Demand for Green Buildings: 
Office Tenants’ Willingness to Pay for Green Features

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Overview

1. CBRE Green Building Research Project - Context
2. Background: Green Building by Numbers
3. Research Process: Focus Group and Survey
4. Analysis & Discussions
5. Q & A
Green Office Building Project - Context

- CBRE “Green Research Challenge” program
- Create a green office building scoring system (e.g. FICO credit score)
- Mix of demand and supply-side green office building measures
Background - Buildings by numbers

- 41% U.S. energy use (EPA, 2012)
- 72% electricity consumption (EIA, 2008)
- 40% of CO2 emissions (DOE, 2012)
- 14% water consumption (US Geological Survey, 2000)

Green Buildings Can Reduce...

- Energy use: 24%* - 50%**
- CO2 emissions: 33%*** - 39%**
- Water use: 40%**
- Solid waste: 70%**

Turner and Frankel (2008); Kats (2003); GSA Public Building Service (2008); and USGBC
Diffusion of Green Office Building

Rank 1st: Minneapolis, 77% of office space is green-certified (supported by financial incentive programs)

Source: CBRE (2014)
Literature Review & Research Gaps

EPA’s *Definition* of Green Building:
- Maximizing the efficiency of buildings’ resources (e.g. energy, water)
- Minimizing buildings’ impacts on the environment and human health

**Market Premium**
- 10% property value premium (Miller, Spivey, and Florance, 2008)
- 7-8% rental price premium (Kok, Miller, and Morris, 2012)

**Employee Productivity** (Miller, Pogue, Gough, and Davis, 2009)
**Occupant Satisfaction** (Paul and Taylor, 2007)
**Impact of Public Policies on diffusion** (Simons, Choi, and Simons, 2009)
**Green Building and Regional Economy** (Allen and Potiowsky, 2008)

“What specific green building attributes are preferred by tenants? Are tenants willing to pay for those attributes?”
Research Process

Demand-side

- Completed 7 focus groups (48 participants) (Chicago, Denver, D.C., and San Francisco Bay area)
- Identified 18 specific green building attributes
- Developed an extensive (online) tenant survey

On-going; 620 responses (20% response rate as to today) from 100+ cities

* Focus on the main findings of the survey
Profile of Respondents

Position

- CEO, 2%
- CFO, 2%
- Director, 3%
- COO, 3%
- Facilities Manager, 3%
- General employee, 14%
- President/VP, 7%
- Others, 12%
- Office manager, 54%

Age

- Prefer not to say, 5%
- 60+, 12%
- 50-59, 32%
- 40-49, 26%
- 30-39, 16%
- 18-29, 9%

Education

- High school or GED, 15%
- Associate's, 18%
- Bachelor's, 47%
- Master's or higher, 20%
- Prefer not to say, 5%

Industry

- Finance and Insurance, 19%
- Others, 37%
- Real Estate, 7%
- Legal Service, 12%
- Energy-related, 4%
- Architectural, Construction, Engineering, 7%
- Computer_IT, 7%
- Health Care and Social, 7%

Others, 37%
The Tenant’s Perception of Green Building Certifications

Perceived Value of the Energy Star-Certified Building Compared to the Non-Certified

- Strongly Agree: 12%
- Agree: 46%
- Neutral: 39%
- Strongly Disagree: 1%
- Disagree: 2%

58% Positive

Perceived Value of the LEED Platinum Compared to the LEED Certified

- Strongly Agree: 7%
- Agree: 22%
- Neutral: 66%
- Strongly Disagree: 3%
- Disagree: 3%

29% Positive
<table>
<thead>
<tr>
<th>Rank</th>
<th>18 Green Building Features</th>
<th>N</th>
<th>% Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Better indoor air quality</td>
<td>556</td>
<td>94%</td>
</tr>
<tr>
<td>2</td>
<td>Access to natural light</td>
<td>534</td>
<td>90%</td>
</tr>
<tr>
<td>3</td>
<td>Comfortable &amp; localized temperature control</td>
<td>436</td>
<td>74%</td>
</tr>
<tr>
<td>4</td>
<td>Efficient electrical and gas use for HVAC</td>
<td>459</td>
<td>78%</td>
</tr>
<tr>
<td>5</td>
<td>Energy efficient lighting</td>
<td>461</td>
<td>78%</td>
</tr>
<tr>
<td>6</td>
<td>Recycling provided on-site</td>
<td>491</td>
<td>83%</td>
</tr>
<tr>
<td>7</td>
<td>Walking access to services and restaurant</td>
<td>446</td>
<td>75%</td>
</tr>
<tr>
<td>8</td>
<td>Public transportation nearby</td>
<td>353</td>
<td>60%</td>
</tr>
<tr>
<td>9</td>
<td>Fitness facility on-site</td>
<td>323</td>
<td>55%</td>
</tr>
<tr>
<td>10</td>
<td>Lease structure</td>
<td>262</td>
<td>44%</td>
</tr>
<tr>
<td>11</td>
<td>Green cleaning products</td>
<td>240</td>
<td>41%</td>
</tr>
<tr>
<td>12</td>
<td>Energy Star designation</td>
<td>210</td>
<td>36%</td>
</tr>
<tr>
<td>13</td>
<td>Water conservation</td>
<td>227</td>
<td>38%</td>
</tr>
<tr>
<td>14</td>
<td>LEED designation</td>
<td>172</td>
<td>29%</td>
</tr>
<tr>
<td>15</td>
<td>Shower on-site</td>
<td>147</td>
<td>25%</td>
</tr>
<tr>
<td>16</td>
<td>Bike racks at building</td>
<td>95</td>
<td>16%</td>
</tr>
<tr>
<td>17</td>
<td>Electric car charging station</td>
<td>50</td>
<td>8%</td>
</tr>
<tr>
<td>18</td>
<td>Green roof</td>
<td>44</td>
<td>7%</td>
</tr>
</tbody>
</table>
Demand vs. Supply
Willingness to Pay for Green Buildings

“How much more do you feel your company would pay for each attribute?”

- Indoor air quality: 1.2%
- Access to natural light: 1.2%
- Localized temperature control system: 0.9%
- Efficient electrical and gas use for heating...
  - Energy efficient lighting: 0.8%
- Walking access to services and restaurant: 0.8%
- Public transportation nearby: 0.6%
- Fitness facility on-site: 0.6%
- Recycling provided on-site: 0.5%
- Lease structure: 0.5%
- Water conservation: 0.4%
- LEED Designation: 0.3%
- Energy Star designation: 0.2%
- Shower on-site: 0.2%
- Green cleaning products: 0.2%
- Bike racks at building: 0.1%
- Green roof: 0.1%
- Electric car charging station: 0.0%

9.3% WTP in total
WTP by Lease Structure and Region

- **FSG, 0.63%**
- **NNN, 0.98%**
- **FSG, 0.57%**
- **NNN, 0.96%**
- **FSG, 0.36%**
- **NNN, 0.32%**

**Efficient electrical and gas use for heating and cooling**

**Energy efficient lighting**

**Water conservation**

**WTP for Water Conservation**

- **Far West: 0.42%**
- **Great Lakes: 0.33%**
- **East: 0.47%**
Logistic Regression

• Intent is to profile tenant respondents/office managers “green-positive” activities
• Use same data base of 620 complete responses
• Green-positive activities include:
  – Willingness to pay for a green office location
  – Willingness to bid a high premium for specific green features
  – Self-reported “high” knowledge of green industry
  – Practice sustainable operations with green suppliers, etc.
Four Logistic Models

- Model 1: *Willingness-to-pay* for green buildings
- Model 2: “High” WTP (>2%)
- Model 3: The tenant’s *knowledge* of Green Buildings
- Model 4: The tenant company’s active promotion of *sustainability*

\[ Y_i = \beta_0 + \beta_1 \text{Region}_i + \beta_2 \text{Industry}_i + \beta_3 \text{Demographics}_i + \beta_4 \text{Company Characteristics}_i + \beta_5 \text{Lease}_i + \beta_6 \text{Floor-plan}_i + \beta_7 \text{Location Decision}_i + \varepsilon_i \]

- Model pseudo R-squared values 0.14-0.32
## Summary of Outputs
(statistically significant variables only)

<table>
<thead>
<tr>
<th>Model 1</th>
<th>Model 2</th>
<th>Model 3</th>
<th>Model 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Willingness to pay)</td>
<td>(High WTP)</td>
<td>(Knowledge)</td>
<td>(Sustainability)</td>
</tr>
<tr>
<td>Young age (less 50)</td>
<td>Energy-related industry</td>
<td>Male</td>
<td>Architecture/Construction industry</td>
</tr>
<tr>
<td>Higher Edu (&lt;MA)</td>
<td>Government</td>
<td>Real estate-related industry</td>
<td>Large company (sqft and rental price)</td>
</tr>
<tr>
<td>Sustainable partners (e.g.) suppliers</td>
<td>Sustainable initiative</td>
<td>Sustainable partners (e.g.) suppliers</td>
<td></td>
</tr>
<tr>
<td>Professional Service</td>
<td>South East regions (FL, GA)</td>
<td></td>
<td>Publicly traded stock</td>
</tr>
<tr>
<td>East regions (-) (NY, MD)</td>
<td>East regions (-) (NY, MD)</td>
<td></td>
<td>Location Decision-Green Buildings Features</td>
</tr>
</tbody>
</table>
Discussion

• A slightly higher “stated valued (9.3% WTP)” of green buildings compared to the “revealed value (7-8% rental premium)” from prior literature

• Difference in WTP for green buildings by specific green feature, industry, region, and lease structure

• The highest willingness to pay for improved indoor air quality and access to natural light

• Low pseudo R square issue (0.14 – 0.32) tells a different story?
Future Research Plans

• Integrate the current survey results with more specific building characteristics and off-site information (e.g. local weather, air quality, energy price)

• Next studies will focus on:
  – the relationship between green buildings and employee productivity
  – the relationship between green building practices and the triple bottom line of sustainability (Profit-tenant, Profit-landlord, Planet, People)
Q & A