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Olayiwola Oladiran, Paul Hallam & Henrie Westlake

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Are the COVID-19 footprints fading? analysing dynamics in work, corporate real estate strategies and building use

Olayiwola Oladiran [a], Paul Hallam [b] and Henrie Westlake[c]

[a]School of Geography and Planning, University of Sheffield, Sheffield, UK; [b]School of Built Environment, Engineering and Computing, Leeds Beckett University, Leeds, UK; [c]Knight Frank, Leeds, UK

ABSTRACT

Sentiments about hybrid working have changed in line with the waning of the Covid-19 pandemic. Businesses and organizations are increasingly driving a return-to-office (RTO) mandate, which questions previous perceptions about reimagining office space use and the ESG and economic impacts at the pandemic apex. Using data from two waves of Knight Frank's (Y)OUR SPACE survey (2021 and 2023), we employ probit models to analyse the link between the COVID-19 pandemic and workspace dynamics. We also compare the influence of business strategies and work patterns on office space use expectations during the lockdown and 2 years after. The results indicate that the COVID-19-driven hybrid working led to firms' decisions to reduce their office space quantity while improving the quality of space. However, these sentiments and expectations are changing in line with post-pandemic work culture and organizational strategies. Our results further reveal that office space flexibility may not be a priority in organizations' future workspace strategy. These insights indicate that economic factors remain core priorities in future workspace strategies while environmental and social factors remain secondary. This study extends the literature beyond the economic drivers of workspace strategies to environmental and social factors.

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KEYWORDS
ESG; organizational strategy; work from home (WFH); return to office (RTO); office; real estate

Introduction

Organizational strategies and work culture have evolved in the last two decades, pushing the boundaries of traditional workspace uses and creating innovative workspace models such as shared spaces and hybrid working (Miller, 2014; Sullivan, 2003). Home-based and virtual team working were beginning to gain momentum at the start of the last decade (Donnelly & Proctor-Thomson, 2015; Hallier & Baralou, 2010), and by the end of the decade, remote working had gained prominence in service occupations such as IT and marketing (Saiz, 2020). An estimated 1.7 million people in the UK (5% of the UK workforce) worked partly or fully remotely in 2019 (Office for National Statistics, 2020). However, the outbreak and spread of the COVID-19 pandemic in 2020 raised concerns about shared building spaces; thus social distancing was introduced through measures such as lockdowns and physical distance recommendations (Jens & Gregg, 2021). This and other factors significantly increased the adoption of remote working (Fiorentino et al., 2022; Hodder, 2020), as demonstrated in Figure 1. Figure 1 shows the pandemic-induced lockdown episodes and corresponding spikes in remote working, highlighting the pandemic's role in redefining work culture and workspace use.

The pandemic led to radical disruptions to organizational priorities and work strategies (Hodder, 2020). At the apex of the lockdown, the work-from-home (WFH) phenomenon was tagged the 'new normal', suggesting that the pandemic would leave robust footprints in work culture and workspace uses. It should be noted that this 'new normal' tag was derived anecdotally, and some studies painted different pictures. For instance, Fiorentino et al. (2022) observed that despite the acceleration towards hybrid working patterns, the observed change in workspace uses would be temporary. Cooke et al. (2022) further cautioned that it was not yet clear whether the changes observed would affect the flex space sector. Regardless, CEOs (Chief Executive Officers) of global corporations (such as Barclays, Google and Facebook) pledged to make structural changes to their corporate real estate (CRE) [1] use (Kalyan et al., 2020). Furthermore, 24% of the CEOs in a

CONTACT Olayiwola Oladiran o.o.oladiran@sheffield.ac.uk

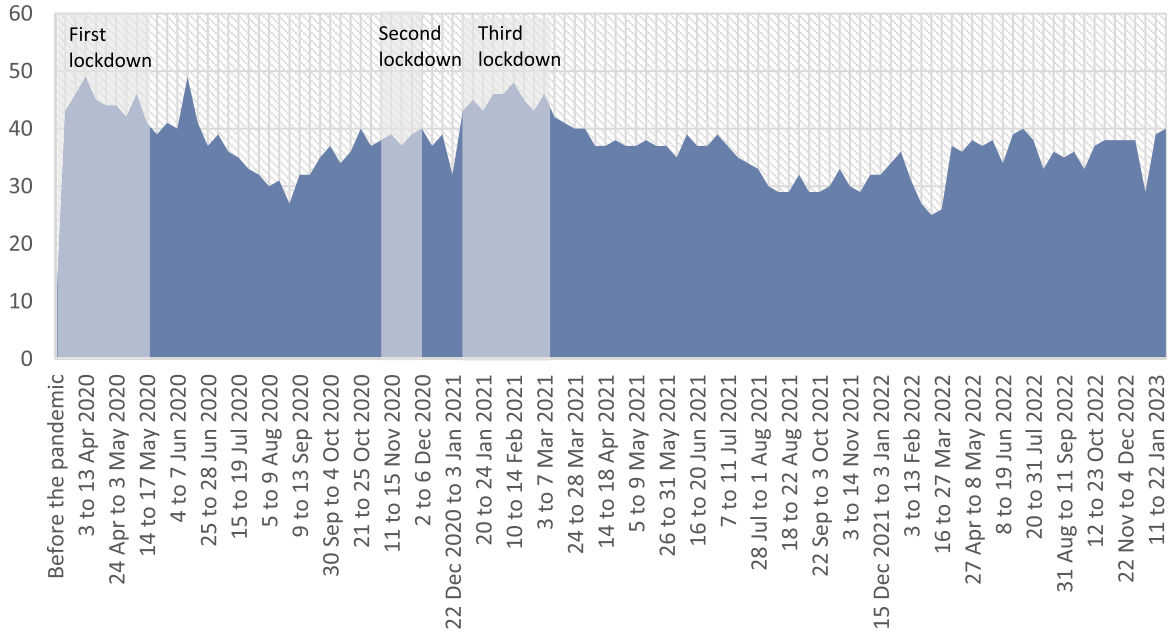

Figure 1. The percentage of employees that worked from home. Source: Authors (Data from Office of National Statistics, 2023).

KPMG Outlook Pulse Survey admitted that their business models would change forever (KPMG, 2021).

Organizational strategy drives commercial real estate strategies, and these typically influence organizations' CRE use. Thus Knight Frank's (Y)OUR SPACE survey (2021) revealed that 75% of corporate real estate leaders planned to make strategic changes to their CRE as a result of the pandemic, further reflecting the sentiments of organizational strategies. Based on these sentiments, Oladiran et al. (2023) projected that organizations that had recorded positive WFH experiences were likely to reduce their office space quantity (sizes), reduce office space densities[2] and negotiate shorter leases in the medium and long terms. They also revealed that despite what seemed like a strong commitment by firms to prioritize ESG (Environmental and Social Governance) factors in their business and CRE strategies, they were prioritizing economic factors.

Post-lockdown sentiments about remote working appear to be changing; the WFH momentum is declining, and employers are now increasingly driving a return to office (RTO) agenda (Cumming, 2024). 72% of organizations now have a return-to-office mandate, and 90% expect to have RTO mandates by the end of 2024 (Birch, 2024). Therefore, this trend questions previous projections about the future of workspace use. For instance, the studies of Akinsomi et al. (2024) and Jens and Gregg (2021) were primarily underpinned by the pandemic-induced WFH practice; however, in light of current RTO mandates and business dynamics, it is not clear what changes can be expected in workspace use. Furthermore, the rapid work culture evolution in the last 5 years has not been accompanied by commensurate empirical insights.

To address these issues, this paper analyses the influence of the pandemic on office space demand in the context of organizational strategies, changing work culture and office space use. It also explores the changes to organizational strategies and workspace use and analyses CRE dynamics during and after the main lockdown episodes. The core research questions are:

(1) What is the link between the COVID-19 pandemic and workspace use strategies?
(2) Have the pandemic-induced workspace strategies such as space quality, densities and flexibility changed in line with post-pandemic sentiments[3]?
(3) How are ESG and other factors likely to influence firms' workspace strategies in the future?

We investigate these questions using two waves of data from Knight Frank's (Y)OUR Space survey (wave 1 survey – December 2020 to January 2021; wave 2 survey – December 2022 to January 2023) which capture the expectations of businesses and organizations across 15 industry sectors with a business presence in the UK. The data was analysed using descriptive statistics and probit models. The data does not cover the period before the COVID-19 pandemic; therefore, this paper does not attempt to make inferences about the causal effect of the pandemic. Rather, it explores the link

between the pandemic cycle, organizational strategies and CRE strategies.

The comparative approach adopted in this paper is important because it provides a nuanced analysis of the dynamics and evolution of work patterns, organizational strategies and workspace use. Although previous studies have provided insight into future workspace use expectations, the data used was collected at the apex of the pandemic, thus reflecting the lockdown sentiments. Our study, therefore, provides an opportunity to assess the extent to which these sentiments have changed in line with the waning pandemic. This provides a more effective approach to examining changing workspace strategies and improving the accuracy of market forecasting considering current financial, geopolitical, environmental and epidemiological uncertainties. It also gives office market investors actionable insights for effective and efficient investment decisions.

Relevant literature and conceptual framework

Office use dynamics and the Black Swan theory

The optimal use of office space, theoretically, drives demand. Traditional models account for micro-level factors such as changes in technology, work practices, corporate management and environmental pressures, and macro-level factors such as population growth, employment, GDP, and the industrial and occupational composition of the economy (see Colwell et al., 2016; Rabianski & Gibler, 2007; Tsolacos et al., 1998; Wheaton et al., 1997). These factors drive office market adjustment through the interplay with supply. Office market dynamics are, therefore, typically modelled through supply and demand adjustment (Hendershott et al., 2010), and the equilibrium-based adjustment model demonstrates how demand factors influence vacancy rates and market rents (Da Silva et al., 2022). Office space providers also influence office market adjustments, and flexible workspaces have been found to contribute to rent adjustments, although the magnitude and nature of this impact may vary for core tenants (Da Silva et al., 2022). This may be due to the higher risk and uncertainty associated with flexible workspaces. Demand for office space also varies by the size and type of business occupier and the leader of the organization. In smaller organizations, the leader (typically the CEO) may perceive commercial real estate, especially the head office, as an expression of themselves (Greenhalgh, 2008). Traditional office market models implicitly assume that office market adjustments take place over a relatively long time frame. However, these conceptual framings are easily questioned when economic, political and institutional shocks and outlier events, such as the COVID-19 pandemic, occur. The COVID-19-induced WFH, for instance, demonstrated that office demand dynamics may operate outside defined theoretical constructs. It invariably questioned traditional office market models and their suitability for future demand modelling as the office market spiralled to the territories of known unknowns and unknown unknowns (Rumsfeld, 2002) during the pandemic.

Taleb's black swan events theory provides useful insight into the impact of shocks on economic constructs. The theory describes rare, unpredictable and outlier events which leave clear footprints and, in most cases, significantly change sector systems and operations (Runde, 2009). The 9/11 terrorist attack in the US, the 2008 Global Financial Crisis and the COVID-19 pandemic are examples of events that can be categorized as black swan events. This theory has been applied in risk management (Aven, 2013), the stock market (Bekiros et al., 2017) and construction (Nafday, 2011), and it has also been extended to real estate research (Higgins, 2013, 2014; Higgins, 2015), albeit in the context of real estate pricing and capital markets.

Several countries have gone through real estate cycles in the past, with the most recent being the great financial crisis of 2008. Although the underlying factors have been different, the impacts have been similar. The Black Swan event theory is, therefore, important for understanding the COVID-19 link to the office market. Although there was a general awareness about the changing work patterns, this may not have been fully disseminated into the public mindset until the pandemic. The pandemic, therefore, became a major event that significantly transformed work and office space use, as illustrated in Figure 1. Previous studies have been primarily framed within the pandemic context and the data used was collected at the apex of the lockdown. Studies by Bae et al. (2021), Forooraghi et al. (2023) and Markkanen and Herneoja (2024) provide insight on some aspects of post-COVID-19 workspace use; however, these are not conceptualized to capture the 'sudden' changes that occurred at the start of the pandemic. Jens and Gregg (2021) provide an analysis of the period before and after the pandemic which captures an important part of the black swan event dimension of the COVID-19 effects; however, these perspectives also reflect the sentiments from the pandemic apex. Due to its limited application to the office sector, the nature and longevity of the effects and implications of the black swan events on the office sector remain

unknown. Our study, therefore, makes a unique contribution to the broader black swan event and office market literature by examining the implications (ex-post) and longevity of black swan events in the office market.

The link between business strategy and office space use

Although office stock has been skewed by spaces delivered by investors and developers and the lease term options, studies have found that business and organizational strategies, occupiers' operations and activities influence office space demand (Guy & Harris, 1997; Rabianski & Gibler, 2007). The ESG strategies of businesses and organizations can also influence their office space (and broader real estate) strategies. A strand of literature captures the ESG issues concerning business strategies, behaviours and outcomes (Fang & Li, 2024; Marie et al., 2024; Nguyen & Vu, 2024). These studies underscore the pandemic's impact on ESG practices, stressing the importance of standards, ratings, assessment systems and regulatory frameworks (Chen et al., 2024; Yang et al., 2024). On the real estate side, the body of literature that explores the office demand dynamics during the pandemic has mainly analysed social and economic factors (Akinsomi et al., 2024; Tagliaro et al., 2021), thus the link between ESG strategies and office demand dynamics is unclear. This, therefore, leaves an important knowledge gap on the link between firms' ESG strategies and their CRE strategies. This is an important factor considering that the built environment contributes to approximately 40% of carbon emissions globally (United Nations Environment Programme, 2020); our study, therefore, provides novel insights into these issues.

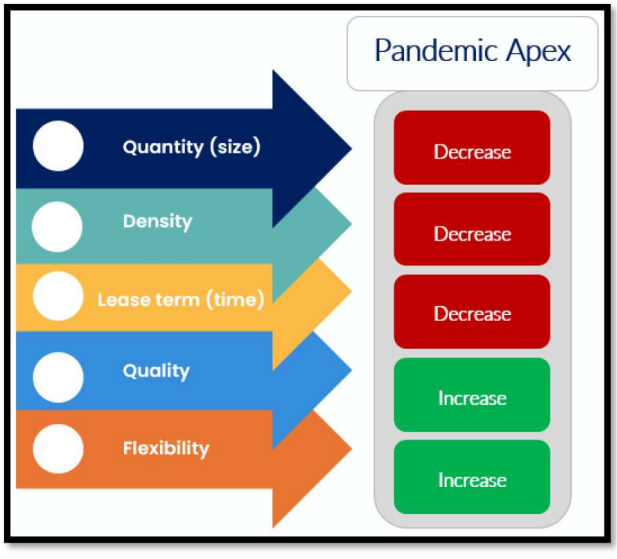

Figure 2. Office space use and the projected pandemic effects. Source: Authors Illustration.

Some important indices of office demand include the density of workspaces, lease terms and office space use. According to Miller (2014), the office density of an organization is likely to increase as the number of employees increases, premised on the assumption that office occupiers will aim to maximize their available space before seeking more space. The emergence of innovative space uses such as shared spaces, hot desking, co-working and remote working have, therefore, become more prominent in line with businesses and organizations' strategies aiming to maximize space use while ensuring reasonable densities (Miller, 2013). These innovative systems and new work practices have enabled organizations to reorganize their workplace strategies to enhance performance amid an increasingly competitive global market (Mesthrige & Chiang, 2019; Oladinrin et al., 2023). These systems should theoretically lead to a reduction in space size (quantity) as an adaptation strategy for business and economic shocks.

The workplace is increasingly being used to convey organizational brand and values, and there is a heightened need to achieve flexibility while enhancing community, amenity and well-being as well as reducing costs (Harris, 2015, 2016). Organizations can also adopt flexible leases to be more agile and flexible (Miller, 2014). This may involve shorter lease terms (years) to accommodate potential economic shocks, and incentives such as rent-free periods, break options and capital contributions. It should be noted that these were primarily aimed at operational cost reduction after the great financial crises in 2008; thus, their applications may differ from the COVID-19 strategies, which were mainly driven by the need to maximize space, improve ergonomics, retain talent, etc.

Businesses and organizations typically review their real estate strategy to align with their operational objectives and organizational dynamics (Scarrett & Wilcox, 2018), and new working practices influence workspace use (Jayantha & Oladinrin, 2019). At the apex of the pandemic, CBRE (2021) predicted a circa 9% reduction in underlying demand for office space, which was linked to businesses moving towards more hybrid working. Data from Knight Frank's (Y)OUR SPACE (2020) survey further revealed that firms and organizations were poised to reduce the workspace sizes, average lease length and density of occupation, while increasing desk sharing, collaborative spaces and the overall quality of amenities provided. Oladiran et al. (2023) further

demonstrated the link between the pandemic and firms' real estate strategy. The study predicted that the pandemic would lead to a decrease in space quantity (size), space density, and shorter leases and an increase in space quality and flexibility (illustrated in Figure 2).

The variables illustrated in Figure 2 are important CRE factors for organizations and businesses, and some of these factors have been investigated in previous research, albeit in silos. For instance, Bae et al. (2021) highlight the importance of space quality on employee well-being, and Jens and Gregg (2021) reveal that the design elements of the building influence social behaviour within the building. Furthermore, Forooraghi et al. (2023) revealed that flexible offices affect working conditions. However, these perspectives are fragmented, and they fail to provide a sufficient scope of the implications of core CRE considerations. For instance, lease terms and space quantity and densities are not covered; the studies are typically limited to the pandemic apex, and changes in post-lockdown sentiments now question these predictions.

These changes challenge the longevity of black swan events on office demand, particularly when the event is primarily linked to socio-cultural changes (namely the remote working adoption). We argue that although there were strong sentiments about the COVID-19 footprints in the office market at the apex of the pandemic, the longevity of effects of this black swan event may be questionable in light of employers now driving a return-to-work mandate (Birch, 2024; Cumming, 2024). We, therefore, propose a new conceptual model to illustrate the potential changes to previous predictions (Figure 3); this represents the conceptual framework and hypothesis that underpinned the empirical design and analysis. We expect that the post-pandemic RTO mandate will lead to an increase in office space quantity (Column 2) rather than the predicted decrease, primarily driven by the WFH sentiments (Column 1). It is also unlikely that space densities will decrease as previously predicted because it will be difficult for businesses and organizations to expand their office space sizes in the short term, which will mean that more people will be using the same space. Furthermore, businesses and organizations are still likely to attempt to negotiate shorter and more flexible leases to make them more flexible and amendable to their organization and operational dynamics; however, the RTO mandate suggests that employers may be less willing to provide flexible working options. Finally, it is unlikely that organizations will reduce their space quality; rather, the RTO policy may lead to improved space quality as an inducement for employees to use the office more.

Data and empirical strategy

Data

This paper uses two waves of data from Knight Frank's (Y)OUR Space survey: Wave 1 contains data from the survey conducted between 1 December 2020 and 31 January 2021; Wave 2 contains data from the survey administered from December 2022 to January 2023. This enables the assessment of the aggregated changes in organizational strategies during and after the pandemic. The data was collected, managed and transformed by Knight Frank's Occupier Research Team, and the anonymized version of the dataset was made available exclusively to the research team for the study. In both waves, purposive sampling was adopted for the survey, sent privately to respondents and targeting 640 corporate organizations in the UK and internationally, drawn from 15 industry sectors and the sample was balanced in terms of the size of the responding organizations with employees ranging from 50 to 100,000.

The total number of completed surveys in Waves 1 and 2 was 373 and 357, respectively (a response rate of 58% in Wave 1 and 56% in Wave 2). The survey was administered online, and the respondents were senior corporate real estate professionals tasked with managing their organization's real estate portfolio. As part of the survey, respondents had to confirm that they had office space responsibilities in their organizations, ensuring that responses were part of the real estate decision making process of their organizations. Respondents that indicated that they only had the day-to-day facilities management functions were excluded from the survey, given that the focus was on the strategic use, rather than tactical delivery of the estate. Only one response was permitted from a single company, and in cases where multiple responses were provided from the same organization, the response of the most senior respondent with the broadest geographical remit was used. Furthermore, respondents were asked to respond based on their role in the organization rather than from their personal opinions.

The (Y)OUR Space survey data reveals that real estate considerations are increasingly being integrated into organizational strategies (Figure 4). Figure 5 further reveals that the appetite for the reduction of office space sizes has reduced after the pandemic (compared to the apex), while the desire to improve space quality has increased. As the conceptual framework suggests, the RTO drive is expected to increase space densities and reduce workspace flexibility, and this is the pattern observed from the data.

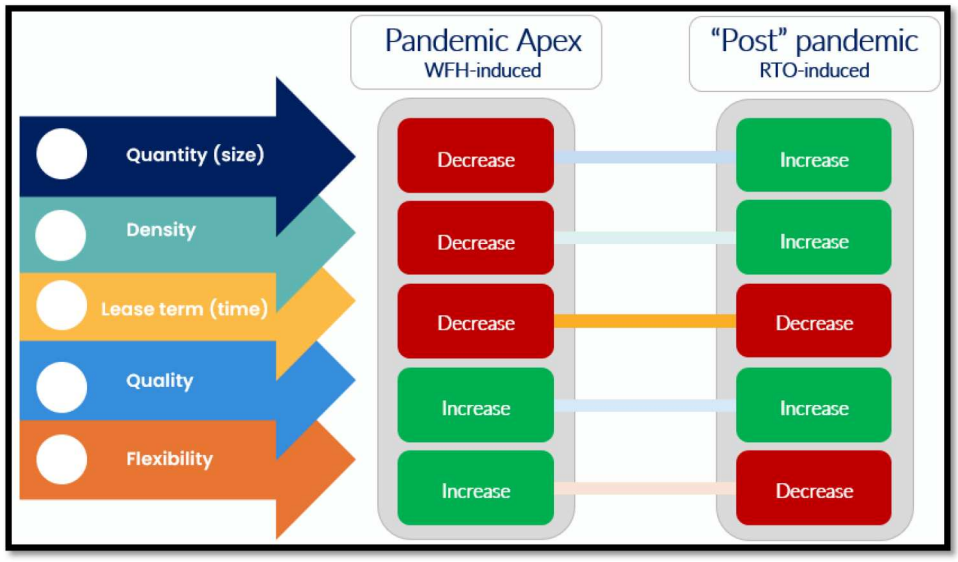

Figure 3. Office space use dynamics (WFH-induced vs RTO-induced effects). Source: Authors Illustration.

Empirical framework

Probability models are used to estimate the conditional probabilities for the various outcome variables. The probit model is appropriate for our study, given the nature of the outcome variables (in binary form). Probit models have nonlinear functions, constraining the values between 1 and 0. They require maximum likelihood estimation because the effect of the predictor variables (x) will be nonlinear. According to Train (2009), dynamic causal modelling (DCM) must have a finite number of alternatives, be exhaustive and mutually exclusive, and the models adopted are defined in terms of latent variable hence, a latent variable approach. The probit model is estimated through maximum likelihood estimation (MLE), which produces β estimates that are most likely to have resulted in observed values of (y), conditioned on explanatory variables (x) and where observations are assumed to be independent of each other.

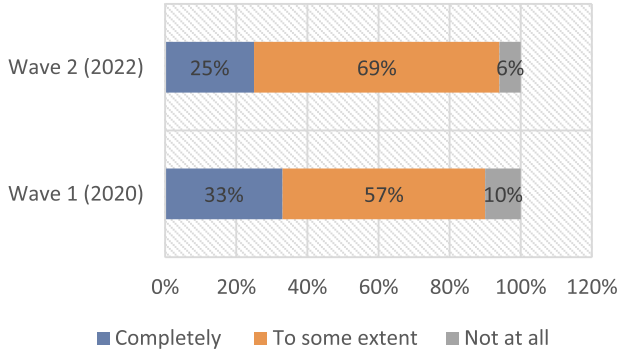

Figure 4. Real estate as a strategic 'device' within businesses and organizations. Source: Authors (using data from Knight Frank, 2021 and 2023).

The models estimate the probabilities that the changes to the various outcomes (y) are influenced by the various predictor variables: the main predictor variable, other controls and fixed effects. Within a probability model framework, these are conditioned on a set of vectors of unobserved characteristics based on the assumption that the zero conditional mean assumption holds:

$$P(y = 1)|x = E(y|x) \tag{1}$$

The binary nature of the outcome variables, therefore, warrants a probit model, which is defined in terms of the latent variables:

$$y_i^* = x_i'\boldsymbol{\beta} + e_i \tag{2}$$

In modelling the various outcome variables, yi^* allows us to observe if the changes to the outcome variable by if the variable (yi^*) crosses a set threshold or not. This implies that a minor shift in some of the observed factors (x) may change the latent variable to induce an organization to make a different decision regarding its office space strategy. e_i captures the errors, which are assumed to be independent of x_i and symmetrically distributed around '0''. The probit model does not have a directly comparable r2 as the OLS, but there are various pseudo r2 measures which are not comparable to the OLS version (Hensher & Johnson, 1981).

The average marginal effects (AME) in Equation (8) are reported in the results table because they indicate the influence of the explanatory and control variables on the probability that a business will take a specific decision

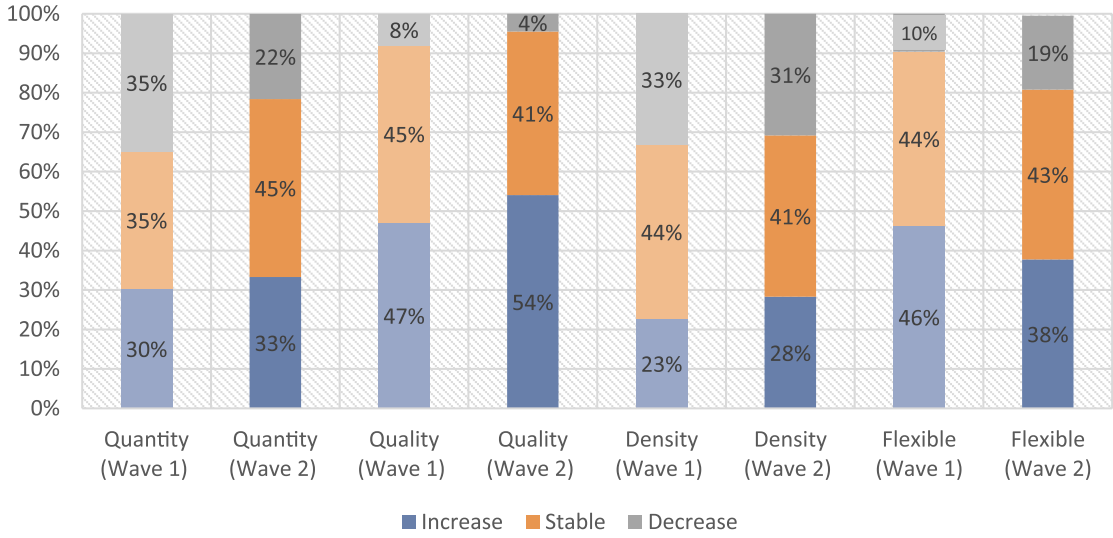

Figure 5. Changes to real estate strategy (space quantity, quality and density[7]). Source: Authors (using data from Knight Frank, 2021 and 2023).

relative to a different alternative. This enables a more straightforward estimation of the effects of the predictor variables on organizations' future office space strategies.

$$g(\bar{x}(k)\hat{\beta}(k) + \hat{\beta}_k) - g(\bar{x}(k)\hat{\beta}(k)) \quad (3)$$

This modelling approach may be associated with some sources of bias such as heteroscedasticity and non-normality in the error term. Heteroscedasticity is the possibility that the size or the error term differs across values of a predictor variable, while non-normality of the error term in the latent variable may suggest that the estimates may be inconsistent. However, Wooldridge (2013) argues that even consistent estimates will not sufficiently capture the magnitude of the marginal effects. Furthermore, this issue is typically associated with cross-sectional data, and there is no consensus about the best solution; hence, it is often ignored, partly because latent variables are not observed.

Empirical strategy and models

The descriptive analysis described earlier provides insights into the changes to businesses' real estate strategies following the waning of the pandemic; however, this does not sufficiently explain the factors that may explain these changes. Our empirical strategy, therefore, facilitates the analysis of some of these factors based on the statistical methods described in the previous section. The analysis is structured around three core issues: the COVID-19 impact on office space use; a comparative analysis to understand the influence of the waning pandemic on future office space use; and the influence of ESG and other factors on future workspace use.

The core variables used within the main empirical exercises are presented in Appendix Table 1.[4]

The influence of the COVID-19 pandemic on office space demand

We use Wave 1 data to investigate the influence of the pandemic on office space demand because it includes questions directly addressing WFH sentiments and COVID-19 influence.[5] The five outcome variables are in binary form as shown in Appendix Table 1: (i) office space quantity to decrease; (ii) office space density to increase; (iii) lease terms to decrease; (iv) space quality to increase; and (v) proportion of flexible space to increase. Respondents to this question are asked to comment on their strategies for the next 3 years; thus we can observe the short-term influence of the pandemic on workspace strategies at the apex of the pandemic. Two explanatory variables are used to capture the pandemic effects. The first is the firms' explicit acknowledgement that the pandemic will influence their CRE strategy, and the second is the firms' views of their employees' WFH experience. The WFH experience variable might be tricky as it is difficult to disentangle a firm's sentiments from the personal sentiments of the respondents, and indeed, there is a likelihood that the data contains mixed sentiments; however, the survey made it clear that respondents were to record the corporate positions of their firms, rather than their individual preference. The WFH impact in the models will, therefore, be interpreted as the firm's general perception of their employees' WFH sentiments.

Other control variables are introduced based on the discussion provided in the review of relevant literature section. The first control variable is *ESG/Sustainability*,

which measures the influence that firms' ESG/sustainability considerations have on their real estate strategies. The *occupational/industry sector* variable (the sector in which the business operates) captures the potential unobserved heterogeneity associated with the occupational requirement of a sector. For instance, those in the financial services industry (tertiary sectors) can more easily commit to WFH compared to those in primary occupations. The occupational sectors have been reclassified into three main categories: tertiary, secondary and others. The 'others' category includes primary occupations and other unclassified categories.[6] The *locationHQ* (location of the head office of the firm) variable was also introduced to capture potential effects arising from the regional and continental location of the policy and strategy centre of the business. A different variable is introduced for the *geographical remit* of the firm to capture the potential variation in the scope of the business, and another variable (*firm size*) is introduced to observe the impact of a firm's size on its office demand strategy changes. Finally, *firms' mobility* is introduced to capture firms' plans to move to a new location soon. The model for the first empirical exercises is shown below (Equation 1):

$$\begin{aligned} Pr\,(Office\ space\ Y) &= \beta_0 + \beta_1 Workfrom\ home\ experience \\ &+ \beta_2 COVID-19\ effect\ on\ space\ use\ strategy \\ &+ \beta_3 Sector\ FE + \beta_4 Location\ FE \\ &+ \beta_5 x + u \text{ if wave} = 1 \end{aligned} \tag{4}$$

Where O*ffice Space Y* represents each of the outcome variables (i. space quantity decrease; ii. space density *increase; iii. lease term decrease; iv. space quality improvement and v. flexible space increasing);* β_0 *is the intercept term*; $\beta_5 x$ represents the control variables and u is the error term.

Comparative analysis (pandemic apex vs post-pandemic)

Data from Waves 1 and 2 are used to investigate the influence of the waning of the pandemic on office space strategies. The models are identical to those used in the previous section; however, there are three differences: first, four outcome variables are tested (space quantity, space density, space quality and proportion of flexible space) because Wave 2 does not include questions about the future lease terms; second, the COVID-19 effect variables are not included because these questions are not asked in the wave 2 survey; and third, a new variable (*Wave*) is introduced to capture time effects, serving as a proxy for the pandemic lockdown. 'Time' is used as a proxy to capture the potential influence of the waning pandemic, changing sentiments about WHF and the general RTO drive. Time is captured primarily through a binary variable (=1 if wave 2; =0 if wave 1) as shown in Equation (2). The coefficient from this variable, therefore, captures the role that differences in time (as a proxy for the pandemic) have played in defining office space demand dynamics.

$$\begin{aligned} Pr\,(Office\ space\ Y) &= \beta_0 + \beta_1 Wave + \beta_2 Sector\ FE \\ &+ \beta_3 Location\ FE + \beta_4 x + u \end{aligned} \tag{5}$$

where O*ffice Space Y* represents each of the outcome variables: (i. space quantity decrease, ii. space density *increase, iii. space quality improvement and iv. flexible space increasing);* β_1 *Wave represents the wave*; $\beta_4 x$ *represents the control variables; and u is the error term*.

We also adopt a coefficient comparison approach where we analyse the same model in Equation (2) but run the models separately for Waves 1 and 2. This enables us to compare the average marginal effects for each wave, thereby providing insight into the varying relationships between the outcome variables and predictor variables within each context of each wave (Equations 3a and 3b).

$$\begin{aligned} Pr\,(Office\ space\ Y) &= \beta_0 + \beta_1 Sector\ FE \\ &+ \beta_2 Location\ FE + \beta_3 x \\ &+ u\ \ if\ \ wave = 1 \end{aligned} \tag{6}$$

$$\begin{aligned} Pr\,(Office\ space\ Y) &= \beta_0 + \beta_1 Sector\ FE \\ &+ \beta_2 Location\ FE + \beta_3 x \\ &+ u\ if\ \ wave = 2 \end{aligned} \tag{7}$$

The influence of ESG and other factors on future office space use

We use the same setup to analyse the influences of ESG and other factors on future CRE using Wave 2 data. This provides insight into the various ways through which future CRE will be influenced by business and organizational strategies. The models used in these exercises are identical to those in Equation (3b); however, the other outcome and control variables are introduced to capture a wider range of expectations and drivers of CRE (Equation 4).

$$\begin{aligned} Pr\,(Office\ space\ Y) &= \beta_0 + \beta_1 Sector\ FE \\ &+ \beta_2 Location\ FE + \beta_3 x \\ &+ u\ \ if\ \ wave = 2 \end{aligned} \tag{8}$$

This section has provided an overview of the data, empirical strategy and the associated considerations. Although robust, they are not without limitations;

these limitations, mitigation strategies and robustness tests are highlighted in the following section.

Results and discussion

This section presents and discusses the results based on the empirical framework described in the previous section. The results presented in the tables are average marginal effects as highlighted in the previous section.

The first subsection presents the baseline results highlighting the influence of the pandemic on office space demand, and the next subsection presents the results of the comparative analysis of the apex and post-pandemic dynamics in response to changing business and organizational strategies. Furthermore, the subsequent section highlights the influence of a range of business and organizational strategies on future office space demand dynamics and the final subsection provides an overview of the various robustness tests and limitations.

The COVID-19 pandemic and office space demand

Table 1 reports the average marginal effects of probit models based on Equation (4), where the five outcome variables (space quantity, quality, lease term, density and proportion of flexible working space) are regressed against the main explanatory variables and other control variables. First, the COVID19-related variables are excluded from the models (columns 1, 3, 5,7,9) to enable us to assess the impact of the other explanatory variables on various outcome variables; then we introduce the COVID-19 variables (columns 2, 4, 6, 8, 10) to observe their impact on the various outcome variables and the model fit (pseudo r2).

The results in Table 1 indicate that the pandemic significantly influenced organizations' CRE strategy. The average marginal effects for office space quantity, lease terms and space densities are statistically significant and positive, suggesting that businesses whose medium and longer-term strategies have been influenced by the pandemic were more likely to reduce their space sizes, length of lease terms and space densities. It is also interesting to note that firms that planned longer-term strategic changes during the pandemic were likely to make more significant changes to their CRE strategies. The results indicate that the pandemic was projected to lead to a decrease in the quantity of space, an increase in the quality of the space, a reduction in the length of lease terms and reduced space densities. This relationship was not statistically significant in the models on improvement to space quality (column 8) and flexibility (column 10). These results reinforce the point that the effect of the pandemic is more likely to drive economic rather than social change. These results also corroborate the proposition that organizational and business strategies are core drivers of workspace use and that businesses review their real estate strategy in line with organizational dynamics (Runde, 2009; Scarrett & Wilcox, 2018).

The results also show that positive and neutral WFH sentiments increase the likelihood of a reduction in space sizes, lease terms and densities, although lease terms, densities, quality and space flexibility are generally not statistically significant. This suggests that WFH sentiments may not be as influential on a firm's real estate strategy, the exception being space size strategies. The importance of space reduction in organizations' strategies may be due to low office use and occupancy during the pandemic (Office of National Statistics, 2023) and the corresponding economic implications of space underutilization, including lower vacancy rates and higher investment yields. These results strengthen previous anecdotes and descriptive evidence that the pandemic would leave indelible footprints in the demand for office spaces (CBI, 2020; CBRE, 2021). The results also provide valuable insights into the WFH effect on office space demand by showing how employees' experiences influenced firms' workspace strategies. They suggest that although companies may have wanted to reduce their office spaces during the pandemic because of the economic benefits, negative WFH experiences from their employees may steer them in a different direction.

The changes observed in the model fit (pseudo r2) when the pandemic-related variables were introduced into the models are also noteworthy. The model fit for the lease term (column 4) and densities (column 6) almost double, and almost triples in the model for space quantity (column 2). However, a much smaller magnitude of increase can be observed for space quality and flexibility. Therefore, it can be concluded that the pandemic's effect on organizations' office space strategies may be driven more by economic factors.

An interesting observation is that companies who state that ESG and sustainability are influencing their organizational strategy are more likely to see a reduction in the space being utilized; however, with the pandemic, these marginal effects become negative, suggesting that when accounting for the effect of the pandemic, the ESG influence is likely to lead to reverse the space reduction. However, it should be noted that ESG is generally not statistically significant for space quantity reduction. A similar position can also be observed in the models on lease lengths. For space densities, the results indicate that firms are likely to reduce their space densities if ESG consideration is a core strategy.

Table 1. Marginal effects and coefficients for factors that influenced office demand strategies in the apex of the pandemic.

		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
		Office space quantity decrease		Lease term decrease		Space density decrease		Space quality increase		Flexible Space Increase	
Variables	Categories	Base	Covid-19	Base	Covid-19	Base	Covid-19	Base	Covid-19	Base	Covid-19
Effect of the pandemic on organization's strategy	Short term	NO	–	NO	–	NO	–	NO	–	NO	–
	Medium	NO	0.224***	NO	0.194***	NO	0.215***	NO	0.031	NO	-0.021
	Long term	NO	0.502***	NO	0.401***	NO	0.297***	NO	0.019	NO	0.119
WFH experience during the pandemic	Negative	NO	–	NO	–	NO	–	NO	–	NO	–
	Neutral	NO	0.277***	NO	0.044	NO	−0.012	NO	0.006	NO	−0.161
	Positive	NO	0.341***	NO	0.153*	NO	0.035	NO	0.064	NO	−0.105
ESG/Sustainability considerations	No influence	–	–	–	–	–	–	–	–	–	–
	Somewhat influential	0.077	−0.009	0.116*	0.019	0.100	0.034	0.248***	0.251***	0.246***	0.249***
	Major influence	0.053	−0.018	0.071	−0.009	0.197**	0.155*	0.309***	0.323***	0.206**	0.202**
Occupational sector	Tertiary	–	–	–	–	–	–	–	–	–	–
	Secondary	0.021	0.067	0.051	0.093	−0.000	0.022	−0.054	−0.048	0.015	0.032
	Others	−0.417***	−0.406**	−0.363***	−0.351***	−0.400***	−0.389***	−0.501***	−0.498***	−0.474***	−0.468***
Geographical remit	Global remit	−0.041	−0.047	0.019	0.016	−0.067	−0.069	0.202***	0.200***	0.207***	0.189***
Continent/region of the HQ	Europe	–	–	–	–	–	–	–	–	–	–
	Asia Pacific	−0.142**	−0.088	−0.132**	−0.082	−0.105*	−0.066	−0.077	−0.074	−0.165***	−0.124*
	Australia and NZ	−0.049	−0.051	−0.177*	−0.180*	−0.162	−0.154	−0.258**	−0.261**	−0.193	−0.180
	MENA	−0.070	−0.077	−0.078	−0.091	−0.150	−0.154	−0.052	−0.054	−0.144	−0.139
	North America	−0.030	−0.035	0.042	0.050	−0.085	−0.085	0.042	0.045	−0.095	−0.082
	Others	0.539***	0.542	0.596***	0.608	0.551***	0.563***	0.495***	0.497***	0.456***	0.468***
Global workforce	Less than 1k	–	–	–	–	–	–	–	–	–	–
	1k – 9.99k	0.222***	0.122*	−0.009	−0.075	0.120	0.077	0.001	−0.014	0.196**	0.194**
	10k – 99.99k	0.393***	0.295***	0.194**	0.121	0.245***	0.213***	−0.083	−0.098	0.061	0.060
	More than 100k	0.254**	0.216**	−0.034	−0.094	0.109	0.063	−0.050	−0.080	−0.018	−0.022
	Unclassified	0.154	0.179*	0.134	0.109	0.071	0.031	−0.014	−0.006	0.141	0.136
	Pseudo r2	0.103	0.283	0.0731	0.181	0.0726	0.124	0.0742	0.0809	0.0795	0.0996
	Observations	326	323	326	323	325	323	326	323	326	323

Standard errors in parentheses.
***$p < 0.01$, **$p < 0.05$, *$p < 0.1$.

Table 2. Marginal effects and coefficients of factors influencing space use accounting for the waning of the pandemic effect.

Panel A: Dummy variable (wave FE) approach

Variables	Categories	(1) Quantity decrease	(2) Density decreases	(3) Quality increase	(4) Flexibility increase
(Time- the waning pandemic effect)	Wave 2 (2022)	−0.081*	0.034	0.111**	−0.041
ESG/Sustainability considerations	No influence	–	–	–	–
	Somewhat influential	0.103**	0.170***	0.204***	0.158***
	Major influence	0.086	0.262***	0.318***	0.223***
Geographical remit	Global remit	0.002	−0.014	0.069*	0.062
Continent/region of the HQ	Europe	–	–	–	–
	Asia Pacific	−0.176***	−0.252***	−0.169***	−0.146***
	Australia and NZ	−0.106	0.052	−0.174*	−0.054
	MENA	−0.184***	−0.284***	0.002	−0.103
	North America	0.059	−0.077	−0.028	−0.014
	Others	−0.045	−0.108	−0.061	−0.038
	Pseudo r2	0.0596	0.0762	0.0450	0.0322
	Observations	683	682	683	683

Standard errors in parentheses.
***$p < 0.01$, **$p < 0.05$, *$p < 0.1$.

Panel B: Comparable analysis approach

		(1) Office space Quantity decrease	(2)	(3) Office space Density decrease	(4)	(5) Office space Quality increase	(6)	(7) Office space Flexibility increase	(8)
	VARIABLES	Wave 1 (2020)	Wave 2 (2022)	Wave 1 (2020)	Wave 2 (2022)	Wave 1 (2020)	Wave 2 (2022)	Wave 1 (2020)	Wave 2 (2022)
ESG/Sustainability considerations	No influence	–	–	–	–	–	–	–	–
	Somewhat influential	0.124*	0.070	0.125**	#	0.236***	0.158	0.258***	0.049
	Major influence	0.081	0.072	0.205**	#	0.283***	0.307***	0.193**	0.213*
Geographical remit	Global remit	−0.042	0.041	−0.069	0.040	0.193***	−0.037	0.177***	−0.026
Continent/region of the HQ	Europe	–	–	–	–	–	–	–	–
	Asia Pacific	−0.201***	−0.156***	−0.140*	−0.323***	−0.084	−0.221***	−0.202***	−0.076
	Australia and NZ	−0.197	−0.049	−0.262**	0.180	−0.284**	−0.153	−0.241	0.075
	MENA	−0.145	−0.188**	−0.209*	−0.353***	−0.042	−0.008	−0.152	−0.031
	North America	0.041	0.110	−0.059	−0.054	0.048	−0.275**	−0.091	0.121
	Others	−0.050	#	−0.079	##	−0.038	#	−0.074	#
	pseudo r2	0.0390	0.0399	0.0420	0.109	0.0609	0.0598	0.0589	0.0290
	Observations	326	357	325	332	326	357	326	357

Standard errors in parentheses.
***$p < 0.01$, **$p < 0.05$, *$p < 0.1$.
Dropped from the model due to collinearity.
No coefficients were reported because that category had no recorded value.

Interestingly, organizations with strong ESG considerations are likely to also have strategies to improve space quality and flexibility. This, however, presents some potential conflicts: ESG and sustainability strategies should work towards space and carbon reduction (environmental), but they might also prioritize social factors such as employee well-being, comfort, flexibility etc.; therefore, organizations may find that they have to balance the desire to reduce the use of space with employee-related factors based on how they physically use and move around in the space. Furthermore, inefficient energy equipment and facilities in residential properties may increase broader carbon emissions.

Comparative analysis (pandemic apex and post-pandemic)

Table 2 Panel A presents the average marginal effects of probit models based on Equation (5) with four outcome variables: space quantity, density, quality and flexibility. The main explanatory variable is the '*Wave 2 (2022)-time- the waning pandemic effect*' – a binary variable to capture the data collected at the apex of the pandemic and post-pandemic. The reference/holdout category is the pandemic apex (2020). Several control variables used in Table 1 were removed from the analysis because they were not included in the questionnaire in Wave 2.

The results show that businesses are less likely to reduce their space sizes (column 1) and less likely to provide more flexible spaces (column 4) after the pandemic, although the space flexibility coefficient is not statistically significant. This may be the result of the decline in the WFH momentum and the increasing RTO mandate (Cumming, 2024). With 72% of organizations now having a return-to-office mandate and 90% of organizations expected to have RTO mandates by the end of 2024 (Birch, 2024), the results might be a

reflection of this mandate and the requirement for greater space volumes and reduced flexibility. Furthermore, firms are more likely to reduce space density and increase their space quality, perhaps driven by their objectives of inducing staff to return to the office.

The results from the comparative analysis further highlight the link between organizational objectives, business strategy and CRE at the pandemic apex and after. The pandemic led to changes in office space planning and strategy, which filtered down into various distinct elements, such as space size (quantity), lease term (years), space density and space flexibility. The results indicate a changing position between the two waves, which aligns with previous studies that business and organizations will review their CRE to ensure it meets business objectives (Scarrett & Wilcox, 2018) and space users' operations and activities influence office demand (Guy & Harris, 1997). Furthermore, it demonstrates long-established theoretical constructs that office space dynamics will evolve with changes to users' needs and space requirement changes (Detoy and Rabin, 1972 cited in Rabianski and Gibler, 2007).

Table 2, Panel B, is based on Equations (6) and (7). The results show the variation in the average marginal effects of the variables in the model based on the separate analysis of the two waves. The outcome and control variables are the same as those used in Panel A, and the results are presented for the two waves: Wave 1 is reported in Columns 1, 3, 5 and 7; Wave 2 is reported in Columns 2, 4, 6 and 8. The results provide interesting insights into the link between ESG, organizational strategy and office space demand. They indicate that businesses and organizations that had ESG and sustainability considerations were more likely to have strategies aimed at reducing space quantity and density and increasing quality and flexibility. The results further reveal that the influence of ESG and sustainability considerations is generally weaker in Wave 2. Wave 2 marginal effects for the office space quantity model are not statistically significant, suggesting that ESG considerations have not had strong effects on office space quantity strategies. For space quality, a contrast can be observed in the influence of ESG and sustainability considerations for both waves: a statistically significant influence on space quality and space flexibility increases in Wave 1 and a weaker influence in Wave 2. However, the marginal effects for Wave 2 are stronger when firms have ESG considerations as core strategies (Columns 6 and 8).

These results indicate that both in-pandemic and post-pandemic considerations are still relevant and may continue to evolve as the inevitable growth of focus continues in this area (Urban Land Institute, 2021); however, in some cases, the nature and magnitude of the ESG and sustainability vary in different contexts. Table 2, Panel B, reveals that the influence of ESG considerations is weaker post-pandemic, particularly concerning space quantity, space quality and flexibility; however, the impact in the more recent survey (Wave 2) is stronger when organizations have ESG considerations as core strategies. These suggest that the influence of ESG strategies on office space strategies may be waning post-pandemic, and ESG factors may not play the important role as predicted at the apex of the pandemic, with an exception for firms that have ESG and sustainability within their core objectives. Although Oladiran et al. (2023) highlight this issue, more recent data shows that it is likely to get worse.

These changes may be attributed to factors put forward during the pandemic to consider future office space strategy, not being as suitable for future strategies in line with RTO mandates. It may also suggest that firms took a 'knee-jerk' reaction during the lockdown and are now carefully re-evaluating their strategies in line with current realities. At the pandemic apex, there was perhaps a tendency for businesses to go above and beyond to satisfy requirements, i.e. business operation/continuity, employee well-being and satisfaction and ESG; however, as normalcy returned, these strategies and propositions were being challenged. Similar issues can be raised about social and corporate governance, which are key ESG elements, suggesting that criteria such as health and safety, working conditions, employee relations, ergonomics and other factors may not be prioritized in terms of workspace use. This, therefore, further reinforces the notion that economic factors within the demand and supply framework are still more likely to be key considerations (Hendershott et al., 2010). While social and environmental factors remain important elements of business strategies and decisions (Fang & Li, 2024; Marie et al., 2024; Nguyen & Vu, 2024), the same cannot yet be said of office space strategies. Thus the predictions during the pandemic that social factors (such as ergonomics) and environmental factors were likely to become core considerations in future workspace planning and management may have been exaggerated.

These results (based on Wave 2) suggest that ESG and sustainability are likely to be less influential in defining future office space strategies. Although these models enable us to observe in- and post-pandemic variations, they generally have low pseudo r2, suggesting that several other important variables have

not been captured in the models. Thus the analysis in the next subsection integrates a wider range of variables.

Future office space use strategies

The analysis in this section is based on Equation (8) and reported in Table 3. We analyse the influence of various business and organizational strategies on various office space strategies. Appendix Table 1 shows the derivation and statistical summary of the variables used in this analysis. We specifically examine the role of ESG strategies on future CRE in light of other business and organizational strategies. We also explore the influence of work styles and CRE plans on office demand dynamics.

Table 3 reveals that, having accounted for a wider range of factors, the ESG variables are statistically significant, implying that ESG and sustainability factors are not likely to influence future office space uses. If they do, then they are likely to contribute to a further decrease in space quantity and density whilst improving quality and flexibility, aligning with some of the earlier observations. The results also show that firms who hold real estate as a strategic asset are less likely to reduce their space sizes and space densities; they are also more likely to improve their space quality and less likely to increase their space flexibility. The results for the models on space quantity are logical because, in addition to the utility these firms enjoy from utilizing the space, they also appreciate other associated benefits. This may also explain the reason that real estate as a strategic asset is likely to increase space quality, suggesting that firms may keep more space and explore channels of using the space for the provision of amenities. It should, however, be noted that the influences highlighted are not statistically significant.

The descriptive statistics in Figure 5 and the models in Table 3 suggest that space demand (quantity) is likely to increase. These results are contrary to predictions at the apex of the pandemic that organizations may require less space. However, they align with propositions that the pandemic would induce firms to provide high-quality space with stronger levels of demand as a potential benefit. Caution should be exercised in interpreting these results because, despite predicting an increase in space demand, the requirement for improved space quality is even much higher. Thus landlords would be required to provide high-quality spaces to compete favourably in the market.

Table 3 further shows that companies that report their business and real estate decisions and strategies are likely to remain the same or become more complex (relative to decreasing) are less likely to reduce their space quantity and density and more likely to improve their space quality, although this is statistically significant. However, space flexibility is likely to reduce as business decisions become more complex while increasing as real estate decisions become more complex. This is counterintuitive and calls for further research. The complexity of real estate decisions, therefore, appears to be a strong factor that will drive office space flexibility. It is also noteworthy that businesses that expect an increase in the complexity of their portfolio decisions are less likely to reduce their space quantity; this corroborates the results for real estate strategy influence, suggesting that organizations that hold real estate as an investment asset are less likely to cut down on their office spaces.

The results on the influence of working styles are also interesting. They show that firms that offer of remote working are more likely to reduce their space quantity and space densities while being more likely to increase their space quality. This highlights the importance of work styles in driving future workspace use and demand. This further demonstrates that the return-to-work mandate is likely to lead to more space utilization and increased densities.

Robustness test and limitations

To gain further insight into the various office space demand dynamics, we attempted to analyse the data using a multinomial approach. The outcome variables in their raw forms are unordered categorical variables, which mean that the predictor variables can be regressed against three potential outcomes (for instance, space quantity decrease, no change, increase) (Duncan, 2007). It is assumed that the probabilities linearly depend on common factors *xi* thus:

$$y* \; im \; = x!i\beta \; m + \; uim \; for \; m = 1, 2, 3 \qquad (9)$$

Convergence was not achieved in the models after 300 iterations, which may be because of the few observations in one of the categories. We also estimated LPM using OLS because it makes fewer assumptions about the structure of error terms; the signs and statistical significance in the results from these models are similar, although a few variations were observed. Furthermore, the Logit model was explored, and the results were generally similar. This aligns with the argument by Angrist and Pischke (2009) that LPM and nonlinear models such as Probit or Logit often lead to similar estimates. Additionally, we also considered the use of a regression discontinuity approach (Lee & Lemieux, 2010);

Table 3. Marginal effects coefficients of factors that will influence future office space use.

	Variables	Categories	(1) Quantity (decrease)	(2) Density (decrease)	(3) Quality (increase)	(4) Flexibility (increase)
ESG Influence	ESG/Sustainability considerations	No influence	–	#	–	–
		Somewhat influential	0.090	#	0.079	−0.022
		Major influence	0.088	#	0.145	0.026
Influence of real estate as a strategic asset	Real estate strategy influence	No influence	–	–	–	–
		To some extent	−0.114	−0.022	0.146	−0.035
		Completely influential	−0.160	−0.071	0.167	−0.005
Complexity of decisions relating to:	Business strategy	Decrease	–	–	–	–
		Stay the same	0.077	−0.187	0.009	−0.021
		Increase	0.123	−0.166	0.099	0.008
	Business decision	Decrease	–	–	–	–
		Stay the same	−0.165	0.076	−0.070	−0.264**
		Increase	−0.178	0.119	−0.150	−0.313***
	Real estate decision	Decrease	–	–	–	–
		Stay the same	−0.013	−0.021	0.046	0.135*
		Increase	0.102	0.019	0.066	0.213***
	Portfolio decision	Decrease	–	–	–	–
		Stay the same	−0.314***	0.092	0.051	−0.139*
		Increase	−0.400***	0.037	0.160*	−0.090
	Workplace	Decrease	–	–	–	–
		Stay the same	0.024	−0.308***	0.167*	−0.130
		Increase	0.051	−0.217*	0.239**	−0.060
	Workstyles	Decrease	–	–	–	–
		Stay the same	0.007	0.136	−0.147	0.173**
		Increase	0.002	0.065	0.011	0.120
Influence of work styles	Workstyle types	Office only/office first	–	–	–	–
		Hybrid	0.149***	0.118**	0.012	0.048
		Fully flexible	0.221***	0.092	0.135	−0.039
		Fully remote	0.061	−0.002	0.134	−0.050
Influence of plans for office space use	The proportion of serviced or co-working space	Less than 5%	–	–	–	–
		5–20%	−0.111**	0.106*	−0.052	0.335***
		21–25%	−0.089	0.078	0.047	0.449***
		More than 50%	−0.101	−0.026	0.177**	0.643***
	Space quantity	Decrease	NA	0.102*	−0.039	0.089
	Desk-to-person ratio decrease	Decrease	0.088**	NA	0.073	0.089*
	Space quality	Increase	−0.036	0.078	NA	0.141***
	Flexible space increase	Increase	0.085*	0.091*	0.160***	NA
Influence of mobility	Plans to change office space (location)	Will not move	–	–	–	–
		Very unlikely	−0.103	0.066	−0.110	0.111
		Fairly unlikely	0.016	0.158*	−0.067	0.090
		Fairly likely	−0.009	0.048	−0.042	0.010
		Very likely	−0.135*	0.053	0.129	0.030
		Definitely	0.072	0.012	0.173*	−0.063
Influence of business/ organizational characteristics	Geographical remit	Global remit	0.010	0.032	−0.007	−0.014
	Continent/region of the HQ	Europe	–	–	–	–
		Asia Pacific	−0.056	−0.272***	−0.180***	−0.033
		Australia and NZ	−0.065	0.246**	−0.230**	0.176*
		MENA	−0.119	−0.282***	−0.019	0.025
		North America	0.105	−0.073	−0.366***	0.072
		pseudo r2	0.241	0.223	0.255	0.323
		Observations	356	331	356	356

Standard errors in parentheses.
***$p < 0.01$, **$p < 0.05$, *$p < 0.1$.
Dropped from the model due to collinearity.

however, the dataset did not have a unique ID for each respondent on both waves; thus it was not possible to track the same participants in both waves. This limitation also made it impossible to attempt panel regression, which would have captured changes within organizations in the two waves. Future studies can explore these approaches if the appropriate dataset for this setup is accessible. Some of these challenges are associated with the sample size; however, we consider the sample size appropriate for the study given that it is relative to the target population of corporate organizations with a presence in both the UK and internationally. The study of Oladiran et al. (2023) uses a smaller sample (Wave 1 only); our study, however, provides a significant boost to this by adding the second wave of data.

The lack of consistency in some variables also made it difficult to have consistent models; thus the models used for each set of analyses were bespoke – based on the questions being investigated and the variables available. This limited the scope of comparative analysis that could have been explored. Additionally, the dataset does not indicate the proportion of organizations or businesses that participated in the surveys; thus it is not clear which if the applications of results will vary for the different groups. The limited range of relevant factors in the dataset made it difficult to explore some other factors further. Thus, some of the models may suffer from unobserved heterogeneity and low model fit, particularly in the comparative analysis. Considering that pseudo r-squared is not comparable to the OLS version, models with pseudo r-squared values between 0.2 and 0.4 are often considered a good fit (Hensher & Johnson, 1981).

Finally, it should be noted that the data does not span the period before the COVID-19 pandemic; therefore, this paper does not attempt to make inferences about the causal effect of the pandemic; rather, it explores the link between the pandemic cycle, organizational strategies and CRE strategies.

Summary, implications and conclusion

The results from this study show that some of the COVID-19 footprints in CRE demand dynamics appear to be being eroded, and this may be due to the post-pandemic RTO mandates (Birch, 2024; Cumming, 2024). Furthermore, we find that ESG and sustainability considerations are less likely to influence future workspace quality and quantity, although firms that have strong ESG and sustainability commitments are likely to continue to demand lower space volumes (quantity) and higher space quality.

This study makes important conceptual and practical contributions to enhancing the understanding of the influence of post-pandemic sentiments on workplace strategies. It provides unique insights into the relationship between changing work patterns and office space demand dynamics. Our results provide insight into the mechanism through which working patterns affect various dimensions of CRE use, providing novel insight into how organizational strategies can serve as the core conduit. In doing this, we provide a wider range of CRE factors, thereby developing much broader perspectives compared to previous studies (such as Bae et al., 2021 and Forooraghi et al., 2023).

The comparative approach adopted in this paper is also new, particularly as it relates to the pandemic apex and post-pandemic comparison for CRE-related studies. This provides unique insight through a nuanced analysis of the dynamics and evolution of work patterns, organizational strategies, and workspace use in the context of the pandemic. This is important, considering the multidimensional dynamics of organizational strategies and work culture. By examining the extent to which COVID-19 sentiments have changed, this study provides a more effective approach to examining workplace strategies which will support future office space use, planning and management. Furthermore, this insight will improve the accuracy of market forecasting considering current financial, geopolitical, environmental and epidemiological uncertainties. It also gives office market investors actionable insights for effective and efficient investment decisions based on current business and organizational strategies.

Our study also makes a significant contribution to the discourse around the application of black swan events and the longevity of their impact in the office market, with specific reference to the pandemic. Previous studies such as Bae et al. (2021), Forooraghi et al. (2023) and Markkanen and Herneoja (2024), though providing insight on the pandemic effects, are not conceptualized to reflect the 'sudden' changes and the work of Jens and Gregg (2021) only reflects the sentiments from the pandemic apex. Our study, therefore, makes a unique contribution to the broader black swan event and office market literature by examining the ex-post implications and longevity of black swan events in the office market.

The results also provide important insight into the links between office space dynamics and environmental, social and economic factors. Office demand models are traditionally conceptualized through economic lenses (Miller, 2014; Rabianski & Gibler, 2007; Wheaton & Krasikov, 2019), and COVID-19 footprints on office demand have been analysed mainly in the context of economic and social factors (Akinsomi et al., 2024; Tagliaro et al., 2021). ESG and sustainability have become important considerations in broader real estate debates (Urban Land Institute, 2021). They have also been linked to business strategies (Fang & Li, 2024; Marie et al., 2024; Nguyen & Vu, 2024) and, more specifically, to issues arising from the pandemic (Chen et al., 2024; Yang et al., 2024). Our study, therefore, extends these considerations to the office sector. Our findings that ESG factors are not likely to influence future office space strategies suggest that businesses and organizations need to be sensitized to the need to re-evaluate their ESG strategies to ensure that they take a more holistic approach. This should include environmental considerations but also broader social and governance issues. The government is also expected to be more proactive in environmental promotion, regulation and incentives; this will incentivize

organizations to explore opportunities to minimize their carbon footprint while also considering broader social and governance factors.

Despite the limitations in this paper, we have been able to examine our hypothesis using various econometric techniques, thus arriving at robust conclusions. We provide empirical evidence on the potential link between RTO and office demand dynamics, thus providing a more effective approach to examining changing workspace strategies and improving the accuracy of market forecasting considering current financial, geopolitical, environmental and epidemiological uncertainties. Our results provide office market investors with actionable insights for effective and efficient investment decisions based on current business and organizational strategies.

Further studies can explore the organizations' office space considerations as part of their broader organizational and business strategies; these insights can be used to develop mechanisms through which firms' office space strategies can be better aligned and how ESG considerations can be considered. Qualitative techniques using data from interviews and focus groups will also provide an opportunity to gain deeper insight into some of these issues. Furthermore, a broader range of stakeholders will also provide valuable perspectives beyond those put forward by corporate property managers, who are the focus of the dataset and, by extension, this study. For instance, it would be useful to better understand how organizational leads (e.g. CEOs) perceive office space use efficiency and their priorities. As work and organizational strategies continue to evolve, CRE strategies will benefit from regular reviews to adapt and maximize value.

Notes

1. CRE is typically used as a term for real estate occupied by a business or organization for its own use.
2. Reducing space densities implies increasing the area per workstation (e.g. from 8 to 10 sqm).
3. CRE flexibility is a multi-faceted concept with physical, functional, financial and legal elements (Apgar, 2009; Cooke, 2021; Gibson, 2000; Lindholm & Leväinen, 2006); however, for the purpose of this study, 'space flexibility' is used primarily in the physical context.
4. We explored several other control variables; however, they were not statistically significant and did not improve the model fit. Some other variables were dropped due to multicollinearity.
5. Wave 2 does not include these questions.
6. This category combines other categories in this variable due to their small cell sizes.
7. The changes to the lease variable are only available in wave 2; we therefore cannot observe variations for this variable.

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ORCID

Olayiwola Oladiran http://orcid.org/0000-0003-4114-2868
Paul Hallam http://orcid.org/0000-0002-6670-5754

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Appendix

Table 1. Variable definitions.

	Variable	Definition	Categories and values
Outcome variables	Office space quantity	Firms' plans for space size adjustment	*Quantity of space will reduce = 1; quantity of space will increase/remain the same = 0*
	Office space density	Firms' plans for space density adjustment	*Space density will reduce = 1; space density will increase/remain the same = 0*
	Office space quality	Firms' plans to change the quality of their office space	*Space quality will increase = 1; space quality will reduce/remain the same = 0*
	Office space flexibility	Firms' plans for the provision of flexible workspaces	*Space flexibility will increase = 1; space flexibility will reduce/remain the same = 0*
	Lease term	Firms' plans to negotiate different lease terms (in terms of number of years)	*Lease length will decrease = 1; lease length will increase/remain the same = 0*
Main explanatory variables	ESG/Sustainability	The influence of firms' ESG/sustainability consideration on organizational strategy	*No influence = 1; Somewhat influential = 2; Major influence = 3*
	Geographical remit	Geographical remit of firms' operations	*Global remit = 1; national remit (operations limited to a country) = 0*
	Continent/region of the HQ	The continent where the HQ of the firm is located	*Europe = 1; Asia Pacific = 2; Australia and NZ = 3; MENA = 4; North America = 5*
Explanatory variables used in Table 1 (Equation 1)	COVID-19 on organization's strategy	Effect of the pandemic on organization's strategy	*No effect = 1; medium-term effect = 2; long term effect = 3*
	WFH experience	WFH experience during the pandemic	*Negative = 1; neutral = 2; long term = 3*
	Occupational sector	The occupational sector of the firm	*Tertiary = 1; Secondary = 2; Others = 3*
	Global Workforce	Number of staff worldwide	*Less than 1k = 1; 1k to 9.99k = 4; 10k-99.99k = 3; more than 100k = 4*
Other explanatory variables used in Table 3 (Equation 4)	Real estate strategy	Real estate as a strategic asset	*No influence = 1; To some extent = 2; completely influential = 3*
	Business strategy	The complexity of decisions relating to business strategy will …	*Decrease = 1; Stay the same = 2; Increase = 3*
	Business decisions	The complexity of decisions relating to business decisions will …	*Decrease = 1; Stay the same = 2; Increase = 3*
	Real estate decision	The complexity of decisions relating to real estate decision will …	*Decrease = 1; Stay the same = 2; Increase = 3*
	Portfolio decision	The complexity of decisions relating to portfolio decisions will …	*Decrease = 1; Stay the same = 2; Increase = 3*
	Workstyles	The complexity of decisions relating to workstyles will …	*Decrease = 1; Stay the same = 2; Increase = 3*
	Workstyle types	Type of working system in the company	*Office only/office first = 1; hybrid = 2; fully flexible = 3; fully remote = 4*
	Serviced or co-working space	The proportion of serviced or co-working space	*Less than 5% = 1; 5–20% = 2; 21–25% = 3; more than 25% = 4*
	Relocation	Plans to change office space (location) soon	*Will not move = 1; very unlikely = 2; fairly unlikely = 3; fairly likely = 4; very unlikely = 5; definitely = 6*