

SIZING UP ASIA PACIFIC REAL ESTATE MARKETS





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ANREV is the Asian Association for Investors in Non-listed Real Estate Vehicles Limited. ANREV is a not-for-profit organisation driven by institutional investors in Asian non-listed property funds. Our aim is to serve as a platform for investors who guide the association's strategy. ANREV's agenda is driven by its members, in particular institutional investors, and is focused on improving transparency and accessibility through market information, professionalism and best practice. Fund managers, investment banks and advisors provide support in addressing key issues facing the Asian non-listed real estate fund markets.

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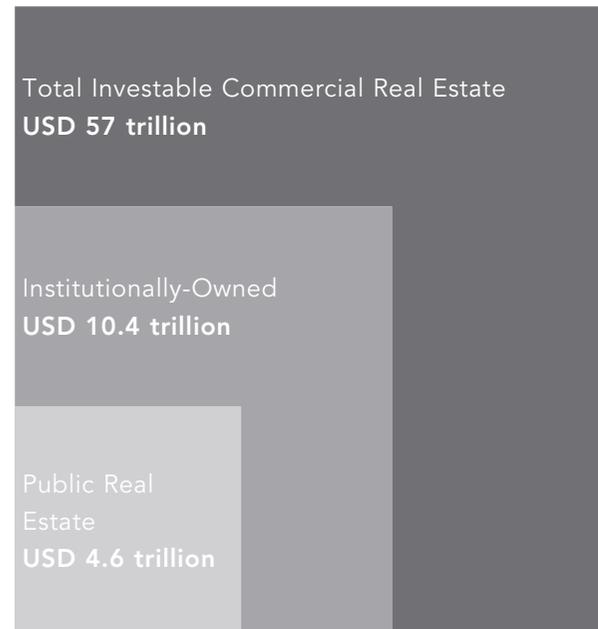
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Each year, LaSalle estimates the total value of investable commercial real estate and its global distribution. Our estimates establish a baseline for the market size of real estate in each country and can help fund managers and investors assess their relative allocations. The relevant investment universe differs by investor type and objectives, and our estimates reflect these differences by

LaSalle 2017 Real Estate Universe



Sources used in LaSalle analysis: Oxford Economics, Citigroup, Bloomberg, NCREIF, MSCI, Investment Property Forum (UK), National Bureau of Statistics of China, US Bureau of Economic Analysis, US Federal Reserve, Company financial statements estimate as of Q3 2017.

breaking the real estate universe into three segments: total investable commercial real estate market size, institutionally-owned, and public.

In LaSalle's recent paper, *The Real Estate Investment Universe in 2018*, we present our estimates of the total value of real estate that is held by institutional investors, as well as the value of the publically listed firms within their portfolios. These estimates supplement private real estate indices, which even in highly transparent markets often only represent a small portion of a nation's investable commercial real estate, and can systematically underrepresent emerging markets, such as China.

All three of LaSalle's estimates increased in the 2018 estimation. Institutionally-owned real estate grew 9% last year, powered mainly by strong price appreciation in Asia Pacific and Continental Europe. LaSalle estimates that institutions own about one-fifth of all investable commercial real estate. The public real estate universe, which is based on our gross asset value estimates rather than market capitalization, only grew 3%. Privatization and delisting activities roughly balanced initial public offering (IPO) activities, but underlying asset appreciation was slower. Public companies own 44% of all institutional-owned real estate, which is down slightly from the 2017 estimation.

Growing Asia Pacific Markets Tilt the Scale

Asia Pacific accounts for a growing share of institutionally-owned real estate, increasing from 18% in 2007 to 33% today. Many factors are driving the growth, including strong capital value appreciation in gateway markets, currency movements, and more new construction. Property values in the region were also more resilient than those in the Americas and Europe during the Global Financial Crisis (GFC), and have been recovering from a higher base than in other regions. Real estate transparency is also playing a key role in driving the growth of the region's institutionally-owned real estate. Real estate transparency in major Asia Pacific countries, particularly Australia and New Zealand, continues to be excellent, and transparency in the region as a whole has seen some of the greatest improvement since early 2000s, according to Jones Lang LaSalle's report *Global Real Estate Transparency Index (GRETI) 2018 – Transparency: Data, Disclosure, and Disruption*.

Furthermore, institutional investors' preferences for core investments in liquid and developed Asia Pacific real estate markets is playing a key role in driving the robust growth of Asia Pacific markets. The shortage of quality real estate assets in the region has driven up asset prices, in some cases, to record highs. The trend is especially noticeable prevalent in Japan and Australia, the main beneficiaries of the increase in capital

allocation towards core real estate. As a result, the institutionally-owned real estate markets in Japan and Australia have grown by 50% and 37% respectively over the last five years. In Japan, the depth of capital market liquidity and diversified occupier market fundamentals continue to attract institutional investors. Relatively loose monetary policies due to Abenomics and the Bank of Japan's yield curve control have supported strong commercial real estate prices. These policies are expected to continue in the near term. In the Australian real estate market, domestic institutional investors have been net sellers of commercial properties in recent years. Australia's excellent market transparency, deep liquidity, well-developed legal and regulatory systems, and landlord-favorable real estate market practices (e.g. long lease terms and inflationary rental review) appeal to cross-border institutional investors. Additionally, the record-low domestic interest rate environment, along with the relatively high real estate yield spreads over 10-year government bond yields in the global context make Australia an attractive market. As a result, institutional portfolios contain higher or equal allocations to Australian real estate as compared to Japanese real estate, despite the fact that Australia's institutionally-owned real estate market is only one-third the size of Japan's.

Even with the growth in many real estate markets, the Asia Pacific region is weighted lower in private global real estate indices and underweighted in most institutional investors' global real estate portfolios. This is in part due to the high levels of public ownership in several countries of the region, alongside a high number of owner-occupied and state-owned enterprise (SOE) properties. Additionally, publicly listed companies in Asia Pacific continue to own a larger share of all institutional properties than those in either the Americas or Europe. We predict that Asia Pacific's weight in institutional portfolios will rise, due to the growth of domestic capital and some rebalancing of cross-border portfolios to address the underrepresentation of Asia Pacific. This outlook is supported by stable real estate fundamentals in major markets of the region, including Australia, Hong Kong, Japan, New Zealand, Singapore and South Korea.

Institutional investors in Asia Pacific, including pension funds, insurance companies and sovereign wealth funds (SWFs), have been increasing their allocations to real estate both in the region and globally. South Korean institutional investors and Singaporean SWFs have recently become more progressive in raising their real estate allocations. Pension funds in Japan, however, are barely scratching the surface. Japanese pension funds' current allocations to real estate are less than 1%

(including J-REITs).¹ The total assets under management (AUM) of pension funds in Japan are estimated to be about JPY 386 trillion (USD 3.4 trillion²).³ If pension funds increase their allocations to real estate by 2%, it would expand institutionally-owned real estate in Japan by ~25%.⁴ Japanese pension funds are in the early stages of raising these allocations. Japan has the largest institutionally-owned real estate market in Asia Pacific and the second largest globally. Due to the depth of Japan's real estate market and its positive outlook over the next few years, Japanese pension funds are expected to have higher allocations to the domestic market than overseas markets in the near term. For those who are currently or starting to consider investing overseas, their focus is primarily on highly transparent and transparent places like the United States, the United Kingdom, Germany, Australia and Singapore.

In Australia, superannuation funds have been growing at over 12% per annum over the past five years, with AUM of about AUD 21.7 trillion (USD 16 trillion).^{5,6} Over the next 20 years, superannuation funds in Australia are projected to grow at 8% per annum.⁷ Australian superannuation funds are enjoying high yields domestically, although they have been slow in venturing overseas since the GFC. However, the growth rate of these funds is expected to substantially exceed that of Australia's commercial real estate market over the next two decades. The superannuation funds can (1) continue to invest domestically and further drive up core prices, (2) significantly widen the scope of their core assets in Australia, or (3) invest offshore. These three scenarios are all viable options, but increasing offshore investments seems inevitable.

Despite strong capital inflows into developed Asia Pacific real estate markets over the past few years, institutional investors continue to face challenges in raising their overall allocations to Asia Pacific, particularly in markets such as China. China is the second largest investable commercial real estate market after the U.S. It is also one of the largest contributors to global investable commercial real estate market growth, with an annual compounded rate of 16% from 2015 to 2017. China's market size and growth potential suggests it deserves a neutral weighting to its estimated market size in investors' regional and global portfolios. However, the disparity in terms of market maturity, transparency, liquidity, and ownership structure across its Tier 1, 2, and 3 cities outweighs the size factor and continues to drive a lower weighting relative to its market-neutral weight. Nonetheless, institutional real estate investors including core, value-add, and opportunistic investors have been adding or raising allocations to Tier 1 cities in China over the past few years. See the figure entitled *China: Real Estate Market Size vs. All Property Types Transaction Volumes*.

¹ Source: Nomura Research Institute and Sumitomo Mitsui Trust Research Institute.

² Source: Exchange rate is based on USD/JPY 114.

³ Source: Bank of Japan, as of December 2017.

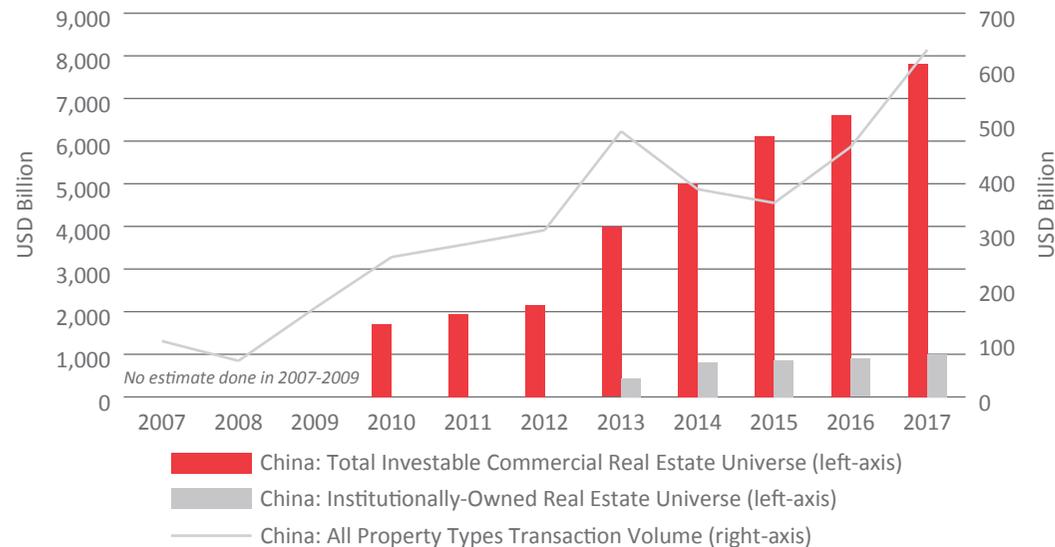
⁴ Source: LaSalle Investment Management, as of December 2017.

⁵ Source: Exchange rate is based on AUD/USD 0.74.

⁶ Source: APRA Statistics, as of December 2017.

⁷ Source: Treasury asset forecast, 2008 and the Association of Superannuation Funds of Australia Limited, as of December 2017.

China: Real Estate Market Size vs. All Property Types Transaction Volumes



Source: China all property types transaction volume data is sourced from Real Capital Analytics (RCA), as of December 2017. Transaction volume is based on independent reports of properties and portfolios that are USD 10 million and greater. All property types consist of office, industrial, retail, apartment, hotel, seniors housing, healthcare, and land sales. China real estate universe data is sourced from LaSalle Investment Management, as of Q3 2017.

China is the third largest primary insurance market in the world after the U.S. and Japan. It is projected to be the world’s second largest insurance market by 2030 and its insurance premium volume is set to triple as well.⁸ However, the insurance market in China is still in its infancy and insurance companies in China only recently began to invest in real estate. These companies have yet to fully allocate funds to commercial real estate, as permitted under Chinese regulations. According to our estimates, if Chinese insurance companies’ allocations to

real estate is increased to the global average, their real estate AUM will need to increase 19 times. Due to new restrictions placed on Chinese companies investing abroad, we anticipate that institutional real estate investors, particularly insurance companies, will increase their allocations to real estate in China, especially in Tier 1 and mature Tier 2 cities in the near to medium term. This activity will be a major driver of the region’s institutionally-owned real estate market growth over the next decade.

Several emerging markets in Southeast Asia are also likely to experience rising allocations in regional or global real estate portfolios as market transparency improves. Malaysia, for example, has been categorized as “transparent” in GRETI since 2016. The country is ranked 30th globally and 7th in Asia Pacific according to Jones Lang LaSalle’s 2018 GRETI. Malaysian pension funds are substantially under-allocated to real estate, and we expect these allocations to increase over the next decade. Transparency in India has also steadily improved. India’s Tier 1 cities are ranked 11th in Asia Pacific. We are seeing early signs of core investors in the market. Meanwhile, other Asian countries, such as Vietnam and Thailand, are still in the early stages of formulating their pension fund investment strategies for real estate. The steady economic growth in Asia Pacific in the past five years has given rise to SWFs and pension funds in some of these emerging markets. Many of these institutional investors have enormous reservoirs of cash and are considering allocations to all asset classes including real estate, primarily for their diversification benefits. However, many of these SWFs and pension funds are starting from a low base and are under-allocated to real estate outside of their own countries. As these institutional investors start to address these under-allocations, the intense competition for quality incoming-generating real estate assets is expected to continue. At the same time, the surplus of capital looking to enter the market will contribute to growth in these real estate markets and improve transparency, particularly among emerging Asian markets as the need for benchmarking increases.

⁸ Source: Insurance Market Outlook for 2018/2019, and Munich RE, as of May 14, 2018.

Comparing Real Estate Indices to the Real Estate Universe

Real estate indices, such as those produced by NCREIF, MSCI, INREV/ANREV, and FTSE EPRA/NAREIT, reflect the underlying real estate universe, although somewhat imperfectly and through a distinct lens. Index allocations often differ markedly from all of the potential real estate investments available across a country's private equity real estate holdings, especially for private real estate investments. Understanding this universe of all potential real estate investments is therefore valuable for portfolio construction and review, for narrowing the universe based on customized investor criteria, and for evaluating indices as potential portfolio benchmarks.

There are at least three reasons for why the real estate universe differs from property indices. First, these indices are often based on different inclusion criteria, which is one reason for why global real estate securities indices differ even though they are largely based on the same underlying public company data. The FTSE EPRA/NAREIT Developed Index, which screens the real estate universe for particular developed markets and includes only companies meeting certain

liquidity and size hurdles, gave a 28% weighting to the Asia Pacific region as of January 31, 2018. The S&P Global Property Index, on the other hand, with its less restrictive inclusion criteria, gave a 39% weighting to the region in the same period.

Second, differences in market transparency and coverage can often distort indices, especially private real estate indices. In addition, many markets lack any private direct real estate indices. Within existing indices, their sample size coverage varies widely, from 4% market share in China to over 50% for Australia and New Zealand.⁹ As a result, based on MSCI/IPD Asia-Pacific Annual Property Index capital values, the Australian real estate market is 28%¹⁰ of the market in the Asia Pacific region, several times its actual share of the investable commercial real estate in the region.

Differences in real estate ownership structures affect both the transparency and coverage of private indices. Index coverage is often lower when the assets held by institutional investors are a smaller segment of the market relative to owner-occupied or family-held assets. Index allocations can also be affected by differences in investment structure. Comingled funds, for example, can account for a larger share of market investments.

As a result of these differences in transparency and structure, the distribution of gross assets held in comingled real estate funds, based on the Global Real Estate Funds Index (GREFI) produced by NCREIF, ANREV, and INREV, tends to be skewed toward Europe and North America. For example, funds in Asia Pacific comprise 18%¹¹ of assets in the Global Real Estate Fund Index compiled by ANREV, INREV, and NCREIF. This is up from a 15% share in Q4 2015 but still low relative to the region's share of global investable commercial real estate. The underweight in Asia Pacific is also partly due to the fact that a large proportion of real estate investments are held in joint ventures (JVs), separate accounts and direct transactions, which are excluded in GREFI. See the figure entitled *Index vs. Universe: The Global Real Estate Funds Index*.

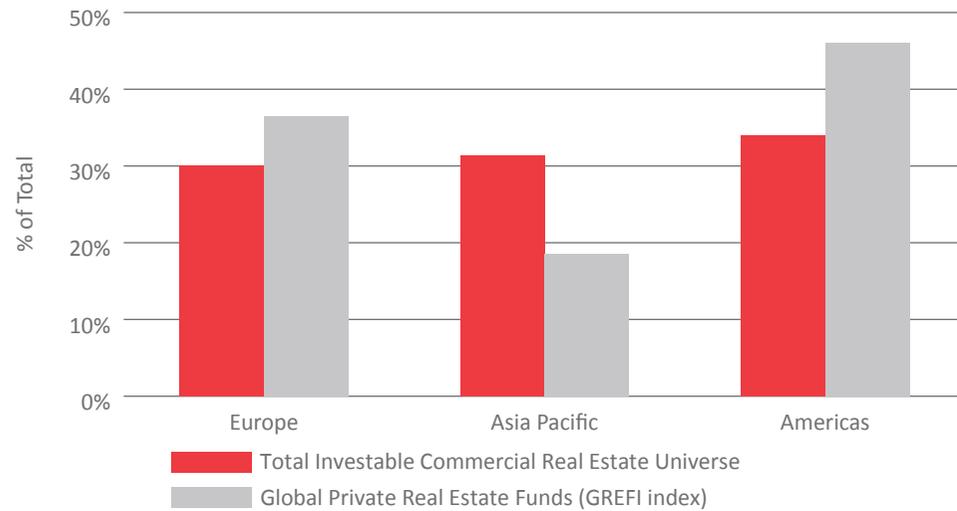
⁹ Source: MSCI/IPD Real Estate Market Size Report 2016.

¹⁰ Source: MSCI/IPD Asia-Pacific Annual Property Index, as of Q4 2017.

¹¹ Source: Global Real Estate Fund Index (GREFI) by ANREV, INREV, and NCREIF as of December 2017.

¹² Source: ANREV, as of December 2017.

Index vs. Universe: the Global Real Estate Index



Source: Global Real Estate Fund Index (GREFI) is sourced from NCREIF, INREV, and ANREV, as of Q4 2017. Total investable commercial real estate universe data is sourced from LaSalle Investment Management, as of Q3 2017.

In Asia Pacific, disparity due to the differences in transparency and market structure is even more apparent. For example, 7.3%¹² of assets in the ANREV All Funds index are in Japan, which is substantially smaller than its actual share of investable commercial real estate in the region. The sample sizes available for inclusion in industry indexes remains a challenge, as some domestic portfolio managers are still reluctant to share their performance data with real estate industry associations such as ANREV.

Third and finally, index distributions may differ from the distributions in the real estate universe because institutional investors, whose assets are combined to create the index, have over-weighted certain markets. As discussed above, Australia in a good example for Asia Pacific. Our data enable us to estimate the degree to which institutional investors have tilted their positions relative to the underlying opportunity set. These tilts are especially interesting at the metropolitan level, because comparing them within a country

helps to control for confounding factors like cross-border differences in index coverage and market structure.

Our real estate universe estimates play a different role in portfolio construction than in appraisal-based real estate benchmark return indices. These estimates enhance our understanding of the real estate universe and help reveal any biases or tilts in the associated indices. These estimates are also useful in cases where appraisal-based real estate benchmark return indices do not exist.

Metropolitan Market Real Estate Universe Estimates

Our real estate universe analysis includes estimates of both institutional ownership (see the table entitled *Total Institutionally-Owned Real Estate, by Metropolitan (Metro)* and total investable commercial real estate in major metropolitan areas (see the table entitled *Total Investable Commercial Real Estate, by Metro*). The estimates are for the 40 largest metropolitan markets. Due to significant cross-border differences in rented residential markets, these estimates, unlike our national estimates, include only office, industrial, and retail properties.

Metropolitan areas are relevant for evaluating property portfolios because each has distinct market fundamentals and economic drivers. Our metropolitan area real estate universe estimates provide useful granularity, especially to differentiate within large countries such as China and the U.S.

Institutional investors typically focus on the most liquid and transparent markets; the 30 largest metros account for nearly 40% of all institutional real estate globally in LaSalle's 2018 estimate, disproportionate to their GDP, which in aggregate represents 20% of world output. Given the sheer size of these metros, investors can technically achieve global real estate diversification by targeting a relatively

small number of metropolitan areas. Large and densely populated metros also have a greater concentration of human capital, are a magnet for talent, and will continue to be economically viable over the long term.

In LaSalle's 2018 real estate universe estimations, cities in Asia Pacific account for 11 of the world's 30 largest metros, including 4 in the top 10. Please see tables *Total Institutionally-Owned Real Estate, by Metro* and *Total Investable Commercial Real Estate, by Metro* for more details. The 10 largest metros in Asia Pacific represent ~50% of the total institutionally-owned real estate market in Asia Pacific. Tokyo remains the world's largest commercial real estate market by value, followed Hong Kong (2nd), Seoul (8th), Singapore (9th), and Sydney (11th). It is not surprising that all of these are business and/or financial centers. Their institutional characteristics and ability to compete on the global stage, in turn, drive occupier demand for real estate space, evidenced in their solid tenant base.

The tenant base in these metros ranges from domestic and multinational firms to local companies. For instance, Hong Kong, Singapore, and Tokyo are among the top five financial centers in world, and also where many Fortune 500 companies have their regional headquarters

or key offices. In addition, these cities attract talent and capital, which appeals to growth industries such as co-working operators, technology firms, and e-commerce retailers. For example, more than 35% of gross office take-up in the Tokyo central office market in 2017 is attributed to technology tenants. Martin Place, located in the Sydney CBD, is another example. Once an enclave for financial institutions, it now has tenants such as Apple, LinkedIn, Dropbox, and WeWork. Other top 10 metros in Asia Pacific are experiencing the same trends. The ability to stay relevant in terms of occupier demand helps boost property values in these locations.

Our metro estimates suggest that some markets that are under-weighted by institutional investors have the potential to gradually increase their market share. For example, Shanghai, Beijing, Guangzhou, and Tianjin, four Chinese metros in the top 30 globally, rank higher in total investable commercial real estate than in institutionally-owned real estate. This is in part due to the higher level of corporate and developer real estate ownership in these cities. Strong investor appetite for commercial real estate is expected to drive the growth in stock in these Chinese cities and many other Asian cities, either via new development or refurbishment of older stock.

Our Estimates in Context

Our global real estate universe estimates show where the world's commercial real estate wealth is held. An investor can use these estimates as a baseline in setting international targets. They are also useful gauges for how much of a country's inventory is controlled by publically listed companies or by individual investors. The estimates also provide asset allocators with several different views on the total size of the commercial real estate investable universe, which can be compared with other asset classes.

As more commercial properties around the world are being included in financially-transparent investment vehicles tracked by indices, it gives us greater confidence in the data; however, less reliable inventory and pricing in some emerging markets also widens our margin of error. Moreover, the majority of these real estate assets are still not part of formal indices. Therefore, our universe estimates in some cases diverge from index allocation data. We believe that the institutionally-owned real estate markets in Asia Pacific are likely to grow substantially faster than in other regions over the near and medium term (see the table entitled *Global Real Estate Investment Universe, by Category and Country*).

Global Real Estate Investment Universe, by Category and Country

	Public Real Estate Universe	Institutionally-owned Real Estate Universe	Total Investable Commercial Real Estate Universe
Total (USD billions)	\$4,606	\$10,444	\$57,407
Regional Share			
Americas	39%	33%	34%
Asia Pacific	44%	33%	31%
Europe	14%	30%	30%
Middle East and Africa	3%	4%	5%
Size By Country/Region (USD billions)			
Americas			
United States	\$1,632	\$2,683	\$15,003
Canada	\$104	\$298	\$1,351
Mexico	\$36	\$107	\$695
Brazil	\$26	\$183	\$1,188
Other Americas	\$16	\$207	\$1,341
Europe			
United Kingdom	\$144	\$638	\$2,543
France	\$156	\$424	\$2,037
Germany	\$128	\$461	\$3,065

Source: LaSalle Investment Management, as of Q3 2017.

	Public Real Estate Universe	Institutionally-owned Real Estate Universe	Total Investable Commercial Real Estate Universe
Italy	\$7	\$121	\$1,476
Spain	\$37	\$86	\$994
Netherlands	\$21	\$153	\$702
Switzerland	\$26	\$230	\$605
Sweden	\$55	\$198	\$459
Other Western Europe	\$62	\$545	\$3,444
Central & Eastern Europe	\$4	\$139	\$1,079
Turkey	\$4	\$88	\$569
Asia Pacific			
Japan	\$481	\$1,131	\$3,820
Australia	\$185	\$337	\$1,155
Hong Kong	\$293	\$333	\$443
Singapore	\$92	\$167	\$263
China	\$824	\$995	\$7,808
South Korea	\$0.3	\$203	\$1,167
Other Asia	\$148	\$263	\$3,347
Middle East & Africa	\$125	\$453	\$2,853

Total Institutionally-Owned Real Estate, by Metro

USD Billions, Includes Office, Industrial, and Retail Only

	City (Metro Area)	RE Size (USD billion)	Change in Rank from Year Ago
1	Tokyo	\$528	↔
2	Hong Kong	\$308	↑
3	London	\$305	↔
4	New York	\$302	↓
5	Paris	\$281	↑
6	Los Angeles	\$219	↓
7	San Francisco Bay Area	\$164	↔
8	Seoul	\$156	↑
9	Singapore	\$155	↑
10	Washington D.C.	\$142	↓
11	Sydney	\$140	↑
12	Toronto	\$99	↑
13	Chicago	\$94	↓
14	Boston	\$92	↓
15	Osaka	\$85	↑
16	Melbourne	\$81	↑
17	Munich	\$78	↑
18	Shanghai	\$77	↑
19	Beijing	\$71	↑
20	Frankfurt	\$68	↑

	City (Metro Area)	RE Size (USD billion)	Change in Rank from Year Ago
21	Miami/South Florida	\$67	↓
22	Stockholm	\$66	↓
23	Dallas-Fort Worth	\$65	↓
24	Moscow	\$61	↑
25	Seattle	\$60	↓
26	Houston	\$59	↓
27	Berlin	\$59	↑
28	Hamburg	\$56	↓
29	Tianjin	\$55	↑
30	Guangzhou	\$54	↑
31	Shenzhen	\$54	↑
32	Zurich	\$51	↓
33	Milan	\$49	↓
34	Atlanta	\$46	↓
35	Sao Paulo	\$45	↑
36	Buenos Aires	\$42	↑
37	Mexico City	\$40	↑
38	Copenhagen	\$40	↓
39	Istanbul	\$38	↑
40	Brisbane	\$38	↓

Source: LaSalle Investment Management, as of Q3 2017.

Total Investable Commercial Real Estate, by Metro

USD Billions, Includes Office, Industrial, and Retail Only

	City (Metro Area)	Change in Rank from Year Ago
1	Tokyo	\$800
2	New York	\$631
3	Los Angeles	\$457
4	Hong Kong	\$443
5	Paris	\$419
6	London	\$410
7	Seoul	\$399
8	Singapore	\$263
9	San Francisco Bay Area	\$256
10	Shanghai	\$228
11	Chicago	\$211
12	Washington D.C.	\$201
13	Sydney	\$201
14	Moscow	\$201
15	Munich	\$195
16	Beijing	\$190
17	Boston	\$178
18	Osaka	\$176
19	Toronto	\$173
20	Nagoya	\$172

	City (Metro Area)	Change in Rank from Year Ago
21	Guangzhou	\$163
22	Melbourne	\$162
23	Tianjin	\$157
24	Houston	\$146
25	Dallas-Fort Worth	\$143
26	Shenzhen	\$142
27	Sao Paulo	\$142
28	Buenos Aires	\$141
29	Miami/South Florida	\$139
30	Madrid	\$138
31	Birmingham	\$131
32	Mexico City	\$130
33	Berlin	\$130
34	Manchester	\$127
35	Istanbul	\$126
36	Copenhagen	\$117
37	Atlanta	\$116
38	Philadelphia	\$114
39	Fukuoka	\$104
40	Dublin	\$104

Source: LaSalle Investment Management, as of Q3 2017.

Methodology

Public Real Estate Universe

The USD 4.6 trillion public real estate universe estimate is the gross asset value (GAV) of commercial real estate owned by companies traded on world stock markets, using data as of Q3 2017. GAV is a combination of net asset value (NAV) and debt, making it a better measure of the value of the underlying real estate owned by public firms than NAV or market capitalization alone. This measure is also independent of public market pricing. In other words, listed companies can trade at very large discounts or premiums to the value of their underlying real estate holdings. Our estimates are based on the GAVs of the property, not the market capitalization of the listed securities. LaSalle Investment Management Securities is the primary source for the data. They actively track public real estate NAVs and debt in the largest developed and emerging markets. The markets they cover represent the majority of the public real estate universe GAV.

For several emerging markets, such as the Philippines or the United Arab Emirates, LaSalle use listed property company enterprise values. These data are collected from Citigroup and Bloomberg. LaSalle include in the public real estate universe listed companies that are long-term holders of real estate and exclude companies whose primary business is residential

homebuilding. LaSalle's estimates of the public real estate universe include vertically-integrated development firms that are also holders of commercial property, which increases the breadth of companies included, particularly in emerging and developing markets like China. LaSalle's inclusion criteria are broader than those used by global indices, such as the FTSE EPRA/NAREIT (e.g. include firms that do not meet the FTSE EPRA/NAREIT requirements on English language reporting, free float, and size).

Institutional Public and Private Real Estate Universe

The USD 10.4 trillion institutional real estate universe encompasses commercial real estate assets owned by institutions, including REITs, pension funds, insurance companies, pooled private funds, and endowments as of November 30, 2017. This universe is smaller than the total amount of institutional-grade stock because it includes only properties within institutional portfolios. It is based on a combination of primary data gathered by MSCI for 25 developed markets with data to year-end 2016, our estimates for six major markets in the Asia Pacific region, as well as our estimates for 70 markets based on the developed market ratio of institutional real estate to GDP, which we measure for the 25 markets with bottom-up data.

For the 25 developed markets covered by MSCI, LaSalle adjusted MSCI's year-end 2016 estimate (or in some cases the year-end 2015 estimate when it was the most recent) of the total size of the institutionally-owned universe. This is a bottom-up estimate that includes all properties owned through investment managers. MSCI's estimates are the best available and are larger than the value of assets tracked by the MSCI or NCREIF indices because not every investment mandate is included in these indices. LaSalle adjusted MSCI's year-end estimates through Q3 2017 by calculating the impact of year-to-date changes in exchange rates and year-to-date value changes.

For the other markets without primary data, we use a methodology based on the ratio of gross domestic product (GDP) per capita and GDP to real estate stock. We include an estimate for the residual "rest of the world" real estate value for small economies not included individually. We estimate that no more than 1% of the total universe of institutionally-owned real estate is in these small economies.

Youguo Liang and Willard McIntosh (1999) developed a GDP-driven investable universe methodology,¹³ which we refined. Rather than using a ratio of high-quality institutional-grade real estate to GDP of 45%, we based our real estate market size estimates on the empirical ratio of invested real estate to GDP for 25 markets where there is data through year-end 2016.

Our calculation is as follows:

$$\text{Institutional Real Estate} = \left(\frac{\text{GDP per capita}}{\text{Wt. Avg. of US GDP per capita and UK GDP per capita}} \right)^{1/3} \times \text{Total GDP} \times \text{Ratio of GDP to Institutional Real Estate in the 25 IPD markets}$$

First, each purchasing power parity (PPP) GDP per capita is divided by the GDP-weighted average of the U.S. and U.K. PPP-adjusted GDP per capita. That ratio is then taken to the power of 1/3. This adjustment takes into account the fact that more developed locations, as measured by GDP per capita, have a greater volume of institutionally-owned real estate, but that the relation is not one-to-one. Second, we multiply this adjustment factor by each GDP to create an adjusted GDP. Third, we multiply by the average ratio of real estate to GDP for locations where we have MSCI data. Our estimates for Hong Kong, Singapore, China, Japan, Australia, and South

Korea are based on a combination of bottom-up data and top-down analysis.

Metropolitan Market Estimates: institutionally-owned

Our estimates for metropolitan markets are the result of a bottom-up and top-down approach, using local data sources and estimates where they are available, such as in London (IPF), U.S. cities (NCREIF), Hong Kong (Rating and Valuation Department), and MSCI city-level data. Our approach starts with national-level institutionally-owned estimates, adjusted to represent only office, industrial, and retail market values.

Next, we determine the market share of each metropolitan market to the national market, which ranges from 100% in city-states like Hong Kong to below 5% for some major U.S. markets. This is a metro’s share of its national index wherever index data are available (e.g., in the U.S., the Atlanta metro’s share is based on its national retail, office, and industrial shares in the NCREIF Index). Where index data is not available, the metro share is estimated using a regression with two inputs: the metro’s share of the national GDP and the metro’s average office market value per square foot (data from JLL). We then multiply the metro’s share of the national estimate by the national total of office, industrial, and retail.

These estimates are for the entire metropolitan market, including the principal city and its suburbs. The geographic definitions for each metropolitan market are based on local definitions wherever available [e.g., in Australia, we use Greater Capital City Statistical Areas defined by the Australian Bureau of Statistics (ABS)]. In cases where a true metro area definition is not available, we use custom definitions, many from the JLL Cities Research Center, the United Nations’ definitions of urban agglomerations, and LaSalle’s E-REGI. Precise geographic definitions are available upon request.

Total Investable Commercial Real Estate Universe

The USD 57 trillion estimate of the total investable commercial real estate universe is the aggregate value of all commercial real estate worldwide, including corporate, government and private investor owned assets as of November 30, 2017. The estimate includes property of all quality types and is intended to represent the value of all assets that have been or could be bought by investors, even if the current owners are not institutional investors (e.g. government-owned commercial property or smaller assets held by individuals or families).

¹³ Youguo Liang and Willard McIntosh, “Global Commercial Real Estate,” Prudential Real Estate Research, April 1999.

We use bottom-up estimates of the total investable commercial real estate in five markets: the U.S., U.K., China, Hong Kong, and Singapore. For the U.S. estimate, we use the U.S. Bureau of Economic Analysis' estimates of fixed real estate assets and adjust them with Federal Reserve data to incorporate the value of the land. For the U.K., we draw on an IPF Research Programme report that estimated the size of the U.K. property market. For China, we used National Bureau of Statistics (NBS) estimates of the cumulative total value of completed properties. The ownership of land in China is retained by the government and investors purchase long-term use rights to it. The value of these usage rights is contained in our estimates of property value wherever possible.

The ratio of total investable commercial real estate to GDP in the U.S. and U.K. is then the starting point for our top-down estimates in other markets lacking bottom-up data. We take this ratio, adjust it based on the PPP GDP per capita in each market (using the same adjustment as used above for the institutionally-owned universe), and then multiply by the nominal GDP. Our USD 57 trillion estimate of investable commercial real estate is useful for putting the asset class as a whole into perspective and comparing the relative size of different regions, but with a notable caveat: there is a large margin of error for emerging markets.

Metropolitan Market Estimates: Commercial Real Estate

Our total commercial real estate estimates at the metropolitan market level are independent of the institutional ownership estimates. For the U.S., U.K., Singapore, and Hong Kong, the estimates are based on granular pricing and inventory data for office, retail, and logistics at the metropolitan level. Estimates of typical pricing, triangulating based on transaction prices per square foot, average yields, and average appraisal assumptions where available, are multiplied by stock for the various segments of the metropolitan market and then aggregated. For the U.S., the data sources include Altus, RCA, CoStar, CBRE-EA, Green Street Advisors LLC, and MPF Research. The metro investable estimates, on the other hand, are based on that metro's share of national GDP and the investable estimate for the country, which are multiplied to estimate the metro's investable commercial real estate size (and adjusted to account for the fact that only three property types are in our metro estimates). As with our institutionally-owned metropolitan market estimates, these commercial real estate estimates are for the entire metropolitan market, including the principal city and its suburbs.



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