

Contents

| | |
|---|-----------|
| 1. Introduction | 1 |
| 1.1. Background and motivation | 1 |
| 1.2. Energy consumers in the sustainable energy transition | 2 |
| 1.2.1. Energy consumption in residential buildings: trends | 2 |
| 1.2.2. The EU directives affecting energy efficiency of residential buildings | 3 |
| 1.2.3. The German Energy Saving Ordinance | 3 |
| 1.2.4. The direct rebound effect in residential buildings | 4 |
| 1.2.5. Causes of the rebound effect: The impact of heating and ventilation behaviors | 5 |
| 1.3. The role of energy prosumers in the energy supply system of the future | 8 |
| 1.3.1. Trends in renewable energies | 8 |
| 1.3.2. Prosumers' participation in the energy sector value chain | 9 |
| 1.3.3. Business-to-Prosumer versus Consumer-to-Business transactions | 11 |
| 2. Aim and scope of the dissertation | 13 |
| 2.1. Research questions | 13 |
| 2.2. Methodological approaches | 15 |
| 2.2.1. The survey design | 15 |
| 2.2.2. The estimation technique | 16 |
| 2.3. Structure and contribution of this dissertation | 19 |
| 2.3.1. Chapter 3 – Some like it hot: The role of environmental concern and comfort expectations in energy retrofit decisions | 20 |
| 2.3.2. Chapter 4 – Shall I open the window? Policy implications of thermal-comfort adjustment practices in residential buildings | 22 |
| 2.3.3. Chapter 5 – On the prosumers' side of the electricity markets: preferences and opportunities for photovoltaic systems with storage | 23 |
| 2.4. Limitations and drawbacks of the methodology applied | 25 |

| | |
|--|-----------|
| 2.5. Scope for future research | 27 |
| 2.6. Overarching conclusions | 28 |
| 3. Some like it hot: the role of environmental concern and comfort expectations in energy retrofit decisions | 31 |
| 3.1. Introduction | 31 |
| 3.2. Methodology | 35 |
| 3.2.1. From the qualitative interviews to the research hypotheses | 35 |
| 3.2.2. The sample | 37 |
| 3.2.3. The design of the Discrete Choice Experiment | 38 |
| 3.3. Data analysis | 43 |
| 3.3.1. Econometric modeling of comfort preferences | 43 |
| 3.3.2. Results | 44 |
| 3.4. Discussion and conclusion | 54 |
| 4. Shall I open the window? Policy implications of thermal-comfort adjustment practices in residential buildings | 57 |
| 4.1. Introduction | 57 |
| 4.2. Methodology | 61 |
| 4.2.1. Research hypotheses | 61 |
| 4.2.2. The sample | 63 |
| 4.2.3. The design of the Discrete Choice Experiment | 64 |
| 4.2.4. The model | 66 |
| 4.3. Results | 68 |
| 4.4. Data quality and robustness checks | 73 |
| 4.5. Conclusions and policy implications | 77 |
| 5. On the prosumers' side of the electricity markets: preferences and opportunities for photovoltaic systems with storage | 81 |
| 5.1. Methodology | 84 |
| 5.1.1. The research hypotheses | 84 |
| 5.1.2. The data | 87 |
| 5.1.3. The design of the Discrete Choice Experiment | 88 |
| 5.2. Data analysis | 90 |
| 5.2.1. The econometric model | 90 |
| 5.2.2. Results | 93 |

| | |
|---|------------|
| 5.3. Conclusions and policy recommendations | 104 |
| Appendices | 123 |
| A. Survey on indoor climate and energy use in Germany | 125 |
| B. Survey on residential small-scale photovoltaic systems in Italy | 147 |