The Value of Awarded Design in Real Estate Asset Pricing

by

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B.S., Interior Design, 2010

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Submitted to the Program in Real Estate Development in Conjunction with the Center for Real Estate in Partial Fulfillment of the Requirements for the Degree of Master of Science in Real Estate Development

at the

Massachusetts Institute of Technology

February, 2019

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ABSTRACT

This study investigates the financial performance of awarded architectural design for buildings in Manhattan, New York. Awarded design is based on the achievement of the architect and/or the architecture firm receiving prestigious awards from the industry such as the Pritzker prize, AIA Architecture Firm Award, the Architectural Innovation Award of the Wall Street Journal to name just a few. To measure financial performance, I use several datasets, Real Capital Analytics, Compstak, Walkscore and NYC public data for New York City. To identify awarded design and compare it to non-awarded design, I employ a matched-pair analysis. I find 846 building transactions with 89 awarded design transactions that are matched geographically to 757 non-awarded design transactions within a quarter mile radius over the 2000 to 2017 period. The results of the multivariate hedonic analysis suggest that, compared with buildings in the quarter-mile neighborhood, office buildings designed by awarded architects and awarded architecture firms have a statistically and economically significant transaction premium of 23.1 percent, ceteris paribus, with a model that explains just under 90 percent of the variation in transaction price. Results of this analysis are intended as way for designers to have agency in the design build development practice and for developers and investors to understand the value of engaging in awarded design effects.

Thesis Supervisor: Dr. Andrea Chegut
Title: Research Scientist for Center for Real Estate

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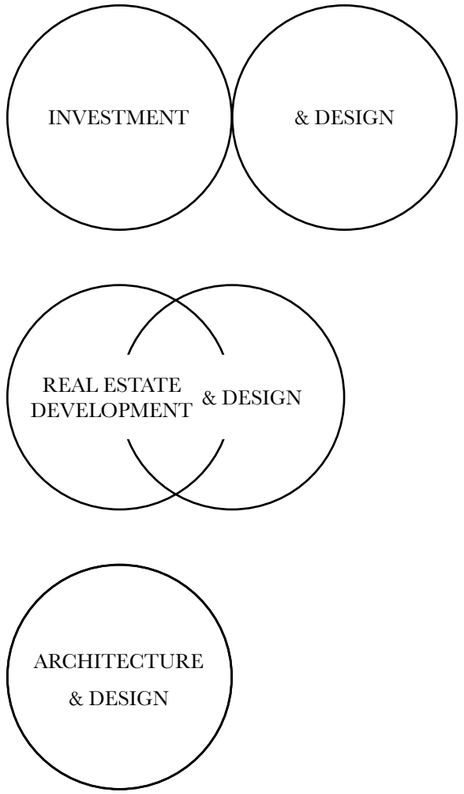
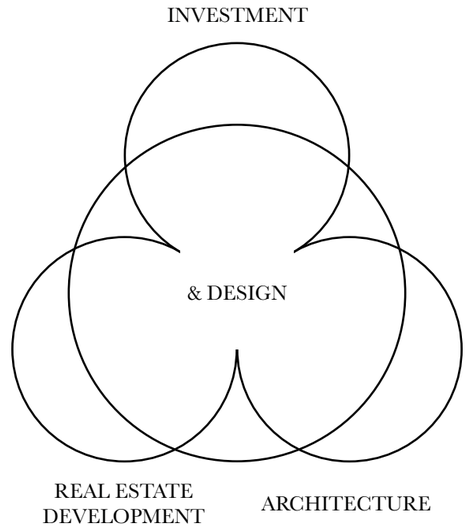


FROM SINGLE DISCIPLINE SET OF UNDERSTANDINGS

OBSTACLE

In recent years, due to increased market education and growth in number of leading examples, investing in high quality design became a standard for the real estate market in New York City. Despite the growing interest, however, a limited number of studies and discussions have been generated to help create a shared value surrounding the subject of design. In this study, we have identified that the difficulty of obtaining data related to design performance being one of the biggest hurdles in enabling further studies to disentangle the value of design. One principle problem is knowing who designed a building, what is their architectural legacy, and can it be matched to a financial performance measure.



TO A SHARED KNOWLEDGE PLATFORM

INTENTION

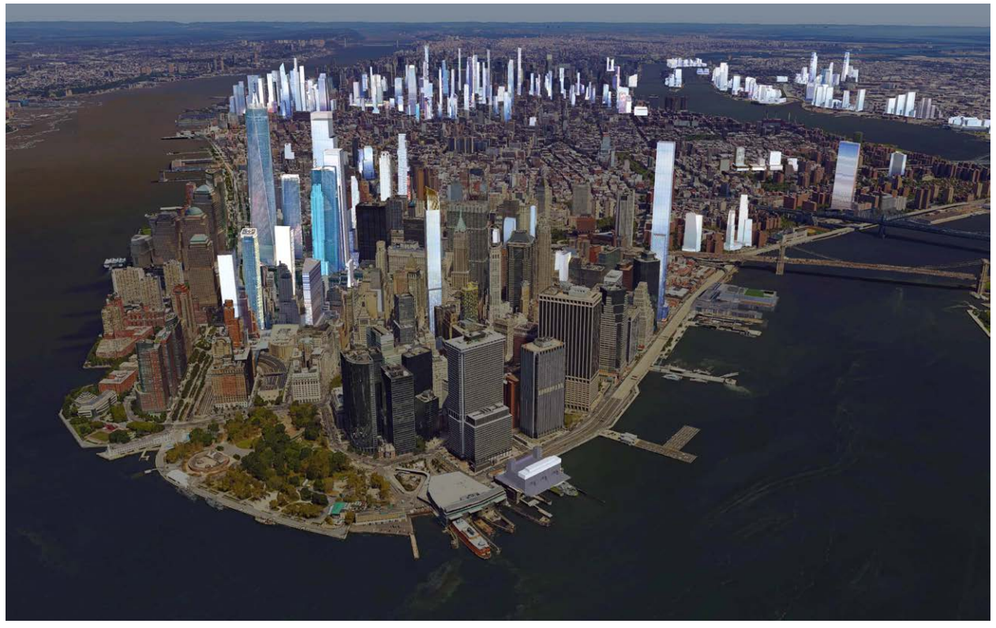
To resolve this issue, we find and measure the architectural legacy of the architects of New York City buildings and pair that with financial data. In addition to using the awards as means to identify architects who have won high status among their peers, this study intend to broaden the scope of understanding the value of design by adding substantially more driving factors in the real estate transaction pricing process by incorporating buyer and seller decisions for all of the transactions over time, specifying the type of awards, and adding information on architects to every building in the sample data set. The added measures improved our model's ability to explain the variation in transaction price. We believe combining new measurements with the accumulated knowledge on design generated by architects will enable us to open up a substantial area for future research regarding the value of design, and moreover will help create agency for design in the realm of finance and economics.

DEFINITIONS

DESIGN
The terminology design is limited to the design of architecture, especially the design of commercial buildings.

BUILT ENVIRONMENT
Man-made structures, features, and facilities viewed collectively as an environment in which people live and work. In this study, we are limiting the terminology to buildings and infrastructure in an urban setting.

DESIGN DEVELOPMENT
In this research, the terminology "design development" is used to indicate a real estate development model that engages both the work of an architect and real estate development professional. It is a business model that typically requires the architect or a designer to invest in the equity portion of the project to form a partnership with a real estate developer. The partnership benefits from increased control in design.



A look into the future: a render of Manhattan. Photograph: CityRealty

New York 2020: A Sea of Design
As part of its latest development report, real estate agency cityrealty has released a series of visualizations, illustrating the new york skyline in the year 2020. In summary, Cityrealty reported while fewer developers in 2016 are signing on to build sky-grazing towers, condominium prices are still on an upward trajectory with anticipated sales totaling roughly $30 billion through 2019. The report added, the new ground breaking developments has largely concentrated on midtown in recent years, there is now set to be a new wave of construction in the financial district.

WHY (STILL) NEW YORK:
BIG APPLE, BIG DATA

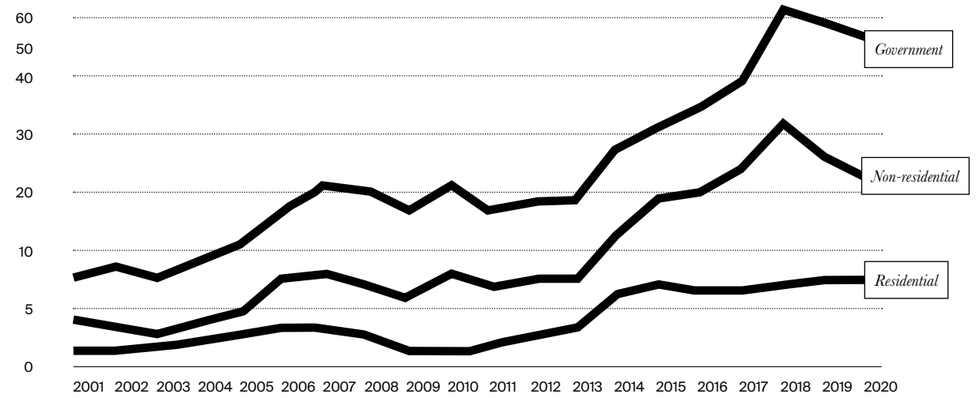


Figure 1 - Annual Construction Spending in New York City, 2001-2020 (in billions)

LEFT, IMAGE 1.
Note: Change in the skyline of New York City from 1921.
Source: https://www.theguardian.com/cities/gallery/2018/oct/19/rising-high-the-evolving-skyline-new-york-city-manhattan-in-pictures

FIGURE 1.
Note: The graph shows the highest construction spending in 2018.
Source: Dodge Data & Analytics, NYS Department of Labor, public sector capital budgets. U.S. Census Bureau, Urbanomics

New York City has historically been the center of modern architecture and the pinnacle of architectural aesthetics. Not only is the city both a showcase and a testing bed of modern architectural innovations, but it is also a museum in its own right with an ever-growing collection of carefully preserved architectural artifacts from the past.

The reputation of the city as the capital of modern architecture still remains intact thanks to the continued influx of skyline-altering developments. The year 2018, marked the highest construction spending New York has ever witnessed in its history. The highlight among the developments was the growth in the number of buildings designed by internationally renowned architects. In 2014, more than 50 buildings designed by the so-called star-architects were to break ground in Manhattan alone. The ambitious developments are mostly upon completion in 2019 and some are already available for sale in the market.

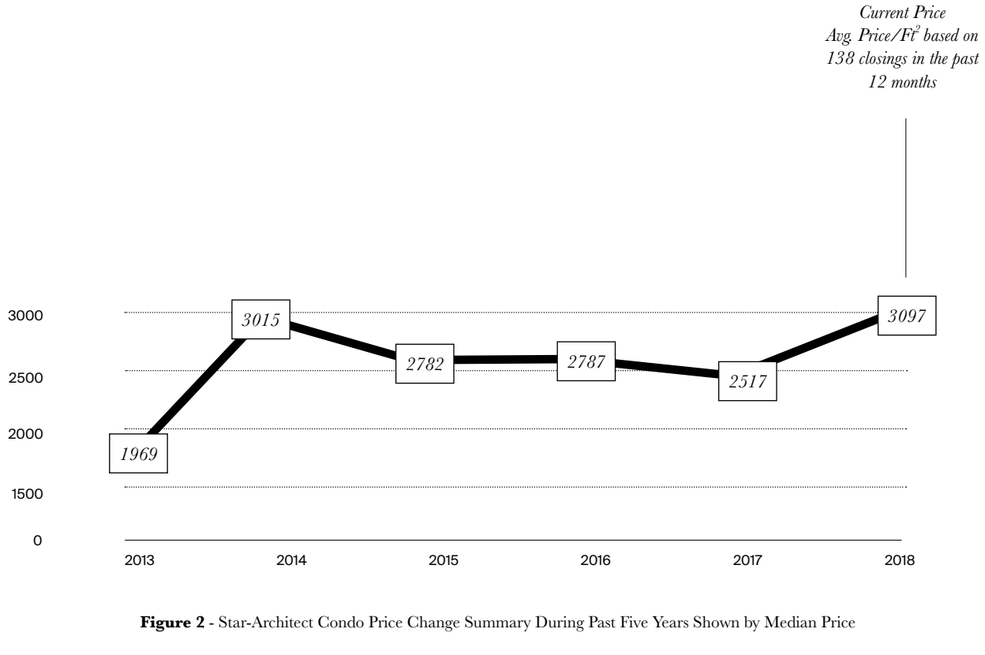


Figure 2 - Star-Architect Condo Price Change Summary During Past Five Years Shown by Median Price

FIGURE 2.
Note: Condominiums designed by internationally renown architects marks the highest price per SF in New York City.
Source: CityRealty Starchitect Condo Index (https://www.cityrealty.com/nyc/building-indices/starchitect-condos/building-list/112)

Amongst various building types, especially pronounced was the sales premium associated with the new supply of Manhattan's luxury condominiums designed by renown architects. According to the sales data provided by CityRealty, a New York based real estate brokerage and consultant firm, as of June 2018, buyers of the condominiums designed by Pritzker prize laureates paid an average $3,126 per square foot, higher than prices in indices such as The CityRealty 100 (at $2,477 per square foot), a sales data covering every sale in the past 10 years for 100 of Manhattan's most expensive condominium buildings.

Image 2 - Previous Mayor of NYC, Michael Bloomberg's Tweet Regarding New York City Open Data Law

IMAGE 2.
Source: Twitter, https://twitter.com/mikebloomberg/status/443753465488367617?lang=en

NYC OpenData
NYC Analytics
NYC Information Technology & Telecommunications

In addition to the rich history of the city and the current building boom, the immense data on the built environment that is available today makes New York the ideal city for this research. The continuing effort to open the city's database encouraged and boosted researchers to better understand the built environment, as demonstrated in "Open Data Law", NYC's recent endeavor to consolidate all public data into a single, easily-accessible platform. The database and the advanced data processing technology available today is opening a new horizon in understanding the price dynamics of the building industry in any given time ■

WHY NOW: CURRENT CLIMATE OF DESIGN IN THE BUILT ENVIRONMENT

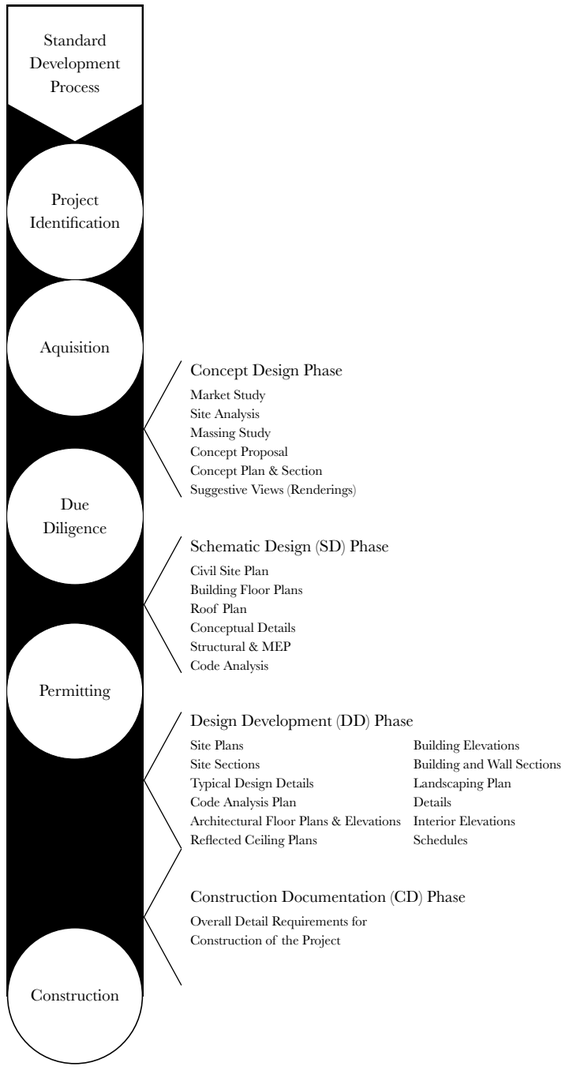
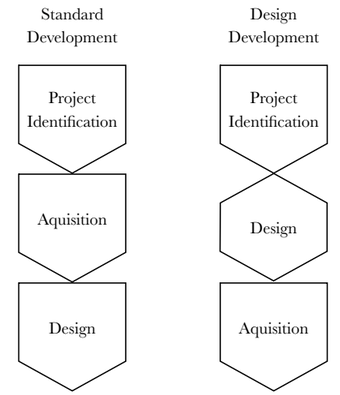


Figure 3 - Standard Real Estat Development Process and Design Phase



Strength of engaging Design in the acquisition process:

- Lowers risk by identifying project's spatial feasibility
- Improves financial underwriting by providing floor area information with better accuracy
- Creative solutions for unconventionaly shaped land plots

Figure 4 - Standard Real Estat Development Process Compared with Design Development Process

FIGURE 3.
Note: Diagram showing the relationship between the standard real estate development process and its overlap with standard design process.

FIGURE 4.
Note: The design development model allows the firm to closely manage design to maximize its potential value.

In recent years, there was a surge of interest in the subject of design from multiple areas of the building industry. Design has become one of the most important amenities for real estate developers. A growing number of design development companies are being established in the major gateway cities such as New York and San Francisco, with a mission to create better development through design and ultimately to differentiate themselves from competitors. The two noticeable strategies for developers approaching design are either by working with famous architects or by creating an in-house design team to initiate and manage design in the closest manner. Hiring renown architects are not something new however, the latter model is a newly growing trend in New York.

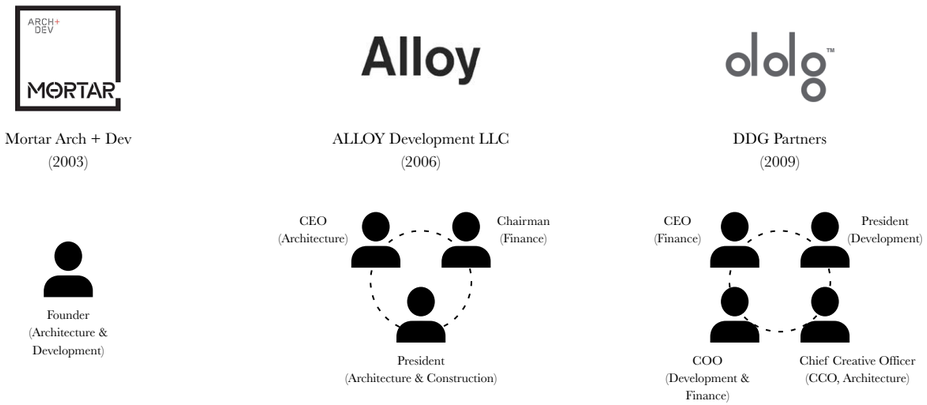


Figure 5 - Desgin Development Companies in New York

FIGURE 5.
Note: The diagram shows the inter-disciplinary management structure of design development companies in New York City.

The real estate development industry is actively re-inventing their relationship with design. The two most well known design development companies in New York are Alloy Development and ddg, established in 2006 and 2009 respectively, have architects as owners/partners of the business. Similar to the role of creative directors in the fashion industry, they take charge in managing the design from its inception to completion on behalf of the development company's interest.

Image 3 - Mckinsey Quarterly Report, 2018, The Business Value of Design

IMAGE 3.
Source: https://www.mckinsey.com/business-functions/mckinsey-design/our-insights/the-business-value-of-design

Design is no longer a foreign concept for the investors as well. Investors have been witnessing the appreciation of design from the market and how that translates into additional profit for their investment. Since 1982, few academic studies from real estate finance and economics have attempted to uncover the investment premiums related with well-designed buildings. There are some differences in the subject market, building product, and the methods used to measure the value of design, however, the results unequivocally show on average 20% sales premium for well-designed buildings.

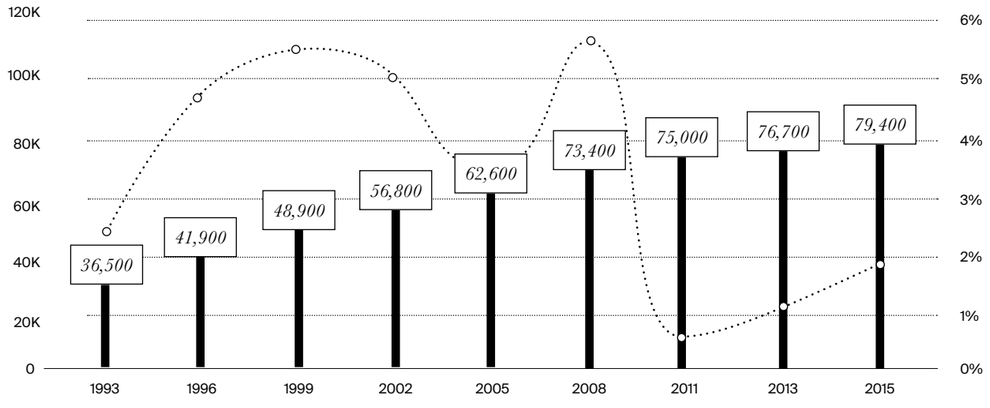


Figure 6 - Average Compensation for All Architectural Staff Postitions over Time (in 2015 Dollars)

FIGURE 6.
Note: According to the 2015 AIA Compensation Survey, the average compensation for architectural staff positions is still recovering from the Great Recession. The report, found that average compensation for staff positions rose 3.5 percent since early 2013 (or 1.75 percent per year). This growth is up from the Great Recession, during which annual compensation increased an average of less than 1 percent, but moderate compared to the past two decades, when annual compensation increases ranged between 4 and 5 percent. Source: AIA Compensation Report 2015

Architects, on the other hand, have been riding the waves of change. Design is no longer the sole realm of architects. Today, design is multi-faceted, highly specialized, and interdisciplinary. So architectural work requires a creative manipulation of specialized design developed by a socially diverse group of experts to deliver the job that once was done by architects. Increasingly architectural work is distributed and dispersed, collaborative and entrepreneurial, knowledge-based and open-sourced. (Peggy Deamer, 2014)

The growing diversity of the work, however, doesn't seem to be contributing to the growth of its market size. According to a survey done by Building Design Magazine, architects' earnings have steadily deteriorated by 30% since 2008. While the result can be interpreted as an influence of the global financial crisis, previous periods show that fees rarely return to their pre-recession levels. (Charles Holland, 2014)

On the other side of the spectrum, there is a widely accepted notion that well-designed space adds more value to the built environment. Sadly, there isn't much public discourse beyond the point; the talk always seems to pivot between the exorbitant price of real estate market and the fetishistic consumption of the character of few architects that has reached

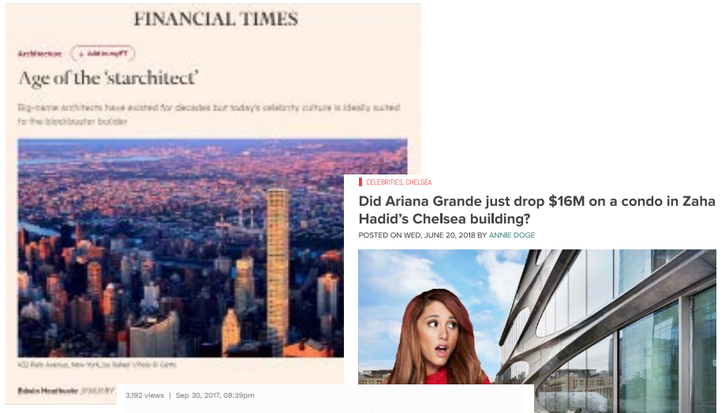


Figure 7 - Media Outlet on the Rise of Design

FIGURE 7.
Note: The media often associates design with an emphasis on the celebrity status and the iconicity of the structure.

TOP IMAGE
Sources: https://www.ft.com/content/d064d57c-df01-11e6-86ac-f253db7791c6

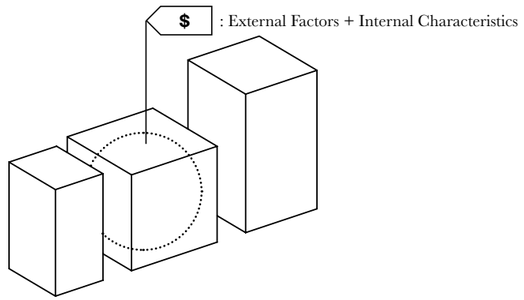
MIDDLE IMAGE
https://www.6sqft.com/did-ariana-grande-just-drop-16m-on-a-condo-in-zaha-hadids-chelsea-building/

BOTTOM IMAGE
https://www.forbes.com/sites/keithflamer/2017/09/30/another-soaring-starchitect-tower-ascends-over-revitalized-downtown-manhattan/#184535e74b33

a pseudo-celebrity status. The popular terminology 'star-architect' or 'starchitectecture' (Foster 2008; Barbas, Delautre, and Oakman 2015; Ponzini 2016) well represents the general public's conception of the subject. The terminology associates design with an emphasis on the celebrity status and the iconicity of the structure. While the implication of the terminology is indeed one aspect of design, it also demonstrates the limited outlook on the current climate of design.

Design has been clearly a subject of growing interest from different industries that define the built environment. However, design is represented and valued differently across the industry. As the findings show above, the subject has been adapted and absorbed by different entities, each of them creating its own cluster of understanding and usage with very few overlaps. As the innovation theory proves, the innovation, in this context design, should be widely adopted in order to self-sustain since the lack of agency of the subject often leads to deterioration (Everett Rogers, 1962). With New York experiencing its biggest building boom of the century, a collective effort towards creating a common ground to nurture a more collaborative future for design is imminent. As a contribution, our research focuses on identifying and bridging the gap between money and design ■

MONEY AND DESIGN: HOW FINANCE, ECONOMICS DEFINE DESIGN



The Hedonic Pricing Method is an asset pricing method that starts from the premise that the price of a property is determined both by internal characteristics and external factors that affect the property's transaction price.

External Factors: Location, Transaction Time, Building Age, Size, Parcel Area, LEED Status, etc.

Internal Characteristics: Building Amenities, Mechanical, Electrical, and Plumbing (MEP) Quality, Building Occupants Use, etc.

Figure 8 - The Hedonic Pricing Method

FIGURE 8.
Note: Visual interpretation of the Hedonic Pricing Model

Due to the immense data collected on the US commercial real estate market, nowadays at any given time we can analyze and understand the commercial real estate price dynamics and can predict future trends with improved accuracy. Two of the main analysis techniques that are often used in this area are the Repeat Sales Index Method and the Hedonic Pricing Method.

The Repeat Sales Index Method calculates changes in the sales price of the same piece of real estate over a specific period of time. By definition, this method can reflect the market conditions in any given period (Geltner & Fisher, 2007) and its strength lies on the ability to reflect the capital gains or depreciation in the market (Chegut, 2013). However, since the methodology is based on available appraisal information and needs a set of properties of repeated sales, a significant amount of time is required to achieve a matured and reliable dataset. Due to this drawback this methodology is not capable of capturing the innovations that are occurring in the market and therefore is not considered to be an appropriate methodology for the purpose of this study.

On the other hand, the Hedonic Pricing Method is a metro-level transaction based index. It is an asset pricing method that starts from the premise that the price of a property is determined both by internal characteristics of the property and the external factors that affect the property's transaction price. Examples of external factors are location, time, age, area of the building, and the internal characteristics are building amenities, operation systems, LEED certification that are offered by the building. Different from the Repeated Sales Index, Hedonic Pricing Methodology uses cross-sectional data and does not require repeated observations of the same

Emporis is a real estate data mining company with specializing in high-rise and skyscrapers

Buildings in Manhattan Identified in Database	83,301 buildings (100%)
Information on the Architect of building	7256 buildings (9% coverage)
Design Architect of building	146 buildings (0.17% coverage)
Landscape Architect of building	125 buildings (0.15% coverage)
Interior Designer of building	201 buildings (0.24% coverage)

Figure 9-1 - Data Providers with Information on Architects

Note: Emporis and NYC DoB are the only two data providers for information on architects, however, the quality and the accessibility of the data are highly limited.

property. Due to this reason, the Hedonic approach is an ideal methodology to measure the innovations and technologies that are implemented in the current real estate marketplace.

As one of the key aspects of innovation in the built environment, the complex nature of design can be disentangled and measured by adopting the Hedonic Pricing Methodology. The inherent strength of the Hedonic analysis is that it is an extremely flexible approach that can yield credible results regarding a wide range of subject matters. For instance, 'Location:' one of the external characteristic that is commonly used in real estate asset pricing studies, can be further studied by looking into related variables such as walk-scores; to measure the walkability of the neighborhood, or building visibility scores; to measure the presence of the building compared to the surrounding context. Since, the two examples, walkability and the iconicity, are often elements that is frequently discussed and valued in the design process of the building, the results of the hedonic analysis may support or guide the designer's future work by providing numerical measurement on the performance related to the design decisions that were made in the past. However there is limited data on design.

So far we have identified largely two directions when measuring the value of design from the academic literature of real estate finance and economics. The two approaches are either relying on peer recognition; taking the award-winning buildings and comparing with others to measure its transaction or rental premium, or collaborating with a group of experts to examine and evaluate the design of the building to understand the premium related to it. Given the extent of externalities and internalities generated by design, both approaches show limited ability in explaining the value of design beyond the recognition of its associated premium.

MONEY AND DESIGN: HOW FINANCE, ECONOMICS DEFINE DESIGN

The New York City Department of Buildings

- Enforces the city's building codes and zoning regulations
- Issues building permits
- The data base includes detail information regarding over 1,000,000 new and existing buildings.
- Currently the information on architects are only available upon request and per buildnig basis.

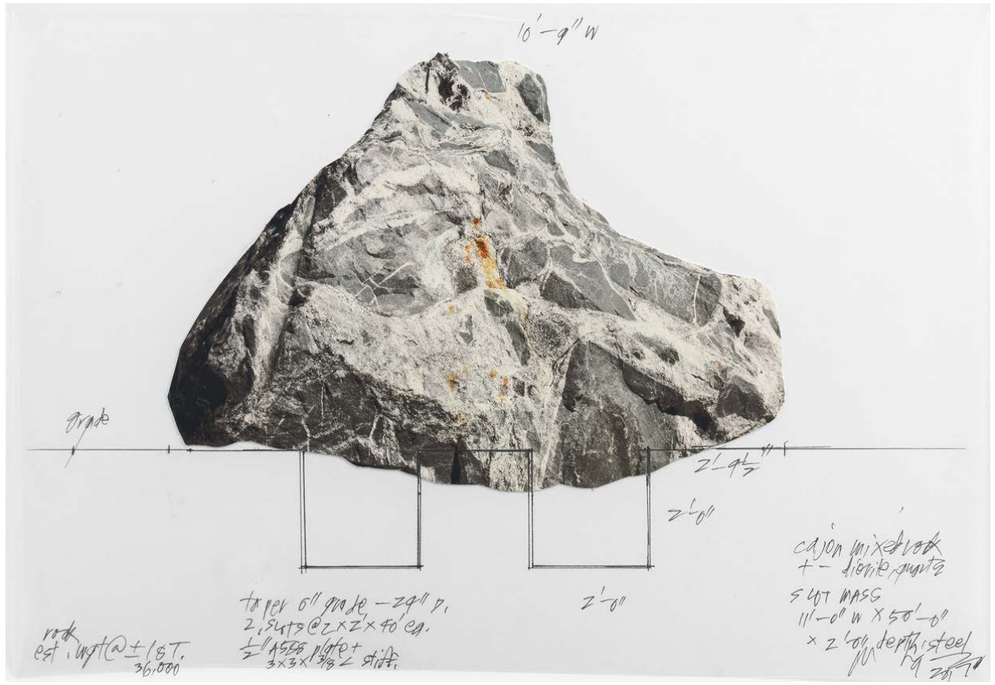
Figure 9-2 - Data Providers with Information on Architects

Note: Emporis and NYC DoB are the only two data providers for information on architects, however, the quality and the accessibility of the data are highly limited.

The biggest challenge behind design studies is the general conception in the subject's elusiveness that subsequently limited the measurement and availability of design related data. Surprisingly the most fundamental aspects of design are often disregarded from both private and public data sources that are frequently used when studying the built environment. For instance, the information on architects who are responsible for the overall design quality of the building is often omitted. In fact, Emporis and New York City Department of Buildings (DoB) are the only two sources of data among all the private and public data providers that include such information. Even with these two data providers, the quality and accessibility of the data are highly limited. The database of Emporis only includes data on the high rise buildings and the coverage is less than 10% of the buildings in Manhattan. On the other hand, since one of the Department of Building's function is to issue building permits, the information on architects should be available for every building that is built, however, such information is only available by request and by per building basis.

Using a compromised dataset can be particularly troublesome when analyzing the subject with the Hedonic Pricing Model since the result heavily relies on the quality and the quantity of the data that is used. Design influences both the external and internal characteristics of the building but so far only a handful of measurements have been looked at. A better understanding of the relationship between the quality of design and value is needed since it could enhance communication between the city, investors, developers, and architects, who frequently argue with their own set of assumptions about the relationship between the design, cost, and return ■

STEPPING STONE



LEFT, IMAGE 4.
Michael Heizer, Slot Mass (section drawing), 1968-2017
18-ton rock and 2 steel earth liners depicted,
Courtesy of the artist and Gagosian Gallery

"Design" is important in ways of affecting the current building industry, however, it is considered a difficult topic to discuss in the context of business decision making. Design still remains an elusive subject and has been studied very little in the context of economics and finance. The popular reason being the lack of consensus on the definition of "design" and its effect on hindering the measurement for its "value" (Vandell, 1989).

Data empowers agency, however, there has been an absence of valid measuring systems to value the contribution of design in the built environment. By utilizing the immense pool of data available today, our research aims to challenge this popular notion of design and to provide a missing link to help understand the fuller picture of the current ecosystem of the built environment. Hopefully, this research can be used as a stepping stone for future studies to ultimately help create an agency for design in the discussion of finance and economics ■

STUDYING THE VALUE OF DESIGN METHODS

The related academic papers that I have identified below are the attempts using the hedonic pricing method to understand design in the built environment. Largely two different approaches were found when understanding and measuring the effects of design on the value of the building. One set of papers examine the quality of design by associating it with the architect's achievement and the recognition of their peers by looking at a sample of buildings designed by architects who have won important architectural prizes (Hough and Kratz, 1982; Fuerst, McAllister, and Murray, 2010; Cheshire and Dericks, 2014). The other approach chooses to conduct a survey by a group of experts to grade the overall design quality of the sample buildings. The experts score building elements such as façade fenestration, building material, massing composition, etc. of the sample buildings and the overall design score of the building is derived by averaging the scores of each element (Vandell and Lane, 1989; Nase, Berry, and Adair, 2016).

In 1982, Hough and Kratz in one of the earliest and most often cited academic papers examining the economics of architecture argued that commercial buildings in the central business district (CBD) of Chicago that have won a Chicago AIA Jury award outperformed in rents per square foot as high as 23% relative to the market for comparable buildings.

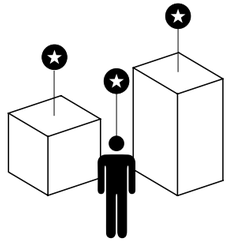
Another similar study was done in 2010. Fuerst, McAllister, and Murray conducted a national, rather than a city, level research focusing on buildings designed by Pritzker prize and/or AIA Gold medal winning architects in the USA. The results of the hedonic analysis also showed premiums that are 5%-7% higher in rents, and 17% higher sales prices in the buildings designed by the award-winning architects compared with other buildings in the same submarket.

The premiums indicated in both of the studies were large enough to hint a strong relationship between the design quality of the award-winning architects and the economic performance of the building. However, the study leaves a few unanswered questions. First, the data does not integrate the cost of providing good design, i.e. construction and operation cost associated with the building's iconic structure and additional fee charges from hiring award-winning architects. Second, the data does not provide any indication on the different aspects of design and associates the value relying solely on the architect's representation; as the production of design becomes more complex the delineation of the input of awarded architect on the design becomes questionable. Third, the award criteria do not capture the current innovations of the industry since the type of awards that are considered in the study only represents the category of lifetime achievement awards which is based on the architect's work throughout their career with a threshold of at least 30 years of accumulated projects.

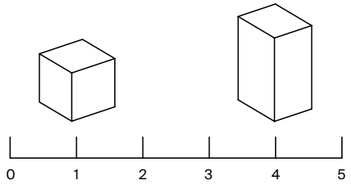
Research done in 1990 by Vandell and Lane attempted to uncover few of the missing links of the previous study by including the construction and operation costs into the framework of the regression analysis and by disentangling the multiple dimensions of design into categories such as, the decorativeness of the façade, color and texture of the surface material, quality of the surface material, and massing. 102 class-A commercial office buildings in Boston and Cambridge were evaluated by a group of architects accordingly and the results confirmed a strong influence of design on rents. Buildings that were rated in the top 20% for design quality were predicted to extract almost 22% higher rents than those rated in the bottom 20%. In contrast, the data showed a weak relationship between vacancy behavior and design quality. Finally, good

D.E.Hough &C.G.Kratz, 1982		**Can "Good" Architecture Meet the Market Test?**
Data Recognized by "official" authority LDMK & CAIA 20 buildings out of 139	**Criteria** 139 Commercial Office building rents in Chicago CBD in 1978	**Conclusion** Is $1.85 (or $1.64) per square foot truly the value of "good" new architecture? If so, at an average rentable area of 844,000 square feet for post-1955 Chicago office buildings, the annual return to this attribute would be $1.6 million (or $1.4 million, using the $1.64 per square foot premium).
F.Fuerst, P.McAllister & C.B.Murray, 2010		**Designer Buildings: Estimating the economic value of 'signature' architecture**
Data CoStar US national database for commercial office rental (16,932 buildnigs observed) & sales (9,418 sales observed) in 682 submarket clusters	**Criteria** Pritzker Prize+AIA Gold Medal, 499 buildings out of 16,932	**Conclusion** Compared with buildings in the same submarket, ODSAs have rents that are 5% - 7% higher than non-ODSAs and sell for prices 12% - 17% higher. In other words, for the average structure, movement into the next higher design quintile will increase rents from $27.58/SF to $28.96SF.
K.D.Vandell & J.S.Lane, 1989		**The Economics of Architecture and Urban Design**
Data 102 Commercial Office building Rents and Vacancy rates in Boston, 1979 - 1986	**Survey criteria** Survey done by panel of architects. Examined in 4 categories and given overall rating. **Categories** Decorativeness of Facade, Color and texture of surface material, quality of surface material, massing	**Conclusion** The coefficient for DESIGN, although positive, is not significant. Consists with the notion that design does not necessarily have to cost more to the extent that "overinvestment" may contribute to negative marginal returns to design.
I.Nase, J.Berry & A.Adair, 2016		**Impact of quality-led design on real estate value**
Data 424 Condominium units in Belfast city center, 2000 - 2008	**Criteria** Survey done by group of local experts. 7 categories on a 5-grade Likert scale. **Categories** Facade material, facade identity, quality of material used, fenestration, massing, height in floors, building condition	**Conclusion** Empirical findings indicate that from the seven building quality features initially investigated, the ones mostly valued by end users are those that are easily perceived visually.

Table 1 - Design Value Studies



1. Examine the Quality of Design by
Associating it with Architecture Awards



2. Scoring Process for Design Quality Variables
ex) Massing, Fenestration, Material Quality, etc.

Figure 10 - Typical Methods Used to Measure the Effects of Design on the Value of the Building

design was shown to cost more to produce on average, but not necessarily in every case. The magnitude of the point estimates of the rent, vacancy, and construction cost effects suggest that good design may not, in fact, be more profitable on average, but as with a lottery, may provide a small probability of a high return to the developer.

A similar methodology was used to study the price premium related with good design on the residential market by Nase, Berry, and Adair in 2016. The study combined the hedonic modeling approach paired with the spatiotemporal model to understand the impact of quality led design on the residential market in Belfast, Ireland. The research took transaction data of 424 condominium units and conducted a survey done by local experts. The survey included 7 categories on a 5-grade scale such as façade material, façade identity, quality of material used, fenestration, massing, the height of floors, and overall building condition. The empirical findings indicate that from the 7 design characteristics examined, the ones most valued by the home buyers are those that are most visible, i.e. the appropriateness to the surroundings of a building's material quality, fenestration, and massing. The other design features namely façade material, façade identity, overall building condition, and floor height were found to be statistically non-significant.

The scoring methodology that is used in the two studies are based on the assumption that the experts' opinions are closely correlated with the judgment process in architectural design practice, therefore, the estimated numerical value incorporates the value of design with less error. However, the method inherits certain limitations. For example, the subjectivity of design may be amplified due to the small number of experts included in the group causing skewness or inconsistency in the resulting score data. In addition, the design elements in which the buildings are measured by are solely focusing on the exterior of the building which leaves out the quality of the interior space and the building's inner spatial relationship that is important for understanding the user's experience and the performance of the building.

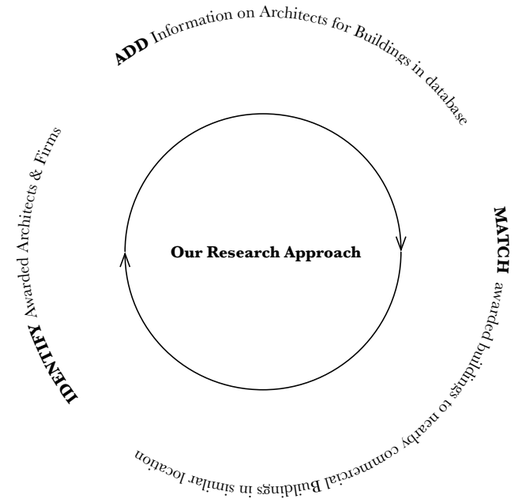


Figure 11 - Our Reseacrh Approach

In line with the studies listed above, other studies find that certain architectural styles (Asabere, Hachey, and Grubaugh, 1989), features of exterior of the building (Moorhouse & Smith, 1994) and urban design features of the neighborhood (Song & Knaap, 2003) achieve rental and sales premium for the residential market. The more recent studies that are currently undergoing in this area attempts to include daylight and views to understand the subject. These findings are informative for the current research since they demonstrate how the market, in general, values design in the context of the built environment.

Our research differs from these previous studies. It focuses on different types of awards that can include a broader range of architects, it includes architecture firms as well as individual architects and further elaborates on the estimation by incorporating information on architects and architecture firms of every building in the data set. The data and methodology of this research are detailed below ■

FIGURE 10.
Note: The diagram illustrates the two popular study methodologies used in measuring the value of design.

FIGURE 11.
Note: The diagram illustrates our research approach, focusing on different types of awards and incorporates information on architects and architecture firms of every buliding in the data set.

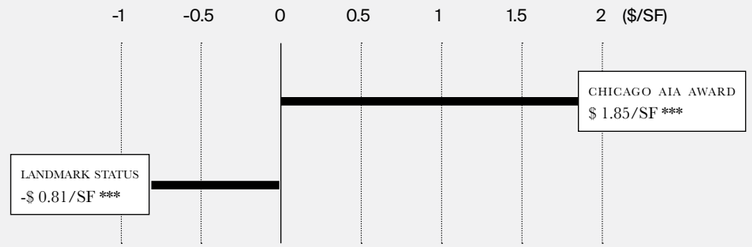
In 1982, Hough and Kratz in one of the earliest and most often cited academic papers examining the economics of architecture argued that commercial buildings in the central business district (CBD) of Chicago that have won a Chicago AIA Jury award out performed in rents per square foot as high as 23% relative to the market for comparable buildings.

TABLE 1
Summary of Results for Hedonic Price Equation Regressions for Downtown Office Buildings

Explanatory variables	Linear Models		Semilog Models	
	(1)	(2)	(3)	(4)
DISTCM	−0.906	−0.809	−1.188	−1.176
	(3.79)	(3.81)	(4.07)	(4.45)
DISTRR	−0.218	—	−0.158	—
	(0.81)		(0.46)	
PUBPK	0.072	—	0.525	0.491
	(0.31)		(2.15)	(2.11)
AGE	−0.047	−0.046	−0.892	−0.899
	(5.38)	(5.35)	(4.68)	(4.78)
GRSFLR	0.000095	—	0.713	—
	(0.11)		(0.53)	
RTAFL	0.015	0.015	0.392	1.055
	(0.69)	(1.57)	(0.29)	(4.24)
NOFLRS	0.055	0.056	0.932	1.442
	(2.01)	(4.13)	(0.69)	(4.34)
REST	−0.518	—	−0.481	—
	(1.27)		(1 24)	
CONF	0.894	0.911	0.661	0.682
	(2 29)	(2.40)	(1.79)	(1.93)
SNKSHP	0.181	—	−0.199	—
	(0.44)		(0.50)	
ELTRK	−0.767	−0.894	−0.736	−0.941
	(1.73)	(2.30)	(1.82)	(2.46)
LDMK	−0.417	−0.304	−0.858	−0.811
	(0.62)	(0.46)	(1.43)	(1.38)
CAIA	1.703	1 701	1.928	1 845
	(2.84)	(2.94)	(3.62)	(3.53)
CONSTANT	10.722	10.049	4.188	4.588
R^2	0 602	0.609	0.655	0.658
F	17.05	27.83	21 20	30.50

Note: Dependent variable is average annual rent per square foot; absolute t-statistics in parentheses; in semilog models, all explanatory variables are in natural logs, except REST, CONF, SNKSHP, ELTRK, LDMK, and CAIA.

Can "Good" Architecture Meet the Market Test?
A considerable rent premium is paid for "good" new architecture but not for "good" old architecture. Chicago AIA award increases the annual rent about $1.85/SF, however Land Mark status decreases the annual rent about $0.81/SF. (D.E.Hough & C.G.Kratz, 1982)



SIGNIFICANCE***
Asterisks in a regression table indicate the level of the statistical significance of a regression coefficient.

*** p<0.01, ** p<0.05, * p<0.1

COEFFICIENT % The standard error is our estimate of the standard deviation of the coefficient.

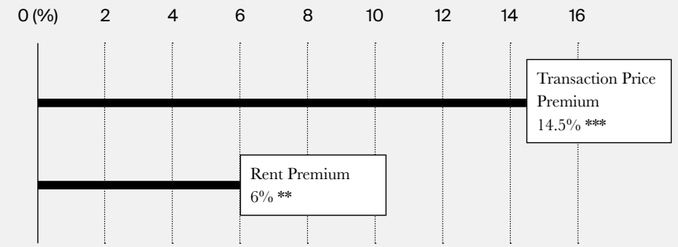
Another study done in 2010 by Fuerst, McAllister, and Murray conducted a national, rather than city, level research focusing on buildings designed by Pritzker prize and/or AIA Gold medal winning architects in the USA. The results of the hedonic analysis also showed premiums that are 5%-7% higher in rents, and 17% higher sales prices in the buildings designed by the award winning architects compared with other buildings in the same submarket.

Table 3. Results from hedonic estimation of sale prices. Dependent variable is natural log of the sale price ($ per square foot).

	Model 1	Model 2	Model 3
Constant	5.76***	5.78***	5.78***
ODSA [a]	0.12**	0.15***	
Top 500 (non-ODSA)		0.23***	0.23***
ODSA (non-top 500)			0.06
ODSA and top 500			0.17***
Net lease	0.08***	0.08***	0.08***
Number of stories (ln)	0.17***	0.16***	0.16***
Size in square feet (ln)	−0.18***	−0.19***	−0.19***
Site area in square feet (ln)	0.08***	0.08***	0.08***
Renovated within 5 years	−0.07**	−0.07**	−0.07**
Renovated 5–10 years ago	−0.01	−0.01	−0.01
Renovated >10 years ago	−0.03	−0.03	−0.03
Age (ln), years			
0–2	−0.17***	−0.17***	−0.17***
3–6	0.12***	0.11***	0.11***
7–10	0.36***	0.35***	0.35***
11–19	0.28***	0.28***	0.28***
20–23	0.12***	0.12***	0.12***
24–26	0.06**	0.06**	0.06**
27–31	0.06**	0.06**	0.06**
32–42	−0.03	−0.03	−0.03
43–62	−0.07**	−0.07**	−0.07**
Occupancy rate	0.00	0.00	0.00
Class A	0.40***	0.40***	0.40***
Class B	0.07***	0.07***	0.07***
Poor market	0.08***	0.08***	0.08***
Strong market	0.06***	0.06***	0.06***
Very strong market	0.16***	0.17***	0.17***
682 Submarket controls included			
Adjusted R^2	0.37	0.38	0.38
F-test	7.96***	7.98***	7.97***
Number of observations	6 970	6 970	6 970

*** Significant at 1% level; ** significant at 5% level; * significant at 10% level.
[a] ODSA—office designed by signature architect.

What is the economic value of 'signature' architecture?
Compared with buildings in the same submarket, Office Designed by Signature Architects have rents that are 5% - 7% higher than Office Designed by Non-Signature Architects and sell for prices 12% - 17% higher. (F. Fuerst, P. McAllister & C. B. Murray, 2010)



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COEFFICIENT % The standard error is our estimate of the standard deviation of the coefficient.

A research done in 1990 by Vandell and Lane included the construction and operation costs into the framework of the regression analysis and by disentangling the multiple dimensions of design into categories such as, the decorativeness of the façade, color and texture of the surface material, quality of the surface material, and massing. 102 class-A commercial office buildings in Boston and Cambridge were evaluated by a group of architects accordingly and the results confirmed a strong influence of design on rents. Buildings that were rated in the top 20% for design quality were predicted to extract almost 22% higher rents than those rated in the bottom 20%.

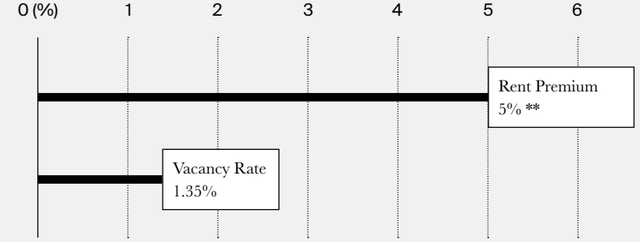
Determinants of Contract Rents and Vacancy Rates: Preferred OLS and 2SLS Specifications

Independent Variable	Determinants of Contract Rents Dependent Variable: Log(*RENT*) OLS	2SLS	Determinants of Vacancy Rates Dependent Variable: Log(*VAC* + .005) OLS	2SLS
INTERCEPT	3.006**	2.960**	4.301	3.495
	(.145)	(.150)	(5.662)	(7.033)
AGE (LNAGEA[a] for Vac. Equ.)	−.00928**	−.00771**	−.6238**	−.6220**
	(.00242)	(.00281)	(.1532)	(.1535)
TOTAREA	1.029×10^{-7}*	1.105×10^{-7}	—	—
	$(.572 \times 10^{-7})$	$(.570 \times 10^{-7})$		
LNTOFLRS	.0889**	.0890**	—	—
	(.0410)	(.0405)		
DESIGN	.0459	.0488**	−.4650	−.4923
	(.0288)	(.0286)	(.5485)	(.5670)
CENTER	−.00000602*	−.00000628*	—	—
	(.00000328)	(.00000325)		
TSTOP	.0000537	.0000663*	−.000780	−.000767
	(.0000322)	(.0000339)	(.000474)	(.000488)
PARKING	.00000404	.00000441	—	—
	(.00001766)	(.00001745)		
ONPARK	−.1032	−.0996	—	—
	(.0667)	(.0660)		
LNVACA, LNVACAP[b]	.00151	.0178	—	—
	(.00698)	(.0167)		
LNRENT, LNRENTP[c]	—	—	−.2943	−.0357
			(1.7285)	(2.1975)
$\bar{R}^2$	.6401	.6486	.2161	.2157
N	55	55	55	55
DEP MEAN	3.317	3.317	.5319	.5319
F-VALUE	11.673**	12.077**	4.722**	4.713**

[a] *LNAGEA* = Log(*AGE* + .005)
[b] *LNVACA* = Log(*VAC* + .005); *LNVACAP* = Predicted Log(*VAC* + .005) from first stage
[c] *LNRENT* = Log(*RENT*); *LNRENTP* = Predicted Log(*RENT*) from first stage
*significant at 10% level
**significant at 5% level

Does well designed buildings rent for more?
For the average structure, 5.0% increase in rents with every increase of one in the design rating. In other words, movement into the next higher design quintile will increase rents from $27.58/SF to $28.96SF. (K.D.Vandell & J.S.Lane, 1989)

Does good design result in lower vacancy?
Insignificant, though consistently negative as expected and always with in the narrow range -.4003 to -.5127 in all specifications. This suggests that, at the mean, an increase of one quintile in design quality would decrease the vacancy rate from 1.7% to 1.0%. (K.D.Vandell & J.S.Lane, 1989)



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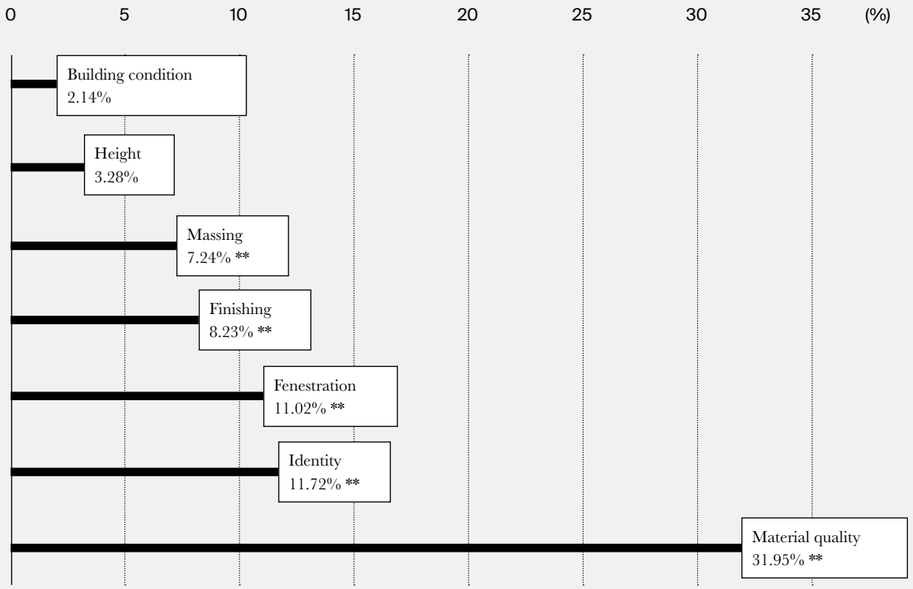
The study done by Nase, Berry, and Adair in 2016, combined the hedonic modeling approach paired with the spatiotemporal model to understand the impact of quality led design on the residential market in Belfast, Ireland. The research took transaction data of 424 condominium units and conducted a survey done by local experts. The survey included 7 categories on a 5-grade scale such as façade material, façade identity, quality of material used, fenestration, massing, the height of floors, and overall building condition. The empirical findings indicate that from the 7 design characteristics examined, the ones most valued by the home buyers are those that are most visible, i.e. the appropriateness to the surroundings of a building's material quality, fenestration, and massing. The other design features namely façade material, façade identity, overall building condition, and floor height were found to be statistically non-significant.

Table 2. Hedonic and spatial model comparisons.

Variable	Model 1 Hedonic (OLS)		Model 2 SEM (ML)		Model 3 SAR (ML)	
Constant	1.5332	(1.8328)	3.0714**	(3.4862)	−1.4176	(−1.6753)
Age	−0.1312*	(−2.3588)	−0.1644**	(−3.0613)	−0.1241*	(−2.4979)
Area	0.9155*	(12.6764)	0.8427**	(12.3922)	0.8054**	(12.1854)
Garage	0.1761*	(3.6562)	0.1930**	(4.4050)	0.2111**	(4.8876)
Bedrooms	−0.0108	(−0.4963)	−0.0016	(−0.0774)	0.0083	(0.4216)
Receproom	0.1357	(1.7292)	0.1741*	(2.4100)	0.1682*	(2.3957)
Floorno	0.0594**	(3.8029)	0.0429*	(2.8552)	0.0343*	(2.3914)
Finishing	0.0823**	(2.9538)	0.0529	(1.9259)	0.0432	(1.7071)
Identity	0.1172**	(3.0372)	0.0817*	(2.1308)	0.0447	(1.2421)
Materialqual	0.3195**	(9.7516)	0.2394**	(6.1798)	0.1749**	(5.0190)
Fenestration	0.1102**	(3.0104)	0.1102**	(3.1965)	0.0909**	(2.7652)
Massing	0.0724**	(3.5583)	0.0675**	(3.4033)	0.0769**	(4.2348)
Height	0.0328	(1.3987)	0.0140	(0.5887)	0.0079	(0.3748)
Condition	0.0214	(0.6128)	0.0293	(0.8707)	0.0312	(1.0008)
Connect	0.0681**	(2.9810)	0.0574*	(2.5617)	0.0654**	(3.2051)
BpR	0.0102**	(5.7598)	0.0077**	(4.4278)	0.0067**	(4.0656)
Attindex	−0.0392**	(−2.7200)	−0.0408**	(−2.8341)	−0.0471**	(−3.6494)
Dgreen	−0.0898**	(−4.5197)	−0.0807**	(−4.0771)	−0.0882**	(−4.9730)
NearST	0.0220*	(2.5806)	0.0201*	(2.1370)	0.0289**	(3.7711)
PWdist	0.0757**	(7.6161)	0.0647**	(6.4809)	0.0566**	(6.1024)
yr2002	−0.0058	(−0.1151)	0.0577	(0.4684)	0.0527	(1.1633)
yr2003	0.1260*	(2.5254)	0.1721	(1.4025)	0.1846**	(4.1258)
yr2004	0.0556	(1.1846)	0.0969	(0.8203)	0.1056*	(2.5103)
yr2005	0.1744**	(3.2972)	0.2234	(1.6761)	0.1878**	(3.9737)
yr2006	0.4421**	(8.7191)	0.5057**	(4.1295)	0.3189**	(6.4205)
yr2007	0.6397**	(11.9617)	0.6657**	(5.3196)	0.4682**	(8.5984)
yr2008	0.4555**	(9.0797)	0.4825**	(3.9844)	0.3387**	(6.9931)
Lambda (λ)			0.6581**	(8.9581)		
Rho (ρ)					0.4279**	(7.5933)
Sigma^2 (σ^2)	0.0210		0.0176		0.0167	
R^2	0.8494		0.8634		0.8706	
Log-likelihood	18.9413		218.4580		231.9330	
N	373		373		373	

What is the impact of quality led design for real estate value?
Empirical findings indicate that from the seven building quality features initially investigated, the ones mostly valued by end users are those that are easily perceived visually. (I.Nase, J.Berry & A.Adair, 2016)



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*** p<0.01, ** p<0.05, * p<0.1

COEFFICIENT % The standard error is our estimate of the standard deviation of the coefficient.

DATA

The commercial building transaction database used in this empirical study was obtained from the Wide Data Project of MIT Real Estate Innovation Lab, which is a combination of publicly available data from New York government entities, Real Capital Analytics (RCA), and Compstak data. The integrated database provides fundamental hedonic variables that we will be using.

Real Capital Analytics (RCA) is a private data provider specializing in property transaction data based in New York City. The database collects data from a network of independent sources with particular emphasis on the building transaction data that includes financing details, prior transaction history, and true owner identification to complete profiles. From this database, we use variables including the transaction price for each contract signed that becomes the dependent variable. The variables used in this study are Price, Submarket, Transaction Year, Built Year, Number of Floors, Building Area (SqFt), Land Parcel Area, Renovation Year, Buyer Type, Seller Type, and Lender Type. This study uses RCA building transaction data as a primary database.

Compstak is a private commercial real estate data platform with offices in New York and Los Angeles. The data is crowdsourced from verified and active professionals at commercial brokerages and appraisal firms and provides lease and sales comparable data. Compstak database contains variables that include lease contract characteristics, tenant profile, and market variables to name a few. From this database, we included a variable which is Building Class. The Building Class variable is an important variable used to control for the overall quality of the buildings in the sample dataset and is a variable that is only available in the Compstak data. We have assigned the building identification number (BIN) for each transaction observation in RCA and matched with the Compstak data set for better accuracy.

REAL CAPITAL ANALYTICS
Transactions. Trends. Tools.
+
COMPSTAK
+
Walk Score®

PRIMARY DATABASE

Variables in Use:

Price
Submarket
Transaction Year
Built Year
Number of Floors
Building Area (SqFt)
Land Parcel Area
Renovation Year
Buyer Type
Seller Type
Lender Type

ADDITIONAL DATABASE

Variables in Use:

Building Class

+

DATA ON ARCHITECTS

The information on architects were manually gathered through multiple sources such as, firm portfolio website, media articles, and architectural magazines

ADDITIONAL DATABASE

Variables in Use:

Walk Score assigned to every building in datrabase

Figure 12 - Data Structure

In addition, we have included a Walk Score variable using the data provided by Walkscore.com. The Walk Score is a metric created to measure the walkability of the neighborhood with a score range from 0 to 100. Neighborhoods with access to public transit, better commutes, and proximity to the people and places, achieve higher scores. For this study, we have matched the address of individual buildings observed in the building transaction sample dataset with the Walk Score provided from the website

Finally, we have included the information on architects who designed the buildings in the integrated database. The information was gathered using multiple sources that include, the architect's web portfolio, architecture magazine, articles from various publications, and Wikipedia ■

FIGURE 12.
Note: The diagram illustrates the data structure of this research.

IDENTIFYING AWARDED ARCHITECTS AND FIRMS

Since the objective of this research is to understand the value of design through the contributions of renown architects and architecture firms, defining the significant architects and firms becomes the central issue for this research.

As the scale of the building grows and adds complexity to the project, the business management aspect of the architecture and design industry have continuously evolved. To prevent the knowledge loss and to secure the design quality of the company, architecture firms are creating a new management model that is in between the typical master and apprentice system and the hierarchical corporate management model (Booth, 2006).

To incorporate this recent trend, we have employed multiple types of awards that each has a significant difference in their evaluation criteria, but nevertheless carries similar weight in value among the industry. Largely three types of award groups are considered in this research.
The first group includes lifetime achievement awards that evaluate the architect's accumulated body of work throughout their career. The group includes: the RIBA Royal Gold Medal, AIA Gold Medal, the Pritzker Prize, the UIA Gold Medal, and the Golden Lion for Lifetime Achievement Award. These awards are typically given to architects with more than 30 years of experience based on their lifetime contribution on expanding the knowledge of the industry. These awards are considered the highest recognition and considered to be the most influential in the architecture industry. The awards are given annually or biannually.

The second group incorporates awards that are given to the contemporary and innovative architects. The group includes: Cooper Hewitt National Design Award and the Wall Street Journal Innovation Awards in Architecture. These awards are given annually and a large part of the evaluation is based on the impact of the architect's project on the year the award is given. Due to this reason, the demographics of the past winners of these awards tend to be younger than the lifetime achievement award laureates.

The third award category is an attempt to recognize the collaborative effort and the business management side of architecture design by including the AIA Architecture Firm Award. The AIA Architecture Firm Award is a unique award since it recognizes the architecture firm that has produced a notable architecture for at least a decade. The candidates of the award are any individual firms or successor firm or organization of architects whose home office is based in the US.

In this research, we have listed the award winners of all three categories from the year 1940 and each award group resulted in 147 architects for group 1, 32 architects for group 2, and 55 architecture firms for group 3. Within this result, we have identified in total 18 awarded architects and firms who designed an existing building in Manhattan at the time of the research.

Within 18 awarded architect/firms, 4 Firms have received more than two awards from three award categories and they are Edward Larrabee Barnes, I. M. Pei & Partners, Kevin Roche John Dinkeloo and Associates, and Skidmore, Orwings & Merrill (SOM). Each group of architects and companies are identified as variables such as Awarded Architects, Awarded Firms, and Awarded Architects and Firms respectively throughout this research.

We have identified 16 buildings designed by Awarded Architects, 14 buildings designed by Awarded Firms, and 22 designed by Awarded Architects and Firms. Overall 52 buildings and 89 transaction observations were found in the treated group data. In addition, information on the awarded architects and firms are assigned to each building in the data set ■

Royal Gold Medal

Organization
RIBA
How often
Annual
First awarded
1848
From 1950
69 awarded

Gold Medal

Organization
AIA
How often
Annual
First awarded
1907
From 1950
59 awarded

Gold Medal

Organization
UIA
How often
Triennial
First awarded
1984
From 1950
26 awarded

Golden Lion

Organization
Venice Biennale
How often
Biennial
First awarded
2000
From 1950
12 awarded

Pritzker Prize

Organization
Pritzker Foundation
How often
Annual
First awarded
1978
From 1950
41 awarded

Innovator Awards

Organization
WSJ
How often
Annual
First awarded
2010
From 1950
7 awarded

National Desgin Award

Organization
Cooper Hewitt
How often
Annual
First awarded
2000
From 1950
26 awarded

Architecture Firm Award

Organization
AIA
How often
Annual
First awarded
1962
From 1950
55 awarded

Awarded Architects: Architects who won the lifetime achievement awards and/or innovation awards

Aldo Rossi	'90	557 Broadway 555 Broadway
Alvar Alto	'63	809 United Nations Plaza
Jean Nouvel	'01 '08	45-47 W 53rd St
César Pelli	'95	Three World Financial Center Four World Financial Center 900 3rd Avenue NY Mercantile Exchange
Norman Foster	'83 '94 '99	610 Lexington Avenue 425 Park Avenue
Fumihiko Maki	'11 '93 '93	51 Astor Place
Mies van der Rohe	'59 '60	Seagram Building
Philip Johnson	'78 '79	5 East 44th Street Sony Plaza Lipstick Building
Walter Gropius	'56 '59	200 Park Avenue

Awarded Firms: Architecture firms who won the AIA Architecture Firm Award

Davis Brody Bond	'75	100 William Five Manhattan West
Gensler	'00	233 Spring Street 161 6th Avenue
Kohn Pedersen Fox	'90	745 7th Avenue Five TIme Square One Vanderbilt 111 Murray Street 1100 6th Avenue 441 8th Avenue 10 Hudson Yards
Murphy / Jahn	05	425 Lexington Avenue 65 East 55th Street
Hugh Stubbins & Assoc.	'67	Citi Group Center

Awarded Architects & Firms: Architects/firms who won both the lifetime achievement award and AIA Architecture Firm Award

Edward L. Barnes	'07 '80	499 Park Avenue 7 Byant Park	
I.M.Pei	'10 '79 '14 '83 '03 '68	JP Morgan Chase HQ Deutsche Bank HQ 31 West 52nd Street 750 Seventh Avenue	
Kevin Roche	'93 '82 '74	125 West 55th Street Avenue of Americas Plaza 787 Seventh Avenue	
Skidmore Orell & Merril	'57 '83 '88 '96	12 West 57th Street Paine Webber Building Marine Midland Bank Bertelsmann Building 300 Madison Avenue 34-36 East 51st Street One Manhattan West Two Manhattan West 450 Lexington Avenue 461 5th Avenue 510 5th Avenue Worldwide Plaza 830 3rd Avenue	875 3rd Avenue 919 T3rd Avenue 28 Liberty

Building Image	Architect Property Name Sub-Market Year Built No. Floors Building Area Building Class
	Skidmore, Orwings & Merrill (SOM) 875 Third Avenue Midtown East 1982 29 FL 719,000 SF A
	Skidmore, Orwings & Merrill (SOM) 830 Third Ave Midtown East 1956 13 FL 144,000 SF A
	Skidmore, Orwings & Merrill (SOM) 510 5th Ave Midtown West 1954 5 FL 70,000 SF B
	Skidmore, Orwings & Merrill (SOM) 300 Madison Ave Midtown East 1910 16 FL 490,560 SF A
	Skidmore, Orwings & Merrill (SOM) PaineWebber Building Midtown West 1960 42 FL 1,749,000 SF A
	Kevin Roche JP Morgan Chase HQ Downtown 1988 47 FL 1,612,000 SF A
	Skidmore, Orwings & Merrill (SOM) 450 Lexington Midtown East 1992 32 FL 910,473 SF A

	Skidmore, Orwings & Merrill (SOM) Bertelsmann Bldg Midtown West 1990 44 FL 1,058,287 SF A
	Kevin Roche 31 West 52nd Street Midtown West 1986 30 FL 729,011 SF A
	Skidmore, Orwings & Merrill (SOM) 461 Fifth Ave Midtown East 1988 26 FL 200,000 SF A
	Skidmore, Orwings & Merrill (SOM) Marine Midland Bank Downtown 1967 52 FL 1,200,866 SF A
	I.M.Pei & Partners 499 Park Ave Midtown East 1981 28 FL 292,966 SF A
	Skidmore, Orwings & Merrill (SOM) 450 Lexington Midtown East 1992 32 FL 910,473 SF A
	Skidmore, Orwings & Merrill (SOM) 450 Lexington Midtown East 1992 32 FL 910,473 SF A
	Kevin Roche Deutsche Bank HQ Downtown 1988 47 FL 1,612,000 SF A

Edward Larrabee Barnes

125 West 55th Street
Midtown West
1989
23 FL
548,881 SF
A

Kevin Roche

750 Seventh Avenue
Midtown West
1989
36 FL
591,169 SF
A

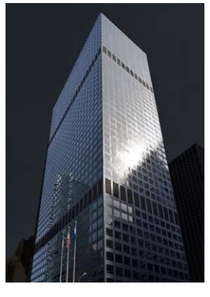
Skidmore, Orwings & Merrill (SOM)
Worldwide Plaza
Midtown West
1989
47 FL
2,055,583 SF
A

Kevin Roche

31 West 52nd Street
Midtown West
1986
30 FL
729,011 SF
A

Skidmore, Orwings & Merrill (SOM)
510 Fifth Avenue
Midtown West
1954
5 FL
61,159 SF
B

Skidmore, Orwings & Merrill (SOM)
34-36 E 51st St
Midtown East
1922
10 FL
41,000 SF
NA



Skidmore, Orwings & Merrill (SOM)
919 Third
Midtown East
1970
46 FL
1,316,758 SF
A

Skidmore, Orwings & Merrill (SOM)
12 West 57th Street
Midtown West
1904
11 FL
84,000 SF
A

Kevin Roche

750 Seventh Avenue
Midtown West
1989
36 FL
591,169 SF
A

Skidmore, Orwings & Merrill (SOM)
875 Third Avenue
Midtown East
1982
29 FL
719,000 SF
A

Skidmore, Orwings & Merrill (SOM)
450 Lexington Avenue
Midtown East
1992
32 FL
910,473 SF
A

Skidmore, Orwings & Merrill (SOM)
PaineWebber Building
Midtown West
1960
39 FL
1,749,000 SF
A

Edward Larrabee Barnes

125 West 55th Street
Midtown West
1989
23 FL
548,881 SF
A

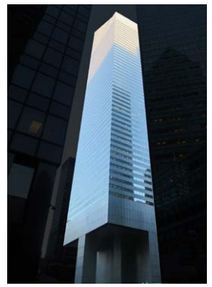
Skidmore, Orwings & Merrill (SOM)
28 Liberty
Downtown
1963
57 FL
2,215,030 SF
NA

I.M.Pei & Partners

499 Park Ave
Midtown East
1981
28 FL
292,966 SF
A

Skidmore, Orwings & Merrill (SOM)
Worldwide Plaza
Midtown West
1989
47 FL
2,055,583 SF
A

Pei Cobb Freed & Partners
7 Bryant Park
Midtown West
2015
30 FL
470,000 SF
A



Hugh Stubbins & Associates

Citigroup Center
Midtown East
1977
59 FL
1,800,000 SF
A

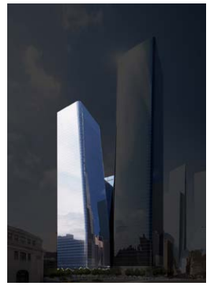
Skidmore, Owings & Merrill (SOM)
PaineWebber Building
Midtown West
1960
39 FL
1,749,000 SF
A

Kevin Roche

31 West 52nd Street
Midtown West
1986
30 FL
729,011 SF
A

Edward Larrabee Barnes

787 Seventh Avenue
Midtown West
1985
51 FL
1,706,007 SF
A



Skidmore, Owings & Merrill (SOM)
Two Manhattan West
Midtown West
2020
62 FL
2,000,000 SF
NA

Skidmore, Owings & Merrill (SOM)
One Manhattan West
Midtown West
2019
67 FL
2,000,000 SF
NA

Kevin Roche

Deutsche Bank HQ
Downtown
1988
47 FL
1,612,000 SF
A

Kohn Pedersen Fox Associates (KPF)
745 Seventh Avenue
Midtown West
2001
38 FL
1,020,000 SF
A

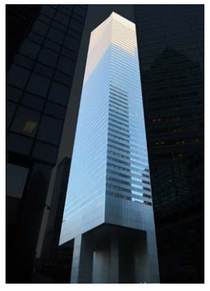
Gensler

233 Spring St
Downtown
1926
10 FL
249,148 SF
A

Murphy/Jahn

425 Lexington Ave
Midtown East
1987
31 FL
750,000 SF
A

Kohn Pedersen Fox Associates (KPF)
Five Times Square
Midtown West
2002
39 FL
1,101,779 SF
A



Hugh Stubbins and Associates
Citigroup Center
Midtown East
1977
59 FL
1,800,000 SF
A

Davis, Brody & Associates

100 William
Downtown
1972
21 FL
357,000 SF
A

Murphy/Jahn

Park Avenue Tower
Midtown East
1986
36 FL
615,857 SF
A

Kohn Pedersen Fox Associates (KPF)
future One Vanderbilt (partial)
Midtown East
1913
17 FL
160,482 SF
B

Kohn Pedersen Fox Associates (KPF)
111 Murray Street
Downtown
1984
10 FL
145,525 SF
NA

Davis, Brody & Associates

Five Manhattan West
Midtown West
1969
16 FL
1750,000 SF
A

Murphy/Jahn

425 Lexington Ave
Midtown East
1987
31 FL
750,000 SF
A

Davis, Brody & Associates

100 William
Downtown
1972
21 FL
357,000 SF
A

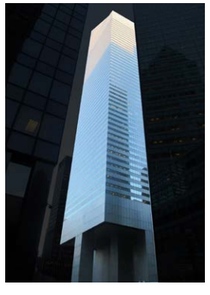
Kohn Pedersen Fox Associates (KPF)
Five Times Square
Midtown West
2002
39 FL
1,101,779 SF
A

Davis, Brody & Associates

Five Manhattan West
Midtown West
1969
16 FL
1,750,000 SF
A

Murphy/Jahn

Park Avenue Tower
Midtown East
1986
36 FL
619,631 SF
A



Hugh Stubbins & Associates

Citigroup Center
Midtown East
1977
59 FL
1,800,000 SF
A

Kohn Pedersen Fox Associates (KPF)
Five Times Square
Midtown West
2002
39 FL
1,132,865 SF
A

Ludwig Mies van der Rohe

Seagram Building
Midtown East
1958
38 FL
820,000 SF
A

Gensler

One Soho Square
Downtown
1904
15 FL
450,000 SF
B

Gensler

One Soho Square
Downtown
1926
10 FL
316,000 SF
A

Kohn Pedersen Fox Associates (KPF)
HBO
Midtown West
1906
15 FL
344,000 SF
A

Kohn Pedersen Fox Associates (KPF)
HBO
Midtown West
1906
15 FL
344,000 SF
NA

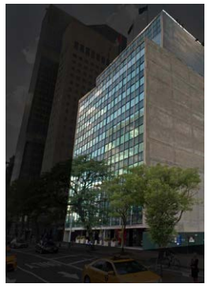
Kohn Pedersen Fox Associates (KPF)
441 Ninth
Midtown West
1953
8 FL
423,000 SF
NA

Kohn Pedersen Fox Associates (KPF)
10 Hudson Yards
Midtown West
2016
52 FL
1,813,465 SF
A

Philip Johnson / Alan Ritchie Architects
5 E 44th St
Midtown East
1940
6 FL
15,726 SF
NA

Philip Johnson

Lipstick Building
Midtown East
1986
34 FL
592,000 SF
A



Alvar Aalto

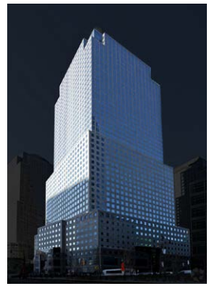
809 United Nations Plaza
Midtown East
1964
11 FL
100,000 SF
NA

Foster + Partners

Fmr YMCA
Midtown East
1926
10 FL
81,017 SF
NA

Philip Johnson

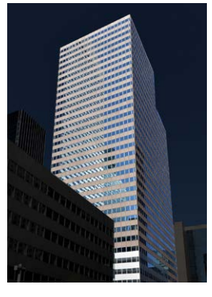
Sony Plaza
Midtown East
1984
36 FL
855,000 SF
A



Cesar Pelli & Associates
Three World Financial Center
Downtown
1986
52 FL
2,100,000 SF
A

Ludwig Mies van der Rohe

Seagram Building
Midtown East
1958
38 FL
820,000 SF
A



Cesar Pelli & Associates

900 Third Ave
Midtown East
1984
36 FL
595,105 SF
A

Philip Johnson

Lipstick Building
Midtown East
1986
34 FL
592,000 SF
A

Foster + Partners

Shangri-La hotel project
Midtown East
1926
10 FL
81,017 SF
NA

Walter Gropius

MetLife Building
Midtown East
1963
58 FL
2,840,000 SF
A

Ludwig Mies van der Rohe

Seagram Building
Midtown East
1958
38 FL
820,000 SF
A

Philip Johnson / Alan Ritchie Architects
5 E 44th St
Midtown East
1940
6 FL
15,726 SF
NA

Foster + Partners

425 Park
Midtown East
1957
31 FL
567,340 SF
A

Fumihiko Maki
Cooper Union Engineering
Dev Site
Midtown South
1960
9 FL
158,816 SF
A

Philip Johnson

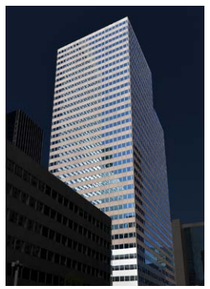
Lipstick Building
Midtown East
1986
34 FL
592,000 SF
A

Aldo Rossi

Scholastic
Midtown South
1999
10 FL
112,500 SF
NA

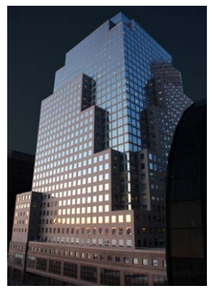
Aldo Rossi

555 Broadway
Midtown South
1900
12 FL
216,000 SF
B



Cesar Pelli & Associates

900 Third Ave
Midtown East
1984
36 FL
595,105 SF
A



Cesar Pelli & Associates

Four World Financial Center
Downtown
1986
34 FL
2,084,079 SF
A

Foster + Partners

425 Park Avenue
Midtown East
1957
31 FL
567,340 SF
A

Cesar Pelli & Associates
New York Mercantile Exchange
Downtown
1997
17 FL
502,000 SF
A

Ludwig Mies van der Rohe

Seagram Building
Midtown East
1958
38 FL
820,000 SF
A

Ateliers Jean Nouvel

53W53
Midtown West
2000
5 FL
28,291 SF
NA

Philip Johnson

Sony Plaza
Midtown East
1984
36 FL
855,000 SF
A

Fumihiko Maki

51 Astor Place
Midtown South
2013
13 FL
400,000 SF
A

CONTROL GROUP DATA

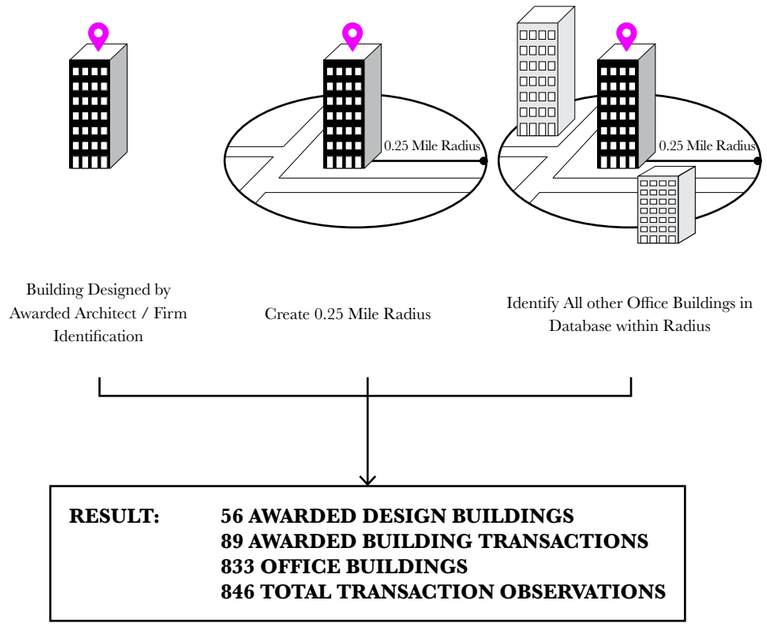


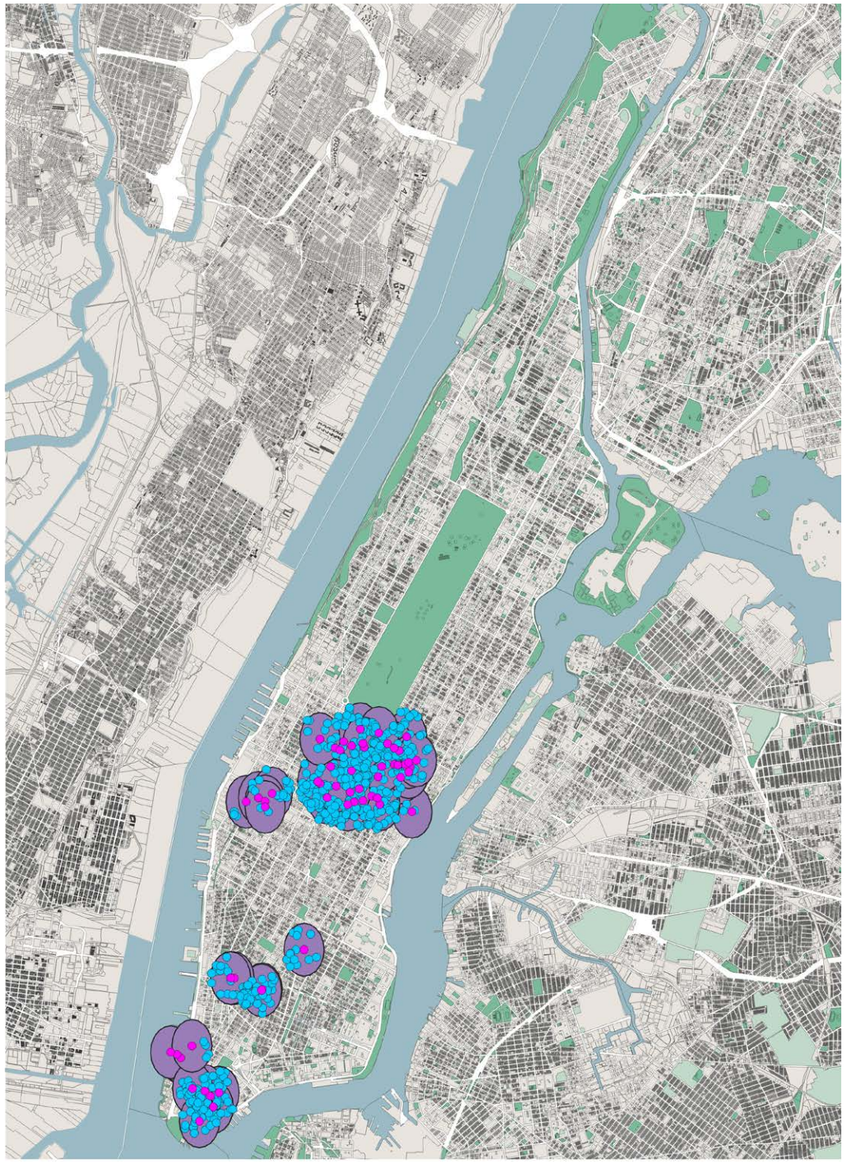
Figure 13 - Control Group Data Process Diagram

In order to understand the effect of the awarded architects and firms on the transaction price, we matched each of the awarded buildings in this sample to nearby commercial buildings in the similar location using the Geographic Information System (GIS). Out of 2,399 office building transactions identified in the integrated database constructed combining RCA and Compstak, 52 buildings were designed by awarded architects/firms. Based on the latitude and longitude of each treated building we created a one quarter mile radius buffer zone to capture all the commercial buildings that intersect with the integrated database. In this way, we created 4 clusters of nearby office buildings. Each small cluster—0.2 square miles—contains one awarded building and at least one non-awarded nearby building. In addition, we have collected the information on architects for all buildings in the control group data set ■

Figure 14-1 - Control Group Data Process, GIS

FIGURE 13.
Note: The diagram illustrates how the data was filtered to construct the control group data set.

FIGURE 14.
Note: The series of maps show the location of the treated buildings, quarter mile radius, and the filtered data points.



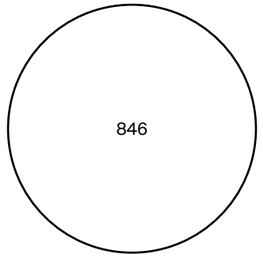
Identify All other
Office Buildings in Database within Radius

Figure 14-2 - Control Group Data Process, GIS

FIGURE 14.
Note: The series of maps show the location of the treated buildings, quarter mile radius, and the filtered data points.

DESCRIPTIVE STATISTICS

TOTAL TRANSACTION OBSERVATIONS



INTEREST VARIABLES (NUMBER OF BUILDING TRANSACTIONS)

Figure 15-1 - Descriptive Statistics
Note: The graphs represent the statistics of each variable used in the regression analysis.

The transaction sample data set contains 489 commercial office buildings with 846 transaction observations. Among which 52 buildings were designed by awarded architects/ firms (treated group) and 437 buildings were designed by non-awarded architects (control group). Related transactions were observed 89 and 757 times respectively. In addition, information on the architects and firms are assigned to each building in the data set. Out of 318 architects and firms in total, 194 were non-awarded architects, 20 were awarded architects and 104 architects were unidentifiable ■

BUILDING TRANSACTION PRICE (AWARDED DESIGNS)

	N	Min	Max	Mean	SD
Transaction Price	89	$ 4.4 M	$ 2.98 B	$ 607.8 M	$ 618.9 M
Log (Price)	89	6.64	9.47	8.53	0.55
Price per SF	89	$ 109	$ 1,951	$ 731	$ 404
Log (PSF)	89	2.04	3.29	2.79	0.26

BUILDING TRANSACTION PRICE (NON-AWARDED DESIGNS)

	N	Min	Max	Mean	SD
Transaction Price	757	$ 1 M	$ 3.4 B	$ 178.8 M	$ 339.7 M
Log (Price)	757	6	9.53	7.79	0.65
Price per SF	757	$ 30.8	$ 6,800	$ 630.6	$ 580.1
Log (PSF)	757	1.49	3.83	2.68	0.32

MARKET CHARACTERISTICS

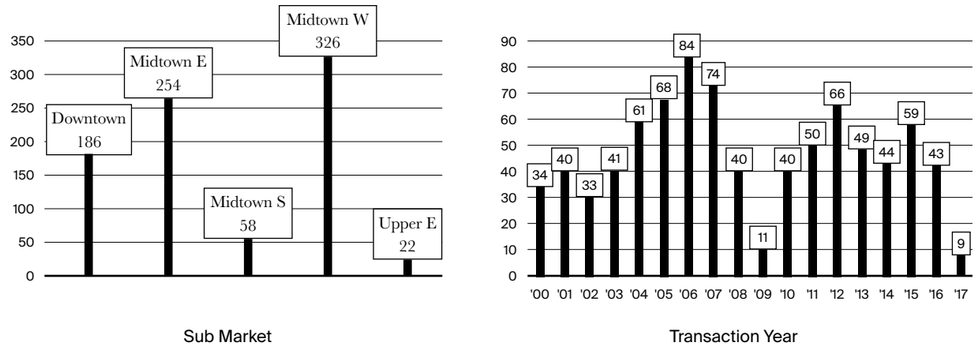
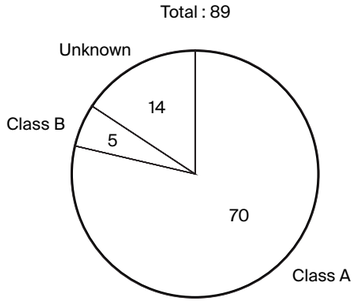


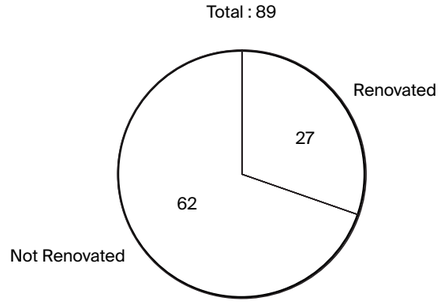
Figure 15-2 - Descriptive Statistics
Note: The graphs represent the statistics of each variable used in the regression analysis.

BUILDING CHARACTERISTICS (AWARDED DESIGNS)

BUILDING CLASS



NUMBER OF RENOVATED BULIDINGS

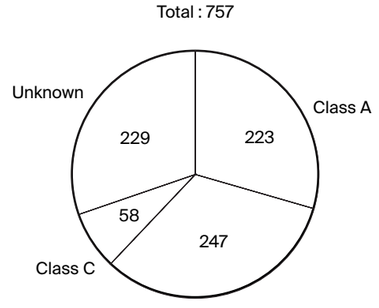


	N	Min	Max	Mean	SD
Age	89	0	118	46.27	28.33
Number of Floors	89	5	67	30.39	15.71
Area SqFt	89	15,726	2,84 M	855,757	666,291
Land Area SqFt	89	2,700	150,718	43,574	32,104
Walk Score	89	94	100	99.16	0.95

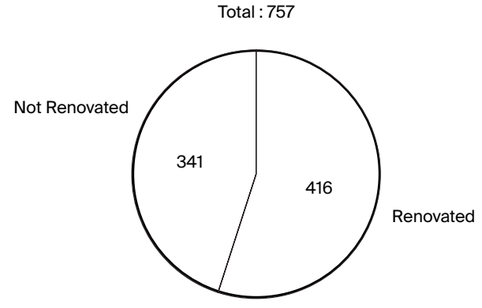
Figure 15-3 - Descriptive Statistics
Note: The graphs represent the statistics of each variable used in the regression analysis.

BUILDING CHARACTERISTICS (NON-AWARDED DESIGNS)

BUILDING CLASS



NUMBER OF RENOVATED BULIDINGS



	N	Min	Max	Mean	SD
Age	757	7	208	86.3	26.64
Number of Floors	757	2	77	18.48	13.21
Area SqFt	757	2,365	2.63 M	331,081	455,666
Land Area SqFt	757	800	130,680	16,220	19,074
Walk Score	757	92	100	99.28	0.96

Figure 15-4 - Descriptive Statistics
Note: The graphs represent the statistics of each variable used in the regression analysis.

TRANSACTION CHARACTERISTICS (AWARDED DESIGN)

Total : 89

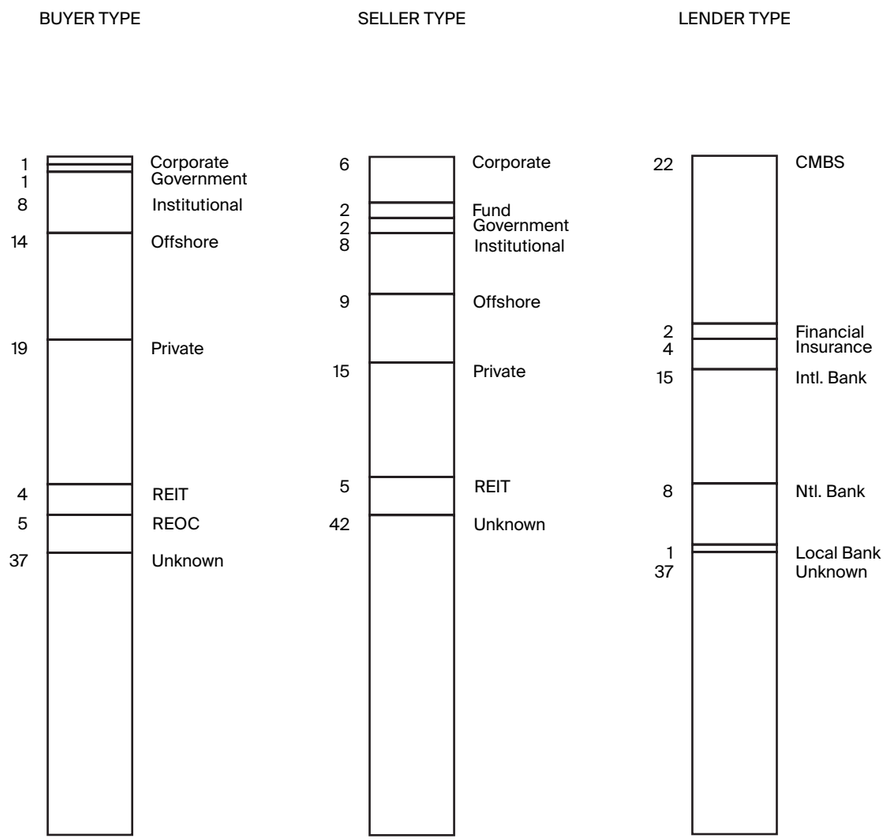


Figure 15-5 - Descriptive Statistics
Note: The graphs represent the statistics of each variable used in the regression analysis.

TRANSACTION CHARACTERISTICS (NON-AWARDED DESIGN)

Total : 757

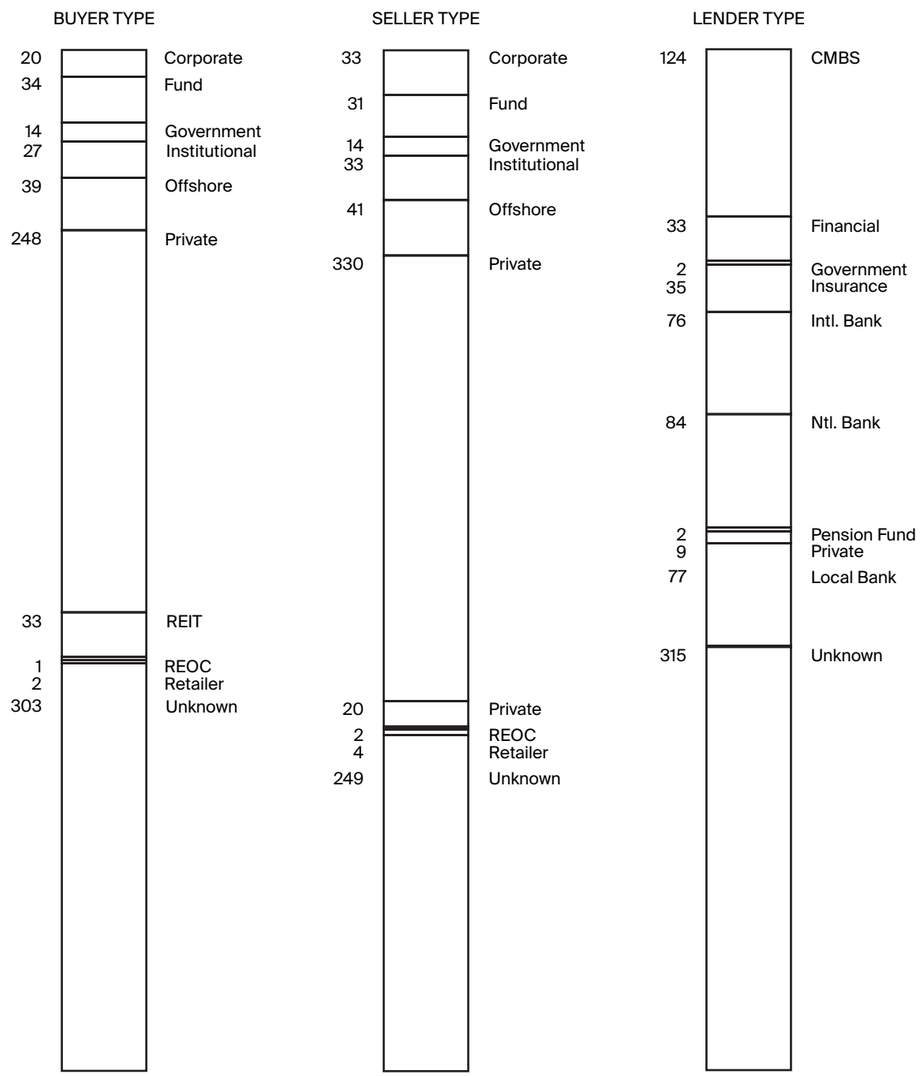


Figure 15-6 - Descriptive Statistics
Note: The graphs represent the statistics of each variable used in the regression analysis.

METHODOLOGY

$$\log Pi = \alpha + \beta Xi + \delta gi + \varepsilon i$$

i	Commercial Office Buildings
$\log Pi$	Logarithm of the Transaction Price
α	Constant
β	Estimated Coefficients for Hedonic Characteristics
Xi	Vector of Hedonic Characteristics(e.g. Location, Transaction Time, Building Features, and Transaction Features)
δ	Estimated Coefficients for Dummy Variable
gi	Vector of Dummy Variables (e.g. Value of 1 if buliding i is designed by awarded architects or firms)
εi	Error Term

Figure 16 - Semi-Log Equation
Note: The equation related the transaction price to the hedonic characteristics of a buliding

We use the MIT Real Estate Innovation Lab NYC Wide Data database to estimate a semi-log equation relating the transaction price to the hedonic characteristics of a building:

$$\log Pi = \alpha + \beta Xi + \delta gi + \varepsilon i$$

The dependent variable is the logarithm of the transaction price Pi in commercial office buildings i. Xi is a vector of hedonic characteristics (e.g., location and time, building features, and transaction features) for buildings i, and gi is a vector of dummy variables with a value of 1 if building i is designed by Awarded Architects, Awarded Firms, or Awarded Architects and Firms and 0 otherwise. α is a constant, β and δ are estimated coefficients and εi is an error term.

Using the logarithm of transaction price instead of the transaction price per square foot may cause measurement error for the size and construction cost may vary over the size of the building. However, we have conducted the same hedonic analysis using the transaction price per sf for every model and a substantial pricing difference was not found. In addition, looking at the functional form of the results, the coefficients and the standard errors were comparable. This could mean the sample data set contains relatively similar scale of buildings therefore the difference in using transaction price and transaction price per sf diminishes. The regression analysis using the transaction price per sf can be found in the Appendix section ■

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RESULTS: AWARDED DESIGNS AND TRANSACTION PRICES

Regression Fixed Effects Log (Price)	(1) Model 1	(2) Model 2	(3) Model 3
Awarded Designs	1.530*** [0.144]	0.171*** [0.059]	0.231*** [0.059]
Constant	17.721*** [0.239]	6.757** [2.625]	8.525*** [2.960]
Location & Transaction Time FE	YES	YES	YES
Building Features FE	NO	YES	YES
Transaction Features FE	NO	NO	YES
Observations	846	846	846
R-squared	0.229	0.899	0.906
F Adj R-Squared	0.21	0.90	0.90

Robust standard errors in brackets
*** p<0.01, ** p<0.05, * p<0.1

Table 4 - Awarded Design, Base Case No Award

Awarded Designs Buildings that are designed by awarded architects and/or firms

Table 3 shows the regression analysis results for the integrated transaction database. Having the logarithm of the transaction price as a dependent variable and relating it to a set of hedonic characteristics. The results explain 90.6% of the variation in the logarithm of transaction price with an adjusted R-squared of 90%. Column (1) to (3) measures the different fixed effects. Column (1) controls for the location and transaction time. Column (2) controls for building features by adding variables such as building age, number of floors, building area, land parcel area, building class, renovation, and walk score, in addition to the fixed effects of Column (1). Column (3) controls for the transaction features by including buyer type, seller type, and lender type, in addition to the fixed effects of Column (1) and Column (2).

The regression result shows, ceteris paribus, Awarded Designs are transacted with a 23.1% premium compared to non-awarded buildings with a positive and significant coefficient. Coefficients for each variable used in the regression analysis can be found in the Appendix section.

In addition, in terms of location, relative to Midtown West, properties in Downtown are valued 30% less, properties in Midtown East are traded with a premium of 9%, and properties in the Upper East Side are transacted with a premium of 44.7%. Class A buildings compared to other building classes are valued with a premium of 37%, and finally larger and taller buildings transacted with a significant premium. All analysis has also been modeled for the log of the price per square foot. Results are statistically similar and available upon request ■

RESULTS: AWARDED ARCHITECTS & FIRMS AND TRANSACTION PRICES

Regression Fixed Effects Log (Price)	(1) Model 1	(2) Model 2	(3) Model 3
Awarded Architects	1.124*** [0.293]	0.089 [0.095]	0.177* [0.102]
Awarded Firms	1.670*** [0.227]	0.248** [0.113]	0.321*** [0.100]
Awarded Architects & Firms	1.729*** [0.186]	0.182*** [0.062]	0.209*** [0.069]
Constant	17.704*** [0.243]	6.836*** [2.635]	8.494*** [2.962]
Location & Transaction Time FE	YES	YES	YES
Building Features FE	NO	YES	YES
Transaction Features FE	NO	NO	YES
Observations	846	846	846
R-squared	0.232	0.900	0.906
F Adj R-Squared	0.21	0.90	0.90

Robust standard errors in brackets
*** p<0.01, ** p<0.05, * p<0.1

Table 5 - Awarded Architects and Awarded Firms, Base Case No Award

Awarded Architects Buildings that are designed by architects who won the lifetime achievement award

Awarded Firms Buildings that are designed by architecture firms who won the AIA Architecture Firm Award

Awarded Architects & Firms Buildings that are designed by architects/firms who won both the lifetime achievement award and AIA Architecture Firm Award

We further broke down the “Awarded Designs” variable to “Awarded Architects”, “Awarded Firms”, and “Awarded Architects and Firms”. Table 4 shows the regression analysis results for the integrated transaction database. Having the logarithm of the transaction price as a dependent variable and relating it to a set of hedonic characteristics. The results explain 90.6% of the variation in the logarithm of transaction price with an adjusted R-squared of 90%. Column (1) to (3) measures the different fixed effects. Column (1) to (3) measures the different fixed effects. Column (1) controls for the location and transaction time. Column (2) controls for building features by adding variables such as building age, number of floors, building area, land parcel area, building class, renovation, and walk score, in addition to the fixed effects of Column (1). Column (3) controls for the transaction features by including buyer type, seller type, and lender type, in addition to the fixed effects of Column (1) and Column (2).

Ceteris paribus, the regression results show all three treated categories, Awarded Architects, Awarded Firms, and Awarded Architects and Firms show 17.7%, 32.1%, and 20.9% transaction price premium respectively compared to non-awarded buildings with a positive and significant coefficient. Coefficients for each variable used in the regression analysis can be found in the Appendix.

Keeping constant the observable characteristics, the result of the regression suggests Awarded Firms achieve a higher sales premium compared to Awarded Architects and Awarded Architects and Firms. Given the significant positive coefficient of building age and building size, this may be related to the fact that the buildings designed by Awarded Firms are on average bigger and more recently built compared to the other award categories ■

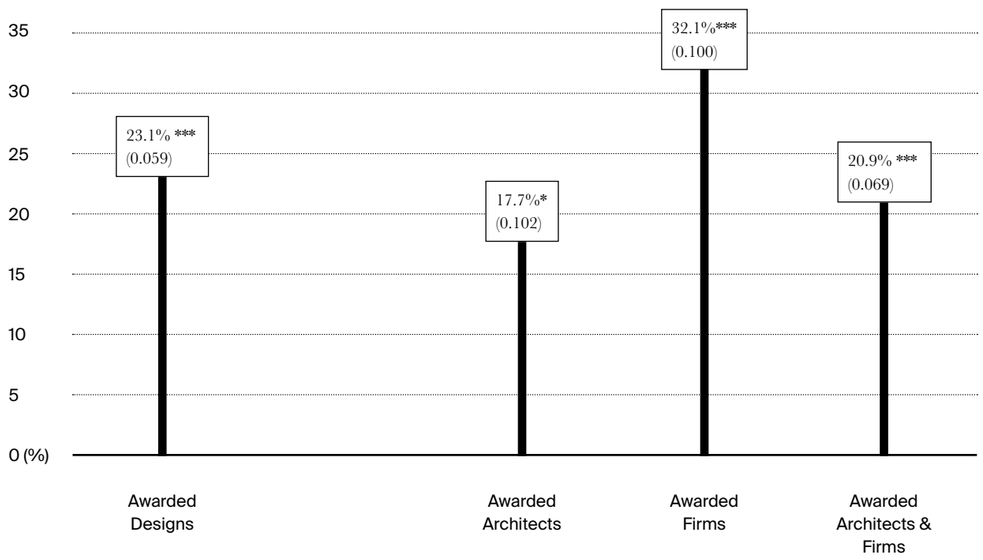

Table 4 Result

Table 5 Result

SIGNIFICANCE***
Asterisks in a regression table indicate the level of the statistical significance of a regression coefficient.

*** p<0.01, ** p<0.05, * p<0.1

COEFFICIENT %
The Regression Coefficient tells about the change in the value of dependent variable corresponding to the unit change in the independent variable.

NOTE:
The regression model controls for location and transaction time, building features (age, number of floors, building area, land parcel area, building class, renovation, and walk score), and transaction features (buyer type, seller type, and lender type)

Figure 17 - Regression Analysis Result Comparison

Note: Ceteris paribus, the hedonic analysis result shown in Figure 15 indicates that buildings designed by awarded architects/firms are transacted with a 23.1% premium relating to buildings that are designed by non-awarded architects. We further specified the study by looking into different type of awards with three categorical variables, Awarded Architects, Awarded Firms, and Awarded Architects & Firms. The result suggests that ceteris paribus, Awarded Architects, Awarded Firms, and Awarded Architects and Firms show 17.7%, 32.1%, and 20.9% transaction price premium respectively compared to non-awarded buildings.

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ROBUSTNESS: ALL ARCHITECTS & FIRMS AND TRANSACTION PRICES

As a robustness check, we specified the Awarded Design category by expanding the categorical variable to include data on individual architects/firms to ensure that no one designer was driving the result of one building.

We have studied the regression analysis result on the relative transaction premiums associated with awarded architects using the non-awarded architects as a base case. The result explained 90.7% of the variation in the logarithm of transaction price with an adjusted R-squared of 90%. The regression model used the same methodology of three fixed effect models that have been previously described and the regression result represents the coefficients and significance of each awarded architects based on the results of the model (3) which controls for location and transaction time, building features, and transaction features.

Ceteris paribus, the results mainly have a low statistical significance, but some with a cautionary threshold indicate that compared to buildings designed by non-awarded architects. The architect Ludwig Mies van der Rohe achieved the most transaction premium of 60.6% with a p-value less than 0.001. Followed by KPF (51.4%), and Hugh Stubbins and Associates (27.4%). Positively awarded designers represent one-third of the transaction sample, the others are not statistically significantly different from zero. However, these designers have small samples.

Looking into the architects and the associated buildings that have a significant positive coefficient, a number of overlapping influencing factors for the transaction premium can be found. To name a few, the buildings that are showing a transaction premium have achieved a landmark status or became a recognizable building for a certain industry, the most innovative construction technology was deployed at the time of construction, rich historical and cultural background, high-quality interior, and amenities such as a celebrated restaurants or cafes are in place. In addition, a number of observations were likely to be valued higher due to the potential development value associated with the land or as a reflection of the major renovation of the building.

However, the result should be considered with extreme caution. There is a probability of measurement error due to the small number of differentiating samples related to each architect. In other words, the result does not suggest performance measurements for individual architecture firms since the results are based on a small differentiating sample. On average 4.9 and 2.5 transaction observations were found per architect ■

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CONCLUSION

LEFT, IMAGE 5
Rem Koolhaas & Madelon Vriesendorp, 1972, The CIty of the Captive Globe, *Delirious New York*, page 294-295

This study expanded the conversation on the value of design by investigating the transaction prices of commercial buildings associated with award-winning architects/firms and their building design in Manhattan over the 2000 to 2017 period.

In line with the relative studies using the awards as means to identify architects who have won high status among their peers, this study intended to broaden the scope of understanding design by adding substantially more controls in the model: incorporating buyer and seller decisions for all of the transaction over time, specifying the type of awards, and adding information on architects to every building in the sample data set. The added variables improved the overall fit of the model as well as explaining the variation in price. It is important to bear in mind that this empirical study does not intend to measure the weighted skillfulness or profitability of individual architects/firms. In essence, this study is an endeavor to recognize the authorship of each building and study their impact on the price dynamics of commercial office buildings in Manhattan, New York.

When controlling for location and transaction time, building features and transaction features, the result of the hedonic analysis suggests that buildings designed by awarded architects/firms are transacted with a 23.1% premium than buildings that are designed by non-awarded architects. We further specified the study by looking into different type of awards with three categorical variables, Awarded Architects: who have won lifetime achievement awards and/or contemporary innovation awards, Awarded Firms: companies that have received the AIA Architecture Firm Award, and Awarded Architects & Firms: who have won both the lifetime achievement award/innovation award and AIA Architecture Firm Award. The result suggests that ceteris paribus, Awarded Architects, Awarded Firms, and Awarded Architects and Firms show 17.7%, 32.1%, and 20.9% transaction price premium respectively compared to non-awarded buildings.

Moreover, we have expanded the categorical variable to study the relative transaction premiums associated with awarded architects using the non-awarded architects as a base case. Ceteris paribus, the result shows a significant transaction premium of 60.6% on the buildings designed by Ludwig Mies van der Rohe relative to the buildings designed by non-awarded architects, followed by KPF (51.4%), and Hugh Stubbins and Associates (27.4%). However, the suggestive results should be treated with extra caution due to the small number of observations related to each architect and firms. The result does not suggest any measurements related to the architecture firm's performance since the results are based on a small differentiating sample. On average 4.9 transaction observations were found per architect.

In general, this study has focused on a quite precise subject that is to understand and acknowledge the architect's influence on the commercial office building's transaction value. In other words, it was a mere attempt to figuratively understand the value associated with the designers of the built environment. The results indeed show a significant premium associated with the architects, however, it only illustrates a small part of the relationship of design and value that is based on price rather than the performance of the building design. Further improvement can be made by integrating the related cost associated with design and identifying other potential omitted variables: for example, the premium associated with the awarded architects may be influenced by the larger SF of a building, higher construction budget, better interior quality, or other endogenous factors.

In recent years, due to increased market education and growth in the number of leading examples, investing in high-quality design became a standard for the real estate market in New York. Despite the growing interest, however, a limited number of studies and discussions have been generated to help create a shared better valued surrounding the subject of design. In this study, we have identified that the difficulty of obtaining data related to design performance being one of the biggest hurdles in enabling further studies to disentangle the value of design. As a first step, a creative approach in gathering a new set of data related to the design performance is needed. For example, the design-related elements that we found in the buildings that have gained significant transaction premium, such as iconicity, relevance in a certain industry, adopting the most innovative construction technology, rich cultural and historical background, high-quality interior, can be studied as new data points in the future studies. We believe combining the new measurements with the accumulated knowledge on design generated by architects will enable us to open up a substantial area for future research regarding the value of design, and moreover will help create an agency for design in the realm of finance and economics ■

REFERENCES

Asabere P. K., Hachey G. & Grubaugh S., 1989, Architecture, historic zoning, and the value of homes, *Journal of Real Estate Finance and Economics*, 2(3), pp. 181–195.

Booth R., 2006, Architect Foster brands it like Beckham to grab a fee, *The Sunday Times*, 22 October, page 42

Charles H., 2014, Architect will crit for coffee: The economies of architecture, *Yale School of Architecture Journal Perspecta 427: Money*, MIT Press, page 156–161

CityRealty, 2018, The CityRealty 100 index, Retrieved from, *https://www.cityrealty.com/nyc/building-indices/the-cityrealty-100/1*

CityRealty, 2018, Star-architect condo index, Retrieved from, *https://www.cityrealty.com/nyc/building-indices/starchitect-condos/building-list/112*

Coxe W.. Hartung N. F., Hochberg H. H., Lewis B. J. Mattox R. F. and Piven P. A. 1986. Charting Your Course: Master Strategies for Organizing and Managing Architectural firms. *Architectural Technology*, May/June, 52–58.

Deamer P., 2014, WORK, *Yale School of Architecture Journal Perspecta 427: Money*, MIT Press, page 28–40

Fein S., 2007, Starchitect branding and the cost of "effortless living" or another episode in the continuing quest for social status through design, *Harvard Design Magazine*, 26, retrieved from http://www.gsd.harvard.edu/hdm.

Foster H., 2008, *Image Building. In Architecture Between Spectacle and Use*, Williamstown, Massachusetts: Sterling and Francine Clark Art Institute, page 164–179

Frampton K., 2005, The work of architecture in the age of commodification, *Harvard Design Magazine*, 23, page 1–5

Ponzini D., (2014) The Values of Starchitecture: Commodification of Architectural Design in Contemporary Cities, *Organizational Aesthetics*: Vol. 3: Iss. 1, 10–18.

Ponzini D., Nastasi M. 2011. *Starchitecture. Scenes, Actors and Spectacles in Contemporary Cities*. Turin: Allemandi.

Rogers E. M., 1962, *Diffusion of Innovations*, New York, Free Press of Glencoe

Song Y. & Knaap, G, 2003, New urbanism and housing values: A disaggregate assessment, *Journal of Urban Economics*, page 218–238.

Hough D. E. & Kratz C. G., 1982, Can 'Good' Architecture Meet the Market Test?, *Journal of Urban Economics*, 14, page 40–54.

Nase I., Berry J. & Adair A., 2016, Impact of quality-led design on real estate value, *Journal of Property Research*, 33:4, page 309–331

Fuerst F., McAllister P. & Murray C. B., 2011, Designer Buildings: Estimating the economic value of 'signature' architecture, *Journal of Environment & Planning*, 43, page 166–184

Vandell K. D. & Lane J. S., 1989, The Economics of Architecture and Urban Design, *AREUEA Journal*, 17, No. 2

APPENDIX

Regression Results: Awarded design (base case no award)

Regression Fixed Effects Log (Price)	(1) Model 1	(2) Model 2	(3) Model 3
Awarded Designs	1.530*** [0.144]	0.171*** [0.059]	0.231*** [0.059]
Constant	17.721*** [0.239]	6.757** [2.625]	8.525*** [2.960]
Location & Transaction Time FE	YES	YES	YES
Building Features FE	NO	YES	YES
Transaction Features FE	NO	NO	YES
Observations	846	846	846
R-squared	0.229	0.899	0.906
F Adj R-Squared	0.21	0.90	0.90

Robust standard errors in brackets
*** p<0.01, ** p<0.05, * p<0.1

Regression Results: Awarded design (base case no award)

Treated Regression Log (Price)	(3) Model 3
Awarded Designs	0.231*** [0.059]
Downtown	-0.299*** [0.053]
Midtown East	0.090** [0.045]
Midtown South	0.068 [0.085]
Upper East Side	0.447*** [0.125]
Transaction 2001	0.046 [0.112]
Transaction 2002	0.179 [0.128]
Transaction 2003	0.124 [0.116]
Transaction 2004	0.268*** [0.088]
Transaction 2005	0.495*** [0.099]
Transaction 2006	0.727*** [0.097]
Transaction 2007	0.979*** [0.095]
Transaction 2008	1.033*** [0.108]
Transaction 2009	0.688*** [0.172]
Transaction 2010	0.518*** [0.134]
Transaction 2011	0.739*** [0.095]
Transaction 2012	0.864*** [0.105]
Transaction 2013	1.037*** [0.120]
Transaction 2014	1.206*** [0.112]
Transaction 2015	1.269*** [0.101]
Transaction 2016	1.390*** [0.115]

Variable	(3)
Transaction 2017	1.221*** [0.116]
Age	-0.006** [0.003]
Age Squared	0.000** [0.000]
Number Floors	0.008*** [0.002]
Log(SqFt)	0.724*** [0.039]
Log(Land SqFt)	0.021 [0.042]
Class A	0.369*** [0.087]
Class B	0.050 [0.060]
Class C	-0.210** [0.086]
Renovated	-0.004 [0.039]
Walk Score	-0.001 [0.029]
BT Corp	-0.042 [0.111]
BT Fund	0.159* [0.091]
BT Gov't	-0.089 [0.086]
BT Inst	0.125* [0.070]
BT Offshore	0.105 [0.082]
BT Private	-0.106** [0.044]
BT REIT	0.086 [0.090]
BT REOC	-0.653** [0.281]
BT Retailer	-0.233* [0.138]
ST Corp	0.006 [0.101]

Variable	(3)
ST Gov't	0.229*** [0.083]
ST Inst	0.146 [0.132]
ST Offshore	0.096 [0.075]
ST Private	0.054 [0.094]
ST REIT	0.164** [0.066]
ST REOC	0.487** [0.237]
ST retailer	0.306 [0.253]
LT CMBS	0.080 [0.054]
LT Financial	-0.107 [0.083]
LT Government Agency	-0.159 [0.131]
LT Insurance	-0.010 [0.062]
LT International Bank	0.095 [0.061]
LT National Bank	0.014 [0.064]
LT Pension Fund	0.596** [0.240]
LT Private	0.071 [0.075]
LT Regional/Local Bank	-0.136* [0.074]
Constant	8.525*** [2.960]
Observations	846
R-squared	0.906
F Adj R-Squared	0.90

Robust standard errors in brackets
*** p<0.01, ** p<0.05, * p<0.1

Regression Results: Awarded Architects & Firms (base case no award)

Regression Fixed Effects Log (Price)	(1) Model 1	(2) Model 2	(3) Model 3
Awarded Architects	1.124*** [0.293]	0.089 [0.095]	0.177* [0.102]
Awarded Firms	1.670*** [0.227]	0.248** [0.113]	0.321*** [0.100]
Awarded Architects & Firms	1.729*** [0.186]	0.182*** [0.062]	0.209*** [0.069]
Constant	17.704*** [0.243]	6.836*** [2.635]	8.494*** [2.962]
Location & Transaction Time FE	YES	YES	YES
Building Features FE	NO	YES	YES
Transaction Features FE	NO	NO	YES
Observations	846	846	846
R-squared	0.232	0.900	0.906
F Adj R-Squared	0.21	0.90	0.90

Regression Results: Awarded Architects & Firms (base case no award)

Treated Regression Log (Price)	(3) Model 3
Awarded Architects	0.177* [0.102]
Awarded Firms	0.321*** [0.100]
Awarded Architects & Firms	0.209*** [0.069]
Downtown	-0.300*** [0.053]
Midtown East	0.093** [0.045]
Midtown South	0.074 [0.086]
Upper East Side	0.447*** [0.125]
Transaction 2001	0.042 [0.111]
Transaction 2002	0.176 [0.128]
Transaction 2003	0.123 [0.116]
Transaction 2004	0.266*** [0.088]
Transaction 2005	0.495*** [0.099]
Transaction 2006	0.724*** [0.097]
Transaction 2007	0.975*** [0.095]
Transaction 2008	1.030*** [0.108]
Transaction 2009	0.686*** [0.171]
Transaction 2010	0.516*** [0.134]
Transaction 2011	0.736*** [0.096]
Transaction 2012	0.861*** [0.105]
Transaction 2013	1.034*** [0.120]
Transaction 2014	1.197*** [0.112]

Variable	(3)
Transaction 2015	1.267*** [0.101]
Transaction 2016	1.378*** [0.115]
Transaction 2017	1.201*** [0.113]
Age	-0.006** [0.003]
Age Squared	0.000** [0.000]
Number Floors	0.008*** [0.002]
Log(SqFt)	0.723*** [0.039]
Log(LandSqFt)	0.021 [0.042]
Class A	0.365*** [0.087]
Class B	0.050 [0.060]
Class C	-0.211** [0.086]
Renovated	-0.002 [0.039]
Walk Score	-0.000 [0.030]
BT Corp	-0.042 [0.111]
BT Fund	0.160* [0.091]
BT Gov't	-0.088 [0.086]
BT Inst	0.124* [0.069]
BT Offshore	0.113 [0.082]
BT Private	-0.107** [0.044]
BT REIT	0.080 [0.090]
BT REOC	-0.633** [0.310]
BT Retailer	-0.226 [0.138]

Variable	(3)
ST Corp	0.007 [0.101]
ST Gov't	0.228*** [0.083]
ST Inst	0.142 [0.129]
ST Offshore	0.102 [0.075]
ST Private	0.058 [0.094]
ST REIT	0.160** [0.064]
ST REOC	0.484** [0.238]
ST retailer	0.308 [0.250]
LT CMBS	0.081 [0.054]
LT Financial	-0.107 [0.083]
LT Government Agency	-0.158 [0.131]
LT Insurance	-0.011 [0.063]
LT International Bank	0.094 [0.061]
LT National Bank	0.014 [0.064]
LT Pension Fund	0.604** [0.240]
LT Private	0.071 [0.074]
LT Regional/Local Bank	-0.136* [0.074]
Constant	8.494*** [2.962]
Observations	846
R-squared	0.906
F Adj R-Squared	0.90

Robust standard errors in brackets
*** p<0.01, ** p<0.05, * p<0.1

ACKNOWLEDGMENTS

I'm eternally grateful for the optimism, encouragement, and knowledge of my brilliant advisor, Dr. Andrea Chegut.

I would also like to express gratitude to my talented colleagues at MIT Real Estate Innovation Lab and MSRED.

And finally, as ever, thanks and love to my family.

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