Willingness to pay for healthy office workplace aspects; Preferences of workplace decision makers

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Abstract

Purpose: Interest in healthy office environments has increased among corporate real estate managers and the real estate sector. Not only workers, but also organizations profit through higher competitive advantages. This study aims to identify office tenants' willingness to pay (WTP) higher rents for healthier office environments. Depending on the WTP, investing in healthy office buildings can be beneficial for landlords through the ability to charge higher rents, potential decreased vacancy risks and higher asset values.

Approach: A survey with a stated choice experiment was carried out in 2019 among workplace decision makers in office organizations leasing from the CBRE Dutch Office Fund (multi-tenant, multi-service office buildings on prime locations). The 84 respondents repeatedly chose between three hypothetical office profiles, generated from an orthogonal factorial experimental design varying combinations of eight aspects' quality levels derived from literature: (1) 'indoor air quality', (2) 'thermal comfort', (3) 'exposure to light', (4) 'noise & acoustics', (5) 'office type', (6) 'view', (7) 'amenities' and (8) 'relative rental price'. Data were analysed to estimate preferences and related WTP values using a Multinomial Logit (MNL) model.

Findings: After 'rental price', the attributes 'thermal comfort', 'noise & acoustics' and 'amenities' were most important when choosing between office alternatives, plus healthier quality levels were preferred. Although obviously price increases were generally disliked, there was a positive WTP for all healthy office workplace aspects, except exposure to light. Considering all significant healthy office workplace aspects as a whole, the WTP for an improvement from a low to a medium quality office is estimated to range from a conservative 6.37 up to an optimistic 12.33% rental increase, from a medium to a high health quality office from +6.17 up to 12.43% and from a low to a high health quality office from +12.54 up to 24.76%.

Originality: Previous studies generally did not focus on healthy workplace preferences of workplace decision makers. Findings contribute to insights for real estate investors, asset managers and developers in which healthy office aspects to implement in their portfolio/projects.

Keywords
healthy workplace, rental premium, multi-tenant offices, stated choice experiment

Introduction

The success of both public and private organisations depends highly on the outcomes of their human capital. This especially concerns organizations that perform service work and knowledge-based activities; generally accommodated in offices. In the Netherlands, almost 40% of the workforce works in an office environment (Ecofys & Fraunhofer IBP, 2018). If these organizations nurture their employees, they can outperform competitors through higher workplace productivity and sustaining

higher stocks of emotional and human capital (Boedker et al., 2017). Numerous studies have proven that healthy office conditions influence wellbeing outcomes of workers (e.g. Al Horr, et al., 2016; Fischl et al., 2007). As labour costs can cover up to 90% of an organization's operating costs (Alker, et al., 2014), supporting employee health with an optimally designed workplace could thus merit additional investments in the physical work environment as a leverage of human capital outcomes.

Some studies tried to monetize such employee outcomes in terms of organisational profits from increased productivity and sustainability outcomes (e.g. Attema, et al., 2018; Muldavin, et al., 2017). Nonetheless, it remains difficult for an office organisation to accurately allocate and measure specific financial consequences of organizational performance outcomes from healthier office workplaces, because the 'holy grail' of measuring health & wellbeing remains intangible due to its dependence on a complexity of influences. The same is true for the office supply side, where investors and developers are struggling to clarify the business case for creating more expensive offices that do provide healthier workplaces, as it is not certain that tenants would pay the rental premium for it. Willingness to pay studies exist for more sustainable offices, suggesting potential rent premiums up to 15% (Feige, et al., 2013a), but not specifically for healthier offices. Besides, it remains unclear which healthy workplace characteristics tenants would be (most) willing to pay for. The decision makers represent office organisations in selecting offices for their employees and make the actual choice for renting an office with healthy workplace aspects or not. So, it is important to understand what they consider relevant and would be willing to pay more rent for. Without this insight, the supply-side of the real estate sector may act restrained with investing in healthy office characteristics.

Therefore, this paper attempts to identify which healthy office workplace aspects could be beneficial to invest in by landlords. It does so, through investigating preferences of tenants' decision makers when making trade-offs between healthy workplace aspects and rental prices. The next section first reviews literature on healthy workplace design to select the most relevant healthy workplace characteristics. Only those aspects that can be influenced by landlords are included, so aspects that tenants implement themselves (e.g. furniture, plants) are not. To measure preferences and estimate WTP-values we used a stated choice experiment and collected data for a sample of 84 workplace decision makers. After the literature review below, the stated choice experiment method is explained in more detail, followed by a discussion of findings and implications for research and practice.

The healthy office workplace

Over the past five decades there has been a growing awareness that offices can affect the health of employees. Since the 1970s, physical symptoms due to unhealthy buildings have been reported in several studies, generally defined as the presence of Sick building syndrome (Redlich, et al., 1997). This includes problems with the mucous membrane of the eyes, nose, and throat, dry skin, headache and fatigue caused by insufficient quality of the building's indoor environment or its use, for example due to overpopulating the space or inadequate performance and maintenance of climate systems (Stolwijk, 1991). Early research also identified other physical symptoms, such as musculoskeletal disorders of neck, shoulders and lower back due to low job variation and sedentary work (Skov, et al., 1996). However, more recently buildings are also found to influence workers' mental wellbeing (Burton, et al., 2008) and social wellbeing (Colenberg, et al., 2021), making the view on a healthy workplace more holistic than before. Nowadays, negative mental and or social conditions causing overload and other burnout symptoms are acknowledged to be an even stronger and growing threat for society than the sick building syndrome.

A healthy office workplace is thus not only believed to decrease negative health outcomes by providing protection for workers from physical health risks such as accidents, injuries or sickness that lead to absenteeism and presenteeism (including spill over effects on colleagues). Additionally, it is assumed to promote positive wellbeing which leads to increases in workers' job satisfaction, morale,

commitment and motivation (Grawitch, et al., 2006). In the longer term, organizations might profit from a healthier workplace through higher productivity, organizational effectiveness, competitive advantages and positive influences on attracting and retaining talent (Grawitch, et al., 2006; Harter, et al., 2003).

These organizational performance outcomes have increased the demand of office organizations for healthy workplaces. This can be interesting for landlords who rent office space to organizations, as they decide on the quality of office buildings that they offer. It might be beneficial for landlords to start investing more in healthy office buildings in their portfolios, if this means they could charge higher rents. Also, vacancy might be less due to quicker lease-up accordance and retaining tenants, which in turn can lead to lower future replacement investments and higher building valuations. A survey among American and Canadian building owners found that respectively 35% and 46% expect to lease such buildings more quickly, respectively 22% and 28% expect that they are able to charge premium rent and respectively 26% and 30% think that healthy building investments impact on the value of the building with an average of 2.5% (Jones & Laquidara-Carr, 2016).

An in-depth literature study was performed to identify which office workplace characteristics influence particular health aspects of office workers. A substantial part of empirical studies study health in office workplaces with a focus on aspects of the building physics that determine the indoor environmental quality (IEQ; air quality, temperature, lighting and noise) (e.g. Bluyssen, 2009; Huang, et al., 2012; Feige, et al., 2013b; Lamb & Kwok, 2016). But some studies also take additional office workplace aspects into account, including spatial and aesthetic elements of the office design, and the available services/amenities in the (proximity of the) office. For example, De Croon et al. (2005) found evidence that workplace type and layout as well as acoustic and visual stimuli also influence office worker wellbeing. Several studies provide comprehensive and substantial overviews of different elements of a healthy office between seven up to nine different characteristics (e.g. Singh, et al., 2010; Clements-Croome, 2015; Allen, et al., 2016; Lee & Clements-Croome, 2019). Although these studies all present a total of healthy office workplace aspects, their extent, content and terminology do differ. Nonetheless, together they bring forward several additional aspects besides IEQ that a landlord can influence. Therefore, the following seven aspects are selected for their proven effects on employee wellbeing and potential to be influenced by landlords: (1) ‘indoor air quality’, (2) ‘thermal comfort’, (3) ‘exposure to light’, (4) ‘noise & acoustics’, (5) ‘office type’, (6) ‘view’ and (7) ‘amenities’.

Research approach

Data collection

Willingness To Pay (WTP) is a measure of the value of nonmarket goods that questions how much an individual or an organization is willing to pay for a certain outcome (Breidert, et al., 2006). In general, when people make choices, these are based on a set of preferences and constraints they take into account to maximize the satisfaction level of their personal or community-based objective (Hensher, et al., 2005). Therefore, a precondition for the method selection in this study was that it could elicit WTP from office tenant decision makers for renting a healthier office type with different design characteristics. A suitable method for this is a Stated Choice experiment (SCE), as it can identify tenants’ preferences for multiple healthy office workplace characteristics including rent and additionally include questions to identify the characteristics of the background of decision makers and their organization. In SCE research, respondents are offered choice sets with (2-3) hypothetical alternatives to choose from. Each alternative is defined in terms of a set of characteristics which are called attributes, that can take on different pre-defined discrete values (attribute levels). The alternatives are constructed based on an orthogonal experimental design that allows the independent estimation of the relative importance of each of the attributes in the choice for an alternative. In this paper, all seven aspects identified in the literature research, were presented by three attribute levels that each follow ordinal qualitative scales, which are respectively applied in a low, medium, and high

health quality healthy office (see table 1). In addition, an eight attribute (8) 'rental price' was included in the experiment with three quantitative levels to derive tenant's willingness to pay for the (quality levels of the) office workplace attributes.

Table 1. Labels of attributes and attribute levels

	ATTRIBUTE LEVEL		
ATTRIBUTE	Conventional office	Average office	Healthy office
Indoor Air Quality	Ventilation indoor-outdoor air	Ventilation with air treatment	Ventilation with air treatment and air filtering
Thermal comfort	Radiators + Airco-units (much comfort fluctuation)	Controlled system with comfort fluctuation	Balanced system with minor comfort fluctuation + Adjustable per space
Exposure to light	Standard window size + Standard light fittings	Standard window size with sun blinds + Light fittings with daylight correction	Large window size with adjustable sun blinds + Adjustable light fittings
Noise & Acoustics	No acoustic measurements	Acoustic insulation external sound sources	Acoustic insulation external & absorption internal sound sources
Office type	Open workfloor	Cell office	Flexible office
View	Only urban environment	Combination of urban and green elements	Fully green environment
Provisions	Reception + Standard (company) restaurant	Reception + Healthy (company) restaurant	Reception + Healthy (company) restaurant + Fitness + (Retail)services
Rental price	Current rent	Current rent + 5%	Current rent + 10%

WTP measures are calculated as the ratios of two parameters, and as such are sensitive to the attribute level ranges used in the estimation of both parameters (Hensher, Rose, & Greene, 2005, p. 464). This means the willingness to pay can be calculated for the utility difference between two levels of an attribute, so a utility gain or loss. Because the sample of this research includes tenants that all pay other rental prices per square meter office space, the levels of the rent price attribute are expressed as a percentage change (increase or decrease) of the current rent price instead of absolute values. As a consequence, the WTP-values are calculated as a percentage increase of the current rental price.

During the SCE, respondents are asked to repeatedly choose from changing combinations of attribute levels, called profiles, that form hypothetical office workplaces (see figure 1 for an example). As each of the 8 workspace attributes has three levels, many possible alternative profiles can be created (3^8 = 6,561). Therefore, an orthogonal fractional design was constructed (see Hensher, et al., 2005) consisting of 27 workspace profiles that allows us to estimate the main effects of the attributes. Not every respondent observed all 27 profiles with eight attributes, because this is a big burden for keeping a respondent's attention during the whole questionnaire. Instead, profiles were randomly assigned to the choice sets, and each respondent evaluated nine choice sets with two profiles and the option to choose 'no preference'. Moreover, at the beginning of the survey, closed-format questions were asked about the background of the decision maker and their organizations (e.g. FTE's, workplace strategies, sector, respondent's age, and gender).

ASPECTS	Workplace 1	Workplace 2	No Preference
Indoor Air Quality	Ventilation with air treatment	Ventilation with air treatment and air filtering	
Thermal comfort	Radiators + Airco-units (much comfort fluctuation)	Controlled system with comfort fluctuation	
Exposure to light	Large window size with adjustable sun blinds + Adjustable light fittings	Standard window size with sun blinds + Light fittings with daylight correction	
Noise & Acoustics	No acoustic measurements	No acoustic measurements	
Office type	Open workfloor	Cell office	
View	Fully green environment	Fully green environment	
Provisions	Reception + Standard (company) restaurant	Reception + Healthy (company) restaurant + Fitness + (Retail)services	
Rental price	Current rent + 10%	Current rent	
CHOICE	O	O	O

Figure 1. Example combination with profile 12 and profile 23

The survey was spread among 550 tenants of eight buildings in the CBRE Dutch Office Fund, which consists of multi-tenant, multi-service office on prime locations in the Netherlands. A few weeks after it was emailed to the decision makers of these tenants, 84 decision makers had fully completed it (15% response rate) and the survey was closed. Gender distribution of the respondents was almost equal, and most decision makers belonged to the age group 30-49 years. Most organisations rented small amounts of space in the building for 1-10 FTE (43%), 10-20 FTE (24%), 20-50 FTE (14%) or more (19%), but they were generally mature firms (>11 yrs, 62%; 4-11 yrs, 26%; 0-4 yrs, 12%). In most cases, the organisations rented space elsewhere as well. Regarding the sector, a large part represented a financial institution (29.8%), followed by consultancy, research, legal and other specialized business services (15.5%) as well as other service activities (14.3%).

Data analyses

The data collected with the experiment is analysed by using a Discrete Choice model, namely a Multinomial Logit model (MNL model). Based on Random Utility Maximization theory and loglikelihood estimation the preference parameters of the model that represent the part-worth utilities of the attribute levels are estimated. Random utility theory states that the utility (U) of the alternative i that is chosen by the respondent(q consists of a structural utility (V_{iq}) component based on the attributes and a random utility (ε_{iq}) related to factors that cannot be observed. In equation:

$$U_{iq} = V_{iq} + \varepsilon_{iq}$$

Each attribute of an alternative is indicated by a value X_{inq} that is multiplied with a parameter to obtain a part-worth utility β_n. The summation of the part-worth utilities across all attributes of the alternative, results in the structural utility component of that alternative:

$$V_{iq} = \Sigma_n \beta_n X_{inq}$$

Based on the estimated values, the MNL model predicts the probability (P_{iq}) that the alternative will be chosen by an individual from the set of alternatives as: *j*.:

$$P_{iq} = \frac{\exp(V_{iq})}{\sum_{i'} \exp(V_{j'q})}$$

Results

Overall preferences

The goodness of fit of the estimated model is determined to check if the model performs properly. This is done by calculating the McFadden's Rho-Square (ρ^2). The log-likelihood of the estimated model (LL(β)) is -707.8 and the log-likelihood of the null model (LL(0)) is -830.6. This results in a ρ^2 of 0.148 and an adjusted rho square of $\rho^2 adj$ = 0.127. The $\rho^2 adj$ is more informative as it takes into account the number of parameters that are estimated. The value is somewhat lower than 0.200, which means that the model does not represent the observed choices well. So, this may indicate that there are relatively large differences in the preferences of the respondents, also called heterogeneity.

Table 2 shows the part-worth utilities of the MNL model for each attribute. Effect coding was used using arbitrarily the highest level as reference. As visible, all attributes have at least one significant quality level, except 'Exposure to light', which means that this is the only one that did not appear to play a role in choosing between the alternatives. The 'Indoor Air Quality' represents the way the air in the office is ventilated. A distinction was made between implementation of air treatment (moisture and CO2 concentration) and air filtering (extracting fine dust, odours, bacteria). Among the attribute levels, the utility assigned to the basic ventilation level of indoor-outdoor air is not significant, suggesting such systems do not contribute to the preference or the dislike when choosing an office workplace. Compared to the average, a ventilation system with only air treatment has a negative utility (-0.167). Respondents only prefer a ventilation system with air treatment enriched with air filtering (0.167), suggesting clearly that an optimized system is favoured for the healthy workplace.

Table 2. Utility coefficients of the MNL model (choices = 756, N=84)

Attribute + levels	Coefficient (β)	Sig.	z
Constant	0.663	***	7.060
Indoor Air Quality			
Ventilation indoor-outdoor air	-0.049		-0.610
Ventilation with air treatment	-0.167	**	-2.060
Ventilation with air treatment and air filtering	0.216		
Thermal comfort			
Radiators + Airco-units (much comfort fluctuation)	-0.369	***	-4.420
Controlled system with comfort fluctuation	-0.040		-0.500
Balanced system with minor comfort fluctuation + Adjustable per space	0.409		
Exposure to light			
Standard window size + Standard light fittings	-0.078		-0.960
Standard window size with sun blinds + Light fittings with daylight correction	-0.039		-0.490
Large window size with adjustable sun blinds + Adjustable light fittings	0.118		
Noise & Acoustics			
No acoustic measurements	-0.358	***	-4.290
Acoustic insulation external sound sources	0.058		0.710
Acoustic insulation external & absorption internal sound sources	0.300		
Office type			
Open work floor	-0.227	***	-2.670
Cell office	0.166	**	2.040
Flexible office	0.062		

View			
Only urban environment	-0.185	**	-2.270
Combination of urban and green elements	0.040		0.510
Fully green environment	0.145		
Amenities			
Reception + Standard company restaurant	-0.338	***	-4.190
Reception + Healthy company restaurant	0.050		0.620
Reception + Healthy company restaurant + Fitness + (Retail)services	0.288		
Rental price			
Current rent	0.516	***	6.320
Current rent + 5%	0.178	**	2.150
Current rent + 10%	-0.694		

***, **, * → Significance at 1%, 5%, 10% level

'Thermal comfort' of a workplace was presented as the way the temperature in the office spaces is controlled with a distinction of system type, comfort fluctuation and adjustability. Respondents strongly disliked the imaginary workplace with radiators combined with airco-units which lead to comfort fluctuations (-0.369). The utility of a controlled system with comfort fluctuation is not significantly different from zero. The balanced system with minor comfort fluctuation only and adjustability per space was highly preferred (0.369). This suggests that mitigating comfort fluctuation and enhancing (personal) control over temperature is increasing preference of respondents.

The attribute 'Exposure to Light' was defined as the amount and quality of light at a workstation, including window size and light fittings. Regarding this attribute, none of the estimated values of the coefficients of attribute levels are significant indicating that tenants have no preferences regarding the levels of this attribute. Thus, the combination of window size, availability of sun blinds, and configuration of light fittings do not influence tenants' choice.

The reduction of noise through acoustic measures was measured with the attribute 'Noise & Acoustics'. This reduction can be achieved by blocking noise from outside the office (traffic, building installations, etc.) as well as absorbing noise within the office space (footsteps, conversations, etc.). The utility associated to only acoustic insulation of external sound sources was not significantly different from zero, which may not be very surprising since this is standard in an office environment. When there are no acoustic measurements applied in a workplace, tenants dislike that much (-0.358). In contrast, a considerable positive preference value is estimated for acoustic insulation of external sound sources and absorption of internal sound sources (0.300).

The 'Office Type' attribute did not really have an ordinal order in quality level, as it distinguished an open work floor, a cell office (enclosed spaces for maximum 3 persons), and a flexible office (different types of workplaces without a fixed workstation per employee). A positive part-worth utility was estimated for the cell office (0.166), followed by a slight positive estimate for the flexible office (0.062). A negative part-worth utility was found for office workplaces with an open work floor (-0.227). In general, this indicates that tenants prefer the possibility to create a variety of (enclosed) workspaces in the leased space. Whether they prefer a fixed or unfixed workstation cannot be traced since the utilities of the open office (negative) and cell office (positive) have opposite signs while they both incorporate fixed workstations.

The attribute 'View' considered the degree of green elements towards urban elements in the view from the office windows. In that consideration, green elements are assumed to be applied in public spaces (trees, grass, etc.) as well as on the facades and roofs of the office building itself. A combination of urban and green elements appeared not to increase or decrease tenants' preference value compared to the average situation. Nonetheless, a total absence of green elements is disliked (-0.185) against a preference for a fully green environment (0.185).

The presence of facilities in the office building, labelled 'Amenities', distinguished that in addition to a reception and a company restaurant, there can also be facilities that encourage healthy nutrition and physical activity or stimulate social integration and reduce stress. The utilities of the attribute levels show that a reception with a standard company restaurant was disliked by respondents (-0.338). Substituting the standard company restaurant with a healthy variant, eliminates the dislike of tenants but does not create a preference of respondents compared to the average. To reach a substantial preference, more facilities like fitness or retail must be added (0.338). These utilities demonstrate that a healthy nutrition provision is essential to prevent respondents' dislike. Adding more amenities that encourage workers' health can rise tenants' preference for office workplaces.

The data from table 2 do not only provide an estimate for the overall preferences for each attribute level, but also provide the possibility to compute the relative importance of each attribute (in %) for office workplace choices (see figure 2). This is calculated from the ratio between each particular attribute's importance and the total importance of all attributes (Randle, et al., 2019). Importance is indicated by the size of the range between the highest and lowest utility within each attribute. For this calculation, when a utility is not significant it is set to zero. It shows that the relative importance of 'Exposure to light' is zero since none of its model estimates has a significant β-value. All other attributes have at least one significant attribute level and thus played a role in the decision-makers' choices. Among those attributes, the 'Rental price' is most important (27.3%) in tenants' considerations, where obviously higher rental prices are disliked in comparison to lower prices (having negative part-worth utilities). Subsequently, 'Thermal comfort', 'Noise & Acoustics' and 'Amenities' have a relatively high impact on respondents' choices as well (within a 15.2-16.6% range). Hereafter, the importance drops to a 7.5-8.9% range for the attributes 'Office type', 'View' and 'Indoor Air Quality'. Their part-worth utilities indicate higher preference for healthier attribute levels as well, but they are thus considered less important as the other attributes when weighing alternatives.

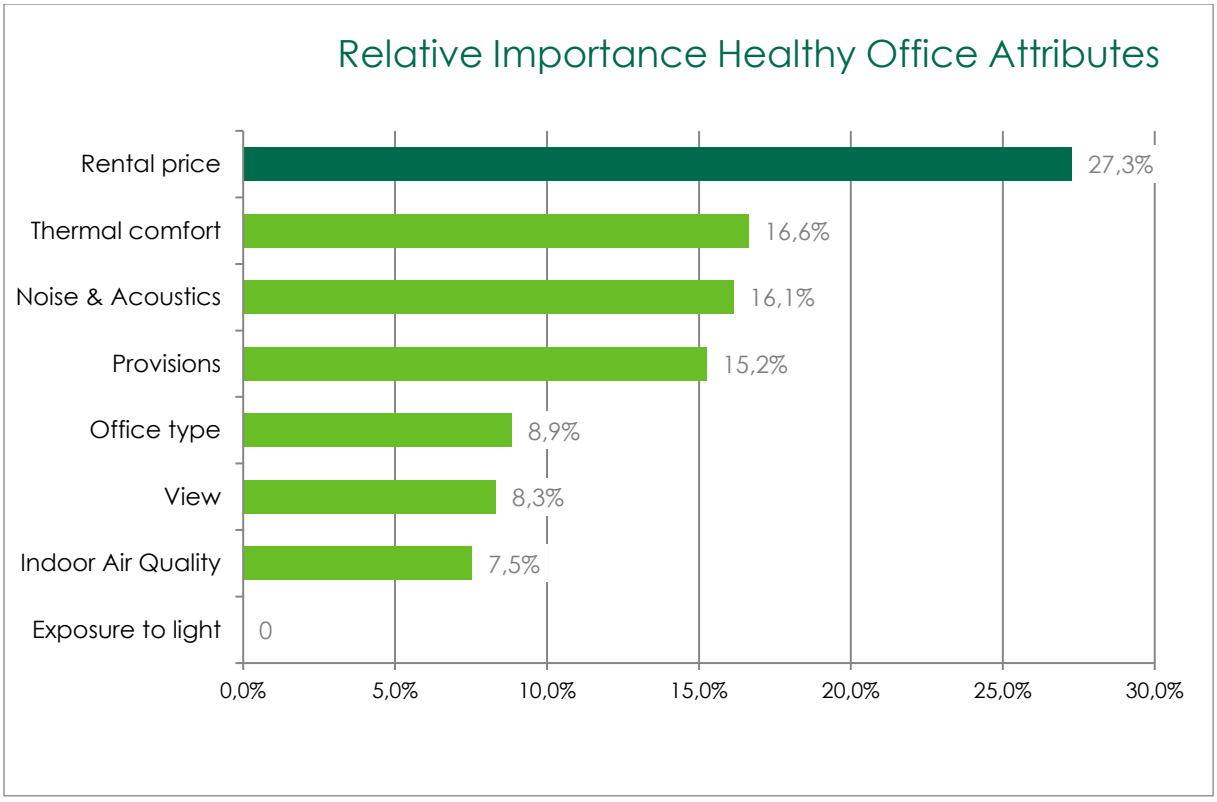

Figure 2. Relative Importance of healthy office workplace attributes (Choices=756, N=84)

Willingness to pay

The willingness to pay is calculated per attribute by the utility difference between two attribute levels of a particular attribute and the utility decrease of a percentage point increase of the rental price. Figure 3 shows the estimates for three measures per attribute: one for the improvement from a low to a medium health quality office workplace, one for the improvement from a medium to a high health quality office workplace and one for the improvement from a low to a high health quality office workplace. Also, in this calculation when the utility is not significant, it was set to zero. As visible, mostly positive WTP percentages came forward, suggesting a potential for rent increases when improving these attributes towards a healthier quality level. Note that when an office workplace will be reduced from one attribute level to a lower attribute level (e.g. high to medium), the inverse of every positive WTP percentage leads to a negative WTP. In other words, tenants are willing to pay less when forced to choose an office workplace that consists of lower attribute quality levels.

However, there are two exceptions. A negative WTP came forward when improving from the low-quality level of indoor air (meaning ventilation with indoor-outdoor air only) to the medium-quality level (ventilation, including air treatment of moisture and CO^2 concentration). Table 2 already showed that the respondents do not like the air treatment ventilation level and strongly prefer the highest quality level of air treatment enriched with air filtering (extracting fine dust, odours, bacteria). However, air quality in general was not very important in choosing between the office profiles. The other negative WTP came forward for improving from a medium quality level for office type (assigned to the cell office) to a high-quality level (assigned to the flexible office). There is no clear finding regarding which office type would have the highest quality level, as satisfaction with office types has shown large variations between studies, and also is likely to depend on the type of work people have to do. However, it does show that tenants at least in our sample are willing to pay more for a cell office than for either a regular open work floor or a flexible open office. If they need to choose between the two open office types, then WTP is higher for the flexible office.

Besides the WTP-values per attribute, it is also interesting to know what the WTP is for the office quality as a whole. Therefore, a WTP-range for improving an office workplace quality as a whole is calculated as the difference between a conservative minimum (weighted average) and an optimistic maximum (sum of the parts) when including all aspects. The calculations estimated a WTP range from an office with all low-quality levels to all medium-quality levels of a conservative 6.37% up to an optimistic 12.33% rental increase, from medium to high health levels from 6.17% up to 12.43% rental increase, and from low to high quality levels from 12.54% up to 24.76% rental increase.

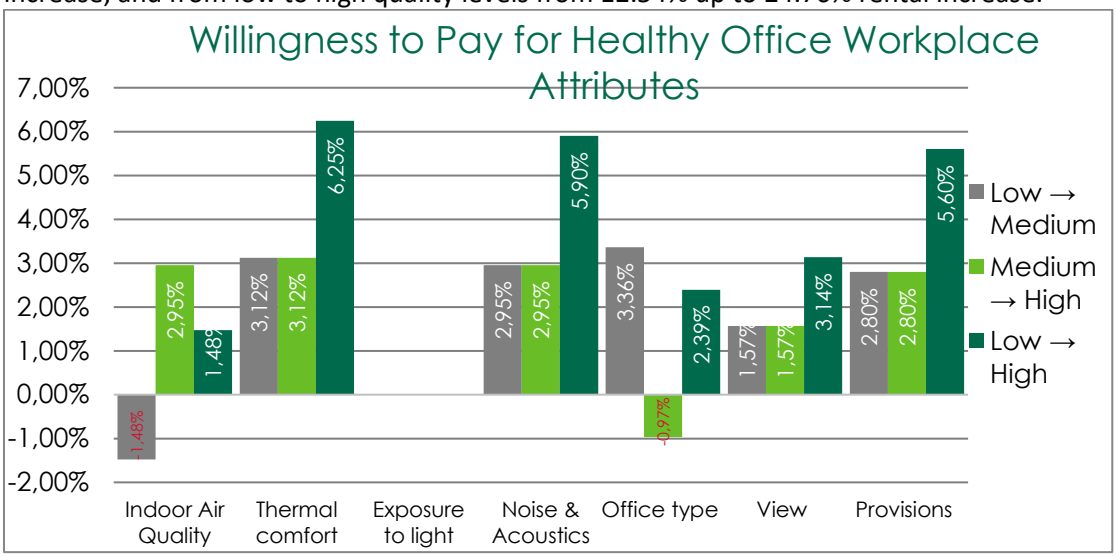

Figure 3. Willingness to Pay for healthy office workplace attributes as factor of the current rental price

Conclusion & discussion

Because this study identified healthy office quality level preferences of workplace decision makers and their WTP, its results provide new insights to justify investments in healthier office buildings by landlords and developers. Previous studies have shown comparable trade-offs between workplace aspects with regard to office occupant satisfaction (Huang, et al., 2012; Hartog, et al., 2018) and productivity (Attema, et al., 2018), but did not yet consider perceived health outcomes. Up to now, existing studies on healthy workplaces are mostly conducted from the perspective of individual office users (the employees). This is very valuable to identify design effects of end-users, but employees are only indirect stakeholders when it comes to deciding which office to rent.

Despite the difficulty for organisations to allocate and measure their benefits from healthier office workplace aspects in a business case, it seems that tenants are generally willing to pay a higher rent to landlords if they would provide them with healthier office workplaces. Depending on the existing health-related quality levels of an office, tenants stated to be willing to pay up to almost 25% more rent when all office workplace aspects could be enhanced to the maximum health quality. Obviously, these are stated preferences and a stated willingness to pay, so future research has to study whether in practice organisations indeed pay higher fees for higher quality healthier offices and to what extent.

The results suggest that thermal comfort, noise & acoustics, and amenities (e.g. healthier food and fitness facilities in the building) are of relatively high importance in making healthy office workplace choices. This accurately reflects previous studies like Huang et al (2012), stating that thermal comfort and noise are also the most important workplace characteristics for achieving employee satisfaction; although satisfaction does not necessarily mean there is an optimised wellbeing. Amenities, not only in the building but also near the office location, are also regularly mentioned aspects in studies about push, pull and keep factors for office tenants (e.g. Pen, 2002, Pellenbarg, 2005) as well as studies on important location characteristics (Remøy, et al., 2007). More surprisingly, exposure to light did not appear to play a role in these decision makers' office workplace choices, while studies (e.g. Beute & De Kort, 2014) have shown its relevance for employee health. This suggests that decision makers might be insufficiently aware of some of the healthy workplace benefits. And as these decision makers are not convinced of positive effects on their employees, they are also unwilling to accept the generally higher costs and thus rent premiums of higher quality lighting levels.

Office type, view, and indoor air quality show less importance for choosing between office workplace alternatives but did play a role. These data stem from before the Covid-19 pandemic, so air quality is highly likely to be much more important now, with an even larger preference for air filtering. Like previous, older studies (e.g. Bodin-Danielson & Bodin, 2009), it is clear that the old-style open office with dedicated desks has become the less preferred office type, and when it comes to health effects the cell office appears to be most preferred. Nonetheless, judging by statistics on the rise of flexible offices in many western countries, the flexible office remains the favourite office type of decision makers when their organisation decides to upgrade the office. The Covid-19 pandemic is also likely to have changed preferences here though now that employees have all experienced working from home. Recently, there seems to be an even larger interest in flexible offices, to accommodate people to work from home more after the pandemic. However, whether they actually will do so (and feel healthy and good about it), is something that only the future can tell.

Limitations and recommendations

The findings of this study provide new knowledge to landlords for justification of investments in healthy office workplace attributes, since it contributes to underpin their business case for offering healthier workplaces by showing increased WTP among tenants. It guides them in which healthy office aspects could be given priority against others to add maximum investment value for future leasing or

selling of their properties. However, it is important to note that generalizing the results of this study to all kinds of office buildings is debatable since the scope of the study was the CBRE Dutch Office Fund that focuses on multi-tenant, multi-service offices on prime locations in the Netherlands only. Also, the response rate and therefore the sample was rather small, and the study thus needs to be repeated amongst bigger samples. Preference parameters and WTP estimates might differ in other samples and throughout time and need further research to be certain of relative importance of the attributes, especially now that the Covid-19 pandemic has put healthy offices in everybody's mind with a focus on viral diseases. This puts attention back on physical health, despite the fact that stress-related disorders are becoming the most important occupational illness in the Netherlands (Flintrop & Vargas, 2014; TNO, 2019), and mental health is a state of well-being that goes beyond the mere absence of disease or illness (Hakanen & Schaufeli, 2012; Seligman, 2008). It is important for workplace decision makers in practice to keep a holistic view on employee health, including physical, mental, and social wellbeing. It is possible that this study left office workplace characteristics out of consideration and let their potential (interaction) effects unrevealed. Future research must strive to incorporate all (holistic) health effects and their contributions to organizational performance, so that total demand and WTP can be estimated with less uncertainty.

In general, the trade-offs made by the decision-makers in this sample provide information for future research to focus on the most preferred workplace attributes or instead provide more evidence for those that were considered less important by the decision makers to convince them of their merit. The SCE approach can be implemented in other circumstances too, such as other countries and other types of office(s) (funds) to examine whether preferences for aspects differ across populations. In addition, the identification of underlying determinants of WTP such as organizational characteristics and the local office market is interesting, followed by the necessary identification of potential market segments with different preferences.

The full research report can be downloaded here:
https://research.tue.nl/files/136202958/Buskermolen_0809340.pdf

References

Al Horr, Y., Arif, M., Kaushik, A., Mazroei, A., Katafygiotou, M. & Elsarrag, E. (2016). Occupant productivity and office indoor environment quality: A review of the literature. Building and environment, 5, 1-11.

Alker, J., Malance, M., Pottage, C. & O'Brien, R. (2014). Health, Wellbeing & Productivity in Offices. The World Green Building Council.

Allen, J. G., Bernstein, A., Xiadong, C., Eitland, E. S., Flanigan, S., & Gokhale, M. (2016). The 9 foundations of a healthy building. Boston, USA: Harvard TH Chan School of Public Health.

Attema, J., Fowell, S., Macko, M. & Neilson, W. (2018). The Financial Case For High Performance Buildings. stok LLC, San Francisco.

Beute, F., & de Kort, Y. A. (2014). Salutogenic effects of the environment: Review of health protective effects of nature and daylight. Applied psychology: Health and well-being, 6(1), 67-95.

Bluyssen, P. (2009). The indoor environment handbook: How to make buildings healthy and comfortable. London: Earthscan.

Bodin-Danielsson, C., & Bodin, L. (2009). Difference in satisfaction with office environment among employees in different office types. Journal of Architectural and Planning Research, 241-257.

Boedker, C., Meagher, K., Vidgen, R., Cogin, J. & Mouritsen, J. (2017). Doing more with less - productivity or starvation? The Intellectual Asset Health Check. Public Money & Management, 37(1), 31-38.

Breidert, C., Hahsler, M. & Reutterer, T. (2006). A review of methods for measuring willingness-to-pay. Innovative Marketing, 2(4), 8-32.

Clements-Croome, D. (2015). Creative and productive workplaces: a review. Intelligent Buildings International, 7(4), 164-183.

Colenberg, S., Appel-Meulenbroek, R., Romero Herrera, N. & Keyson, D. (2021). Conceptualizing social well-being in activity-based offices. Journal of Managerial psychology, Vol. ahead-of-print No. ahead-of-print.

De Croon, E., Sluiter, J., Kuijer, P. & Frings-Dresen, M. (2005). The effect of office concepts on worker health and performance - a systematic review of the literature. Ergonomics, 48(2), 119-134.

Ecofys & Fraunhofer IBP. (2018). Healthy Homes Barometer 2018. Velux Group.

Feige, A., Mcallister, P., & Wallbaum, H. (2013). Rental price and sustainability ratings: which sustainability criteria are really paying back?. Construction Management and Economics, 31(4), 322-334.

Feige, A., Wallbaum, H., Janser, M. & Windlinger, L. (2013). Impact of sustainable office buildings on occupant's comfort and productivity. Journal of Corporate Real Estate, 15(1), 7-34.

Fischl, G., Varkevisser, M., Gärling, A. & Keyson, D. (2007). The restorative potential of a built environment: development and evaluation of a research based design (ed.). In: (Ed.), Paul Havinga; Maria Eva Magdalena Lijding; Nirvana Meratnia (Ed.), Smart surroundings moving forward: . Paper presented at . Enschede: Twente University of Technology.

Flintrop J, Vargas O, Unia Europejska, Urząd Publikacji. 2014. Psychosocial risks in Europe prevalence and strategies for prevention: a joint report from the European Foundation for the Improvement of Living and Working Conditions and the European Agency for Safety and Health at Work. Luxemburg: Publications Office of the European Union.

Grawitch, M., Gottschalk, M. & Munz, D. (2006). The path to a healthy workplace: A critical review linking healthy workplace practices, employee well-being, and organizational improvements. Consulting Psychology Journal: Practice and Research, 58(3), 129-147.

Hakanen, J. J., & Schaufeli, W. B. (2012). Do burnout and work engagement predict depressive symptoms and life satisfaction? A three-wave seven-year prospective study. Journal of affective disorders, 141(2-3), 415-424.

Harter, J. K., Schmidt, F. L. & Keyes, C. L. (2003). Well-being in the workplace and its relationship to business outcomes: A review of the Gallup studies. In C.L. Keyes & J. Haidt (Eds.), Flourishing: The Positive Person and the Good Life (pp. 205-224).

Hartog, L., Weijs-Perrée, M. & Appel-Meulenbroek, R. (2018). The influence of personality on user satisfaction: multi-tenant offices. Building Research & Information, 46(4), 402-416.

Hensher, D., Rose, J. & Greene, W. (2005). Applied choice analysis: a primer. Cambridge university Press.

Huang, L., Zhu, Y., Ouyang, Q. & Cao, B. (2012). A study on the effects of thermal, luminous, and acoustic environments on indoor environmental comfort in offices. Building and Environment, 49, 304-309.

Jones, S. & Laquidara-Carr, D. (2016). The Drive Towards Healthier Buildings 2016: Tactical Intelligence to Transform Building Design and Construction - SmartMarket Report. Bedford: Dodge Data & Analytics.

Lamb, S. & Kwok, K. (2016). A longitudinal investigation of work environment stressors on the performance and wellbeing of office workers. Applied Ergonomics, 52, 104-111.

Lee, Y. & Clements-Croome, D. (2019). Linking the environment to human data for a comprehensive wellbeing assessment in the workplace: Lessons from health research. CIB World Building Congress. Hong Kong SAR.

Muldavin, S., Miers, C. & McMackin, K. (2017). Buildings emerge as drivers of health and profits. Corporate Real Estate Journal, 7(2).

Pellenbarg, P. (2005). Firm migration in the Netherlands. ERSA congress. Amsterdam.

Pen, C. (2002). Wat beweegt bedrijven; besluitvormingsprocessen bij verplaatste bedrijven. Groningen: University of Groningen.

Randle, M., Kemperman, A. & Dolnicar, S. (2019). Making cause-related corporate social responsibility (CSR) count in holiday accommodation choice. Tourism Management, 75, 66-77.

Redlich, C., Sparer, J. & Cullen, M. (1997). Sick-building syndrome. The Lancet, 349, 1013-1016.

Remøy, H., Koppels, P., Van Oel, C. & De Jonge, H. (2007). Characteristics of vacant offices: A Delphiapproach. In ENHR International Conference. ENHR International Conference.

Seligman, M. E. (2008). Positive health. Applied psychology, 57, 3-18.

Singh, A., Syal, M., Grady, S. & Korkmaz, S. (2010). Effects of green buildings on employee health and productivity. American journal of public health, 100(9), 1665-1668.

Skov, T., Borg, V. & Orhede, E. (1996). Psychosocial and physical risk factors for musculoskeletal disorders of the neck, shoulders, and lower back in salespeople. Occupational and environmental medicine, 53, 351-356.

Stolwijk, J. (1991). Sick-Building Syndrome. Environmental Health Perspectives, 95, 99-100.

TNO (2019). Factsheet werkstress 2019. Available at: http://publications.tno.nl/publication/34634961/52Bq2P/TNO-2019-werkstress.pdf