University of Basel

# SWISS REAL ESTATE RESEARCH CONGRESS 2019

## The Rent Premium Development of Residential Minergie Buildings in Switzerland

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# Background

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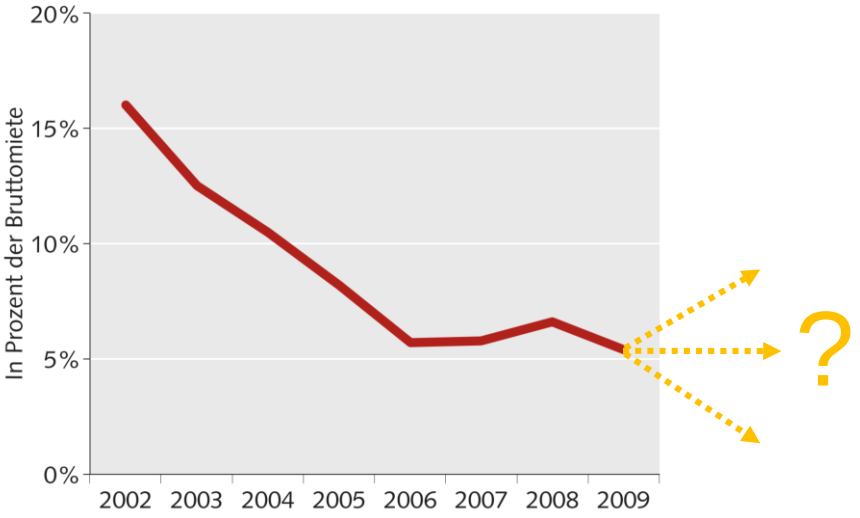
## Research Problem

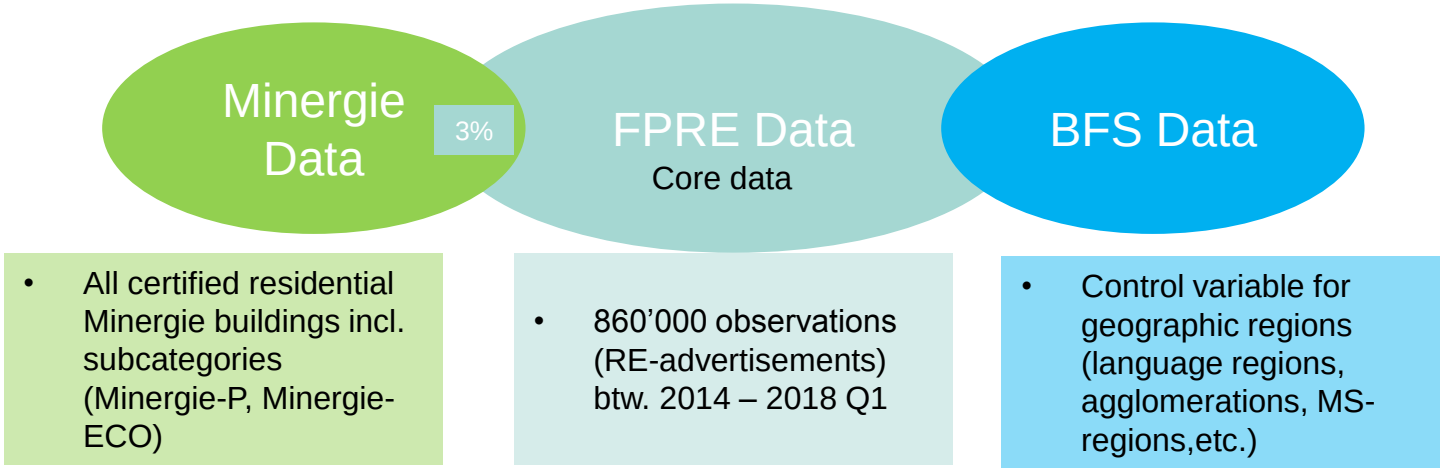
- 50% of overall energy consumption and 40% of CO2 emissions stems from the building stock
- Rent premium of green buildings required to create incentive to invest for rational investor

## Research Goals

- Study by Salvi et al. (2010) suggests higher willingness to pay for Minergie in 2000s
- Rent premium decrease since 2002 identified
- Investigate existence and development of Minergie rent premium
- Critically discuss source of rent premium if still existent



# Empirical Research - Data




**Data management and main issues**

- Matching Minergie data with FPRE data
- Building year missing for roughly 45% of observations
- Removal of implausible data (rent, living surface, floor level, etc.)
- 383'000 total observations remained whereof 12'000 are Minergie labeled

# Empirical Research – Hedonic Models and Hypothesis

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**Table 2: Overview of groups for empirical research**

| Group 1 | Group 2 | Group 3 |
|---|---|---|
| Minergie certified objects incl. subcategories and ECO | Non-Minergie certified objects with building year > 2005 | Control group – all non-Minergie certified buildings |
| 12'587 observations | 161'373 observations | 370'643 observations |

**Model 1**

$$\ln R_i = \beta_0 + \beta_1 lnF_i + \beta_2 E_i + \beta_3 BZ_i + \beta_4 RT_i + \beta_5 M_i + \beta_6 MS_i + \beta_7 T_i + \varepsilon_i$$

**Model 2**

$$\ln R_i = \beta_0 + \beta_1 lnF_i + \beta_2 E_i + \beta_3 BZ_i + \beta_4 RT_i + \beta_5 MO_i + \beta_6 ME_i + \beta_7 MP_i + \beta_8 MS_i + \beta_9 T_i + \varepsilon_i$$

**Hypothesis 1**
The rent premium for Minergie has decreased since 2010 due to the convergence of Minergie and the building standards of new non-certified buildings.

**Hypothesis 2**
The subcategories of Minergie command a higher premium than the basic Minergie standard.

# Empirical Research – Hedonic Regression Results (1/3)

Table 3: Result of hedonic regression models / Group 1 (All Minergie) vs. Group 3 (all non-Minergie)

| | Model 1 | Model 2 |
|---|---|---|
| **Dependent Variable** | **net rent per m² / p.a.** | **Net rent per m² / p.a.** |
| **Constant** | 6.59 *** | 6.59 *** |
| **Minergie-certified** | 0.046 *** | |
| **Substandard** | | |
| **Minergie** | | 0.046 *** |
| **Minergie-P** | | 0.061 *** |
| **Minergie-ECO** | | -0.032 *** |
| **Net living space (log)** | -0.29 *** | -0.29 *** |
| **Floor** | 0.01 *** | 0.01 *** |
| **Construction year** | | |
| **<= 1920** | omitted | omitted |
| **1921 - 1930** | 0.01 *** | 0.01 *** |
| **1931 - 1940** | -0.02 *** | -0.02 *** |
| **1941 - 1950** | -0.04 *** | -0.04 *** |
| **1951 - 1960** | -0.04 *** | -0.04 *** |
| **1961 - 1970** | -0.05 *** | -0.05 *** |
| **1971 - 1980** | -0.04 *** | -0.04 *** |
| **1981 - 1990** | -0.05 *** | -0.05 *** |
| **1991 - 2000** | -0.02 *** | -0.02 *** |
| **2001 - 2005** | 0.04 *** | 0.04 *** |
| **2006 - 2010** | 0.06 *** | 0.06 *** |
| **> 2010** | 0.12 *** | 0.12 *** |

# Empirical Research – Hedonic Regression Results (2/3)

| Tabel 3 (continued): Result of hedonic regression models / Group 1 (All Minergie) vs. Group 3 (all non-Minergie) | | |
|---|---|---|
| **Micro-location rating (main rating)** | 0.03 *** | 0.03 *** |
| **Rating sunlight** | 0.01 *** | 0.01 *** |
| **Rating view** | 0.01 *** | 0.01 *** |
| **Rating district image** | 0.04 *** | 0.04 *** |
| **Rating service quality** | 0.003 *** | 0.003 *** |
| **Rating leisure** | 0.01 *** | 0.01 *** |
| **Rating public transport access** | 0.02 *** | 0.02 *** |
| **Rating road access** | 0.01 *** | 0.01 *** |
| **Rating noise emission** | -0.003 *** | -0.003 *** |
| **Year** | | |
| **2014** | omitted | omitted |
| **2015** | -0.007 *** | -0.007 *** |
| **2016** | 0.005 *** | 0.005 *** |
| **2017** | -0.02 *** | -0.02 *** |
| **2018** | -0.005 *** | -0.005 *** |
| **Spatial regional clustering** | MS-Region | MS-Region |
| **Adjusted $R^2$** | 0.51 | 0.51 |
| **F Test** | 3065 *** | 3019 *** |
| **Observations** | 383'230 | 383'230 |

**Notes:**

**Heteroscedasticity-consistent standard errors are used in all models**

***** indicates significance at a 1% level; ** indicates significance at a 5% level; * indicates significance at a 10% level**

# Empirical Research – Hedonic Regression Results (3/3)

**Table 4: Result of hedonic regression models / Group 1 (All Minergie) vs. Group 2 (New non-certified)**

| | Model 1 | | Model 2 | |
|---|---|---|---|---|
| **Dependent Variable** | **net rent per m² / p.a.** | | **net rent per m² / p.a.** | |
| **Constant** | 6.84 | *** | 6.84 | |
| **Minergie-certified** | 0.045 | *** | | |
| **Substandard** | | | | |
| **Minergie** | | | 0.044 | *** |
| **Minergie-P** | | | 0.073 | *** |
| **Minergie-ECO** | | | -0.034 | *** |
| **Net living space (log)** | -0.32 | *** | -0.32 | *** |
| **Floor** | 0.01 | *** | 0.01 | *** |
| **Construction year** | | | | |
| **2006 - 2010** | omitted | | | |
| **> 2010** | 0.05 | *** | 0.05 | *** |
| | | | | |
| **Micro-location rating (main rating)** | -0.001 | | -0.001 | |
| **Rating sunlight** | 0.01 | *** | 0.01 | *** |
| **Rating view** | 0.01 | *** | 0.01 | *** |
| **Rating district image** | 0.04 | *** | 0.04 | *** |
| **Rating service quality** | 0.005 | *** | 0.005 | *** |
| **Rating leisure** | 0.01 | *** | 0.01 | *** |
| **Rating public transport access** | 0.02 | *** | 0.02 | *** |
| **Rating road access** | 0.01 | *** | 0.01 | *** |
| **Rating noise emission** | 0.001 | * | 0.001 | |

# Empirical Research – Summary of Findings and Limitations

| Hypothesis 1 rejected | Hypothesis 2 partially confirmed |
|---|---|
| ➢ Convergence of building standards due to technological enhancement and regulations have not led to smaller Minergie premium<br>➢ Net rent Minergie premium remains constant across time (3.7% to 5% from 2014 – 2017)<br>➢ Net rent premium remains robust when only compared to newer buildings | ➢ Higher Minergie-P than Minergie basic premium<br>➢ Results for Minergie-ECO seem to be biased<br>➢ More observations needed to test robustness |

- **The sources of the rent premium are still unclear**
  - Energy efficiency might be only a small contributor to the premium
    - Energy building standards became very similar and premium remained on the same level
  - Unobserved characteristics of Minergie buildings maybe at the source of the premium
  - Brand-/signaling effect seem to be present
  - Combination of increased energy efficiency, additional unobserved characteristics of Minergie buildings, as well as a brand effect suspected to be at the source of the rent premium