Motivations for Investment in Smart Technologies and Energy Efficiency

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Objectives

- RQ1 (building owners): Effect of past renovation activities and impact of taxes and subsidy programs on investment behavior
- RQ2 (home owners): Role of experience and complexity in investment decisions
- RQ3 (tenants and owners): Various trade-offs impacting investment decisions across different population segments
- RQ4 (tenants and owners): Relative effectiveness of various policy schemes and psychological levers on investment preferences
- This presentation's focus is on RQ2 to RQ4

Outline

- Summary of Main Findings
- Methodology
- Results with figures:
  - Home Owners' Intentions and Stated Preferences
  - Tenants' Stated Preferences
- Conclusion

Main findings (I)

- Willingness to invest: glass half-full or half-empty?
  - Choice experiments show a significant WTI in energy-related projects for both owners and tenants
  - But, this could be limited to certain groups (strong heterogeneity exists across investment types and individuals)
  - Also, involving tenants is far from obvious since collective investment is not appreciated
- Subsidies could represent a central instrument of the energy transition:
  - Historical data reveals a link between subsidies and retrofit rates
  - Experiments suggest that subsidies are appreciated beyond what is expected from their cost saving impact
- It is not clear whether gas network accelerates moving away from heating oil or slows down the adoption of heat pumps:
  - Without the opportunity to install a gas system, it is possible that investors would switch directly from oil systems to heat pumps or wood heating systems

Main findings (II)

- What to do with CHF 10’000 unexpected funds?
  - Investment in their buildings is a priority for a substantial share of home owners (44% of SFH owners, 25% of flat owners).
    - But inside renovations are favored by most of these owners (especially flat owners)
  - A minority of SFH owners (about 15%) are ready to consider energy-related investments especially renewables
- Flat owners and tenants tend to prefer purchasing renewable energy (heat and electricity) rather than own investment
- There is no evidence for any preference for collective investments
- The evidence for appreciation of smart technologies is quite limited:
  - Only a specific combination is appreciated by SFH owners

Main findings (III)

- The data do not show any clear evidence of any effect of the studied policy measures. This includes CO_2 levy or its increase:
  - Two exceptions emerge:
    - There is a general appreciation of subsidies among all groups (including tenants)
    - Stringent regulation such as CO_2 caps may be relatively effective
- There is strong heterogeneity among respondents indicating variability in opportunity costs of investment
  - There is no one-size-fits-all policy
  - Geographical location, building's age, and the investor's age and education are important dimensions that could be considered to tailor policy programs

Methodology: surveys

Analysis / Research Question	Description	Data
Analysis 1 **RQ1**	Analysis of revealed preferences of owners to address RQ1 Renovation of building elements and heating systems	Cantonal and period variations in retrofit rates 1991-2019
Choice Experiment 1 (2020) owners **RQ3 & RQ4**	Stated preferences analysis of owners (6 choice tasks per respondent)	Cantons survey: 1025 owners including 88 flat owners, across 19 cantons SHEDS 2020: 426 owners, including 120 flat owners

Methodology: surveys

Analysis / Research Question	Description	Data
Choice Experiment 2 (2021) owners RQ2	Stated preferences analysis of owners (4 tasks per respondent)	SHEDS: 1639 owners including 489 flat owners and 58 MFH owners Cantons survey: 142 owners including 35 MFH owners, from canton Zurich Pronovo data: 2341 owners, incl. 31 flat owners and 138 MFH owners
Choice Experiment 3 (2020) tenants RQ3 & RQ4	Stated preferences analysis of 680 tenants (6 choice tasks per respondent)	SHEDS: 680 tenants

An illustration of a choice task

	Option 1	Option 2
	Photovoltaikanlage 	**Energetische Verbesserung der Gebäudehülle** 
Kosten	40 CHF pro Monat	130 CHF pro Monat
Nutzen: Einsparung von nicht erneuerbarer Energie und CO_2-Emissionen	40%	40%
Finanzierung	Ihr Vermieter	Ihr Vermieter
Batteriespeicher	Ohne	Ohne

	Option 1	Option 2	Keine der beiden
Ihre Wahl:	○	○	○

Econometric analysis

- Revealed preferences (actual renovations):
  - Retrofit rates are analyzed by a series of panel data regression models
- Experimental data (discrete choice experiments):
  - Hypothetical choices in repeated choice tasks are analyzed by a series of mixed logit models
- Self reported preferences and intentions:
  - Responses to a selection of pre- and post-experiment questions are analyzed using descriptive methods

Self-reported intensions

- % share by intended usage of an unexpected tax refund of CHF 10k

	Flat owners	SFH owners
Invest in financial market	11	7.9
Save for retirement	30	22
Purchase new car	1	2
Spend for vacation	6	5
Buy EE appliances	10	9
Use it for my flat	24	-
Use it for my house	-	44
Other usage	17	10
Total	100	100
Number of respondents	208	1,234

Self-reported intensions

- % share of those owners interested in dwelling investment

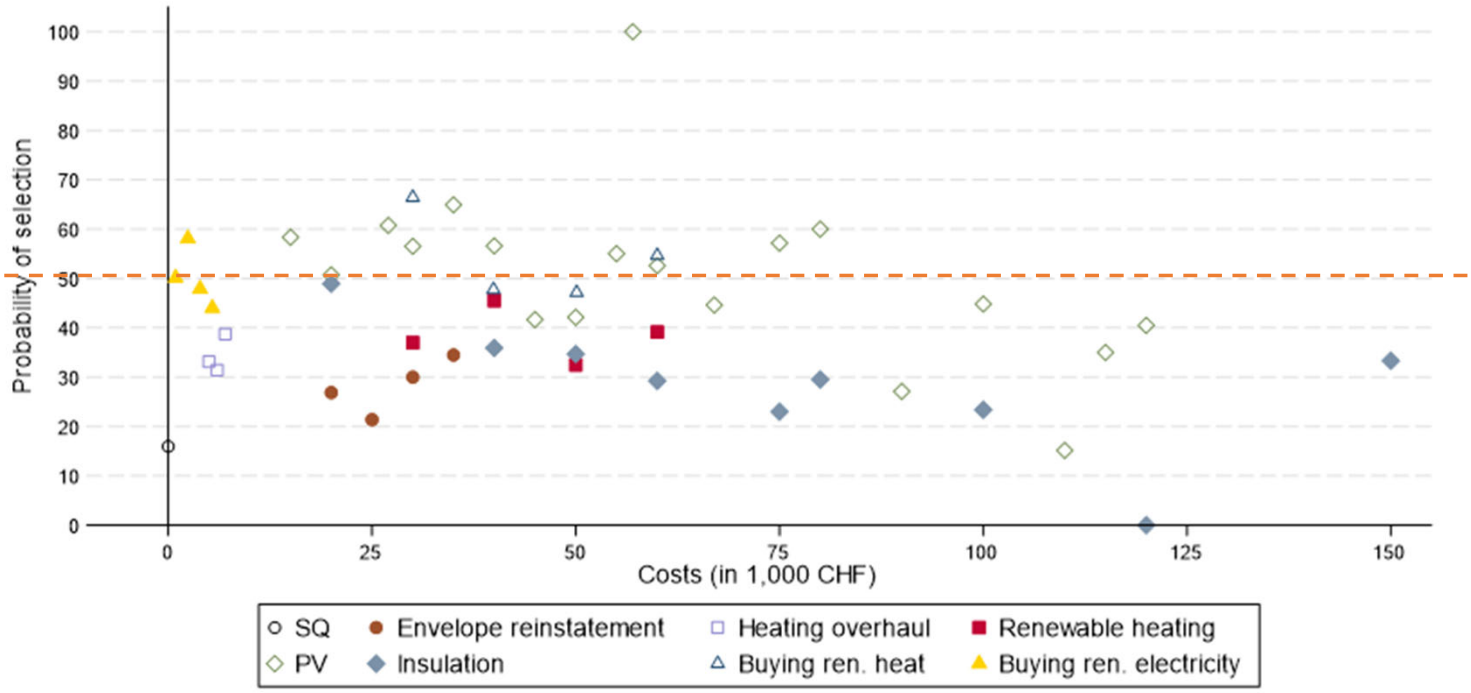
	Flat owners	SFH owners
Repair of facade or roof	1	7
Inside addition or renovation	14	16
Heating system	3	7
Solar panel	2	8
Other usage	4	6
Total	24	44
Number of respondents	51	541

Owners (in %) who never, sometimes, or always select a specific investment when it is offered

	Status Quo (None of the two)	Envelope Reinstatement	Heating Overhaul	Renewable Heating	PV	Insulation	Buying Renewable Heat	Buying Renewable Electricity
Never	67	68	38	40	23	47	36	46
Sometimes	28	11	50	34	50	43	14	11
Always	5	22	11	26	27	10	49	43
Number of respondents	1451	831	224	361	1449	1134	247	1022
Number of offered choices	8561	1348	993	1063	6503	5060	413	1742

DCE 1: owners' stated preferences

Energy investment probability by equivalent energy investment costs (in '000 CHF)

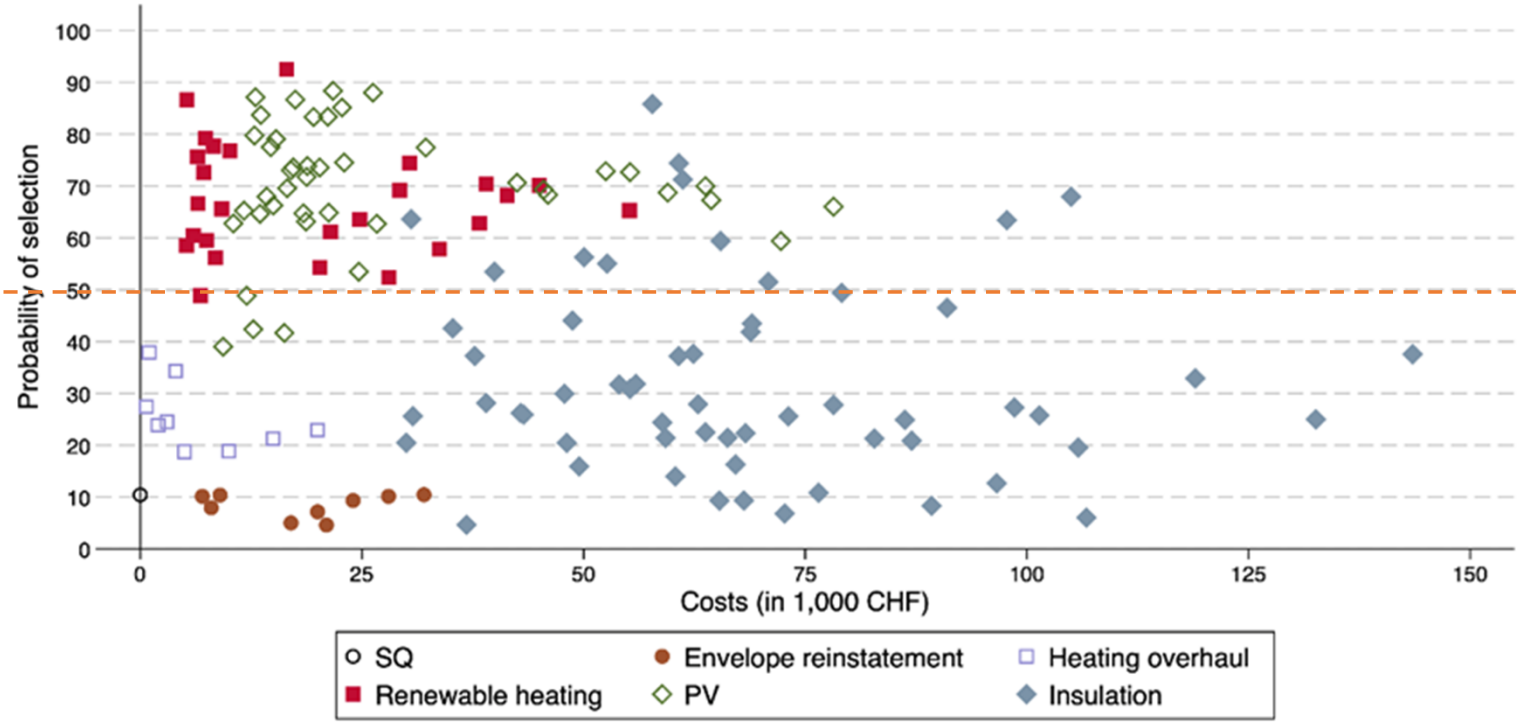


DCE 1: home owners

- General tendency for low-cost options (esp. RE purchase)
- PV is favoured over insulation

Purchase costs are calculated as add-on premiums, relative to a reference cost without investment.

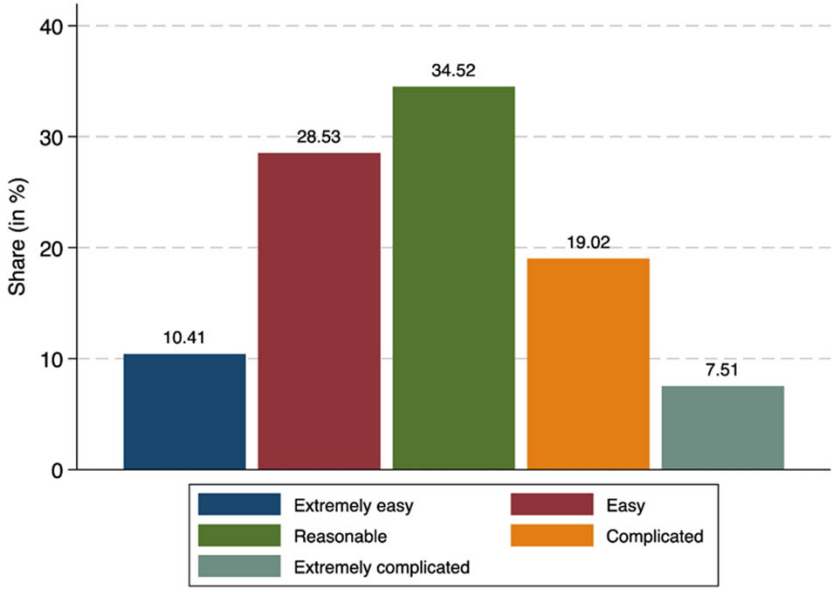
Energy investment probability by investment costs (in '000 CHF)

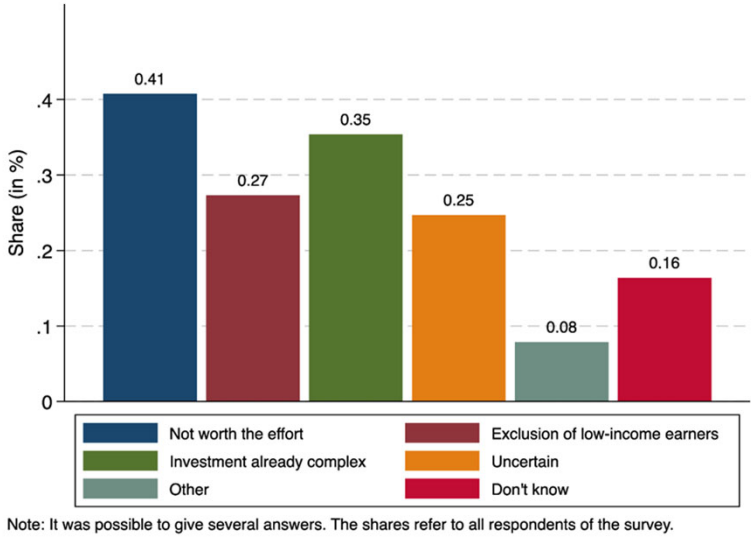


DCE 2: home owners

- General tendency for relatively low-cost options (esp. heat pumps)
- PV is favoured over insulation

Perception of the subsidy application process





Note: It was possible to give several answers. The shares refer to all respondents of the survey.

Pre-experiment questions (DCE 2): home owners

- About 27% of respondents find it complicated

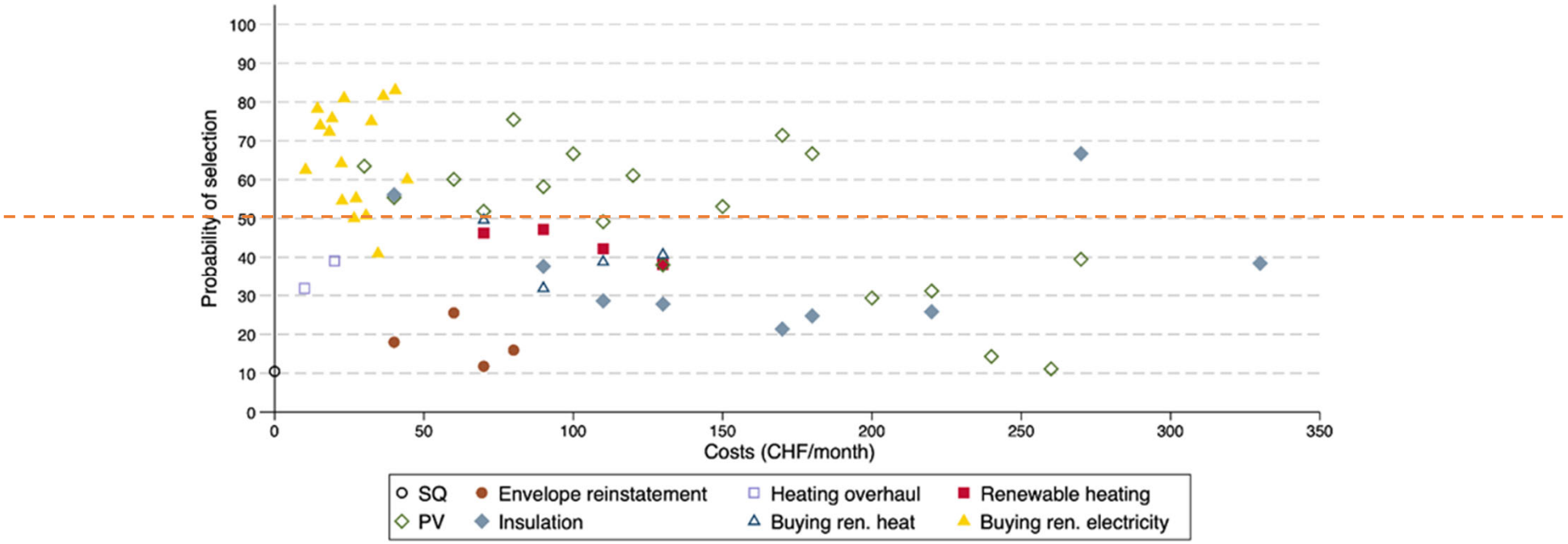
When asked further: from 25% to 40% selected “uncertainty”, “exclusion of low-income groups”, “complexity of investment decision” and “much effort for little worth” as the main problems of subsidies

Tenants (in %) who never, sometimes, or always select a specific investment when it is offered

	Status Quo (None of the two)	Envelope Reinstatement	Heating Overhaul	Renewable Heating	PV	Insulation	Buying Renewable Heat	Buying Renewable Electricity
Never	74	78	35	28	15	44	46	24
Sometimes	23	9	52	47	62	46	22	14
Always	3	14	14	25	23	10	32	61
Number of respondents	680	280	162	293	680	452	206	459
Number of offered choices	4080	458	787	906	3052	1854	335	768

DCE 3: tenants' stated preferences

Energy investment probability by monthly costs (in CHF) for tenants



DCE 3: tenants

- General tendency for low-cost options (esp. RE purchase)
- PV is favoured over insulation

Main results

- Both owners and tenants favor renewables as opposed to efficiency investments
- Investment costs stand out as a main barrier to investments
- Subsidy system can be improved regarding the inclusion of low-income groups and uncertainty
- Little evidence of any significant effect from studied policy instruments and collective financing options

Recommended actions

- Public administration:
  - Targeting substantial subsidies to potential investors from low-income groups including tenants
  - Reducing uncertainty in application process and requirements
  - Out-of-the-box policies such as targeted subsidies and facilitation measures for energy contracting options
- Energy providers and ESCOs:
  - Exploiting scale economies to finance individual projects at low upfront costs (e.g. leasing and renting)
  - Focus on renewables and large-scale connected networks of prosumers