The Value of Sustainable Property Management in Real Estate: Evidence from Hong Kong

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Abstract:

This study investigates whether sustainability in property management is valued by property buyers. Using a sample of 312,474 property transactions in Hong Kong from 2007 to 2021 and based on a hedonic pricing model, we find that the environmental, social, and governance (ESG) performance of property management companies is positively associated with housing prices, and that housing prices drop if property management companies experience ESG-related risk incidents. The results are robust when the sample is restricted to repeat-sales transactions and when using a location-based matching approach and an instrumental variable approach. Further analysis shows that housing prices increase with the social and governance performance of property management companies but not with their environmental performance. The negative effect of ESG incidents on housing prices increases if the incidents are reported by high-reach media. Homebuyers and non-local buyers are more willing to pay a premium for sustainability in property management than are real estate speculators and local buyers. Additional evidence suggests that ESG practices play a more significant role in affecting property value through lower risk or a higher rental income growth rate than through higher gross rents. Overall, this study provides evidence of the value of sustainable property management in real estate.

Keywords: sustainable property management; ESG rating; ESG incident; housing price; homebuyer; non-local buyer

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1. Introduction

Companies are increasingly aware of environmental, social, and governance (ESG) issues, due to a number of factors including increased stakeholder pressure, changing regulations, and a growing understanding of the importance of sustainability and responsible business practices. Companies recognize that ESG issues can affect their long-term financial performance and reputation, as well as their ability to attract and retain employees, customers, and investors. However, the value of ESG and sustainable business practices is still unclear. Numerous studies suggest that corporate ESG (or corporate social responsibility, CSR) performance is positively associated with corporate financial performance (Orlitzky et al., 2003). However, some studies reveal that there is no relationship, or even a negative relationship, between sustainability and corporate financial performance, probably because sustainable practices are costly (Margolis, Elfenbein, and Walsh, 2009; Wang et al., 2016). Most studies examine the impact of sustainability on businesses[1]. Although real estate represents the largest asset class in the world, studies of the value of sustainability in real estate assets remain rare[2]. This study fills this notable research gap by focusing specifically on the value of sustainable activities in property management and its impact on housing prices.

Property management services are critical for the successful operation and management of high-rise residential buildings, especially those in Asia. Property management companies are responsible for regularly inspecting the building structure, elevators, and fire safety systems, managing the flow of people and goods within the building, creating a sense of community by organizing social events, managing common areas such as clubs and their income and expenses, repair and maintenance of common areas and structures, and handling problems or disputes between residents. Sustainable property management by ESG-minded property management companies can add value for residents by ensuring their safety, comfort, and satisfaction, maintaining building conditions, reducing the risk of accidents in the building, and properly

[1] Another strand of the literature explores the relationship between ESG/CSR and stock returns. The evidence on whether ESG/CSR is associated with positive stock returns is also mixed (see, e.g., Hong and Kacperczyk, 2009; Edmans, 2011; Dimson et al., 2015; Lins et al., 2017; Pastor et al., 2021, 2022; Pedersen et al., 2021).

[2] Studies on sustainability in real estate focus on the effect of CSR/ESG on the performance of real estate investment trusts (Eichholtz et al., 2012; Chiang et al., 2019; Feng and Wu, 2023; Fan et al., 2024) and the green building premium (e.g., Eichholtz et al., 2010). Our study differs from these studies in that we investigate the value of sustainable property management in real estate.

managing income and expenses related to common areas[3]. Thus, sustainable property management is expected to add value to residential properties. We test this hypothesis using a large number of property transactions in Hong Kong, where most residential buildings are managed by professional property management companies.

Based on a sample of 312,474 property transactions in Hong Kong from 2007 to 2021, we use a hedonic pricing model to investigate whether responsible property management is valued by property buyers. We measure the sustainability of property management using the ESG ratings of property management companies provided by MSCI, a leading ESG rating agency, and the ESG risk incidents of property management companies provided by RepRisk. The results can be summarized as follows. First, we find that housing prices increase significantly with the ESG performance of property management companies, while they decrease significantly if property management companies experience ESG risk incidents. These results are robust across multiple analyses, including using a sample of repeat-sales transactions, a sample of location-based matched transactions, and the instrumental variable approach. Second, the impacts of ESG factors of property management on housing prices are significant for the governance and social performance of property management companies, but not for their environmental performance. ESG risk incidents covered by high-reach media have more negative effects on housing prices. We further find that non-local buyers and homebuyers are more willing to pay a premium for properties managed by property management companies with better ESG performance. Non-local buyers and homebuyers value responsible property management more than local buyers and real estate speculators, probably due to their risk aversion to avoid loss of property value arising from future ESG-related incidents in buildings. Finally, we provide evidence that the association between ESG practices in property management and housing prices arises from lower risk or a higher growth rate rather than from higher gross rents.

This study contributes to understanding of the value of sustainability in real estate. Studies mainly focus on the effects of CSR/ESG in real estate investment companies (e.g., real estate investment trusts) and the impacts of green features of buildings on housing prices (Eichholtz et al., 2010; Eichholtz et al., 2012; Chiang et al., 2019; Feng and Wu, 2023). In contrast, we explore the value of sustainability among a group of key stakeholders in real estate, namely the

[3] We use "responsible property management" and "sustainable property management" interchangeably in this study. There is no official definition of responsible property management. According to RICS (2021), a responsible property management company must focus on long-term sustainability and incorporate ESG factors into the management of properties and facilities.

companies that provide property management services to residents. This study is the first to document the positive value of sustainable property management for property buyers.

The remainder of the paper is structured as follows. In Section 2, we discuss the background of this study and the related literature in depth and develop our hypothesis. The data and sample used in our research are presented in Section 3. In Section 4, we report our empirical results. Finally, in Section 5, we conclude the paper and discuss the implications of the results.

2. Background, literature review, and hypothesis development

Background

Hong Kong is well known worldwide for its densely populated development and confined developable areas. In Hong Kong, high-rise and compact residential buildings are ubiquitous, in contrast with most foreign regions (especially beyond Asian countries), where residential flats are constructed in a detached or semi-detached style (Gifford, 2007). In multi-story dwellings, each homeowner is responsible for the common areas of the building. However, the repair and maintenance of these areas are often neglected by property owners because the common areas are not part of their private dwellings. This negligence can depreciate housing prices and thus harm the private interests of building owners. The "tragedy of the anti-commons" introduced by Heller (1998) describes this phenomenon, referring to the excessive fragmentation of property rights, which leads to insufficient coordination among property owners and causing a loss of their assets and properties.

To prevent the occurrence of such a phenomenon and its negative impacts on properties, property management services have become an essential component of residential buildings in Hong Kong[4]. Various guides and practices have been developed by recognized professional bodies to clarify the duties of property managers in Hong Kong. According to the Hong Kong Institute of Surveyors (2015), property managers are responsible for all services related to a property's operation, security and cleaning, repair and maintenance (including procurement and tendering for repair work), financial management of income and expenses related to common areas, and emergency management, among others[5]. Property owners normally pay a

[4] A real-life example of the "tragedy of the anti-commons" in Hong Kong are buildings more than half a century old, generally referred to as "three-nil buildings" (i.e., no owners' corporation, no residents' organization, and no property management companies) (Legco, 2020).

[5] The maintenance part includes repair and cleaning work in common areas and routine checking of building services to maintain the functionality of the property. In the operation part, checking security, handling complaints, and solving disputes between clients are the responsibility of property managers.

property management fee each month, as well as additional fees to use certain facilities like a swimming pool. Property management fees vary depending on the type and size of the property, the level of services required, and the location of the property. The monthly property management fee paid by property owners is equivalent to approximately 5% of a property's monthly rent. In addition to regular property management fees, property owners may incur additional costs to repair and maintain the common areas, structure, and external walls of buildings every few years. Property management companies are responsible for collecting and managing these expenses[6].

Property management companies in Hong Kong have integrated ESG factors into their practices. These companies are usually concerned with the "environmental" part of ESG and use various strategies to achieve green targets, such as carbon neutrality, energy-saving measures, and waste reduction. Therefore, some features of green buildings and renewable energy supply have long been implemented by property management companies in recent years, such as installing solar panels and using Internet of Things technology to optimize energy consumption (Deloitte, 2022). Furthermore, the "social" element of ESG plays a crucial role in determining which property management companies are socially responsible. This involves engaging in community contributions through initiatives such as charity work and volunteering services. Promoting gender equality is another aspect of social responsibility, such as increasing the representation of women in management positions. Large property management companies also prioritize continuous training and development of their employees to enhance their professionalism. Finally, to improve their governance quality, these companies often establish anti-corruption and anti-bribery policies and disclose insiders' information to increase transparency (See recent annual reports in Kowloon Development Company Ltd., Kerry Properties Limited, Sun Hung Kai Properties, etc.)[7]. Unfortunately, small and medium-sized property management companies often neglect the "governance" component of ESG (Deloitte, 2022).

Literature review

[6] Based on data provided by the Urban Renewal Authority of Hong Kong (2023), the average repair and maintenance cost per property is HKD63,384, with the highest recorded cost reaching HKD268,962 for a rehabilitation project. These statistics align with the estimated building maintenance cost per unit every 10 years, as projected by the Hong Kong Institute of Surveyors in 2012.

[7] The Hong Kong real estate market is dominated by prominent developers such as Sun Hung Kai Properties, Henderson Land Development, CK Asset Holdings, and New World Development (Shen et al., 2018; Shen et al., 2019). Some of these developers have subsidiaries that are large property management companies.

Since Rosen's (1974) seminal paper, studies have explored factors that can affect housing prices, primarily physical characteristics such as location, size, age, building features, and neighborhood. Some studies explore the impacts of intangible characteristics on property transaction prices, such as school quality (e.g., Brasington, 1999; Seo and Simons, 2009; Gibbons, Machin, and Silva, 2013), crime and violence (e.g., Pope, 2008; Ihlanfeldt and Mayock, 2010; Besley and Mueller, 2012), and environmental externalities (Chay and Greenstone, 2005; Greenstone and Gallagher, 2008; Currie et al., 2015; Muehlenbachs et al., 2015). Buyers will pay a premium for the anticipated benefits of improved transport infrastructure. Furthermore, Jayantha et al. (2015) reveal that the announcement of a project has a positive effect on housing prices in Hong Kong. These studies show that housing prices do indeed reflect the value of social and environmental activities.

In Hong Kong, several studies show that unnatural deaths and superstition have a negative effect on housing prices. Specifically, the price of units associated with haunted properties is approximately 20% lower than that of other units (Bhattacharya et al., 2021). In addition, this negative impact spills over and results in a price reduction of 10% for units located on the same floor, 7% for units in the same block, and 1% for units in the same housing estate (Bhattacharya et al., 2021). Furthermore, property buyers can distinguish between private space and shared space. Chan et al. (2008) find a negative relationship between the amount of shared space and housing prices in Hong Kong. In addition, homebuyers are sensitive to different forms of shared space, such as clubhouses, and are discerning about how gross housing space is distributed. Finally, Hui et al. (2017) find that property buyers are willing to pay a higher price for green-certified office properties than for residential properties. These findings indicate that commercial property buyers are concerned about improving the environmental or energy performance of buildings.

Hypothesis development

Property managers play an essential role in the operation and management of buildings. Real estate property managers are increasingly required to integrate ESG considerations into their management. To determine how the ESG performance of property management companies may affect housing prices, we consider a Gordon growth model to determine the value of a property for property owners as follows:

$$Property\ value = \frac{NOI}{r - g}$$

(1)

where *NOI* is net operating income, *r* is the property's discount rate, and *g* is the long-term growth rate of net operating income. Net operating income can be derived from gross rental income net of expenses, such as vacancy, property management fees, repair and maintenance costs, and taxes.

Several factors contribute to the ESG performance of property managers, including their ability to incorporate sustainable and socially responsible practices into their property management practices, such as energy efficiency, waste management, tenant satisfaction, community engagement, and employee training and governance. The ESG performance of property managers can influence housing prices through different elements of our model above. Residents can benefit from better housing services from responsible property management companies (after considering the property management fees they pay), leading to higher gross rents for these properties. When the governance quality of property management companies improves, their income and expenses related to common areas are less likely to be misused, resulted in a reduction in repair and maintenance costs for property owners[8]. With effective routine checks, repair and maintenance, residential buildings managed by property managers with strong ESG practices can have more stable future rents, slower value depreciation, and lower vacancy rates. Hence, improving the ESG performance of property managers can contribute to an increase in net operating income[9].

Improving the ESG performance of property management companies can also reduce the probability of unforeseen negative incidents in buildings (e.g., unnatural deaths), which can significantly harm property value. Thus, property risks may be lower if the property is managed by responsible property management companies, leading to a lower discount rate. Furthermore, positive tenant experiences and improved property conditions, driven by higher ESG scores,

[8] Repair and maintenance costs are closely linked to the governance quality of property management companies. In a recent case, the Independent Commission Against Corruption charged 23 individuals, including employees of property management companies, in connection with a housing renovation project. The project involved contracts worth HKD520 million and bribes amounting to over HKD6.5 million (South China Morning Post, 2023). In addition, routine repair and maintenance costs account for approximately 27.7% of property management fees (Consumer Council, 2023). Therefore, property owners should take into consideration the governance quality of property management companies when making investment decisions.

[9] Property management companies may need to increase their property management fees to improve their ESG performance. If property management fees increase substantially, the benefits of enhancing ESG may be fully offset, leading to no change or even a decrease in net operating income. However, property management fees for buildings in Hong Kong normally remain stable over time. In addition, certain ESG practices, such as governance and employee training and development, may not cost much to property management companies, but they can help increase gross rents and decrease the maintenance costs of property owners.

can create an advantageous setting for landlords to consider future rental price adjustments. As the ESG performance of property management companies can enhance a property's net operating income, decrease property risks, or increase the rental growth rate, according to the Gordon growth model, property buyers may be more willing to pay a premium for the properties they manage. Therefore, the following hypothesis is formulated:

H1: Residential properties managed by property managers with better ESG performance trade at higher prices.

3. Data and sample

We use individual-level housing transaction data from the Economic Property Research Centre (EPRC), which meticulously maintains all residential transaction records documented by the Hong Kong Land Registry (Hui et al., 2007; Hui et al., 2017). In addition to offering comprehensive information on transactions and housing characteristics such as transaction prices, property areas, number of floors, number of bedrooms, and number of dining rooms, this dataset provides the names of buyers. This information enables us to identify non-local buyers by analyzing the spelling of their names (Fan et al., 2023b). We also use this information to identify homebuyers, also known as non-flippers, who hold onto their property for at least two years (Agarwal et al., 2022). We exclude buyers that are companies and organizations[10].

The list of property managers is obtained from the Hong Kong Association of Property Management Companies. This association provides information about its members and the properties they manage. It consists of 113 members providing property management services to over 70% of Hong Kong residents, commercial buildings, car parks, and private and government facilities. The property managers are then manually matched with the ESG performance data provided by MSCI and the ESG risk incidents from the RepRisk database by identifying their names and parent companies. We use both the ESG ratings and ESG risk incidents to capture the ESG performance of property management companies.

Since 2007, MSCI ESG ratings have been updated monthly by assessing a company's exposure to ESG issues. MSCI provides an overall ESG score and a score for three subcategories (i.e., an environmental pillar score, a social pillar score, and a governance pillar score) for a company. The MSCI ESG scores range from 0 to 10. Prior studies use MSCI ESG

[10] These buyers often use different strategies when purchasing residential properties, such as bulk purchasing and negotiation, which can significantly influence housing prices. Additionally, their decision-making processes differ from those of individual buyers.

data to examine the link between ESG performance and stock returns (e.g., Giese et al., 2020; Pastor et al., 2022). RepRisk screens daily updated data from 100,000 public sources in 23 languages. It flags and monitors ESG incidents and violations of international standards that may negatively impact a company's reputation, compliance, and finances. As the world's largest database, it covers more than 200,000 public and private companies worldwide (Li and Wu, 2020; Dai et al., 2021). In total, MSCI provides ESG scores for 21 property managers, while RepRisk provides ESG incidents for 30 property managers[11].

We identify the addresses of buildings managed by property management companies and the addresses of properties in the housing transaction data from the EPRC. Addresses are obtained through the Address Lookup Service provided by the Office of the Government Chief Information Officer of the Hong Kong government and the Location Search API provided by the Lands Department of the Hong Kong government. By matching the addresses from the EPRC housing transaction data with addresses of buildings covered by property management companies, we merge the databases of housing transactions and ESG performance of property management companies. The sample period for our analysis spans the period from 2007 to 2021, as both MSCI ESG scores and RepRisk ESG incidents begin in 2007. To ensure the robustness of our analysis and mitigate the influence of outliers, we follow previous studies and winsorize the transaction prices and property areas at the top and bottom 1% levels[12] (Zheng et al., 2020; Wong et al., 2022). In our sample consisting of 312,474 transactions, we capture approximately 29.8% of the total number of residential property transactions[13].

[Insert Table 1 here]

[11] Property management companies are unlikely to bribe rating agencies or receive preferential treatment from them. MSCI, for instance, employs a rules-based methodology that uses artificial intelligence (AI), machine learning, and natural language processing to rate companies based on their ESG performance and exposure to material ESG risks in their industry. The ratings are determined by objective criteria rather than subjective judgments, which helps ensure the fairness of the evaluation process. Similarly, RepRisk, another important rating agency, employs a rules-based methodology to systematically identify and monitor material ESG risks and violations of international standards that can have reputational, compliance, and financial impacts on a company. It does this by screening various public sources, including print, online, and social media, using AI and machine learning techniques. While we cannot completely rule out the possibility of bias in rating agency processes, the use of rules-based methodologies and the application of AI and machine learning techniques aim to reduce subjective judgments and increase the objectivity of the assessment.

[12] As recommended by an anonymous reviewer, we conduct an analysis excluding all transaction prices per square foot that are in the top and bottom 1% range. We find that our results remain robust even after implementing this trimming procedure.

[13] Our sample size is highly representative, as the EPRC covers transactions related to various types of residential properties, including buildings managed by property managers, as well as independent houses and other forms of residential properties without a property manager. Furthermore, not all property managers in our sample have ESG information, especially small private companies. Additionally, buyers affiliated with companies are excluded from our sample to focus on individual homebuyers.

The key variable *LNPRICE* is the logarithm of the housing price of a transacted property. *ESGSCORE* is the overall ESG score of the property manager of the corresponding transacted property, ranging from zero to ten. *RISK* is a dummy variable equal to one if the property managers of the transacted property experienced an ESG risk incident within one year of transaction time. Other variables of ESG performance and ESG risk incidents as well as control variables are also constructed. Detailed definitions of the variables can be found in Appendix A1.

Table 1 presents the summary statistics for the variables used in this study. Panel A gives statistics for property transactions. The average logarithm of property transaction prices (*LNPRICE*) is 15.254, corresponding to approximately HKD4.21 million. The logarithm of property areas (LNAREA) has an average value of 6.286[14]. Furthermore, our analysis shows that 33.9% of the property buyers in our sample are non-local buyers (*NONLOCAL*), while 79.5% are considered homebuyers (*HOMEBUYER*) who have kept their property for at least two years. The average number of floors (*FLOORNUM*) is 19.098, and 2.6% of the properties include a parking space (*CARPARK*). On average, there are 1.970 bedrooms (*BEDRMNUM*) and 1.659 living rooms (*LIVDINNUM*) per property[15].

Panel B reports the statistics of property management companies. Regarding the ESG information of property managers, the overall ESG score (*ESGSCORE*) is on average 4.816. The average scores for the environmental (*ENVSCORE*), social (*SOCSCORE*), and governance (*GOVSCORE*) pillars are 5.407, 4.757, and 4.627, respectively. Our results show that 34.7% of the residential properties in our sample are managed by property managers who have had ESG incidents (*RISK*) in the past year. Of these incidents, 14.1% had a limited reach (*LIMITEDRISK*), meaning that they were covered by local media, local governmental bodies,

[14] The average property price per square foot is around HKD7,990. According to the Rating and Valuation Department of the Hong Kong government, the average price of residential properties between 40 (430 square feet) and 69.9 square meters (752 square feet) is HKD90,158 per square meter, which is equivalent to approximately HKD8,380 per square foot. Furthermore, there was a significant decline in housing transactions following the implementation of the special stamp duty in November 2010, which was further intensified in October 2012 to curb speculative investments in residential properties (Agarwal et al., 2022).

[15] Moreover, 57.9% of the properties in our sample are purchased with a clubhouse. It is important to note that our sample only includes private estates, consisting of multiple buildings sharing common facilities. Stand-alone buildings, which typically offer fewer amenities, and public housing built by the Hong Kong government are excluded from our sample. This exclusion contributes to the high concentration of properties with clubhouses and swimming pools in our data. Another reason may be the coverage of our datasets. MSCI ESG ratings primarily focus on publicly listed companies, while the RepRisk database includes both public companies and large private companies. As a result, the property management companies in our sample are often affiliated with or owned by large companies. These companies typically manage mid- to high-end properties, equipped with amenities such as clubhouses.

and social media. Additionally, 14.7% of these incidents had a medium reach (*MEDIUMRISK*), involving coverage by most national and regional media. Finally, 25.8% of these incidents had a high reach (HIGHRISK), indicating coverage by globally recognized media.

4. Empirical results

Baseline estimates

To explore the association between the ESG performance of property managers and housing prices, we use a hedonic model, which is widely used in previous research (Rosen, 1974; Agarwal et al., 2022; Fan et al., 2023b). We use housing prices as the dependent variable in our analysis. The model is specified as follows:

$$LNPRICE_{i,t} = \alpha + \beta_1 ESGSCORE_{i,t} + CONTROLS_{i,t} + ESTATE_i + YearMonth_t + \varepsilon_{i,t} \quad (2)$$

where $LNPRICE_{i,t}$ is the logarithm of the price of house *i* at time *t*. *ESGSCORE* is the overall ESG score of the property manager of the corresponding transacted property. *CONTROLS* includes a number of variables, namely property size (*LNAREA*, the logarithm of the area measured in square feet), the number of floors (*FLOORNUM*), a dummy variable indicating whether the transaction includes a car park (*CARPARK*), a dummy variable indicating whether the property has a garden (*GARDEN*), and the number of bedrooms (*BEDRMNUM*) and living or dining rooms (*LIVDINNUM*). To control for the time-invariant characteristics of real estate and the time-varying trends of housing prices in Hong Kong, our model further includes estate fixed effects (*ESTATE*) and year-month fixed effects (*YearMonth*). Estate fixed effects account for time-invariant factors of estate and property management companies, and year-month fixed effects account for time-varying factors, such as macroeconomic factors in Hong Kong. By including these fixed effects, we mitigate any potential bias and ensure the robustness of our analysis.

[Insert Table 2 here]

Table 2 presents the regression results. In column (1), the regression of *ESGSCORE* on property transaction prices shows a coefficient of 0.024. This indicates that a one standard deviation increase in *ESGSCORE* is associated with a 2.9% increase in property transaction

prices, equivalent to approximately HKD139,000[16]. The coefficient is both economically and statistically significant, with a *t*-statistic of 4.02[17].

The next step in our study is to investigate the impact of ESG risk incidents attributed to property managers on property transaction prices. Our model is as follows:

$$LNPRICE_{i,t} = \alpha + \beta_1 RISK_{i,t} + CONTROLS_{i,t} + ESTATE_i + YearMonth_t + \varepsilon_{i,t} \quad (3)$$

where $RISK_{i,t}$ is a dummy variable equal to 1 if the property managers of house *i* experienced an ESG risk incident within one year of transaction time *t*.

Table 2, column (2) presents the results of our analysis, focusing on the impact of ESG risk incidents attributed to property managers on the transaction prices of residential properties. The results show that these incidents have a significant negative effect on property transaction prices, leading to a 2.2% decrease in property transaction prices over a one-year period, which corresponds to a reduction of approximately HKD92,700[18].

The results of our study highlight a significantly positive correlation between ESG performance and residential property prices. Properties associated with better ESG performance experience higher price appreciation. Conversely, the occurrence of ESG risk incidents negatively impacts residential property value, resulting in a decline in prices. These findings emphasize the importance of considering ESG factors when evaluating property investments and the potential impact of ESG risks on property value. Property buyers incorporate ESG considerations into their decision-making processes, thereby affecting property valuations.

Our study also incorporates several control variables to account for additional factors that may influence property transaction prices. The results show that the property area has a significant positive association with property transaction prices. Properties located on higher

[16] In our ESG score subsample (untabulated), the average transaction price is HKD4.81 million (exp(15.383) = 4,794,596), and the standard deviation of *ESGSCORE* in the property transaction sample is 1.176. A one standard deviation increase in *ESGSCORE* results in a 2.9% increase in property transaction prices ((exp(0.024)-1)*1.176 = 2.9%), which is equivalent to HKD139,043 (0.029 * 4,794,596 = 139,043).

[17] Our subsequent empirical results remain robust when we use price per square foot as the dependent variable. As recommended by an anonymous reviewer, we run a regression using the logarithm of *ESGSCORE* as the independent variable (see Appendix A2). Our results continue to be both statistically and economically significant. This additional analysis shows that our results are not influenced by any abnormal distribution of MSCI ESG scores.

[18] The occurrence of risk incidents attributed to property management companies leads to a 2.2% reduction in housing prices (exp(0.22)-1 = 2.2%). This reduction is equivalent to HKD92,715 (exp(15.254)*2.2% = 92,715).

floors are associated with higher prices. Specifically, for every 10-floor increase, the property transaction prices increase by 3%. Properties with a garden benefit from a substantial price premium of around 25%. The presence of a garden therefore enhances the desirability and value of the property. The number of bedrooms in a property has a positive effect on its price, while the number of living or dining rooms has a negative effect.

Robustness tests

To assess the robustness of our main results, we conduct a repeat-sales analysis, a widely used method in real estate valuation that compares the current price of a property with its previous purchase price. This approach keeps most unit characteristics constant, providing valuable insights. The model is as follows:

$$LNPRICE_{i,t} = \alpha + \beta_1 ESGSCORE_{i,t} + CONTROLS_{i,t} + Property_i + YearMonth_t + \varepsilon_{i,t} \quad (4)$$

where *Property* is the property fixed effect. This approach further enables us to incorporate observations that have missing data on certain property characteristics, such as property area, floor number, and the number of bedrooms and living rooms. However, it is important to note that this method is limited to properties that have undergone multiple transactions during the sample period (Gupta et al., 2022), resulting in a reduced sample size. The regression models used in our repeat-sales analysis are the same as equations (2) and (3).

[Insert Table 3 here]

Table 3 presents the results of the repeat-sales analysis. In column (1), we observe a positive association between the ESG scores of property managers and the transaction prices of residential properties. Specifically, a one-standard-deviation increase in *ESGSCORE* is associated with a 1.5% increase in total transaction prices[19]. Column (2) focuses on the impact of ESG risk incidents attributed to property managers on housing prices. The results show that housing prices decrease by 2.0% following the occurrence of ESG incidents over the past year. While the coefficients from the repeat-sales analysis are lower than those from the overall sample, they remain significant both statistically and economically[20]. Our repeat-sales analysis

[19] The standard deviation of *ESGSCORE* in the repeat-sales analysis is 1.14. Thus, a one-standard-deviation increase in *ESGSCORE* results in a 1.5% increase in property transaction prices ((exp(0.013)-1)*1.14 = 1.5%).
[20] The repeat-sales method focuses on measuring price changes between two (or more) consecutive sales of a particular property. However, this approach may introduce selection bias. Specifically, it tends to favor properties that are more liquid in the property market and whose price trends are more stable or predictable. Research

provides further evidence supporting the positive correlation between ESG performance and residential property prices, as well as the adverse effect of ESG risk incidents on property value.

To further address endogeneity concerns in our study, we incorporate the instrumental variable approach into our repeat-sales analysis[21]. A valid instrumental variable should have a strong correlation with the ESG scores of property management companies, while remaining unaffected by other factors that may influence property transaction prices. We use the fact that property management companies are often subsidiaries of larger companies in Hong Kong. These parent companies may operate in various industries beyond real estate management services, such as real estate development, commercial services and supplies, industrial conglomerates, and surface transport[22]. We use the ESG scores of peer companies in the same industries as the parent companies of the property management companies in our sample as an instrumental variable (*IVESGSCORE*). Previous studies, such as Cao et al. (2019) and Liu and Wu (2016), reveal that companies are influenced by the ESG practices and activities of their peers. We expect the ESG scores of property management companies to be positively affected by the scores of their parent companies' industry peers. To conduct our instrumental variable analysis, we perform a first-stage regression using the instrumental variable. The model is as follows:

$$ESGSCORE_{i,t}{}_{i,t} = \alpha + \beta_1 IVESGSCORE_{i,t} + CONTROLS_{i,t} + Property_i + YearMonth_t + \varepsilon_{i,t} \quad (5)$$

conducted by Luo (2022) shows that assets with high liquidity have a lower ESG premium compared to those with low liquidity. Consequently, when using the repeat-sales sample, the estimated ESG premium may appear lower than that obtained with the baseline method.

[21] We employ the instrumental variable approach within a repeated-sale sample framework. This method is particularly effective because it allows us to account for all time-invariant unobserved property characteristics. Some property characteristics could potentially be correlated with both the instrument variable and the outcome variable. By controlling for these time-invariant unobserved characteristics, we reduce the risk of violating the exogeneity assumption, ensuring a more robust and reliable analysis.

[22] For example, New World Property Management Company Ltd is a subsidiary of New World Development Co Ltd, a prominent real estate development company in Hong Kong. China Overseas Property Services Ltd is a subsidiary of China Overseas Property Holdings Ltd, which falls under the commercial services and supplies industry according to MSCI. It not only provides property management services but also engages in environmental engineering construction, landscape architecture design, building renovation, and related activities. Shun Tak Property Management Ltd is a subsidiary of Shun Tak Holdings Ltd, an industrial conglomerate involved in shipping, property, hospitality, and investments. While MTR Corporation Limited manages some properties, its primary business focuses on surface transport.

where *IVESGSCORE* is calculated based on the ESG scores of other companies belonging to the same industries as the parent companies of the property management companies in our sample.

Table 4 presents the results of this analysis. It is important to note that the sample for this analysis is smaller than our main sample, as not all peers of parent companies are rated by MSCI ESG agencies. The coefficient of *IVESGSCORE* is 0.116, with a *t*-statistic of 27.93, which is statistically significant at the 1% level. Although the coefficient may appear relatively small, it is crucial to consider that the model incorporates year-month fixed effects to capture time variation in overall ESG trends. Our instrumental variable passes the weak identification test, as evidenced by a Cragg–Donald Wald F statistic of 561.306, surpassing the critical value of 16.38 according to Stock and Yogo (2005).

[Insert Table 4 here]

We observe a positive association between the ESG scores of property management companies and property transaction prices. The estimated coefficient of *ESGSCORE* on property transaction prices is 0.025, which is higher than the estimate from OLS regressions. This finding indicates that a one-unit improvement in the ESG score is linked to a 2.5% increase in property prices. These results suggest that the OLS approach may underestimate the effect of the ESG performance of property management companies on property valuation.

To address concerns about potential spurious correlations between ESG performance and property transaction prices due to the influence of property location, we implement a geographic matching strategy. This strategy accounts for the time variation of housing prices across different regions and ensures a more rigorous analysis. In our study, property managers are classified into high and low ESG score groups based on the median ESG score each month. To further refine our analysis, we only retain residential properties in the high ESG score group that are within a 500-meter radius of residential properties in the low ESG score group, based on their coordinates. This geographic matching approach helps to control location-specific factors that may confound the relationship between ESG performance and housing prices. This strategy takes into account the time variation of housing prices across different regions, rather than the specific changes in ESG scores of property management companies. Matching by distance also helps to control community and district characteristics that may influence housing prices.

Table 5 presents the results of this geographic matching analysis. Column (1) reveals that a one standard deviation increase in *ESGSCORE* is associated with a 1.6% increase in property transaction prices[23].

[Insert Table 5 here]

Our study extends the matching strategy to analyze the impact of ESG risk incidents on property transaction prices. Specifically, we match residential properties managed by property managers who have experienced ESG risk incidents in the past year with properties managed by managers who have not, considering a 500-meter radius for the matching process. Column (2) shows that property managers' ESG risk incidents lead to a significant reduction in property transaction prices by 1.6%. The results show a robust relationship between ESG performance and housing prices, even after controlling for time-varying location-based influences. These findings highlight the importance of ESG risk management for property managers and suggest that such incidents can have tangible financial implications in the real estate market.

ESG heterogeneity

This section focuses on investigating the impact of heterogeneous characteristics of ESG factors on property transaction prices. We first examine the ESG performance of property managers across the three key environmental, social, and governance pillars. The objective is to determine which pillar has the greatest effect on property buyers' transaction decisions.

To this end, we use the following model:

$$LNPRICE_{i,t} = \alpha + \beta_1 ENVSCORE_{i,t}/SOCSCORE_{i,t}/GOVSCORE_{i,t} + CONTROLS_{i,t} + ESTATE_i + YearMonth_t + \varepsilon_{i,t} \quad (6)$$

where $ENVSCORE_{i,t}/SOCSCORE_{i,t}/GOVSCORE_{i,t}$ represent the environmental score, the social score, and the governance score, respectively, of the property managers of house *i* at time *t*.

Table 6 presents the regression results. Column (1) shows the relationship between environmental scores and property transaction prices. However, the results do not show a

[23] In the geographic matching sample, the standard deviation of *ESGSCORE* is 1.126. Notably, a one standard deviation increase in *ESGSCORE* corresponds to a 1.6% increase in property transaction prices ((exp(0.014)-1)*1.126 = 1.6%).

significant correlation between environmental scores and housing prices. Conversely, column (2) reveals a positive association between the social scores of property managers and property transaction prices, with a coefficient of 0.006, statistically significant at the 10% level. A one standard deviation increase in social scores corresponds to a 1.1% increase in property transaction prices. Column (3) shows the impact of the governance performance of property managers on property transaction prices, with a coefficient of 0.10, statistically significant at the 1% level. A one standard deviation increase in governance scores leads to a 1.9% increase in property transaction prices. In column (4), we combine the environmental, social, and governance scores in the regression model. The results indicate that the governance performance of property managers has the greatest influence on property transaction prices, followed by their social performance. However, property buyers do not appear to prioritize the environmental performance of property managers.

[Insert Table 6 here]

While some studies show a positive relationship between green building features and property valuation (Eichholtz et al., 2010; Eichholtz et al., 2013), others suggest that environmental performance may not be as salient or influential to property buyers (Coën et al., 2018; Fan et al., 2023a). The environmental performance of property management companies mainly focuses on water conservation and waste management. However, these factors may not be explicitly perceived or valued by property buyers in housing prices. As a result, the impact of environmental components may be neglected in the property valuation process.

It is crucial to consider consumer preferences and the regulatory environment as additional factors that influence housing prices. Property management companies that prioritize social responsibility may engage in community initiatives, foster social inclusion, and create positive living experiences for residents. These efforts can enhance user satisfaction, increase demand for properties, and ultimately increase housing prices. Similarly, property managers with strong corporate governance practices, transparent communication, and ethical standards may instill confidence in buyers and users. This trust and reliability can have a positive effect on housing prices, as buyers seek assurance of their investments and the quality of property management services.

Next, we examine how the intensity of ESG risk incidents affects property transaction prices. The RepRisk database categorizes risk incidents into three levels: limited reach, medium reach, and high reach. The limited reach level signifies that news of risk incidents is confined to local

media, local government agencies, and social media. The medium reach level indicates that risk incidents are covered by a wider range of national and regional media. Finally, the high reach level implies that risk incidents are widely covered by global media. Property managers may disseminate their ESG risk incidents through various media, with varying effects on housing prices. Whether this information is limited to local media or extends to global media will affect the magnitude of this impact. Global media coverage exposes ESG risk incidents to a wider audience, including local investors and non-local property buyers. This can lead to a loss of investor confidence, a withdrawal of capital and, consequently, a decrease in property value. Conversely, ESG risk incidents covered by local media may only affect the perception of local investors[24]. To analyze the impact of the intensity of ESG risk incidents on property transaction prices, we use the following model:

$$LNPRICE_{i,t} = \alpha + \beta_1 LIMITEDRISK_{i,t} + \beta_2 MEDIUMRISK_{i,t} + \beta_3 HIGHRISK_{i,t} + CONTROLS_{i,t} + ESTATE_i + YearMonth_t + \varepsilon_{i,t} \quad (7)$$

where $LIMITEDRISK/MEDIUMRISK/HIGHRISK$ indicate that the property manager has experienced a limited, medium, or high reach risk incident in the past year.

Table 7 presents the results regarding the impact of the intensity of ESG risk incidents on property transaction prices. When examining limited reach risk incidents, the coefficient indicates a 1.0% reduction in property transaction prices; however, this result is not statistically significant. In contrast, for medium reach risk incidents, the coefficient indicates a 1.5% decrease in property transaction prices, statistically significant at the 10% level. The most significant impact is observed for high reach risk incidents. Widely known ESG risk incidents result in a reduction in property transaction prices of 4.1%, which is statistically significant at the 1% level. These results suggest that as risk incidents become more widely known, their negative impact on property transaction prices increases. This trend can be attributed to potential buyers' increased awareness of the associated ESG risks, leading to a reduced willingness to purchase the property.

[Insert Table 7 here]

[24] Following the recommendation of an anonymous reviewer, we provide concrete examples of the reach level of risk incidents in Appendix A3.

To determine whether the decrease in property value is attributed to the effect of stigma or a decline in long-term property management quality, we explore the influence of risk incidents over time. We add to our model a variable representing the number of months since the occurrence of risk incidents and investigate its relationship with property transaction prices:

$$\begin{aligned} LNPRICE_{i,t} = \alpha &+ \beta_1 RISK1MONTH_{i,t} + \beta_2 RISK3MONTH_{i,t} + \beta_3 RISK6MONTH_{i,t} \\ &+ \beta_3 RISK12MONTH_{i,t} + \beta_3 RISK36MONTH_{i,t} + \beta_3 RISKLT_{i,t} \\ &+ CONTROLS_{i,t} + ESTATE_i + YearMonth_t + \varepsilon_{i,t} \end{aligned} \quad (8)$$

where *RISK1MONTH* is a dummy variable equal to 1 if the property transaction takes place in the month following the occurrence of a risk incident attributed to the corresponding property manager, and 0 otherwise. *RISK3MONTH/RISK6MONTH/RISK12MONTH/RISK36MONTH* indicate that the property transaction takes place between 1/3/6/12 months and 3/6/12/36 months of the occurrence of a risk incident. *RISKLT* indicates that the transaction takes place more than 36 months after the occurrence of an incident.

Table 8 presents the regression results for the impact of the timing of ESG risk incidents on property transaction prices. The results show that there is a negative impact of ESG risk incidents on property transaction prices, which decreases over time. In the month following the occurrence of the risk incident, property prices decrease by 3.8%, which is significant at the 5% level. This suggests that property buyers react quickly to ESG risk incidents and incorporate these risks into their pricing decisions. Over the next two months, the price reduction eases to 2.4%. Subsequently, the magnitude of the price reduction decreases substantially and ceases to be statistically significant. This suggests that as more information becomes available and the incident is better understood, housing prices return to pre-incident levels. These results highlight the short-term nature of the negative impact of ESG risk incidents on housing prices. The observed drop in housing prices is attributable primarily to the effect of stigma, rather than to the actual performance of property management companies. Property buyers appear to react quickly to the occurrence of risk incidents, but as time passes and more information becomes available, the market adjusts and the effect diminishes.

[Insert Table 8 here]

Heterogeneity of property buyers

We examine how different types of property buyers perceive the ESG performance of property managers. We acknowledge that non-local buyers and homebuyers may have different perspectives on and reactions to ESG information compared with local buyers and real estate speculators. Non-local buyers, who may be less familiar with the local market and have limited access to local property management information, may rely more on ESG information when evaluating the quality of property management. Given their limited knowledge of local property managers, they may use ESG performance as a valuable indicator to assess the overall management quality and social responsibility of property managers. Furthermore, non-local buyers may prefer properties with enhanced security measures and better management, which are often associated with better ESG performance[25].

The following difference-in-differences models are applied to determine how non-local buyers perceive the ESG performance of property managers:

$$LNPRICE_{i,t} = \alpha + \beta_1 NONLOCAL_{i,t} \times ESGSCORE_{i,t} + \beta_2 ESGSCORE_{i,t} + \beta_3 NONLOCAL_{i,t} + CONTROLS_{i,t} + ESTATE_i + YearMonth_t + \varepsilon_{i,t} \quad (9)$$

$$LNPRICE_{i,t} = \alpha + \beta_1 NONLOCAL_{i,t} \times RISK_{i,t} + \beta_2 RISK_{i,t} + \beta_3 NONLOCAL_{i,t} + CONTROLS_{i,t} + ESTATE_i + YearMonth_t + \varepsilon_{i,t} \quad (10)$$

where *NONLOCAL* is a dummy variable equal to 1 if the property buyer is not a local resident. Non-local residents are identified by the non-Cantonese spelling of their names[26]. We are interested in the interaction terms of $NONLOCAL_{i,t} \times ESGSCORE_{i,t}$ and $NONLOCAL_{i,t} \times RISK_{i,t}$. If non-local buyers rely more on ESG information from property managers, we expect $NONLOCAL_{i,t} \times ESGSCORE_{i,t}$ to be positive, indicating that non-local buyers will pay a

[25] We thank an anonymous reviewer for providing us with this possible alternative channel. Companies with a global presence may have higher ESG scores due to their commitment to sustainability practices and the implementation of ESG-related measures, which appeal to non-local buyers. To thoroughly evaluate this possible explanation, we also regress ESG scores on the non-local buyer dummy while controlling for property characteristics. Appendix A4, column (3) indicates that non-local buyers are not significantly associated with properties managed by property management companies with high ESG scores. Therefore, we can conclude that this explanation is not strongly supported by our results.

[26] We further conduct an analysis of the differences in housing prices based on buyer type. Appendix A4, column (1) shows that non-local buyers tend to pay a higher price for residential properties than local buyers. Specifically, non-local buyers pay a premium of 0.9% over local buyers, and this difference is statistically significant at the 1% level. As most non-local buyers are from mainland China, the results are consistent with those of Fan et al. (2023), who show that mainland buyers pay a premium of 1.4% over local buyers.

premium for properties managed by property managers with better ESG performance. If non-local buyers are more cautious and sensitive to negative ESG events, because of their limited knowledge of the local market, we expect $NONLOCAL_{i,t} \times RISK_{i,t}$ to be negative.

Table 9, Panel A indicates that non-local buyers will pay a premium for properties managed by property managers with higher ESG scores. Column (1) shows that non-local buyers are willing to pay a 1.4% premium for a one standard deviation increase in *ESGSCORE*. Column (2) reveals that the coefficient of *NONLOCAL* × *RISK* is -0.014 for property transaction prices, which is statistically significant at the 1% level. These findings support the hypothesis that non-local buyers rely more on ESG information when evaluating the management quality of property managers. They are also more sensitive to ESG risk incidents associated with property managers and only make a purchase decision when they are presented with discounted prices.

[Insert Table 9 here]

Homebuyers, who prioritize the reputation of the property management company and its social responsibility, may place greater importance on the ESG performance of property managers. They may be more concerned about the quality of property management and consider ESG factors as important criteria in their decision-making process. In contrast, real estate speculators, who are primarily motivated by short-term investment opportunities, may not attach as much importance to the ESG performance of property managers. They may focus more on financial indicators and potential returns than on the long-term sustainability and social responsibility aspects associated with ESG. The following difference-in-differences models are used to determine how homebuyers perceive the ESG performance of property managers:

$$LNPRICE_{i,t} = \alpha + \beta_1 HOMEBUYER_{i,t} \times ESGSCORE_{i,t} + \beta_2 ESGSCORE_{i,t} + \beta_3 HOMEBUYER_{i,t} + CONTROLS_{i,t} + ESTATE_i + YearMonth_t + \varepsilon_{i,t} \quad (11)$$

$$LNPRICE_{i,t} = \alpha + \beta_1 HOMEBUYER_{i,t} \times RISK_{i,t} + \beta_2 RISK_{i,t} + \beta_3 HOMEBUYER_{i,t} + CONTROLS_{i,t} + ESTATE_i + YearMonth_t + \varepsilon_{i,t} \quad (12)$$

where *HOMEBUYER* is a dummy variable equal to 1 if the property buyer is a homebuyer or a non-flipper. Flippers are buyers who purchase a flat and resell it within two years[27]. If non-local buyers rely more on ESG information and homebuyers value the high ESG scores of property managers, we expect the interaction terms between these buyer types and the ESG scores of property managers to be positive, indicating that non-local buyers and homebuyers are willing to pay a premium for properties managed by property managers with better ESG performance. In addition, a negative coefficient for the interaction term between home buyers and ESG risk incidents would indicate that home buyers are more concerned about negative ESG risks and prefer properties managed by property managers with a better track record of ESG risk management. This would imply that homebuyers are more risk averse and are willing to pay a premium for properties that are less likely to experience negative ESG risk incidents.

Table 9, Panel B indicates that homebuyers place a higher value on the ESG performance of property managers than real estate speculators. Column (1) shows that homebuyers are willing to pay a 1.1% premium for a one standard deviation increase in *ESGSCORE*. This suggests that ESG considerations play a role in the decision-making process of homebuyers and that they are willing to pay more for properties managed by socially responsible property managers. In column (2), the coefficient of the interaction term between ESG risk incidents and homebuyers is negative at -0.005, and is not statistically significant.

Property heterogeneity

This section examines the heterogeneity of the impacts of ESG performance property managers on property transaction prices across different types of properties. Property management companies may show a preference for larger estates or luxury properties, investing more efforts into improving ESG performance. Consequently, larger estates or luxury properties could experience the benefits of enhanced ESG-driven management practices, attracting investors with increasing ESG awareness who seek to mitigate environmental and social risks. In contrast, property management companies may already provide very high-quality management services to large or luxury properties. Therefore, further improvement in

[27] Appendix A4, column (2) shows no significant difference in housing prices between homebuyers and real estate speculators. This indicates that both types of buyers are willing to pay similar prices for residential properties. Furthermore, Appendix A4, column (4) shows that homebuyers do not explicitly prioritize properties with higher ESG scores.

property management quality through ESG practices may not generate additional value for owners or users. As a result, the precise impact of property managers' ESG performance on different property types remains unclear. To fill this knowledge gap, our analysis explores the differentiation between properties in large estates and those in small estates, as well as properties with clubhouses and those without. Clubhouses are used as an indicator for luxury properties. The findings of this analysis are presented in Table 1.

Panel A presents the effects of property managers' ESG performance on property transaction prices in large and small estates. Columns (1) and (2) examine the relationship between property managers' ESG scores, the occurrence of ESG-related risks, and transaction prices within large estates. Interestingly, the results indicate that property managers' ESG performance does not have a significant impact on housing prices in large estates. However, ESG risk incidents play a crucial role in shaping property values in these larger estates.

In contrast, Columns (3) and (4) reveal that housing prices in smaller estates display a higher sensitivity to improvements in property managers' ESG performance. However, housing prices in small estates appear to be indifferent to ESG risk incidents. This observation underscores the nuanced influence of ESG practices, suggesting that small estates may directly benefit more from enhancements in ESG performance, highlighting a contrasting dynamic compared to what is observed in larger estates.

[Insert Table 10 here]

Panel B of Table 10 presents the results of luxury and non-luxury properties. Columns (1) and (2) show the relationship between ESG scores, risk incidents of property managers, and transaction prices of properties in the sample of properties with clubhouses. Our results indicate that properties with clubhouses are less affected by the overall improvement in ESG performance of property management companies. Properties with clubhouses typically cater to a high-end market segment and offer a range of amenities and services. As a result, buyers of high-end properties with clubhouses may prioritize the overall quality of property management and the presence of desirable amenities, regardless of specific ESG performance. However, property buyers are sensitive to ESG risk incidents, which are captured by the risk incidents of property managers. The stigma effect driven by ESG risk incidents, such as ethical breaches or environmental controversies, can significantly influence buyers' risk perceptions and decision-making. The incidents may indicate potential risks to the property's value, reputation, or long-term sustainability.

Columns (3) and (4) show that properties without a clubhouse are more sensitive to overall ESG performance than to specific ESG incidents. These properties may offer fewer amenities and services, making the overall ESG performance of property management companies more salient in the decision-making process.

Heterogeneity of property management companies

To provide a more granular examination of how property management company size influences the relationship between ESG performance and property transaction prices, we have divided our sample based on the median number of properties managed by the companies.

Table 11 reveals intriguing findings. For the group of property managers handling fewer properties than the median, we observe that ESG performance does not have a significant impact on property transaction prices. However, ESG risk incidents do have a pronounced negative effect on these prices. The stigma theory suggests that small property managements with lesser capacity to manage and recover from such incidents. Thus, investors are particularly sensitive to ESG risks when dealing with small companies.

[Insert Table 11 here]

Conversely, for larger property management firms, we find a significant positive correlation between ESG performance and property transaction prices. This indicates a premium placed by investors on better ESG performance among larger firms. Moreover, the ESG risk incidents do not significantly affect the transaction prices. This implies that larger firms are more resilient to the adverse impacts of ESG risk incidents. According to resource-based view theory, this resilience could be attributed to various factors, including potentially better risk management practices or greater resources at their disposal to mitigate ESG risks.

Our findings are consistent with the property type analysis, which indicates that properties with clubhouses demonstrate heightened sensitivity to ESG risk incidents, whereas those without clubhouses are more responsive to overall ESG performance. In untabulated summary statistics, small property management companies oversee 67% of properties with clubhouses, compared to larger property management firms, which manage only 42% of such properties. Investors in properties with clubhouse might prioritize luxury amenities and high-quality property management over general ESG performance, but they are not immune to the potential

drawbacks of ESG risk incidents, to which boutique property managers may be more vulnerable.

Gross rent analysis

In the Gordon growth model, it is important to recognize that the increase in housing prices resulting from sustainable property management can stem from various factors. These factors include higher gross rents that housing users are willing to pay for responsible property management services, a decrease in property risks, or an increase in the growth rate of rental income. In this section, our objective is to distinguish the impact on property transaction prices by examining whether the ESG performance of property management companies influences gross rents. If the positive association between the ESG performance of property management companies and property transaction prices is primarily driven by an increase in gross rents, rather than a decrease in risk or an increase in the growth rate of rental income, we expect a positive correlation between the ESG performance of property managers and property rental income. To test this conjecture, we use rental transaction data from the EPRC with the following model:

$$LNRENT_{i,t} = \alpha + \beta_1 ESGSCORE_{i,t}/RISK_{i,t} + CONTROLS_{i,t} + ESTATE_i + YearMonth_t + \varepsilon_{i,t} \quad (15)$$

where $LNRENT_{i,t}$ is the logarithm of gross rental income per month for house *i* at time *t*.

[Insert Table 12 here]

The results of our analysis are presented in Table 12. Column (1) indicates that there is no significant correlation between the ESG scores of property managers and the gross rental income of a property. In addition, column (2) demonstrates that ESG risk incidents do not significantly impact gross rental income. These findings suggest that the positive relationship between the ESG performance of property managers and property transaction prices is not driven by higher gross rental income.

In the Gordon growth model, fluctuations in rental income can occur due to repair and maintenance expenses, posing a significant risk to property returns. This component is borne not by the tenants but by the property owners. The governance quality of property managers

plays a crucial role in these expenses. Property management companies that adhere to high ESG standards are less likely to misappropriate property management fees or engage in unethical activities such as collusion or corruption with construction firms. Consequently, ethical conduct can lead to lower repair and maintenance costs, which in turn reduces the discount rate and increases property value.

Furthermore, properties managed by companies with higher ESG scores have higher tenant retention rates, reduced vacancy periods, and increased demand. These higher ESG scores are associated with lower discount rates, which can also contribute to increased property value. Moreover, an increase in the growth rate means that higher future rental income is expected. Positive tenant experiences and improved property conditions, influenced by higher ESG scores, can create a favorable environment for landlords to potentially adjust rental prices in the future.

5. Conclusion

Our study indicates that the ESG performance of property managers is indeed valued by property buyers. First, we show a positive association between the ESG performance of property managers and housing prices. A decline in housing prices is also observed when property management companies are exposed to ESG-related risk incidents. Buyers are sensitive to ESG performance and view relevant incidents as indicators of poor management practices.

In addition, our results show that the social and governance performance of property managers is more likely to affect housing prices than their environmental performance, which does not have a similar impact. Our study further highlights how media coverage influences perceptions of ESG incidents. Housing prices are negatively affected by ESG incidents when they are reported by high reach media outlets. Thus, media exposure plays an important role in shaping buyers' perceptions and willingness to pay for sustainable property management. In addition, different buyer groups exhibit different preferences. Compared with local buyers, non-local buyers are more inclined toward sustainable practices. Property owners, compared with real estate speculators, are more likely to pay a premium for sustainable property management. The positive relationship between property value and ESG practices is driven by lower risk rather than higher property rents.

Our study provides empirical evidence of the benefits associated with sustainable property management, showing that integrating ESG practices can have a positive impact on housing

prices. Companies involved in property management should prioritize their ESG performance and minimize the negative impact of ESG risk incidents on housing prices and their reputation. Policymakers should encourage sustainable practices in property management in accordance with this study. Standards and regulations that encourage the integration of ESG factors in the real estate sector will contribute to the appreciation of social wealth and a more sustainable and resilient community.

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Table 1. Summary statistics

Panel A. Property variables

	N	Mean	Std. Dev.	Min	Max
LNPRICE	312,474	15.254	0.723	13.561	17.281
LNAREA	312,474	6.286	0.336	5.472	7.389
NONLOCAL	312,474	0.339	0.473	0	1
HOMEBUYER	312,474	0.795	0.404	0	1
FLOORNUM	312,474	19.098	13.492	1	80
CARPARK	312,474	0.026	0.160	0	1
GARDEN	312,474	0.001	0.038	0	1
BEDRMNUM	312,474	1.970	1.058	0	6
LIVDINNUM	312,474	1.659	0.697	0	7

Panel B. Property management company variables

	N	Mean	SD	Min	Max
ESGSCORE	2,052	4.785	1.255	1.504	7.644
ENVSCORE	2,052	5.206	1.405	0	9.2
SOCSCORE	2,052	4.765	2.155	0	9.2
GOVSCORE	2,052	4.551	1.815	0	10
RISK	5,400	0.202	0.402	0	1
LIMITEDRISK	5,400	0.093	0.290	0	1
MEDIUMRISK	5,400	0.095	0.293	0	1
HIGHRISK	5,400	0.134	0.341	0	1
RISK1MONTH	5,400	0.043	0.204	0	1
RISK3MONTH	5,400	0.056	0.231	0	1
RISK6MONTH	5,400	0.049	0.216	0	1
RISK12MONTH	5,400	0.054	0.226	0	1
RISK36MONTH	5,400	0.084	0.278	0	1
RISKLT	5,400	0.020	0.140	0	1

Table 2. ESG scores, reputation risk, and property transaction prices

VARIABLE	(1) LNPRICE	(2) LNPRICE
ESGSCORE	**0.024*** **	
	(4.02)	
RISK		**-0.022** **
		(-2.43)
LNAREA	0.999***	0.995***
	(40.80)	(44.43)
FLOORNUM	0.003***	0.003***
	(14.45)	(17.17)
CARPARK	0.094***	0.089***
	(5.66)	(5.81)
GARDEN	0.248***	0.218***
	(9.15)	(7.00)
BEDRMNUM	0.013**	0.009
	(2.52)	(1.60)
LIVDINNUM	-0.026***	-0.022***
	(-3.40)	(-2.87)
Observations	228,334	312,474
R-squared	0.909	0.916
Estate FE	YES	YES
Year-Month FE	YES	YES

Note: The *t*-statistics are reported in parentheses and standard errors are robust to heteroskedasticity and clustered at the estate level. ***, **, and * indicate that the point estimate is significantly different from 0 at the 1%, 5%, and 10% levels, respectively.

Table 3. Robustness tests (repeat-sales sample): ESG scores, reputation risk, and property transaction prices

	(1)	(2)
VARIABLES	LNPRICE	LNPRICE
ESGSCORE	**0.013****	
	(2.05)	
RISK		**-0.020****
		(-2.32)
Observations	131,522	181,879
R-squared	0.914	0.921
Property FE	YES	YES
Year-Month FE	YES	YES

Note: The *t*-statistics are reported in parentheses and standard errors are robust to heteroskedasticity and clustered at the estate level. ***, **, and * indicate that the point estimate is significantly different from 0 at the 1%, 5%, and 10% levels, respectively.

Table 4. Robustness tests (the instrumental variable approach in the repeat-sales sample): ESG scores and property transaction prices

Instrumental approach: second-stage regression	(1)
VARIABLE	LNPRICE
ESGSCORE	**0.025***
	(1.92)
Observations	96,897
Controls	YES
Property FE	YES
Year-Month FE	YES
Instrumental approach: first-stage regression	
IVESGSCORE	0.116***
	(27.93)
Cragg–Donald Wald F statistic	561.306
Stock–Yogo (2005) critical value at the 10% level	16.38

Note: The *t*-statistics are reported in parentheses and standard errors are robust to heteroskedasticity. ***, **, and * indicate that the point estimate is significantly different from 0 at the 1%, 5%, and 10% levels, respectively.

Table 5. Robustness tests (geographic matching sample): ESG scores, reputation risk, and property transaction prices

VARIABLE	(1) LNPRICE	(2) LNPRICE
ESGSCORE	**0.015***** **(2.65)**	
RISK		**-0.016*** **(-1.76)**
Observations	102,719	133,178
R-squared	0.904	0.908
Controls	YES	YES
Estate FE	YES	YES
Year-Month FE	YES	YES

Note: The *t*-statistics are reported in parentheses and standard errors are robust to heteroskedasticity and clustered at the property level. ***, **, and * indicate that the point estimate is significantly different from 0 at the 1%, 5%, and 10% levels, respectively.

Table 6. ESG components and property transaction prices

VARIABLE	(1) LNPRICE	(2) LNPRICE	(3) LNPRICE	(4) LNPRICE
ENVSCORE	**-0.003**			**-0.006**
	(-0.67)			**(-1.15)**
SOCSCORE		**0.006***		**0.006***
		(1.90)		**(1.82)**
GOVSCORE			**0.010*****	**0.011*****
			(3.75)	**(4.05)**
Observations	228,334	228,334	228,334	228,334
R-squared	0.908	0.908	0.909	0.909
Controls	YES	YES	YES	YES
Estate FE	YES	YES	YES	YES
Year-Month FE	YES	YES	YES	YES

Note: The *t*-statistics are reported in parentheses and standard errors are robust to heteroskedasticity and clustered at the estate level. ***, **, and * indicate that the point estimate is significantly different from 0 at the 1%, 5%, and 10% levels, respectively.

Table 7. Media coverage of ESG incidents and property transaction prices

VARIABLE	(1) LNPRICE
HIGHRISK	**-0.041*** **
	(-4.28)
MEDIUMRISK	**-0.015***
	(-1.72)
LIMITEDRISK	**-0.010**
	(-0.76)
Observations	312,474
R-squared	0.916
Controls	YES
Estate FE	YES
Year-Month FE	YES

Note: The *t*-statistics are reported in parentheses and standard errors are robust to heteroskedasticity and clustered at the estate level. ***, **, and * indicate that the point estimate is significantly different from 0 at the 1%, 5%, and 10% levels, respectively.

Table 8. Duration of ESG incidents and property transaction prices

VARIABLE	(1) LNPRICE
RISK1MONTH	**-0.038****
	(-2.02)
RISK3MONTH	**-0.024**
	(-1.48)
RISK6MONTH	**-0.017**
	(-1.09)
RISK12MONTH	**-0.002**
	(-0.13)
RISK36MONTH	**0.008**
	(0.44)
RISKLT	**-0.005**
	(-0.22)
Observations	312,474
R-squared	0.916
Controls	YES
Estate FE	YES
Year-Month FE	YES

Note: The *t*-statistics are reported in parentheses and standard errors are robust to heteroskedasticity and clustered at the estate level. ***, **, and * indicate that the point estimate is significantly different from 0 at the 1%, 5%, and 10% levels, respectively.

Table 9. Buyer heterogeneity analysis

Panel A. Non-local buyers, ESG and property transaction prices

VARIABLE	(1) LNPRICE	(2) LNPRICE
ESGSCORE x NONLOCAL	**0.012***** **(2.68)**	
RISK x NONLOCAL		**-0.014***** **(-3.05)**
ESGSCORE	0.021*** (3.30)	
RISK		-0.017** (-2.07)
NONLOCAL	-0.045** (-2.44)	0.014*** (3.64)
Observations	228,334	312,474
R-squared	0.909	0.916
Controls	YES	YES
Estate FE	YES	YES
Year-Month FE	YES	YES

Panel B. Homebuyers, ESG and property transaction prices

VARIABLE	(1) LNPRICE	(2) LNPRICE
ESGSCORE x HOMEBUYER	**0.009***** **(3.02)**	
RISK x HOMEBUYER		**-0.005** **(-1.15)**
ESGSCORE	0.018*** (2.75)	
RISK		-0.018** (-2.28)
HOMEBUYER	-0.040*** (-3.17)	0.000 (0.03)
Observations	228,334	312,474
R-squared	0.909	0.916
Controls	YES	YES
Estate FE	YES	YES
Year-Month FE	YES	YES

Note: The *t*-statistics are reported in parentheses and standard errors are robust to heteroskedasticity and clustered at the estate level. ***, **, and * indicate that the point estimate is significantly different from 0 at the 1%, 5%, and 10% levels, respectively.

Table 10. Property heterogeneity analysis

Panel A. Estate size, ESG and property transaction prices

	(1)	(2)	(3)	(4)
	Large Estate		Small Estate	
VARIABLES	LNPRICE	LNPRICE	LNPRICE	LNPRICE
ESGSCORE	0.004		0.030***	
	(0.65)		(3.84)	
RISK		-0.024*		-0.009
		(-1.75)		(-1.58)
Observations	124,992	162,029	103,342	150,445
R-squared	0.894	0.907	0.923	0.924
Controls	YES	YES	YES	YES
Estate FE	YES	YES	YES	YES
Year-Month FE	YES	YES	YES	YES

Panel B. Luxury, ESG and property transaction prices

	(1)	(2)	(3)	(4)
	With Clubhouses		Without Clubhouses	
VARIABLE	LNPRICE	LNPRICE	LNPRICE	LNPRICE
ESGSCORE	0.001		0.013*	
	(0.21)		(1.87)	
RISK		-0.018*		-0.004
		(-1.69)		(-0.67)
Observations	158,461	185,448	69,873	127,026
R-squared	0.910	0.915	0.898	0.901
Controls	YES	YES	YES	YES
Estate FE	YES	YES	YES	YES
Year-Month FE	YES	YES	YES	YES

Note: The *t*-statistics are reported in parentheses and standard errors are robust to heteroskedasticity and clustered at the estate level. ***, **, and * indicate that the point estimate is significantly different from 0 at the 1%, 5%, and 10% levels, respectively.

Table 11. Property management company heterogeneity analysis

	(1)	(2)	(3)	(4)
	Small PMC		Large PMC	
VARIABLES	LNPRICE	LNPRICE	LNPRICE	LNPRICE
ESGSCORE	**0.007**		**0.023*** **	
	(1.04)		**(2.64)**	
RISK		**-0.028** **		**-0.010**
		(-2.28)		**(-1.24)**
Observations	120,223	174,189	108,111	138,285
R-squared	0.906	0.912	0.910	0.920
Controls	YES	YES	YES	YES
Estate FE	YES	YES	YES	YES
Year-Month FE	YES	YES	YES	YES

Note: The *t*-statistics are reported in parentheses and standard errors are robust to heteroskedasticity and clustered at the estate level. ***, **, and * indicate that the point estimate is significantly different from 0 at the 1%, 5%, and 10% levels, respectively.

Table 12. ESG scores, reputation risk, and rental prices

VARIABLE	(1) LNRENT	(2) LNRENT
ESGSCORE	**0.000**	
	(0.01)	
RISK		**0.003**
		(0.33)
Observations	52,424	52,424
R-squared	0.956	0.956
Controls	YES	YES
Estate FE	YES	YES
Year-Month FE	YES	YES

Note: The *t*-statistics are reported in parentheses and standard errors are robust to heteroskedasticity and clustered at the estate level. ***, **, and * indicate that the point estimate is significantly different from 0 at the 1%, 5%, and 10% levels, respectively.

Appendix A1. Variable definitions

Variable	Definition
LNPRICE	The natural logarithm of housing prices.
LNAREA	The natural logarithm of the area of the transacted residential property measured in square feet.
LNRENT	The natural logarithm of rental income per month.
RISK	A dummy variable equal to 1 if the transaction takes place within 12 months following the occurrence of a risk incident attributed to the corresponding property manager, and 0 otherwise.
LIMITEDRISK	A dummy variable equal to 1 if the transaction takes place within 12 months following the occurrence of a limited reach risk incident attributed to the corresponding property manager, and 0 otherwise. The limited reach level means that news of risk incidents is covered by local media, local governmental bodies, and social media.
MEDIUMRISK	A dummy variable equal to 1 if the transaction takes place within 12 months following the occurrence of a medium reach risk incident attributed to the corresponding property manager, and 0 otherwise. The medium reach level includes most national and regional media.
HIGHRISK	A dummy variable equal to 1 if the transaction takes place within 12 months following the occurrence of a high reach risk incident attributed to the corresponding property manager, and 0 otherwise. The high reach level indicates that incidents are reported in global media outlets.
RISK1MONTH	A dummy variable equal to 1 if the transaction takes place in the month following the occurrence of a risk incident attributed to the corresponding property manager, and 0 otherwise.
RISK3MONTH	A dummy variable equal to 1 if the transaction takes place between one and three months after the occurrence of a risk incident attributed to the corresponding property manager, and 0 otherwise.
RISK6MONTH	A dummy variable equal to 1 if the transaction takes place between three and six months after the occurrence of a risk incident attributed to the corresponding property manager, and 0 otherwise.
RISK12MONTH	A dummy variable equal to 1 if the transaction takes place between six and 12 months after the occurrence of a risk incident attributed to the corresponding property manager, and 0 otherwise.
RISK36MONTH	A dummy variable equal to 1 if the transaction takes place between 12 and 36 after the occurrence of a risk incident attributed to the corresponding property manager, and 0 otherwise.
RISKLT	A dummy variable equal to 1 if the transaction takes place more than 36 months after the occurrence of a risk incident by the corresponding property manager, and 0 otherwise.

ESGSCORE	The overall ESG scores of the corresponding property manager.
ENVSCORE	The environmental score of the corresponding property manager.
SOCSCORE	The social score of the corresponding property manager.
GOVSCORE	The governance score of the corresponding property manager.
NONLOCAL	A dummy variable equal to 1 if the buyer is not local, and 0 otherwise. Local buyers are identified by their names following to Fan et al. (2023b).
HOMEBUYER	A dummy variable equal to 1 if the buyer is not a flipper, and 0 otherwise. Flippers are buyers who buy and resell the same flat within two years (Agarwal et al., 2022).
FLOORNUM	The number of floors.
CARPARK	A dummy variable equal to 1 if the transaction includes a car park, and 0 otherwise.
GARDEN	A dummy variable equal to 1 if the property has a garden, and 0 otherwise.
BEDRMNUM	The number of bedrooms.
LIVDINNUM	The number of living or dining rooms.

Appendix A2. The logarithm of ESG scores and property transaction prices

VARIABLE	(1) LNPRICE
LNESGSCORE	**0.096***** **(3.21)**
LNAREA	0.999*** (40.81)
FLOORNUM	0.003*** (14.40)
CARPARK	0.093*** (5.58)
GARDEN	0.248*** (9.08)
BEDRMNUM	0.013** (2.48)
LIVDINNUM	-0.026*** (-3.45)
Observations	228,334
R-squared	0.909
Estate FE	YES
Year-Month FE	YES

Note: The *t*-statistics are reported in parentheses and standard errors are robust to heteroskedasticity and clustered at the estate level. ***, **, and * indicate that the point estimate is significantly different from 0 at the 1%, 5%, and 10% levels, respectively.

Appendix A3. Examples of the reach level of risk incidents

High reach incident: Great Eagle Holdings Limited, the parent company of Keysen Property Management Services Limited, has experienced high media coverage of its negative ESG risk incidents. One such incident occurred on March 25, 2017, when at least 18 people were injured due to an escalator malfunction at a shopping mall in Hong Kong's Langham Place, which is managed by Great Eagle Holdings Limited. This escalator accident was widely covered by local and international media and was even documented in several languages on Wikipedia[28]. This example shows how such incidents can attract global media attention.

Medium reach incident: On August 14, 2020, Sau Mau Ping Wet Market, managed by Link Property Management Services Ltd., was exposed to a serious rat infestation. This event was covered by international and regional media, raising concerns about hygiene issues among citizens[29].

Limited reach incident: On March 11, 2017, an industrial accident occurred at the MTR Siu Ho Wan Depot, where a worker tragically lost their life. This incident was only covered by local Hong Kong media, such as HK01 and *Sing Tao Daily*. The Labor Department of Hong Kong conducted an investigation and issued a suspension notice to the contractor involved. This example demonstrates how incidents of limited reach are primarily covered by local news sources.

[28] The event was reported by SCMP (https://www.scmp.com/news/hong-kong/law-crime/article/2136585/lift-firm-otis-fined-hk320000-over-hong-kong-mall-escalator), ABC News (https://abc7ny.com/hong-kong-escalator-china-mall/1820350/), and was also covered on the Chinese and English Wikipedia pages (https://en.wikipedia.org/wiki/Langham_Place_(Hong_Kong)).

[29] The event was reported by English media such as SCMP and Chinese media including Yahoo News (Hong Kong), Ming Pao, Sing Tao, Ta Kung Pao, and HK01. This event was also covered on the Chinese Wikipedia page for Sau Mau Ping Shopping Centre.

Appendix A4. Buyer heterogeneity and property transaction prices

VARIABLE	(1) LNPRICE	(2) LNPRICE	(3) ESGSCORE	(4) ESGSCORE
NONLOCAL	0.009***		0.004	
	(2.98)		(0.77)	
HOMEBUYER		-0.001		-0.001
		(-0.52)		(-0.12)
Observations	312,474	312,474	228,334	228,334
R-squared	0.916	0.916	0.824	0.824
Controls	YES	YES	YES	YES
Estate FE	YES	YES	YES	YES
Year-Month FE	YES	YES	YES	YES

Note: The *t*-statistics are reported in parentheses and standard errors are robust to heteroskedasticity and clustered at the estate level. ***, **, and * indicate that the point estimate is significantly different from 0 at the 1%, 5%, and 10% levels, respectively.