is good data availability: Australia, France, and Japan. Australia is the second-largest REIT market in the world, after the United States, with the highest REIT office market share in the world, peaking at 35% in 2005. France is the third-largest REIT market in the world but has an office market penetration of only about 4%. Similarly, Japan is a relatively large market, but its office market penetration is about that of France.

Our estimation results (which are not reported for space considerations—for additional detail, see Packer and Riddiough [2012]) are consistent across countries, in the sense that the price variable is positive and statistically significant in all of the country-level estimations. But only in Japan do we find evidence for the hypothesized REIT market-supply moderation effect. We can offer two explanations for the inconsistent results. First, while the United States and Japan have well-structured REIT markets, some structural inefficiencies exist with Australian and French REITs. For example, Australian REITs are generally externally managed—a structure thought to generate inferior investment performance (see Capozza and Seguin [2000]). French REITs tend to be structurally rather complex and hence relatively opaque (see Green Street Advisors [2012] report on Pan-European REITs). Second, there are significant differences in the institutional ownership of REITs. As of 2010, institutions owned 67.4% and 65.2% of the value-weighted shares issued by US and Japanese REITs, respectively. In contrast, institutions owned only 33.4%

and 26.9% of the REIT equity market in Australia and France, respectively. These relations suggest to us that institutional ownership may in fact be a better proxy for relevance and attention among key players than REIT market share.<sup>10</sup>

We have calculated new construction as a percentage of stock for a number of countries located in Asia-Pacific and Europe with active REIT markets. Consistent with the US experience, it is apparent that construction activity has generally decreased over time, on average, across most countries, and that construction activity is less volatile in later years. Yet, many of these countries really do not have “viable and credible” REIT markets that invite the attention of key players in the commercial property markets—suggesting that other factors are playing a role in moderating the supply side. We are sympathetic with this view, believing that structural factors such as Internet technology, more efficient space usage by firms, and serious regulatory/political and natural constraints in many major cities around the globe contribute to moderating construction activity.<sup>11</sup>

That said, as noted in our estimations using US data, structural changes in the supply and demand for space will show up in real rents and, ultimately, in property prices. After controlling for property prices in construction estimation equations, the fact that REIT market share is significant in the United States (and Japan) in spite of these other structural adjustments, implies that both effects are relevant. These positive findings are associated with countries where REITs are reasonably well structured and credible. By this, we mean a REIT sector that deploys leverage in moderation and is populated with a large number of firms that are known to be well managed and well governed, to own and internally operate high-quality assets, to be relatively transparent, and to be subject to rules that create incentives for managers to maximize shareholder value as a going concern. In this setting, price discovery and analyst coverage help defeat the destructive effects of information lags, one-off investment/financing incentive problems, and short-termism in a market that is otherwise susceptible to boom and bust tendencies.

## CONCLUSION

In this article, we ask whether there are economic goods that can be generated by the securitization of real estate interests. To address this issue, we consider the

securitization of commercial property equity interests through the so-called listed equity REIT market. Our principal finding is that the U.S. REIT market provides a nice example of how a well-structured real estate securitization market, by moderating construction boom and bust tendencies, can generate positive spillover benefits to the economy at large.

The impact of REIT markets on new construction activity does not appear to be as strong in most other countries. 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, identifying better proxies for attention supplied by key market participants, and assigning causation remain topics for future research.

## ENDNOTES

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<sup>1</sup>See Packer and Riddiough [2012] for a fuller description and analysis of the similarities and differences between the boom, bust, and post-bust recovery periods in US housing and commercial property markets.

<sup>2</sup>Retail, multi-family, and warehouse property types show similar and often even lower levels of construction activity.

<sup>3</sup>Pun intended. Again, see Packer and Riddiough [2012] for additional analysis of demand side and other supply-side rationales.

<sup>4</sup>Real office market rents have remained low in good part due to structural changes in labor markets and information technology. But, at the same time, there has been a persistent and apparently structural decline in commercial property capitalization rates that have caused property values to increase substantially, in spite of relatively low rent levels. It

is built asset value relative to construction cost, and not rents to construction cost, that is central to the developer's investment decision. It is also worth noting that real construction costs increased rapidly during the 2000s, which is incorporated into (and had a depressing effect on) the property value–construction cost ratio displayed in Exhibit 2.

<sup>5</sup>Others, including notably MacKinnon [2010], have made the link between the development of the U.S. REIT market, price discovery achieved through exchange-traded share prices, and effects on construction activity. But we believe we are the first to emphasize the critical role of attention required by key market participants, as well as the first to formally empirically test the hypothesized causative linkages.

<sup>6</sup>We start with Q4 1991, because that is the start date of the SNL Financial REIT data.

<sup>7</sup>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 sum total that includes six values.

<sup>8</sup>Note that data for estimation purposes go from Q1 1994 to Q4 2011. Seven quarters at the front end of the data are spoken for due to lags, one additional quarter is lost due to first differencing, and one final quarter is lost due to specifying an AR(1) process for the error term.

<sup>9</sup>Results are unchanged when we use NCREIF rather than REIT data to measure asset prices. We also consider the possibility that 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]. We find that uncertainty has no statistical effect on supply outcomes; rather, its inclusion further strengthens the significance of the REIT market share variable.

<sup>10</sup>Another possible explanation for the inconsistent results is that the transactions-based culture for allocating finance in the United States is responsible for the requisite attention paid by key market participants. In contrast, most other countries are much more bank-centered in financial capital allocation, implying that key domestic market participants may take information contained in REIT share prices much less seriously. But this rationale cannot account for the significance of the Japanese REIT data results, as Japan is considered to have a bank-centered financial system.

<sup>11</sup>See Miller [2012] for more on office space demand and Malpezzi et al. [1998] for an analysis of the effects of regulation and natural constraints on supply.

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