



**KTH Architecture and  
the Built Environment**

# **Economic studies of Green Commercial Buildings in Sweden**

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Licentiate Thesis  
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## Abstract

Climate change has risen to become one of our most critical global issues to resolve. Greenhouse gas emissions have been identified as one of the main causes for increased global temperature. As most energy production causes emission of greenhouse gases, a more energy efficient real estate sector could reduce the global greenhouse gas emissions. This reduction could be dramatic, as the real estate sector accounts for quite a large share of the society's total energy usage. However, it is argued that even economically profitable investments are not being conducted to the full extent, leaving an "energy efficiency gap". From an economic perspective there are multiple hinders that hampers environmental and/or energy efficiency investments (e.g. transaction costs, split incentives, capital constraints).

This licentiate thesis studies environmental issues from an economic point of view in the commercial built environment in Sweden. The main purpose is to illustrate how different real estate actors respond to building environmental and/or energy performance, with focus on barriers, actions and economic outcome/impact. The thesis consists of an introductory essay and two articles.

The first article studies the implementation of green leases. The study showed that complex contract structure involving different parties easily create so called "split incentives", which can be very hard to resolve by additional agreements. This could be one explanation to why some profitable energy efficiency investments are not being realized. Furthermore, the study showed that the building owners were quite risk averse, in the sense that they were reluctant to conduct energy efficiency investments with longer pay-off periods than the current lease term. As Swedish commercial leases have a short contract length, this myopic view hampers energy efficiency investments with longer pay-off periods. An additional result from the study was the emotional aspect, from the tenant's point of view, to invest in somebody else's property. In general, the tenant considered building improvements to be the landlord's responsibility. All in all, a conclusion that could be drawn is that the separation of building ownership and usage may have a negative impact on the leased commercial building stock's energy performance.

The second article studies whether energy performance affects the appraised value of office buildings. The overall result was that the energy performance rating had no impact on the commercial office buildings' market values. The study indicated that rents, "time of valuation", changes in vacancy rates, location and "low building age" had the greatest impact on assessed market values. This result could be due to that the correlation between energy usage and maintenance costs is low. Further explanation could be that the specified model suffers from multicollinearity, as the effect of improved energy efficiency cannot be separated from the building age or rent.

The including studies support the notion that energy efficiency measures are difficult to implement and appraise to the full extent. Hence, future research is going to focus on how "green" features better could be incorporated into real estate valuation practices as well as evaluation of how environmental certified buildings are actually performing (concerning rents, energy usage, user satisfaction etc.).

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*Magnus Bonde*

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Author: Magnus Bonde

Paper 2: “Is Energy Performance Capitalised in Office Building Appraisals?”

Authors: Magnus Bonde and Han-Suck Song