



POLICY BRIEF

Homeowners' Valuation of the Minergie Technology

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Executive Summary

- Homeowners are willing to pay a premium of 6% to 7% of the monthly rental value for the Minergie certification.
- Homeowners who live in Minergie-certified homes value the comfort ventilation system between 80 and 260 CHF/month; those valuing indoor air quality are in the upper end of this range.
- Homeowners who do not live in Minergie-certified homes fall into two categories: one fraction report no value for the ventilation system, and a second fraction highly value the improved indoor air quality provided by Minergie technology through its ventilation system.

Outline

Swiss government agencies, both at federal and cantonal levels, have issued several measures aiming to generate a substantial reduction in energy consumption in the building sector. For instance, energy-efficient renovations are promoted via subsidies, information programs, and energy-efficiency labels, and

construction of new energy-efficient buildings is regulated via strong energy-efficiency building codes, promotion via information campaigns, and subsidies for construction of Minergie-certifiable buildings.

Minergie buildings are characterised by low energy consumption that results from high-quality insulation and an energy-saving and comfort ventilation system (ESV) and from using renewable energy sources. ESV can be characterised as providing three non-energy-related co-benefits: indoor air quality (IAQ), noise reduction, and thermal comfort, which are in addition to energy savings.

In cooperation with the Statistical Office of the Canton of Zurich, we implemented a household survey with which in early 2020, we reached out to 16,700 homeowners living in single-family homes in the Swiss Canton of Zurich. We stratified the sample to have a large enough percentage of homeowners who had conducted a renovation recently and a sufficient sample of Minergie owners. Each household received a mailed invitation letter with a lottery entry as an incentive to participate. We obtained a total of

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This policy brief is based on the following research papers:

- Value of Co-Benefits from Energy Saving Ventilation Systems—Contingent Valuations on Swiss Homeowners, Nina Boogen, Massimo Filippini, and Adan L. Martinez-Cruz; Available at the ETHZ Library under: <https://doi.org/10.3929/ethz-b-000535197>
- Conditional Topic Allocations for Open-Ended Survey Responses, Tobias Wekhof; Available at SSRN under: <https://dx.doi.org/10.2139/ssrn.4190308>

3,471 responses to our survey, of which 524 were Minergie owners (2,947 responses were from conventional building owners).¹ In this policy brief, we first summarise the results arising from an analysis that estimates the market premium of the Minergie-certification label on housing prices. Second, we outline results from a second study that estimates the value of the comfort ventilation system.

Housing value and energy efficiency

When prospective homeowners are deciding what type of building to invest in, financial considerations and their personal preferences are closely intertwined. To understand the potential for energy-efficient buildings, it is important to know if homeowners are willing to pay a premium to live in a Minergie-certified building. In practice, however, this is a challenge because homeowners could pay a premium for preferences that often occur with Minergie-certified buildings but which are not associated with the technology per se (e.g. architecture or dwelling size).

With the household survey, we analysed the housing value for Minergie-certified and conventional homes with a hedonic regression, using the self-declared rental value as a proxy.² On average, Minergie-certified homeowners declared a higher rental value for their home by 494 CHF. However, this can be due to multiple factors, including building characteristics such as location or dwelling size and personal characteristics such as income. Indeed, most of the premium can be explained by Minergie-certified homes' inhabitants' higher incomes.

People buy houses according to preferences such as the location and modern architecture, which can be correlated with Minergie-certified homes; other homeowners may invest in an older building and subsequently remodel it. Individual preferences may also be associated with higher rental values, as in the case of homeowners who place high importance on their buildings' aesthetics and might be willing to pay a premium for these attributes. If, coincidentally, in addition to their energy efficiency, Minergie-certified buildings also have aesthetic benefits, determining if a Minergie-certified homeowner is willing to pay a higher price because of energy efficiency or the aesthetics may be difficult. For this reason, we also inquired into homeowners' preferences with respect to housing and analysed the rental-value premium associated with each preference. To that end, we presented respondents with several attributes, such as noise protection or location, and asked them to rate these attributes on a scale of how much it contributes to their personal satisfaction with their home. We found location, floor space, and noise protection are positively associated with a higher housing value. In a novel methodological approach, we used open-ended text questions to elicit elements that homeowners positively as-

sociate with their homes. Traditional closed-ended questions, with which respondents rate the importance of each attribute on a scale, could suffer from an elicitation bias (i.e. respondents might give a rating to an attribute they would not have thought about prior to the survey). In contrast, the open-ended text questions provide the top-of-mind elements positively associated with the respondent's home. With this approach, we can control for individual preferences and the sentimental value people associate with their homes. Using a machine learning approach, we incorporated the information contained in the text answer into several model specifications. This gives us the possibility to use two complementary approaches.

The empirical results obtained by estimating several model specifications and using both the classical approach based on closed-ended questions and the novel approach based on open-ended responses suggest a Minergie-certification premium of around 300 CHF. To note that not all specifications yield a statistically significant result. This magnitude represents 6% to 7% of the rental price and is statistically significant.

The value of co-benefits and the ventilation system

For household decision makers and real estate companies deciding between building a new house equipped with an energy-saving and comfort ventilation system (ESV) or a new conventional house, it is important to consider the costs and benefits of both alternatives. Benefits in this context arise not only as energy savings but also as co-benefits, such as improvement in indoor air quality, noise reduction, and thermal comfort. However, information about the monetary value of such co-benefits is rather rare, and household decision makers and real estate companies thus tend to not consider them in their investment analysis.

To measure the value homeowners place on the comfort ventilation system, we analysed two groups of owners: owners of Minergie-certified homes who have already experienced the ventilation system and conventional homeowners who have not experienced the ventilation system. Both groups first received basic information about the benefits of these ventilation systems with respect to not only energy savings but also co-benefits, such as improved air quality, thermal comfort, and noise reduction. The Minergie-certified homeowner group was presented with a hypothetical scenario in which their ventilation system was broken, and they had to wait three months for the repairs. The scenario included a monthly compensation for the waiting time, which was a random bid between 40 CHF and 240 CHF (the bids were one of the following numbers: 40/80/120/160/200/240 CHF). Minergie-certified homeowners were asked if they deemed their compensation as sufficiently high or not (willingness to accept). Conventional homeowners were asked a similar question

¹ Unfortunately, no statistical information on socioeconomic variables for Minergie-owners is available. Therefore, we cannot provide information on the representativeness of the sample.

² In Switzerland, homeowners are aware of the rental value of their property for taxation reasons.

with the same random monetary values. However, because they have no experience with the ESV system, the conventional-homeowner respondents were asked a question on their hypothetical willingness to pay a specific monthly amount for a ventilation system for the next 20 years (analogously, a random number between 40 CHF and 240 CHF).

Figure 1 shows the share of respondents who accepted the random bid. In the left panel, the share of owners of Minergie-certified houses who have experience with the ventilation system and were asked to wait for the repairs on their ESV. As expected, these percentages increase as bids increase. Around 30% of respondents answered yes to the lowest bid (CHF 40); and the highest bid (CHF 240) received around 59% of yes responses. The dotted line above the solid line reflects percentages arising from the sub-sample of respondents who consider indoor air quality (IAQ) as important for satisfaction with their home. The dotted line below the solid line reflects percentages arising from the sub-sample of respondents who consider IAQ as not important for their satisfaction. Indeed, Figure 1 visually suggests respondents in the Minergie-certified houses sample who consider IAQ

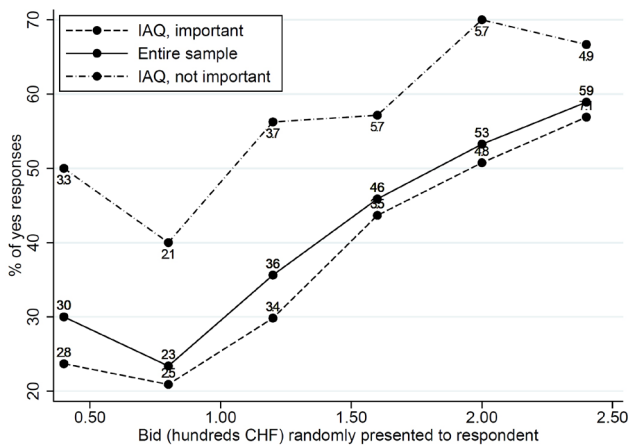


Figure 1: Percentage of respondents owning Minergie-certified-homes, who accepted a bid for the ventilation system. The middle graph represents all Minergie-certified-home owners, and the upper and lower graphs consist of a subset of respondents, depending if they put a high or low importance on indoor air quality (IAQ).

an important element of satisfaction require higher compensation to wait to use ESV.

In Figure 2, we show the results from homeowners of conventional homes; they do not have experience with ESV. As expected, these percentages decrease as bids increase. Around 38% of respondents answered yes to the lowest bid (CHF 40); and the highest bid (CHF 240) received around 19% of yes responses. Because the respondents answering the willingness-to-pay (WTP) bids have not experienced the IAQ provided by an ESV, a binary variable reflecting whether there are household members with allergies is used as proxy of relevance of IAQ. Consistently with the visual finding seen in the left panel, it also visually suggests respondents in the conventional house sample who report allergies in their household are willing to pay more for ESV. However,

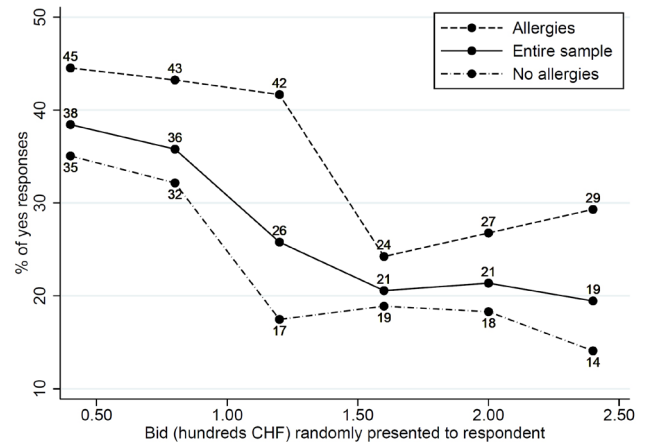


Figure 2: Percentage of respondents owning conventional-homes, who accepted a bid for the ventilation system. The middle graph represents all conventional-home owners, and the upper and lower graphs consist of a subset of respondents, depending if a member of their household has allergies.

note also around 60% of the households receiving the lowest bid did not accept it; this thus shows they were unwilling to pay for the ESV.

The empirical evidence suggests the valuation of the ventilation system varies across types of households. Homeowners who value indoor air quality are willing to pay for the ventilation system between 160 CHF and 260 CHF, independently if they live in a Minergie-certified building or not. Homeowners who do not emphasise the importance of indoor air quality tend to give a lower value to the ventilation system. For Minergie-certified homeowners in that group, the willingness to pay is around 80 CHF for the ventilation system. Whereas homeowners living in conventional buildings and who do not place importance on indoor air quality are not willing to pay any amount for a ventilation system.

A cost-benefit analysis with our valuation estimates of the value of co-benefits (CHF 181 or CHF 163, respectively) yields benefits that are twice as much as costs, thus justifying investment in ESV systems in the residential sector. Estimated costs used in this cost-benefit exercise arise from a back-of-the-envelope calculation yielding a range of values between CHF 88 and CHF 96 for monthly expenses arising from acquiring an ESV system.

Conclusion

Households and real estate professionals alike are confronted with a complex set of information when it comes to energy-efficient housing. Construction of Minergie-certified buildings is characterised by higher initial costs in the range of 5% to 10% (Salvi et al., 2008). The higher value of energy-efficient housing is closely intertwined with other housing characteristics such as the location, size, and owners' individual preferences. Our results indicate the Minergie-certification premium at about 270 CHF, which corresponds to 6% of the monthly rental value (the average rental value for Minergie-certified buildings in our sam-

ple is at 4425 CHF). In a second study, we find the value of co-benefits (such as the indoor air quality) from the Minergie-certified ventilation system is estimated at a monthly value between 80 and 180 CHF, depending on the experience with the Minergie technology and preference for indoor air quality. A fraction of homeowners of conventional homes have reported no WTP for the co-benefits of ESV; however, this zero WTP may become positive if they experience ESV.

Implications and Policy Recommendations

Information campaigns and educational programs may be designed to include tools that support decision makers in companies and households. Specifically, our results suggest an opportunity to design perhaps a label not only reflecting houses' energy-saving features (Minergie-label) but also communicating more effectively the presence and value of co-benefits from such energy saving features (e.g. a Comfort and Energy Saving House label). Our results confirm that the existing information on the co-benefits provided by Minergie is important to homeowners.

References

Salvi, M., Horehájová, A., and Müri, R. (2008). Der Nachhaltigkeit von Immobilien einen finanziellen Wert geben – Minergie macht sich bezahlt [Giving a financial value to the sustainability of real estate—Minergie pays off]. Technical report, Center for Corporate Responsibility and Sustainability, University of Zurich.

Nina Boogen, Massimo Filippini, and Adan L. Martinez-Cruz (2022). Value of Co-Benefits from Energy Saving Ventilation Systems—Contingent Valuations on Swiss Homeowners. Available at the ETHZ Library under: <https://doi.org/10.3929/ethz-b-000535197>

Tobias Wekhof (2022). Conditional Topic Allocations for Open-Ended Survey Responses. Available at SSRN under: <https://dx.doi.org/10.2139/ssrn.4190308>

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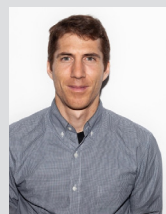
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