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Designer Buildings: An Evaluation of the Price Impacts of Signature Architects.

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Abstract

This study investigates whether commercial offices designed by signature architects in the United States achieve rental premiums compared to commercial offices designed by non-signature architects. Focusing on buildings designed by winners of the Prizker Prize and the Gold Medal awarded by the American Institute of Architects, we create a sample of commercial office buildings designed by signature architects drawing on CoStar's national database. We use a combination of hedonic regression model and a logit model to estimate the various rent determinants. While the first stage measures the typical rental price differential above the typical building in a particular sub-market over a specific timeframe, the second stage identifies a potential price differential over a set of buildings closely matched on important characteristics (such as age, size, location etc.). We find that in both stages offices design by signature architects exhibit a premium. However these results are preliminary. The premium could be indeed an effect of the name of the architect, but others factors such as micro-market conditions might be the cause. Further tests are needed to confirm the validity of our results.

Introduction and Background

In 1936, in one of the earliest documented examples of an 'A-list' architect arguing the commercial benefits of his reputation, an exasperated Frank Lloyd Wright pointed out to a client concerned about additional costs that he was providing a "record of economic as well as creative achievement" (Wright, 1986, 154). According to Wright's argument, the positive publicity generated by his reputation would have cost the client "thousands of thousands" but came in fact at very little extra cost to the client.

In this study, we investigate the effect of the reputation or brand of the architect on the rental prices obtained for commercial real estate assets by analyzing a large empirical dataset of office properties across the United States. Our analysis rests on the basic assumption that price signals play a central role in real estate markets by providing the information basis for the allocation of resources. Thus, in the absence of objective measurements of design quality any significant and systematic differences in rents can be interpreted as higher utility derived from occupying a building designed by a signature architect (controlling for age, size, locations and other factors).

This paper is organized as follows. In the first section, a brief introduction to branding architecture and the growing importance of media and self promotion discusses the emergence of signature architecture. This is followed by a discussion of some of the different dimensions of design and value with a review of previous research on the linkages between design and financial performance in real estate markets. In the third section, the data and methodology of the paper are outlined and the results are analysed. Finally, conclusions are drawn and potential future research directions are suggested.

Branding, Culture and Signature Architecture

Brands are a pervasive part of the imagery used daily in our mediated culture (Sherry, 2005). Klingmann (2007) argues that in the last two decades there has been a fundamental change in the nature of brands and that they have become detached from use value; instead they are increasingly attached to an object's "aura" expressing cultural values and beliefs. Because of this shift, it has been suggested that the role of design has also changed so that object itself is not what is consumed anymore but the culture that is wrapped around it and that it is "brand equity" that designers have to provide (Foster, 2002). Brands not only refer to consumer goods. In the context of individual's careers, branding can take an important part of self-promotion (Wernick, 1991). The fact that a well-known architect can command a different price for the same work as other less well-known architects, has given rise to a new form of promotional practice which

Wernick (1991, 183) describes as "the construction of celebrityhood".[1] The focus of attention has been on how architects can increase their public profile and on how to convince developers that they could bring added value to their projects (Schmiedeknecht, 2005).

One term that has come to define the work of famous architects is "signature architecture", a label that highlights the implicit parallels between the finished building and a work of art. One reason why some commentators link modernist architects to signature architecture is the role and scale of the media. The subject has been explored by several authors who are exploring the relationships between media, architecture and the creation of a brand leading to, what are known (with only a little irony) in the media as 'starchitects' (Davis and Schmieddeknecht, 2005, Klingmann, 2007).

Branding architects' careers is primarily related to gaining status either by achievements in practice or theory winning the attention of critics who, in turn, generate media interest. Architects can build their reputation or brand in a number of ways. There are many examples of famous architects who made their names by architectural competitions such as Zaha Hadid or Daniel Libeskind. Others made their names by merits of their intellectual discourse, Robert Venturi and his famous book *Learning from Las Vegas* (1972) or Reem Koolhaas and his *Delirious New York* (1978). There are even those, it has been claimed, that made their names by the clever use of a "miniscule portfolio and a wide range of well placed acquaintances" within circuit of the Institute of Architecture and Urban Studies (Ghirardo, 1994, 72). The common ground for any of these pathways is the use of the media in order to publish their work and achieve artistic or intellectual respect among their peers.

Branding architecture stands at the intersection of multiple factors. It may be hat the name of the architect attracts media attention, or the name of the building is embedded in the local culture, or the city or area where the building stands already has an added value. The concept of *brandscape* has been used to summarise the multiplicity of factors that contribute to the marketing of human geographies (Evans, 2003, Sherry, 2005, Klingmann, 2007). Considering all these aspects and the scope of this paper, the focus of study is on the architect as a brand which may overshadow the features such as the functionality, iconicity and location of a building.

Design and Value

[1] The conference "How to Become an A-List Architect?" held in 2004 provides a good example of this shift.

A key problem with investigating the effects of building design on value is that it is a multi-dimensional concept. Design can be analysed as being concerned with image, function and symbolism of buildings. In the urban landscape, building design is often evaluated in terms of its interaction with the urban context. From an economic point of view, a key distinction is between those aspects of design that are captured in the price and rent of a building and those aspects that generate externalities. Broadly, whilst owners and users obtain utility from positive aesthetic perceptions (sometimes termed 'psychic income') and may thus exhibit higher willingness to pay, an iconic building may generate positive externalities in that neighbouring properties might command higher rents and prices due to the proximity to that building. However, the functional aspects of design *inside* the building (internal appearance, internal finishes, services, facilities and layout) should be reflected in its price. Thus, the aspects of design pertaining to the interior of the building, whether intrinsic to the design process or regulated by economic factors, may be transmitted to rental and capital prices of the asset. The quality of the *exterior* appearance of the building is likely to be partially reflected in its price (inasmuch as owners and tenants derive utility from it) but also generates positive spillover effects in its vicinity.

An obvious concern when measuring the impact of design on value has been the definition of value. Whilst social and cultural values are undoubtedly important and related, this study focuses only on the measurement of the effects on economic value. Our approach to disentangling the various dimensions of economic value is by focussing on key stakeholders. For commercial offices designed by signature architects, there are three main categories. These are:-

Owners/Investors: concerned with investment performance driven by changes in capital and rental values. Key factors that signature architects may influence are development and operating costs, depreciation, rental growth and risk premium.

Occupiers: concerned with the relative costs and benefits in terms of business performance. Their decision to occupy a signature building may be attributed to a bundle of potential benefits linked to design including reduced costs of occupation, higher productivity and image benefits.

Neighbouring Occupiers and Owners: Due to positive externalities from commercial real estate assets designed by signature architects, other proximate groups may obtain economic benefits. For example, neighbouring businesses could benefit from an increase in the number of visitors to the area or other owners could benefit from increase in demand of commercial properties in the vicinity which could lead to higher rents and values.

For a commercial real estate asset, its design has the potential to be transmitted to prices through a number of channels. Financial variables affected include the:-

i. costs to the owner of developing the asset (construction, financing, leasing period, professional fees)
ii. costs to the occupier of operating the asset (utilities, maintenance, repair)
iii. the costs to the occupier of operating a business in the asset (productivity)
iv. costs to the owner of holding the asset (vacancy periods, management costs, depreciation)
iv. (linked to ii, iii and iv) the financial return that the owner receives in terms of rent or sale value for the asset.

Related Previous Research

Given the extent of externatilities and internatilities generated by design, there has been a surprisingly limited body of research on the linkage between the design characteristics of buildings and their exchange values. It is indicative of the different interpretations of design that the research in the residential sector has been concerned with urban design features of the neighbourhood rather than on the design attributes of the buildings themselves (see Song and Knaap, 2003; Eppli and Tu, 1999). An exception is Asabere, Hachey and Grubaugh (1989) who examined the impact of architectural style on the prices of residential properties. Not surprisingly, they found price differentials for different architectural styles of housing.

A number of studies in the UK have used a case study approach to this topic. For instance, Carmona, De Magalhaes and Edwards (2002) use case studies of six paired office developments in three UK provincial cities. Focussing on the urban design aspects of the buildings, they conclude that there is some link between the quality of urban design (as subjectively rated by researchers) and economic value. However, whilst the authors are careful to acknowledge that the research is preliminary, their investigation of linkages between economic value and urban design lacks rigour. There is no clear representation of their metrics of economic value. There are no controls for differences between the pairs in terms of urban location and building specification *inter alia*.

There is also a body of work that measures the relationship between various attributes of office buildings and their rental or capital values. There are a number of studies that confirm the linkage between building attributes that can be objectively measured. For instance, it has been found that there is a positive relationship between number of stories and rental income (Shilton and Zaccaria,

1994). Furthermore, a number of studies have looked at the relationship of floor area and price (Clapp, 1980; Gat, 1998; Bollinger, Ihlanfeldt and Bowes, 1998). The impact of age was investigated by Bollinger, Ihlanfeldt and Bowes (1998), Slade (2000) and Dunse *et al* (2003). Similar to Carmona *et al* (2002), the requirement of the subjective measurement of design quality recurs when aesthetic issues are explored. For instance, Laverne and Winson-Geideman (2003) investigated the effect of trees and landscaping on office rental rates based on a comparison of 85 office buildings that comprise 270 individual and unique leases in the Cleveland, US. Hedonic regression was used to isolate the economic effects of landscaping. Consistent with previous work in residential markets (see Henry 1994), their analysis found a strong positive effect for those buildings with good landscaping aesthetics (as rated by data collectors) and building shade provided by trees. Conversely, they found that landscaping that provided a good visual screen produced significant negative impacts on rental rates. They attribute the latter finding to business occupiers' greater preference for visibility over privacy.

The most relevant work in the context of this study (Hough and Kratz, 1983; Vandell and Lane, 1989 and Gat, 1998) focuses on specific markets. Hough and Kratz (1983) examined award winning buildings in Chicago. They attempted to address the question of whether the positive externality of 'good' architecture could be internalized and reflected in higher rental rates. In total they identified 139 buildings in Chicago that had been awarded status of architectural importance. Interestingly, whilst the authors found that, in the case of newer offices awarded status of architectural importance, a rental premium was paid: for older buildings there was no significant evidence of a rental premium. They attributed this finding to the restrictions on owners' and occupiers' rights to alter older buildings that had been awarded status of architectural importance.

The second study focussed on Class A office buildings in Boston and Cambridge, Massachusetts (Vandell and Lane, 1989). It examined the performance of these buildings in terms of rents and vacancy rates. The aesthetic qualities of buildings were rated by an expert panel. They found evidence of aesthetic obsolescence whereby "'signature' towers may be perceived as passé or inappropriate in a different milieu" (Vandell and Lane, 1989, 248). Overall they found that buildings rated in the highest quintile in terms of aesthetics had rents that were 22% higher than buildings in the lowest quintile controlling for differences in location, number of stories etc. However, the data showed a weaker relationship between design quality and vacancy rates.

As part of a wider study on office rent determination in Tel Aviv, Gat (1998) used several architects to grade 50 individual buildings on a scale of 1-10 in terms of the quality of architecture. No detail is provided on the specific criteria involved in defining this variable. The

mean rating was 7.29 with a standard deviation of 1.27. He then used this variable as one of the independent variables in a number of hedonic regression models. In all models he found a consistent and statistically significant positive relationship between the quality of architecture rating and the level of office rent.

Our study builds upon this work whilst being different in a number of significant aspects. It addresses different research questions focussing on award-winning architects (rather than award-winning buildings): it is at a national rather than city level and uses a different methodology.

Research Aims

It is clear that there are complex interactions between different dimensions of brand (of the architect, the building and the location), design (aesthetic and functional) and value (exchange/owner, user/operator and neighbour/social). This study aims to address a specific aspect of this debate: whether, *ceteris paribus*, offices designed by signature architects (ODSA) achieve rental and price premiums compared to offices designed by non-signature architects. Our aim is to test the ability of signature architects to add value to office buildings through increased rents which should, in turn, be transmitted to increased capital values.

Research Method and Data

Identifying signature architects

Given that this project intends to measure the performance of architects that have achieved a high profile, we select architects from the two most important architectural prizes that exist at international and national level - the Pritzker Prize and the American Institute of Architects' Gold Medal. Both prizes recognise outstanding contributions to humanity and the built environment.

Identifying the samples of offices designed by signature architects and a control group

We collect data on separate samples of US office buildings. In order to create a sample of commercial buildings of offices designed by signature architects, this study draws on CoStar's comprehensive national database of US commercial real estate.

Data

Our benchmark sample consists of 10,556 commercial buildings in 682 submarket clusters spread throughout the United States. This means that our hedonic model is measuring price differences between ODSAs and randomly selected buildings in the same sub-market cluster controlling for differences in age, height, quality, sub-market cluster etc.[2] In the next step, we compile the sample of ODSAs by identifying in the CoStar database all properties that were designed by architects that have been recipients of the Pritzker Prize and/or AIA Gold Medal. Hence, we consider these two prizes as proxies for being recognized as a "signature architect" of international acclaim. Applying this method, we compiled a database of 230 properties designed by award-winning architects. Details of the individual architects and the number of buildings designed by each can be found in the Appendix.

Descriptive Statistics

It is clear immediately from Exhibit 1 that there are substantial differences between ODSA and the typical office building in the US. Although they have similar plot sizes, ODSA tend to be much taller with an average of 20 storeys compared to two for typical office buildings. This suggests that they are prevalent in central business districts. Give the previous point, not surprisingly, ODSA are also significantly larger than typical office assets. The average size of an ODSA is over 350,000 sq. ft. In contrast, the typical size of buildings in the benchmark sample is approximately 26,000 sq. ft. This indicates that there are systematic differences between ODSA and the benchmark sample. ODSA are typically larger, taller buildings located in major urban centres. On average, ODSA tend to have higher rents per sq ft and higher occupancy rates. However, without controlling for differences between ODSA and the benchmark sample, we cannot infer that the effect of having an award winning architect is an increase in rent and a low vacancy level.

Exhibit 1

[2] However, this method does not necessarily control for micro-location effects. It is possible that ODSA tend to occupy the best locations in sub-markets e.g. adjacent to major railway terminals, and that observed price premiums may reflect small differences in quality of location rather than quality of design or brand of designer.

Descriptive Statistics

	ODSA (median)	Non-ODSA (median)
Rent	26.7	19.2
Size	381,086	25,956
Storey	20	2
Year built	1987	1985
Plot Size	1.55	1.16
Occupancy Rate	93.7	73.9
N	230	10,556

As well as concentrated within cities, ODSA are also concentrated in the major urban centres. Nearly 60% of all ODSA are in Washington (17.43%), New York City (14.23%), Chicago (8.42%), Boston (7.21%), Los Angeles (6.61%) and San Francisco (5.21%). Since ODSA tend to be concentrated in the most expensive locations of the most expensive cities, the need to control for differences in location when conducting the hedonic analysis is reinforced.

Empirical models of measuring the premium

Hedonic regression

The standard method for measuring the contribution of individual characteristics of a product to its price is hedonic regression. It is also the 'workhorse' model in real estate research to investigate the effect of various locational, physical and lease characteristics on rents and transaction prices of commercial and residential property assets. Rosen (1974) pioneered the use of the hedonic pricing framework. He generalized that the hedonic price function covering any good or service consisted of a variety of utility-bearing characteristics. In the office rent determination literature, the use of hedonic modeling typically involves using structural, locational and lease characteristics as the independent variables determining value.

We use this method in our study primarily to isolate the effect of office buildings designed by award-winning architects (ODSAs). As described in the literature review section of this paper, higher rents or transaction prices may simply be due to the fact that ODSAs are newer, higher or

located in more attractive locations or markets. In its simplest form, the log-linear hedonic rent model reads as follows:

$$\ln R_i = \alpha_i + \beta x_i + \phi Z_i + \varepsilon_i \quad (1)$$

Where R_i is the natural log of average rent per square foot in a given building, x_i is a vector of the natural log of several explanatory locational and physical characteristics, β and ϕ are the respective vectors of parameters to be estimated. Z_i is a vector of time-related variables and ε_i is a random error and stochastic disturbance term that is expected to take the form of a normal distribution with a mean of zero and a variance of σ_e^2. The hedonic weights assigned to each variable are equivalent to this characteristic's overall contribution to the rental price (Rosen 1974).

The model used in this paper takes the following form:

(2)

$$\ln R_i = \beta_0 + \beta_1 \ln Y_i + \beta_2 \ln O_i + \beta_3 \ln S_i + \beta_4 \ln L_i + \beta_5 \ln F_i + SMC + ODSA_i + \varepsilon_{it}$$

In this model, Y_i represents the year of construction or major refurbishment (whichever occurred more recently), O_i is the occupancy rate of the property, S_i is the number of stories of the property, L_i is the land area, F_i is the size of a typical floor in the building, SMC is a dummy variable for the submarket cluster and ε_i is the error term which is assumed to be normally distributed with constant variance and a mean of zero. A rent premium for ODSA is captured by the $ODSA_i$ term, a dichotomous variable that takes the value of 1 for ODSA buildings and a value of 0 otherwise. Details of regression can be found in Exhibit 2.

When controlling for the most important rent determinants such as age, height, size and sub-market location, we find a statistically significant rent premium of 14% in ODSA compared to non-ODSA in the same submarket cluster. The control variables used in the regression show the expected signs. The coefficient on the year constructed is positive indicating that the higher this

number, the higher the rent. Similarly to other previously mentioned studies, we find that there is a positive relationship between the number of stories and size of the building and the rental level. The latitude coefficient shows that properties located in the north of the United States exhibit lower rents than properties in the south. It is important to remember, however, that the positive effect of large metropolitan markets in the northern US such as New York, Boston or Chicago will be captured by the market dummy. Similarly, the longitude variable suggests higher rents in the western US (again controlling for individual markets). Overall, this regression explains approximately 51% of the cross-sectional variation in rents in the entire sample.

Exhibit 2

Impact of Signature Architect Design on Rent

	Coefficient	Std. Error	t-Statistic	Prob.
C	-34.49	1.90	-18.13	0.00
SIGNATURE	0.14	0.02	6.74	0.00
LOG(YEAR_TOTAL)	4.95	0.25	19.89	0.00
LOG(RBA)	0.01	0.00	2.67	0.01
LOG(STORIES)	0.10	0.01	17.58	0.00
LOG(LATITUDE)	-0.16	0.07	-2.49	0.01
LONGITUDE	0.00	0.00	-4.00	0.00
R-squared	0.54	Mean dependent var		2.90
Adjusted R-squared	0.51	S.D. dependent var		0.42
S.E. of regression	0.30	Akaike info criterion		0.45
Sum squared resid	1180.43	Schwarz criterion		0.82
Log likelihood	-2505.82	Hannan-Quinn criter.		0.57
F-statistic	22.71	Durbin-Watson stat		1.65
Prob(F-statistic)	0.00			

Logistic regression

While the hedonic regression approach is the principal method for determining rent and price premium since it enables the researcher to control for a host of relevant building characteristics, it is subject to a potentially serious methodological problem. If buildings in the treatment group (ODSAs in our case) and the control group (Non-ODSAs) differ systematically with respect to characteristics that are significant factors in rent formation, the hedonic model will not attribute the price effect of individual factors accurately and the model as such is subject to omitted variable bias. This problem may arise because of unmeasured common features of ODSAs, for example certain micro-locational characteristics that are not entered as independent variables in the hedonic model. Therefore, we complement the hedonic analysis with a logistic regression framework which serves as a basis for selecting buildings in the control sample that are

sufficiently similar to the ODSA group. Based on the individual probability scores obtained from the logistic regression, we can then define a cutoff point for inclusion in the peer group sample.

Model specification

Our logistic model assumes a dichotomous dependent variable which measures the probability π_i of being an ODSA as

$$\pi_i = \frac{\exp(\eta_i)}{1+\exp(\eta_i)} \qquad (4)$$

Thus, we can determine a likelihood function lf for n observations $y_1,...,y_n$, with probabilities $\pi_1,...,\pi_n$ and case weights $w_1,...,w_n$, can be expressed as

$$lf = \prod_{i=1}^{n} \pi_i^{w_i y_i} (1 - \pi_i)^{(1-y_i)} \qquad (5)$$

In the logarithmic form used in our paper, the full model L is thus:

$$L = \ln(lf) = \sum_{i=1}^{n} w_i y_i \ln(\pi_i) + w_i (1 - y_i) \ln(1 - \pi_i) \qquad (6)$$

Results

Based on the continuous variables building age and land area as well as the categorical variables building class, city and market, we estimate the logistic model. The results are satisfying in that information on building age, land area, class and location is sufficient to correctly predict membership in the non-ODSA control group in 99.2% of cases and for the ODSA group in 53.3% of cases (Exhibit 3). The Nagelkerke R square for this estimation is 0.633. Further estimations with more variables did not improve the model results significantly and are therefore not reported.

Exhibit 3 Logistic Model Estimate

			Predicted		
			Signature		Percentage
			NO	YES	Correct
Observed	signature	NO	**11,015**	86	99.2
		YES	176	**201**	53.3

a. The cut value is .500

Having obtained probability values for each building in our sample of 11,101 buildings with valid observations, we select a smaller sample of matched buildings with a calculated probability value of at least 13 percent of belonging in the ODSA group (without actually being an ODSA). The cut-off value was defined to match the number of valid rent observations in both groups. While a probability value of 13 percent may appear low in overall terms, it is important to keep in mind that the vast majority of buildings in our sample exhibit very low or zero probabilities. Put differently, a building with a 13 percent probability value is within the top 6% of all buildings in terms of probability (including 'true' ODSAs). It appears thus justified to set a relatively low probability value. Exhibit 4 reports the mean and median for key values for both the ODSA and the matched sample. Compared to the large differences between ODSAs and the overall control sample shown in Exhibit 1, these two groups show a much greater degree of similarity of building attributes. As indicated above, only the age and land area variables were used in the logistic regression. It is therefore remarkable to find that both groups are also similar with regard to other important characteristics not used in the regression. More importantly, rents are quite similar although rents in the ODSA sample are still somewhat higher with a median of $26.65/sq.ft. At this stage, however, it is not possible to infer from these results that a premium exists. Further tests are required to confirm the existence of a premium.

Exhibit 4 Mean and Median of Key Values[3]

	ODSA sample						
	Rent	**Size (sq.ft.)**	**Stories**	**Year built**	**Year renovated**	**Land area**	**% leased**
N	276	479	478	472	109	480	480
Mean	33.67	543,071	22.42	1980	1993	6.58	88.79
Median	26.65	378,538	16.00	1984	1995	1.55	93.7
	Matched sample (p>0.13)						
	Rent	**Size (sq.ft.)**	**Stories**	**Year built**	**Year renovated**	**Land area**	**% leased**
N	277	408	408	408	123	408	408
Mean	31.66	353,191	15.76	1979	1996	4.76	88.42
Median	25.04	250,749	12.00	1984	1998	1.81	94.87

[3] We have tested whether the differences in height, size and vacancy rate between the two samples have any statistically significant effect on the rent for the sample. The model was not jointly significant and none of the individual variables were significant at the 5% level. This suggests that observed rental differences in rents are not caused by these factors for this particular sample.

Conclusions

The appearance of terms such as 'signature architect' or 'starchitect' is illustrative of the growing iconization not just of buildings but of architects themselves. For architects, the creation, maintenance and enhancement of a brand has become increasingly important in financial terms. We have used the award of AIA Gold Medal and/or Pritzker Prize as a means of identifying architects that have won high status among their peers and the critics. However, it is important to bear in mind that this empirical analysis does not measure purely the impact of the architect's brand. *A priori,* there are a number of potential ways in which the architect can influence the value of assets. Increased value may be caused by superior architectural ability resulting in exceptional design in terms of function and/or image and/or symbolism. In addition, the commissioning of a signature architect may be part of a wider effort by the developer to create a market leading product. However, it may also be a product of the iconic status of the architect in the absence of any superior architectural ability.

In essence, this study has attempted to assess the extent to which offices designed by architects who have obtained prestigious architectural awards achieve rental price premiums compared to offices designed by architects who have not. The key methodological issue in this study has been identifying an appropriate benchmark against which to compare the rents of ODSA. It is clear from the analysis that ODSA differ systematically from typical US offices. The majority are concentrated in centres of six major cities and they tend to be large in scale in terms of both their average floor plan and height.

When controlling for differences in size, stories and location, the results of the hedonic analysis suggest that, compared to buildings in the same sub-market, they have rents that are 14% higher. However, this result should be treated with some caution since ODSA may occupy the best locations within their sub-market clusters. Said differently, the observed rental premium may be due to micro-location effects rather than superior design or the brand of the architect. The premium may also be due to other non-observed differences. In order to address this issue, we have used a logistic regression to identify non-ODSA which had similar characteristics to ODSA. This provided us with a sample of buildings that where similar to ODSA in terms of height, size etc. The results suggest that the rental premium is much smaller at 6.4%.

In summary, the initial results of this study appear to confirm a rental premium for office buildings designed by award-winning architects. The fundamental difficulty of any study attempting to isolate this effect is to control for the large variety of confounding factors that determine rents. To this end, we have used both a hedonic regression framework and a probabilistic binomial logistic regression model. Further tests are required to confirm the validity of our preliminary results. For example, this could entail case studies at micro-location level, including in depth study of submarkets to measure spillover effects; surveys and interviews with occupiers, agents and designers, as well as adding variables to the current analysis such as AIA Design Awards which will enable to control for building materials and the quality of the design.

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Appendix 1: List of award winning architects and number of buildings included in the study

Architect	Year of Pritzker Prize	Year of AIA Gold Medal	Number of commercial office buildings in USA
Antoine Predock		2006	1
Arthur Erickson		1986	4
Benjamin Thompson		1992	10
Cesar Pelli		1995	35
Joseph Esherick		1989	1
Norman Foster	1999	1994	2
Frank O. Gehry	1989	1999	5
Ieoh Ming Pei	1983	1979	45
Kenzo Tange	1987	1966	1
Kevin Roche	1982	1993	26
Michael Graves		2001	7
Ronaldo Giurgola		1982	9
Tom Mayne	2005		2
Philip Johnson	1979	1978	29
Renzo Piano	1988	2008	1
Richard Meier	1984	1997	3
Richard Rogers	2007		2
Louis Skidmore		1957	316
Nathaniel A. Owings		1983	as above[4]

[4] The names of Louis Skidmore and Nathaniel A. Owings are both linked to the architectural firm SOM