Landmark Buildings and Diversification Opportunities in the Residential Market

by

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Abstract

Landmark buildings are outstanding constructions recognizable for their unique design, high visibility, and/or extraordinary relevance for the country. Literature on housing markets demonstrates that their price and rent dynamics are not comparable to those of other types of residential buildings. However, no evidence on the advantages of their inclusion in a diversified real estate portfolio exists.

Using a database representative of a country with some of the world's greatest cultural and natural heritage, Italy, this paper applies market portfolio theory to study the advantages related to a diversification strategy in the residential sector that includes landmark investments.

The results show that a landmark building can be a good investment opportunity, especially for high-risk/return investors. A low correlation of the returns of this asset class with other types of housing investments implies the existence of a minimum investment in this asset class for almost all portfolios on the efficient frontier. Empirical evidence supports the hypothesis that institutional real estate investors can take advantage of investing in landmark buildings in the residential sector as well, because there are no reasons to limit such investments to trophy buildings in the office and commercial sectors.

Keywords: Landmark building, portfolio diversification, efficient frontier
JEL codes: H31, C61

1. Introduction

The definition of a landmark is not unique, but the market normally recognizes a landmark building on the basis of design, visibility, and/or relevance. The design characteristics involve such features as size, shape, and quality; visibility refers to the structure's distinctiveness, and relevance is related to symbolism or history (Appleyard, 1969). Empirical analyses show that residential buildings designated as landmarks sell for a substantial premium over comparable properties (Noonan, 2007) and that a rent premium may be paid for "good" architecture (Hough and Kratz, 1983).

The literature notes the advantages related to diversification opportunities in a real estate portfolio by applying standard market portfolio theory (MPT) to this market (Pagliari et al. 1995). The main issue is identification of the type of asset class in the real estate industry because the diversification benefits of real estate investments can be accurately estimated only if the real estate investment categories are sufficiently homogeneous (Hartzell et al. 1986). In the residential market, investment type specifications are typically ad hoc and researchers stratify samples based on prior expectations related

to municipal boundaries, school districts, racial divisions, or housing types (e.g. Goodman and Thibodeau, 1998). Studies on the price and rental trends for different types of residential buildings normally distinguish by building size and geographical area (Brown et al., 2000) and sometimes between standard and luxury houses (Hui et al., 2011). There is no empirical evidence of the usefulness of historical or artistic features in identifying the best residential asset class.

This paper contributes to the existing literature about intra-sector diversification opportunities in residential real estate units by focusing on the distinctive features of landmark buildings. Using a representative database for the Italian market, we point out differences in the rent and appreciation yield of landmark buildings compared to other types of residential buildings and demonstrate that, under the assumptions of MPT, landmark buildings can play an important role in a diversified portfolio with a high-risk/return profile. Studies show that although nowadays real estate institutional investors mainly larger landmark buildings in the office and commercial sectors (e.g., Block, 2011), smaller investments in the residential sector can also be a reasonable option on the basis of portfolio optimization.

This paper presents a detailed literature review on landmark buildings characteristics and their impact on the rental and appreciation of real estate units (Section 2). It conducts an empirical analysis of the role of this type of asset in a diversified portfolio constructed using the standard MPT approach (Section 3). Finally, it discusses concluding remarks and the development of future research (Section 4).

2. Literature review

Landmark buildings are real estate units with significant historical, architectural, and cultural features that ensure their aesthetic appeal (Moon et al., 2010). These types of buildings may survive no longer than undistinguished structures of similar size, age, location, and function but, due to their value as public goods, public or quasi-public authorities have instituted legal protection against their alteration and destruction (Hough and Kratz, 1983).

Designations of historic properties or landmark buildings typically take one of two forms: the designation of individual properties as historically significant or the designation of neighborhoods as a historic district (Coulson and Leichenko, 2001). In the former, the landmark designation is normally driven by the structure's age and other culturally significant features but is also affected by neighborhood context, such as demographic, economic, and cultural features (Noonan and Krupka, 2010). In the latter designation, the districts in question are groups of buildings with a unique

architectural, historical, or character worth and the historic district designation allows the definition of laws for the preservation of exterior facades and appearance (Ford, 1989).

According to hedonic pricing models, residential buildings that are designated landmarks sell for a substantial premium over comparable properties (Noonan, 2007), mainly due to a tax advantage or the design's utility for the owner/user.

Many countries support the maintenance of historical buildings, offering their owners a reduction in property taxes in return for an agreement to not alter the exterior facade of the designated building (Narwold et al., 2008). Empirical evidence demonstrates that the tax advantage offered has a positive impact on the price of residential units, but some countries limit the tax saving opportunity to non–owner-occupied residential properties (Asabere and Huffman, 1994). Thus the effect of the tax advantage may differ according to building use.

The role of design on the prices of residential units can be studied by separately considering internal and external appearance (Fuerst et al., 2009). Functional aspects of design inside a building (internal appearance, internal finishes, services, facilities, and layout) should be reflected in the rental and capital prices of the asset if the user evaluates these features positively. The quality of the building's exterior appearance is likely partially reflected in its price (as much as owners and tenants derive utility from it) and generates positive spillover effects in its neighborhood. A house's architectural style, in terms of both functional layout and external appearance, is considered more by home buyers such as white collar professionals (Asabere et al., 1989): The main reason behind the premium is the prestige and style associated with ownership (Zahirovic-Herbert and Chatterjee, 2011). Due to this clientele effect, a landmark building's price premium is normally higher if the building is distinctive with respect to all neighborhoods.

Looking at the externalities, the price of the neighborhood's houses could be biased by the existence of a landmark building and normally the price effect is higher on lower-end properties (Zahirovic-Herbert and Chatterjee, 2012). The average price of buildings can increase due to the area's better reputation of the area and the expected increase in the quality of the neighborhood or could be negatively affected by the increase of the maintenance cost, the tighter constraints in new construction and refurbishment (Clark and Herrin, 1997). The net effect of externalities on landmark prices and rents is unclear and depends on the characteristics of the landmark district (Leichenko et al., 2001), but when the preservation policies imposed are too tight, the market reaction to a landmark designation is normally negative (Schaeffer and Millerick, 1991). Considering big cities, the presence of a landmark building normally increases the mean price of the neighborhood and, unless the creation of the historic district

adds to the overall demand for housing in the city, decreases that in all other areas of the city (Coffin, 1989).

Even if a landmark building affects the price of all the other residential units in the entire city, there is no evidence of a relation between the performance trend of this asset class and that of other types of housing. In the event of a misalignment between the trend of different real estate asset classes in the housing sector, there may be diversification opportunities for portfolio management.

3. Empirical analysis

3.1. Sample

To study the value of landmark investments, we analyze one of the most important worldwide markets for historic and cultural buildings, Italy. Italy has the highest concentration of properties recognized by UNESCO as part of the cultural and natural World Heritage (around 4.5% in 2011).[1] The Italian Land Registry (Agenzia del Territorio, 2013) includes such buildings in the category of residential buildings, with castles and palaces registered as real estate assets.[2] Unlike other countries, such as the United States (e.g., Noonan and Krupka, 2011), landmark status in the residential sector is prevalently driven by specific historical relevance and artistic features. There is no ex ante relation with the building's value and/or that of the reference district because frequently landmark status is assigned only to one or only few buildings in each district.

We collect information about all residential buildings available in Italy through the Italian Land Registry website, classified by their city of location and building type. Due to data availability, we consider the annual data of all Italian cities during 2007–2011[3] (Table 1).

[INSERT TABLE 1 ABOVE THERE]

As expected, the number of landmark buildings is significantly lower than for the other types of buildings (less than 0.01% of the overall sample), but these buildings are not geographically concentrated in any city or geographical area. Even if the northwest presents the highest number of landmark buildings, certain cities in central and southern Italy (i.e., Rome) have an outstanding cultural

[1] For further details about the UNESCO World Heritage list, see http://whc.unesco.org/en/list.

[2] For further details about the Agenzia del Territorio's classification, see http://www.agenziaterritorio.it and/or the residential units category description provided in the Appendix.

[3] Before 2007 the data cannot be used to estimate the market price for each type of building and only appraisal data are available.

and historical heritage and therefore a high number of such buildings. Less than 5% of the cities considered have no landmark building and, on average, each city has over 20 landmark buildings. Some cities (e.g., Bologna, Milan, Rome, and Turin) present an outstanding historical heritage and therefore have over 100 landmark buildings each.

For each type of residential unit in each city, we collect all the information available about the appraisal value per square meter, the rent per square meter, and, to avoid the problem related to appraisal bias, the average ratio between the market price and the appraisal value for each geographical area.[4] Based on the appraisal value, we define the equivalent market value as the product of the appraisal value of all existing buildings and the ratio of the market price to the appraisal value for all real estate transactions in the same area in the same year. We use standard winsorization to replace extreme values (lower than 5% and above 95% of the overall distribution) with the corresponding values of the bound percentiles (e.g., Dixon, 1960). We conduct a preliminary analysis of the differences between the landmarks and other buildings, comparing prices and rents for landmark buildings with those of other buildings (Table 2).

[INSERT TABLE 2 ABOVE THERE]

Landmark buildings are an upper-class investment and, on the basis of both price and rent, they are comparable to luxury apartments and manors. Within this class of residential investments, the average prices and average rents of landmark buildings are the lowest and similar to those of Maison.

Analysis of time trends shows that landmark buildings decreased in price per square meter in all the years considered (excluding a small correction made in 2010). Analysis of the trend in rent per square meter does not show a clear time pattern and, except for 2009, the annual rate of change was always lower than 1%. The time trends identified for landmark buildings differ from those of low-quality buildings—such as low-income apartments, economy apartments, rural houses, and crude buildings—in the majority of the years considered and all years present increasing trends for prices and/or rental incomes. The difference identified for landmark buildings with respect to the rest of the housing market is consistent with affordability index dynamics: Empirical analyses proposed for the Italian real estate market demonstrate that during the financial crisis, access to houses is worsening (e.g., Agenzia del

[4] To convert appraisal data into market-equivalent data, we use data from the periodical survey released by the Italian Land Registry, which, since 2008, publishes statistics on the difference between the appraisal value and market price for all transactions made in the country during the year. For further details, see www.agenziaterritorio.it.

Territorio, 2013) and there is therefore a high probability that demand has highly likely shifted from more expensive to less expensive buildings.

The Kolomogorov–Smirnov test (e.g. Chakravarti, Laha, and Roy, 1967) supports the hypothesis that the price and rent dynamics of landmark buildings are not comparable with those of other types of housing investments. The hypothesis of similarity is rejected at the 99% confidence level.

3.2. Methodology

Following the approach proposed in literature on analyzing land registry data (e.g., Fu and Ng, 2001), we construct indexes of the prices and rents per square meter for each type of building in each area. The data collected, as for almost all markets (Seiler et al. 1999), are available only yearly. We compute two different measures of performance, with the following formulas:

$$Price\ Yield_t = \frac{(P_t - P_{t-1})}{P_{t-1}} \tag{1a}$$

$$Overall\ Yield_t = \frac{Rent_t + (P_t - P_{t-1})}{P_{t-1}} \tag{1b}$$

Following a standard approach proposed in the literature (e.g., Guntermann and Smith, 1987), the price yield is defined as the ratio between the yearly appreciation of the price per square meter $(P_t - P_{t-1})$ with respect to the price at time t. This index is a proxy of the return on the investment in the event of a vacancy and represents the standard return measure for developing real estate investment.

The overall annual return for the year t $(Overall\ Yield_t)$ represents a comprehensive measure of performance, defined as the ratio between recurring property earnings (annual rent) plus appreciation from time t - 1 to time t with respect to price at time t - 1 (Ibbotson and Siegel, 1984). The data available cannot be used to measure the costs related to an investment and the index constructed therefore represents a gross return measure.

To test for any differences in the performance trend achieved by different types of residential investments, we compute summary statistics and conduct a Kolmogorov–Smirnov test to compare the yields.

Once the differences are identified, we evaluate the role of landmark buildings in a diversified real estate portfolio using standard MPT (Markowitz, 1952). Due to the low (yearly) frequency of data available, we adopt a cross-sectional asset pricing approach for each year (Cannon et al. 2006): We

compute for both measures of performance (*Price Yield* and *Overall Yield*) the average, standard deviation, and covariance on the basis of the values for all the cities considered in the sample (n = 101) for each type of housing asset (A1 to A11), respectively:

$$E(Price\ Yield)_t = \begin{pmatrix} \frac{1}{n}\sum_{i=1}^{n} Price\ Yield_{i,t}^{A1} \\ \cdots \\ \frac{1}{n}\sum_{i=1}^{n} Price\ Yield_{i,t}^{A11} \end{pmatrix} \quad (2a)$$

$$E(Overall\ Yield)_t^k = \begin{pmatrix} \frac{1}{n}\sum_{i=1}^{n} Overall\ Yield_{i,t}^{A1} \\ \cdots \\ \frac{1}{n}\sum_{i=1}^{n} Overall\ Yield_{i,t}^{A11} \end{pmatrix} \quad (2b)$$

$$Cov(Price\ Yield)_t = \begin{pmatrix} Cov\left(Price\ Yield_{it}^{A1}, Price\ Yield_{it}^{A1}\right) & \cdots & Cov\left(Price\ Yield_{it}^{A1}, Price\ Yield_{it}^{A11}\right) \\ \cdots & \cdots & \cdots \\ Cov\left(Price\ Yield_{it}^{A11}, Price\ Yield_{it}^{A1}\right) & \cdots & Cov\left(Price\ Yield_{it}^{A11}, Price\ Yield_{it}^{A11}\right) \end{pmatrix} \quad (3a)$$

$$Cov(Overall\ Yield)_t = \begin{pmatrix} Cov\left(Overall\ Yield_{it}^{A1}, Price\ Yield_{it}^{A1}\right) & \cdots & Cov\left(Overall\ Yield_{it}^{A1}, Price\ Yield_{it}^{A11}\right) \\ \cdots & \cdots & \cdots \\ Cov\left(Overall\ Yield_{it}^{A11}, Price\ Yield_{it}^{A1}\right) & \cdots & Cov\left(Overall\ Yield_{it}^{A11}, Price\ Yield_{it}^{A11}\right) \end{pmatrix} \quad (3b)$$

The average yields and covariance matrixes are used to construct yearly efficient frontiers for each of the years considered (2008–2011). For the optimization procedure, we follow the standard MPT approach and apply the constraint of no short selling opportunities. We define the risk–return profile of a portfolio of housing investments with the following formulas:

$$E(Price\ Yield)_t^P = \begin{pmatrix} \omega_t^{A1} \\ \cdots \\ \omega_t^{A11} \end{pmatrix} \times E(Price\ Yield)_t \quad (4a)$$

$$\sigma(Price\ Yield)_t^P = \begin{pmatrix} \omega_t^{A1} \\ \cdots \\ \omega_t^{A11} \end{pmatrix} \times (\omega_t^{A1} \quad \cdots \quad \omega_t^{A11}) \times cov(Price\ Yield)_t \quad (4a)$$

$$E(Overall\ Yield)_t^P = \begin{pmatrix} \omega_t^{A1} \\ \cdots \\ \omega_t^{A11} \end{pmatrix} \times E(Overall\ Yield)_t \quad (5a)$$

$$\sigma(Overall\ \ Yield)_t^P = \begin{pmatrix} \omega_t^{A1} \\ \cdots \\ \omega_t^{A11} \end{pmatrix} \times (\omega_t^{A1} \quad \cdots \quad \omega_t^{A11}) \times cov(Overall\ Yield)_t \quad (5b)$$

We determine the weights $(\omega_t^{A1}, \quad \cdots \quad , \omega_t^{A11})$ assigned to each type of housing investment to maximize the return for an expected level of risk. To consider different investor risk attitudes, we compute the optimal weights for different levels of risk exposure.

To study the degree of efficiency of landmark buildings with respect to optimal investment portfolios, we compute the distance of all solo portfolios with respect to the efficient frontier and compare the distance from the efficient solution for the landmark portfolio with respect to the other specialized portfolios. The degree of efficiency is defined as the minimum distance with respect to all the portfolios on the efficient frontier. In other words,

$$Distance\ Price_t^{Aj} = min\left\{\begin{array}{c}\sqrt{\left(E(Price\ Yield)_t^{Aj} - E(Price\ Yield)_{1t}^{*}\right)^2 + \left(\sigma(Price\ Yield)_t^{Aj} - \sigma(Price\ Yield)_{1t}^{*}\right)^2} \\ \dots \\ \sqrt{\left(E(Price\ Yield)_t^{Aj} - E(Price\ Yield)_{it}^{*}\right)^2 + \left(\sigma(Price\ Yield)_t^{Aj} - \sigma(Price\ Yield)_{it}^{*}\right)^2} \\ \dots \\ \sqrt{\left(E(Price\ Yield)_t^{Aj} - E(Price\ \ Yield)_{nt}^{*}\right)^2 + \left(\sigma(Price\ Yield)_t^{Aj} - \sigma(Price\ Yield)_{nt}^{*}\right)^2}\end{array}\right\} \quad (6a)$$

$$Distance\ Overall_t^{Aj} = min\left\{\begin{array}{c}\sqrt{\left(E(Overall\ Yield)_t^{Aj} - E(Overall\ \ Yield)_{1t}^{*}\right)^2 + \left(\sigma(Overall\ Yield)_t^{Aj} - \sigma(Overall\ Yield)_{1t}^{*}\right)^2} \\ \dots \\ \sqrt{\left(E(Overall\ Yield)_t^{Aj} - E(Overall\ \ Yield)_{it}^{*}\right)^2 + \left(\sigma(Overall\ Yield)_t^{Aj} - \sigma(Overall\ Yield)_{it}^{*}\right)^2} \\ \dots \\ \sqrt{\left(E(Overall\ Yield)_t^{Aj} - E(Overall\ \ Yield)_{nt}^{*}\right)^2 + \left(\sigma(Overall\ Yield)_t^{Aj} - \sigma(Overall\ Yield)_{nt}^{*}\right)^2}\end{array}\right\} \quad (6b)$$

where, for each year (t varies from 2008 to 2011) and for each type of residential investment (Aj varies from A1 to A11), we compute n =100 distance measures of the solo portfolios with respect to the efficient portfolios. The distance computed is a standard Euclidean measure of the square root of the square of the horizontal differences $(\sigma(Overall\ Yield)_t^j - \sigma(Overall\ Yield)_{1t}^{*})$ and vertical differences $(E(Overall\ Yield)_t^j - E(Overall\ \ Yield)_{1t}^{*})$ in the linear distances between the solo and efficient portfolios. We consider the minimum distance to construct a proxy for the inefficiency of a concentrated portfolio with respect to an optimized one for both *Price Yield* (formula 6a) and *Overall Yield* (formula 6b). The analysis considers both a one-year time horizon and a multiple-year time horizon.

To study the role of landmark buildings in a diversification strategy, we also consider the composition of portfolios on the efficient frontier and evaluate the role of different types of residential investments on the basis of the risk–return profile of efficient portfolios. Summary statistics for the portfolio composition for different levels of risk and return are presented for each year. The analysis considers both a one-year time horizon and a multiple-year time horizon.

3.3. Results

Using data for rent and price per square meter, we compute two yearly indexes of performance (*Price Yield* and *Overall Yield*) for 2007–2010 for all the residential types of buildings in the sample. Analysis

of the indexes computed for each type of residential property allows the identification of interesting differences between landmark buildings and other types of residential investments (Table 3).

[INSERT TABLE 3 ABOVE THERE]

Considering the mean yield, the price yield achieved by landmark buildings is frequently higher than for other housing investments. The results are even stronger when the overall yield is considered, because, excluding 2007, performance is always higher with respect to other investment opportunities. The overperformance achieved by landmark investments is partially offset by the higher risk exposure of such investments. Landmark buildings are never the best investment solution to minimize risk for any of the years considered because the risk assumed is normally double that of the safest solutions .

A comparison of yield distributions on the basis of Kolmogorov–Smirnov test cannot identify an investment opportunity that has a distribution strictly comparable with that of landmark buildings. In addition, the degree of similarity decreases over time, especially if we consider the overall trend.

The extra performance offered by landmark buildings demonstrates their usefulness as a solo portfolio investment; however, to evaluate their usefulness in a diversified portfolio, one must also consider the performance achieved by other types of residential investments. Analysis of the different housing investments shows different degrees of correlations between the returns of different asset classes (Table 4).

[INSERT TABLE 4 ABOVE THERE]

The correlation between the returns of landmark buildings and other assets is normally higher when overall yield is considered, due to the higher variability of price returns. During 2008–2010 the correlation is usually high and statistically significant, whereas in 2011 the correlation decreases significantly and is almost never statistically significant. This anomaly in 2011 can be explained on the basis of the negative trend of transactions registered for the landmark sector due to the decrease in demand for this type of expensive building.

To evaluate the relevance of landmark investments in a diversified portfolio, we construct the efficient frontiers for each year for both price and overall yield measures and measure the distance of solo portfolios with respect to the nearest efficient portfolio (those with more comparable risk–return tradeoffs). The data are summarized in Table 5.

[INSERT TABLE 5 ABOVE THERE]

If we analyze the price dynamics, landmark buildings are not always on the efficient frontier. In 2010 and 2011 solo portfolios concentrated in other type of housing investments obtained a risk–return tradeoff more similar to that of an efficient portfolio. When overall yield is considered, landmark building solo portfolios are the only ones that are always on the efficient frontier; none of the other concentrated portfolios achieves comparable results.

If we consider multiple time horizons, the results do not change significantly and the landmark building solo portfolio is frequently an optimal investment strategy (Table 6).

[INSERT TABLE 6 ABOVE THERE]

Regarding price dynamics for a four-year time horizon, the landmark solo portfolio is always the concentrated portfolio nearest to the frontier with respect to other investment opportunities, whereas over a two- or three-year time horizon other solo portfolios may be more efficient than portfolios investing only in landmark buildings. Lower returns for the investment strategy on two- and three-year time horizons attain an investment strategy that includes 2011, the worst year in the period analyzed for the landmark and all other upper class real estate investments (cf. Table 3).

Regarding overall yield, the distance with respect to the efficient frontier of solo landmark portfolios is always zero and all other portfolios available are more distant from the efficient frontier. The distance of the other investment opportunities with respect to the efficient portfolio normally increases with the duration of the investment strategy (excluding low-income apartments).

To evaluate the usefulness of landmark buildings in a diversification strategy, we study the relation between the number of real estate assets considered and the role of landmark buildings in the composition of efficient portfolios (Figure 1).

[INSERT FIGURE 1 ABOVE THERE]

Significantly fewer types of assets were considered in 2008 and 2010 (between four and five) with respect to 2011 (more than seven, on average). The anomaly related to the efficient portfolios

constructed in 2011 is related to the price performance dynamics that year, which show a significant decrease of all the correlations between asset classes (cf. Table 4) and so an increase the usefulness of more diversified portfolios in order to obtain the highest advantages related to a diversification strategy. In examining the role of landmark buildings, our empirical analysis demonstrates that this type of asset is usually useful in a diversification strategy, with the role of the asset increasing in importance with the rise in risk assumed by the portfolio constructed.

To evaluate in more detail the relation between the risk of the portfolio constructed and the role of landmark buildings, we classify efficient portfolios into deciles on the basis of portfolio risk and compute statistics for each group of portfolios on only the role of landmark investments (Table 7).

[INSERT TABLE 7 ABOVE THERE]

If we compare the results obtained with the price return measure with those achieved with the overall yield, the role of landmark buildings is greater for the latter on the basis of both the median and mean values. If we consider overall yield, an efficient portfolio cannot be constructed without this asset (the minimum is always higher than zero). Except for the price dynamics in 2011, the role of landmark buildings grows with increases in risk and the highest-risk portfolios invest at least double in landmark buildings with respect to the lowest-risk portfolios.

If we consider multiple time horizons, the results do not change significantly and the role of landmark buildings in the efficient portfolios is always greater when overall yield is considered (Table 8).

[INSERT TABLE 8 ABOVE THERE]

Comparing the results obtained using the overall yield with those obtained with price performance, the role of landmark buildings in efficient portfolios is greater for the former than for the latter. This difference is relevant to both the mean and median values. The median and mean do not increase proportionally with the increase in the duration of the investment strategy time horizon and the mean is always higher than the median

Regarding the percentile distribution, excluding the price performance of the investment strategy for 2010 and 2011, the role of landmark buildings increases proportionally with the risk of the portfolio constructed. Therefore, the relevance of landmark buildings is normally higher for riskier investors, even for multiple-year time horizons.

4. Conclusion

Landmark buildings present price and rent dynamics that are not comparable with those of other types of housing investments. The low correlation between the returns of this asset class with respect to those of other types of residential investments could increase the usefulness of landmark buildings in the construction of diversified portfolios. The standard MPT optimization usually includes landmark buildings in the efficient portfolios and the role of this asset class increases with the rise in investor risk tolerance. The results are relevant independently with respect to the time horizon of the investment strategy and frequently a multiple-year time horizon magnifies the extra performance offered by landmark investments compared to other housing investment opportunities.

Tax incentives have played an important role in transforming real estate investment trusts into one of the main investors in landmark–trophy buildings in the commercial and office sectors (Getzedanner, 2004). The results presented in this paper support the hypothesis that landmark buildings represent an interesting investment opportunity for the institutional investor, not only in the commercial and office sectors but also in the residential sector. Due to the high number of specialized residential real estate vehicles developed in the last years in both the United States and Europe (e.g., Colin, 2007), the portfolio managers of such funds must consider the diversification benefits related to including landmark buildings, as done by other portfolio managers not specialized in the residential sector.

Empirical evidence demonstrates a strict relation between maintenance costs or other expenses and building appreciation/depreciation (e.g., Wilhelmsson, 2008). Therefore a more complete analysis needs to consider not only gross returns (price or overall) but also net returns. Moreover, there is evidence of a greater relevance of maintenance costs for historical buildings and, more generally, high-quality standards buildings. Further investigation is thus necessary to evaluate if the extra gains related to landmark investments still exist when net performance measures are considered.

Once the role of landmark buildings in a diversified housing portfolio is demonstrated, the next step would be to test its usefulness in a diversified portfolio that includes other real estate asset classes (e.g., office, industrial, and commercial). Analysis of such diversification issue must consider the possibility of including landmark buildings that are not classified as residential units and requires the construction of indexes for price and/or overall performance that are comparable among different real estate asset classes.

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Appendix

On the basis of the current law defined in 1939 (the so called "Nuovo Catasto Edilizio Urbano"), Italian houses are classified in one of the following categories:

Type A1 – Luxury house: Real estate units places in highly requested areas characterized by construction standards, technology and refurbishment higher that the average for the residential sector.
Type A2 - High income apartment: Real estate units characterized by construction standards, technology and refurbishment coherent with the local area demand.
Type A3 - Middle income apartment: Real estate units constructed with under the average quality standards and technology limited to essential.
Type A4 – Low income apartment: Real estate units constructed with lower quality standards and technology limited to essential.
Type A5 – Economy apartment: Real estate units constructed with the lowest quality standards.
Type A6 – Rural Houses: Real estate units constructed for agriculture purposed and used also as an house by the owners.
Type A7 – Maison: Independent real estate units characterized by construction standards, technology and refurbishment coherent with the local area demand or under the average.
Type A8 – Independent real estate units places in highly requested areas characterized by construction standards, technology and refurbishment higher that the average for the residential sector.
Type A9 – Castles or villas characterized by outstanding / unique features with respect to other building available for the same type of households.
Type A11 – Crude building: Mountain Dew, Shack, etc..

Source: Agenzia del territorio data processed by the author

Table 1. Sample description

*Overall sample – number of residential units**				
	2008	2009	2010	2011
Landmark building (A9)	2,430	2,451	2,463	2519
Luxury apartment (A1)	36,732	36,385	36,291	36154
High income apartment (A2)	10,817,919	11,093,017	11,330,912	11,580,391
Middle income apartment (A3)	11,431,139	11,637,545	11,821,498	12,061,170
Low income apartment (A4)	5,673,259	5,672,572	5,665,910	5,683,426
Economy apartment (A5)	1,132,215	1,098,443	1,068,257	1,035,957
Rural Houses (A6)	859,111	833,421	808,526	782,429
Maison (A7)	1,993,667	2,058,375	2,118,819	2,193,650
Manor (A8)	34,288	34,427	34,628	35,007
Crude Building (A11)	17,086	17,435	18,061	18,696

Landmark buildings				
	2008	2009	2010	2011
N° of Landmark buildings in North-west	1690	1691	1693	1703
N° of Landmark buildings in North-east	96	97	97	99
N° of Landmark buildings in Center	513	553	563	604
N° of Landmark buildings in South and Islands	131	110	110	113
N° of cities with landmark buildings	86	86	86	86
N° of cities without landmark buildings	15	15	15	15
Mean landmark buildings for each city	24	24	24	25
Min landmark buildings for each city	0	0	0	0
Max landmark buildings for each city	512	505	503	502

Source: Agenzia del territorio data processed by the author

Table 2. Summary statistics of price and rent for m^2 by type of residential unit

The table presents average value and in brackets the Kolmogorov-Smirnov test for the comparison between Landmark building distribution and the other type of residential units (null hypothesis equal distribution)

		2007	2008	2009	2010	2011
Landmark building (A9)	Price m^2	*2218.28 €*	*2193.26 €*	*2171.95 €*	*2192.02 €*	*2176.41 €*
	Rent m^2	*51.21 €*	*50.75 €*	*54.52 €*	*51.04 €*	*51.47 €*
Luxury apartment (A1)	Price m^2	2710.14 € [0.00]	2712.76 € [0.00]	2653.27 € [0.00]	2649.83 € [0.00]	2736.46 € [0.00]
	Rent m^2	62.46 € [0.00]	61.88 € [0.00]	65.56 € [0.00]	61.07 € [0.00]	63.93 € [0.00]
High income apartment (A2)	Price m^2	1512.26 € [0.00]	1507.42 € [0.00]	1478.18 € [0.00]	1486.22 € [0.00]	1442.53 € [0.00]
	Rent m^2	35.05 € [0.00]	34.83 € [0.00]	37.06 € [0.00]	34.36 € [0.00]	34.79 € [0.00]
Middle income apartment (A3)	Price m^2	1065.44 € [0.00]	1056.06 € [0.00]	1052.69 € [0.00]	1052.22 € [0.00]	1011.26 € [0.00]
	Rent m^2	24.65 € [0.00]	24.58 € [0.00]	26.56 € [0.00]	24.54 € [0.00]	24.51 € [0.00]
Low income apartment (A4)	Price m^2	693.44 € [0.00]	696.43 € [0.00]	697.79 € [0.00]	684.02 € [0.00]	707.18 € [0.00]
	Rent m^2	16.03 € [0.00]	16.14 € [0.00]	17.56 € [0.00]	15.90 € [0.00]	16.70 € [0.00]
Economy apartment (A5)	Price m^2	523.02 € [0.00]	528.98 € [0.00]	518.89 € [0.00]	517.63 € [0.00]	553.35 € [0.00]
	Rent m^2	12.09 € [0.00]	12.26 € [0.00]	13.08 € [0.00]	12.05 € [0.00]	12.66 € [0.00]
Rural Houses (A6)	Price m^2	405.17 € [0.00]	403.72 € [0.00]	401.07 € [0.00]	409.77 € [0.00]	418.04 € [0.00]
	Rent m^2	9.54 € [0.00]	9.54 € [0.00]	10.34 € [0.00]	9.65 € [0.00]	9.76 € [0.00]
Maison (A7)	Price m^2	1731.99 € [0.00]	1729.86 € [0.00]	1680.19 € [0.00]	1679.45 € [0.00]	1608.17 € [0.00]
	Rent m^2	39.84 € [0.01]	39.95 € [0.01]	42.11 € [0.00]	38.93 € [0.00]	39.52 € [0.00]
Manor (A8)	Price m^2	2761.64 € [0.00]	2686.72 € [0.00]	2621.82 € [0.00]	2672.68 € [0.00]	2673.70 € [0.00]
	Rent m^2	63.35 € [0.00]	62.40 € [0.00]	65.41 € [0.00]	61.55 € [0.00]	63.62 € [0.00]
Crude Building (A11)	Price m^2	397.59 € [0.00]	423.51 € [0.00]	429.15 € [0.00]	412.56 € [0.00]	382.49 € [0.00]
	Rent m^2	9.53 € [0.00]	10.14 € [0.00]	10.98 € [0.00]	9.86 € [0.00]	9.86 € [0.00]

Source: Agenzia del territorio data processed by the author

Table 3. Annual rate of return for different types of residential investments

The table presents summary statistics (mean and standard deviation) for both the price yield and overall yield and presents the results of the Kolmogorov-Smirnov test for the comparison between Landmark building distribution and the other type of residential units (null hypothesis equal distribution)

		2008		2009		2010		2011	
		Price Yield	Overall Yield	Price Yield	Overall Yield	Price Yield	Overall Yield	Price Yield	Overall Yield
Landmark building (A9)	Mean	-0.72%	1.69%	0.51%	3.07%	-0.19%	2.88%	-0.38%	2.45%
	St.Dev	0.97%	0.98%	5.95%	5.27%	4.75%	3.28%	2.25%	1.31%
Luxury apartment (A1)	Mean	-0.06%	2.34%	-0.25%	2.16%	-0.15%	2.58%	0.58%	2.36%
	St.Dev	0.89%	0.98%	3.66%	3.27%	3.41%	2.93%	2.70%	1.52%
	KS test	56.26%	68.28%	3.27%	10.24%	34.99%	7.15%	0.00%	0.00%
High income apartment (A2)	Mean	-0.18%	2.32%	-0.62%	1.62%	-0.41%	2.03%	-2.39%	0.13%
	St.Dev	0.53%	0.44%	2.33%	2.15%	1.85%	1.81%	1.23%	1.16%
	KS test	3.27%	3.27%	0.00%	0.32%	19.76%	0.54%	0.00%	0.00%
Middle income apartment (A3)	Mean	-0.62%	1.79%	-0.87%	1.39%	-0.81%	1.69%	-2.43%	0.18%
	St.Dev	1.42%	1.31%	2.35%	2.15%	1.86%	1.73%	1.93%	1.68%
	KS test	1.38%	2.15%	0.00%	0.00%	7.15%	0.00%	0.00%	0.00%
Low income apartment (A4)	Mean	-0.69%	1.71%	-0.48%	1.69%	-0.35%	2.19%	-0.02%	2.44%
	St.Dev	0.94%	0.93%	2.30%	2.19%	2.34%	2.04%	1.51%	1.46%
	KS test	10.24%	4.89%	0.00%	1.38%	26.59%	4.89%	0.00%	0.00%
Economy apartment (A5)	Mean	-0.85%	1.56%	-0.73%	1.61%	-0.50%	2.03%	-0.71%	1.72%
	St.Dev	1.07%	1.07%	2.77%	2.26%	2.31%	2.01%	1.78%	1.79%
	KS test	19.76%	4.89%	0.19%	1.38%	68.28%	19.76%	0.00%	0.00%
Rural Houses (A6)	Mean	-0.69%	1.75%	-0.87%	1.41%	-0.79%	1.77%	0.04%	2.14%
	St.Dev	1.10%	1.07%	2.53%	2.17%	2.02%	1.67%	3.65%	2.70%
	KS test	10.24%	10.24%	0.19%	0.87%	26.59%	0.54%	0.00%	0.00%
Maison (A7)	Mean	-0.72%	1.68%	-0.66%	1.53%	-0.50%	2.00%	-4.68%	-1.90%
	St.Dev	1.12%	1.15%	2.29%	2.17%	1.99%	1.90%	3.44%	2.73%
	KS test	0.11%	0.87%	0.00%	0.32%	26.59%	0.19%	0.00%	0.00%
Manor (A8)	Mean	-0.80%	1.67%	-0.56%	1.63%	-0.57%	1.90%	-1.17%	1.39%
	St.Dev	1.22%	1.12%	2.40%	2.34%	2.08%	1.82%	2.73%	2.44%
	KS test	10.24%	10.24%	0.54%	4.89%	14.38%	3.27%	0.00%	0.00%
Crude Building (A11)	Mean	-0.64%	1.80%	-0.85%	1.55%	-0.82%	1.64%	-4.67%	-1.85%
	St.Dev	1.23%	1.28%	1.48%	1.02%	0.96%	0.92%	3.86%	3.35%
	KS test	0.00%	0.00%	0.00%	0.00%	19.76%	0.00%	0.00%	0.00%

Source: Agenzia del territorio data processed by the author

Table 4. Correlation analysis

Considering both the price yield and overall yield, the table presents the Pearson pairwise linear correlation coefficient between landmark building performance and other type of residential investment.

	2008	2009	2010	2011
Price Yield				
Luxury apartment (A1)	41.47%**	49.25%*	29.89%**	-7.23%
High income apartment (A2)	53.98%**	44.71%**	11.26%**	-2.70%
Middle income apartment (A3)	54.06%**	46.81%**	12.50%**	-4.12%
Low income apartment (A4)	55.05%**	41.46%**	13.01%**	-8.68%
Economy apartment (A5)	44.04%**	30.21%**	3.56%*	-8.18%
Rural Houses (A6)	52.96%**	23.71%**	6.03%	-0.74%
Maison (A7)	51.50%**	46.52%**	9.14%**	2.40%
Manor (A8)	42.71%**	35.21%**	12.11%*	5.46%
Crude Building (A11)	28.08%**	13.06%	3.47%	-6.21%
Overall Yield				
Luxury apartment (A1)	41.52%**	54.38%**	37.44%**	-10.79%
High income apartment (A2)	54.52%**	44.45%**	43.22%**	-15.56%*
Middle income apartment (A3)	55.95%**	46.46%**	43.44%**	-10.13%
Low income apartment (A4)	54.41%**	43.90%**	42.75%**	-16.85%
Economy apartment (A5)	47.84%**	38.29%**	36.81%**	-13.64%
Rural Houses (A6)	53.59%**	25.79%**	20.14%*	16.07%
Maison (A7)	52.61%**	44.80%**	41.81%**	-17.02%
Manor (A8)	42.73%**	34.74%**	20.89%*	-7.72%
Crude Building (A11)	23.82%*	7.03%	-0.90%	-4.71%

Notes: * Significant at 95% level ** Significant at 99% level

Source: Agenzia del territorio data processed by the author

Table 5. Statistics on the distance between efficient frontiers and type of investments

Considering both price yield and overall yield, the table presents the minimum distance between the efficient frontier and the solo-portfolio investment constructed on different types of residential units.

	Price Yield				*Overall Yield*			
	2008	2009	2010	2011	2008	2009	2010	2011
Landmark building (A9)	0.00%	0.00%	1.34%	0.81%	0.00%	0.00%	0.00%	0.00%
Luxury apartment (A1)	0.46%	0.28%	0.00%	0.26%	0.40%	0.32%	0.25%	0.23%
High income apartment (A2)	0.17%	0.28%	0.04%	1.32%	0.22%	0.49%	0.34%	1.44%
Middle income apartment (A3)	0.34%	0.52%	0.42%	1.74%	0.43%	0.71%	0.62%	1.64%
Low income apartment (A4)	0.29%	0.14%	0.08%	0.00%	0.29%	0.44%	0.29%	0.16%
Economy apartment (A5)	0.32%	0.51%	0.23%	0.73%	0.39%	0.53%	0.43%	0.88%
Rural Houses (A6)	0.46%	0.58%	0.45%	1.74%	0.39%	0.69%	0.52%	1.42%
Maison (A7)	0.21%	0.30%	0.15%	4.44%	0.28%	0.58%	0.41%	3.95%
Manor (A8)	0.35%	0.24%	0.24%	1.67%	0.37%	0.54%	0.47%	1.55%
Crude Building (A11)	0.20%	0.10%	0.12%	4.70%	0.09%	0.03%	0.15%	4.27%

Source: Agenzia del territorio data processed by the author

Table 6. Statistics on the distance between efficient frontiers and type of investments on multiple time horizons

Considering both price yield and overall yield, the table presents the minimum distance between the efficient frontier and the solo-portfolio investment constructed on different types of residential units.

Proxy	*Price Yield*						*Overall Yield*					
Length of the time horizon	2 years			3 years		4 years	2 years			3 years		4 years
Years	2008 2009	2009 2010	2010 2011	2008 2010	2009 2011	2008 2011	2008 2009	2009 2010	2010 2011	2008 2010	2009 2011	2008 2011
Landmark building (A9)	0.00%	0.00%	1.46%	0.00%	3.37%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Luxury apartment (A1)	0.62%	0.35%	0.00%	0.66%	0.00%	0.27%	0.67%	0.55%	0.33%	0.92%	0.57%	0.90%
High income apartment (A2)	0.43%	0.31%	0.48%	0.45%	0.86%	0.94%	0.71%	0.76%	0.70%	1.01%	1.08%	1.27%
Middle income apartment (A3)	0.86%	0.91%	1.17%	1.23%	1.34%	1.56%	1.14%	1.27%	1.19%	1.73%	1.42%	1.80%
Low income apartment (A4)	0.35%	0.24%	0.33%	0.45%	0.27%	0.38%	0.69%	0.65%	0.38%	0.94%	0.34%	0.52%
Economy apartment (A5)	0.74%	0.72%	1.05%	0.92%	1.49%	1.48%	0.82%	0.87%	1.17%	1.18%	1.24%	1.33%
Rural Houses (A6)	0.94%	0.99%	1.17%	1.31%	1.48%	1.74%	1.03%	1.14%	1.39%	1.51%	1.43%	1.67%
Maison (A7)	0.48%	0.44%	3.36%	0.62%	2.67%	2.57%	0.85%	0.90%	3.14%	1.21%	2.59%	2.67%
Manor (A8)	0.42%	0.46%	1.67%	0.63%	1.48%	1.56%	0.79%	0.95%	1.48%	1.22%	1.47%	1.66%
Crude Building (A11)	0.25%	0.16%	3.63%	0.31%	2.81%	2.66%	0.12%	0.14%	3.44%	0.26%	2.46%	2.33%

Source: Agenzia del territorio data processed by the author

Table 7. Statistics on the role of landmark investment in the efficient portfolios

The table presents for both the price yield and overall yield the mean, median, maximum and minimum weight of the landmark portfolios. The table presents also the mean weight of landmark portfolios in the efficient portfolios reclassified on the basis of their return and risk profile: the lowest percentile encompass the lower risk portfolios and the highest considers the riskiest ones.

	Price Yield				*Overall Yield*			
	2008	2009	2010	2011	2008	2009	2010	2011
Overall sample								
Mean	42.97%	40.80%	7.97%	15.33%	51.73%	45.75%	34.66%	30.22%
Median	39.15%	34.38%	6.89%	16.26%	51.75%	44.95%	32.08%	28.89%
Min	0.00%	0.00%	0.00%	0.00%	3.88%	0.78%	2.70%	22.46%
Max	100%	100%	22.80%	18.28%	100%	100%	100%	100%
Percentiles								
1^{st}-10^{th} percentile	1.82%	2.88%	0.68%	14.32%	8.23%	4.58%	5.29%	23.05%
11^{th}-20^{th} percentile	8.80%	9.92%	1.88%	14.87%	17.92%	13.46%	11.08%	24.34%
21^{st}-30^{th} percentile	16.85%	16.87%	3.40%	15.43%	27.60%	22.45%	17.23%	25.64%
31^{st}-40^{th} percentile	25.43%	23.81%	4.85%	15.98%	37.28%	31.45%	23.22%	26.94%
41^{st}-50^{th} percentile	34.48%	30.75%	6.30%	16.53%	46.93%	40.45%	29.14%	28.24%
51^{st}-60^{th} percentile	43.90%	39.78%	7.76%	17.09%	56.57%	49.45%	35.03%	29.53%
61^{st}-70^{th} percentile	55.52%	51.50%	9.21%	17.64%	66.20%	58.45%	40.94%	30.83%
71^{st}-80^{th} percentile	68.21%	63.81%	11.58%	18.08%	75.84%	67.44%	46.86%	32.22%
81^{st}-90^{th} percentile	80.89%	76.35%	15.71%	17.84%	85.48%	77.18%	54.69%	33.65%
91^{st}-100^{th} percentile	93.79%	92.30%	18.30%	5.49%	95.19%	92.56%	83.09%	47.78%

Source: Agenzia del territorio data processed by the author

Table 8. Statistics on the role of landmark investment in the efficient portfolios on multiple time horizons

The table presents for both the price yield and overall yield the mean, median, maximum and minimum weight of the landmark portfolios. The table presents also the mean weight of landmark portfolios in the efficient portfolios reclassified on the basis of their return and risk profile: the lowest percentile encompass the lower risk portfolios and the highest considers the riskiest ones.

Proxy	*Price Yield*						*Overall Yield*					
Length of the time horizon	2 years			3 years		4 years	2 years			3 years		4 years
Years	2008 2009	2009 2010	2010 2011	2008 2010	2009 2011	2008 2011	2008 2009	2009 2010	2010 2011	2008 2010	2009 2011	2008 2011
Overall sample												
Mean	44.18%	31.74%	4.13%	36.95%	3.39%	9.98%	49.89%	39.68%	21.59%	44.13%	20.98%	24.56%
Median	39.61%	22.96%	4.12%	29.74%	1.65%	4.09%	49.81%	37.18%	15.15%	42.90%	8.07%	12.06%
Min	2.25%	0.55%	0.00%	1.85%	0.00%	0.00%	3.04%	0.91%	4.65%	2.07%	0.00%	0.00%
Max	100%	100%	8.37%	100%	18.63%	100%	100%	100%	100%	100%	100%	100%
Percentiles												
1^{st}-10^{th} percentile	5.48%	2.20%	0.89%	4.28%	0.00%	0.00%	6.85%	4.00%	5.55%	5.69%	0.02%	0.67%
11^{th}-20^{th} percentile	12.92%	6.63%	2.04%	9.76%	0.00%	0.21%	16.26%	11.40%	7.57%	14.05%	0.91%	2.41%
21^{st}-30^{th} percentile	20.54%	11.29%	3.20%	15.47%	0.00%	1.15%	25.88%	18.79%	9.58%	22.32%	2.58%	4.69%
31^{st}-40^{th} percentile	28.17%	15.96%	4.35%	21.18%	0.41%	2.28%	35.46%	26.15%	11.59%	30.57%	4.73%	7.62%
41^{st}-50^{th} percentile	35.80%	20.63%	5.51%	26.89%	1.31%	3.49%	45.02%	33.50%	13.89%	38.79%	6.96%	10.58%
51^{st}-60^{th} percentile	43.62%	25.73%	6.66%	33.15%	2.14%	4.69%	54.59%	40.86%	16.41%	47.00%	10.39%	14.57%
61^{st}-70^{th} percentile	54.87%	35.13%	7.71%	43.60%	2.97%	6.19%	64.15%	48.21%	19.03%	55.22%	18.95%	24.54%
71^{st}-80^{th} percentile	67.37%	47.49%	8.13%	55.35%	4.80%	10.97%	73.72%	55.57%	24.53%	63.43%	31.80%	38.15%
81^{st}-90^{th} percentile	79.92%	63.73%	2.81%	69.59%	8.57%	20.02%	83.28%	68.26%	36.78%	73.03%	50.64%	57.20%
91^{st}-100^{th} percentile	93.15%	88.64%	0.00%	90.22%	13.70%	50.77%	93.67%	90.11%	70.97%	91.18%	82.77%	85.20%

Source: Agenzia del territorio data processed by the author