

FutuRES-PV

Stakeholder Workshop

25.02.2025, 13:30, WIFO

Agenda

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13:30-13:45 Begrüßung und Projektüberblick

13:45-15:00 Charakteristika österreichischer Prosument:innen und
Motive und Barrieren für die Investitionen in PV-Anlagen

- Präsentation der Ergebnisse einer Haushaltsumfrage in Österreich
- Interaktive Diskussion

15:00-15:30 Ausblick und Wrap up

Projektüberblick

A Comprehensive Analysis of Future Residential PV Development in Austria

- ACRP – 15. Call
- Projektlaufzeit: November 2023 – April 2026
- Projektteam
 - WIFO
Claudia Kettner, Mark Sommer, Julia Bock-Schappelwein, Katharina Köberl, Susanne Markytan
 - AIT
Gustav Resch, Carolin Monsberger
 - RWTH
Reinhard Madlener, Ayse Tugba Atasoy, Kagan Yüksel
- Projektwebsite: <https://futures-pv.wifo.ac.at/>



- Hauptziel:

Integrierte Analyse von Diffusionsszenarien für Haushalts-PV-Systeme in Österreich

- Simulation von unterschiedlichen Diffusionsszenarien für Haushalts-PV-Systeme ("Prosumer Scenarios") mit einem neuartigen Technologiediffusionsmodell
- Evaluierung der makroökonomischen Effekte sowie der Verteilungswirkungen dieser Szenarien auf verschiedene Haushaltsgruppen (differenziert nach Einkommensquantilen und anderen relevanten sozio-ökonomischen Merkmalen)
- Entwicklung von Politikempfehlungen, die die Beteiligung vulnerabler Gruppen an der Energiewende sicherstellen

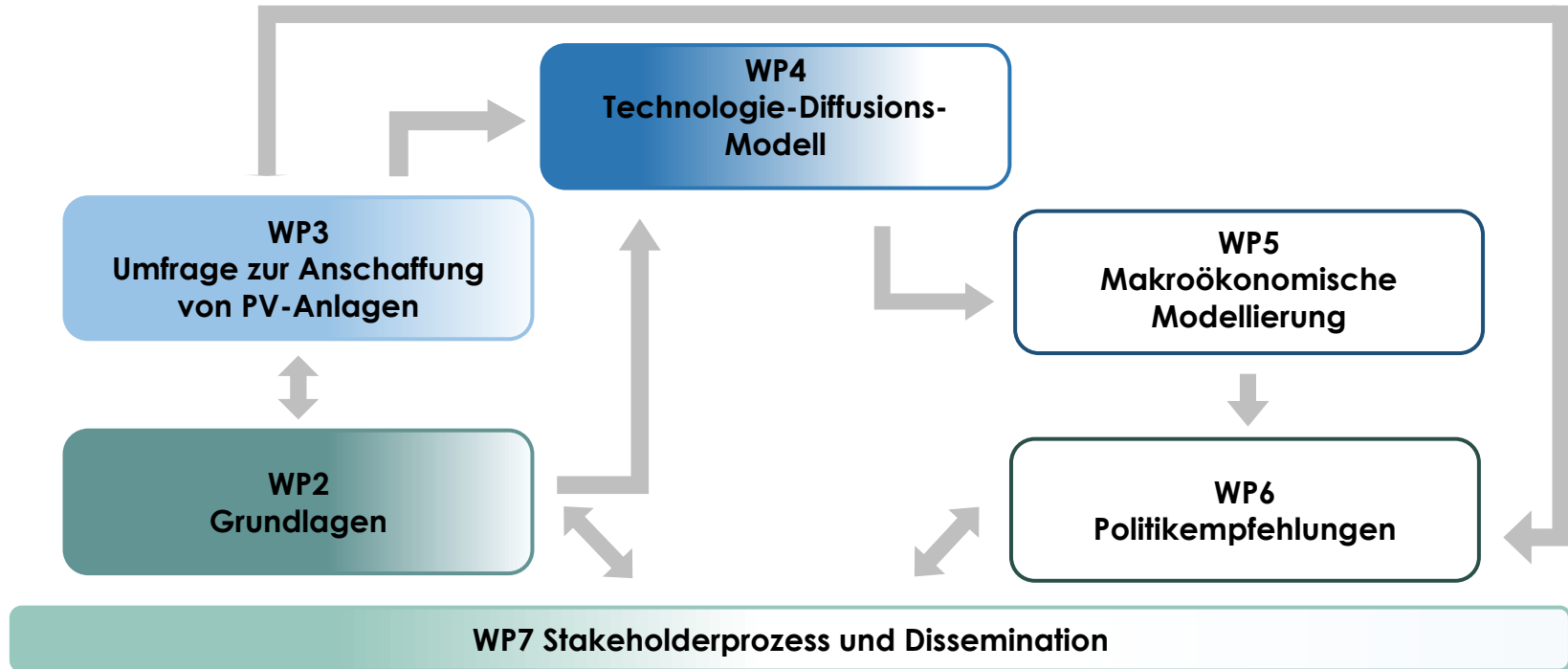
Projektziele (II)

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- Nebenziele:
 - Ermittlung von Faktoren, die die Investitionen österreichischer Haushalte in PV-Systeme mit und ohne Batteriespeicher bestimmen
(z.B. Haushaltsmerkmale, rechtliche Rahmenbedingungen und Förderprogramme)
 - Bestimmung der Motive für die Anschaffung von PV-Systemen
 - Identifikation nicht-finanzieller Barrieren für die Einführung von Haushalts-PV-Systemen
 - Entwicklung eines Technologiediffusionsmodells für Haushalts-PV-Systeme und Integration in das makroökonomische Modell DYNK

Projektstruktur

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Charakteristika österreichischer Prosument:innen und Motive und Barrieren für die Investitionen in PV-Anlagen

FutuRES-PV

WP3: Characteristics of PV Adoption (Preliminary Descriptive Analysis)

25.02.2025

Stakeholder Meeting

Dr. Ayse Tugba Atasoy

Prof. Dr. Reinhard Madlener

Introduction and Motivation

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- Despite decreasing costs and technological maturity, **adoption remains limited** due to:
 - **Financial barriers** (e.g., upfront investment costs)
 - **Technical challenges** (e.g., building structure limitations)
 - **Regulatory & administrative hurdles** (e.g., complex permission processes)
- This WP aims to identify **motives and barriers behind PV adoption** by conducting a **representative survey questionnaire** for the population in Austria.

Survey Overview

Web-based survey conducted in **January 2025** (N=1,001), **representative sample** of Austrian households by geographical location, age, and gender

- **PV adopters (n=358, ~ 36%)** and **non-adopters (n=643, ~ 64%)**

Survey Structure

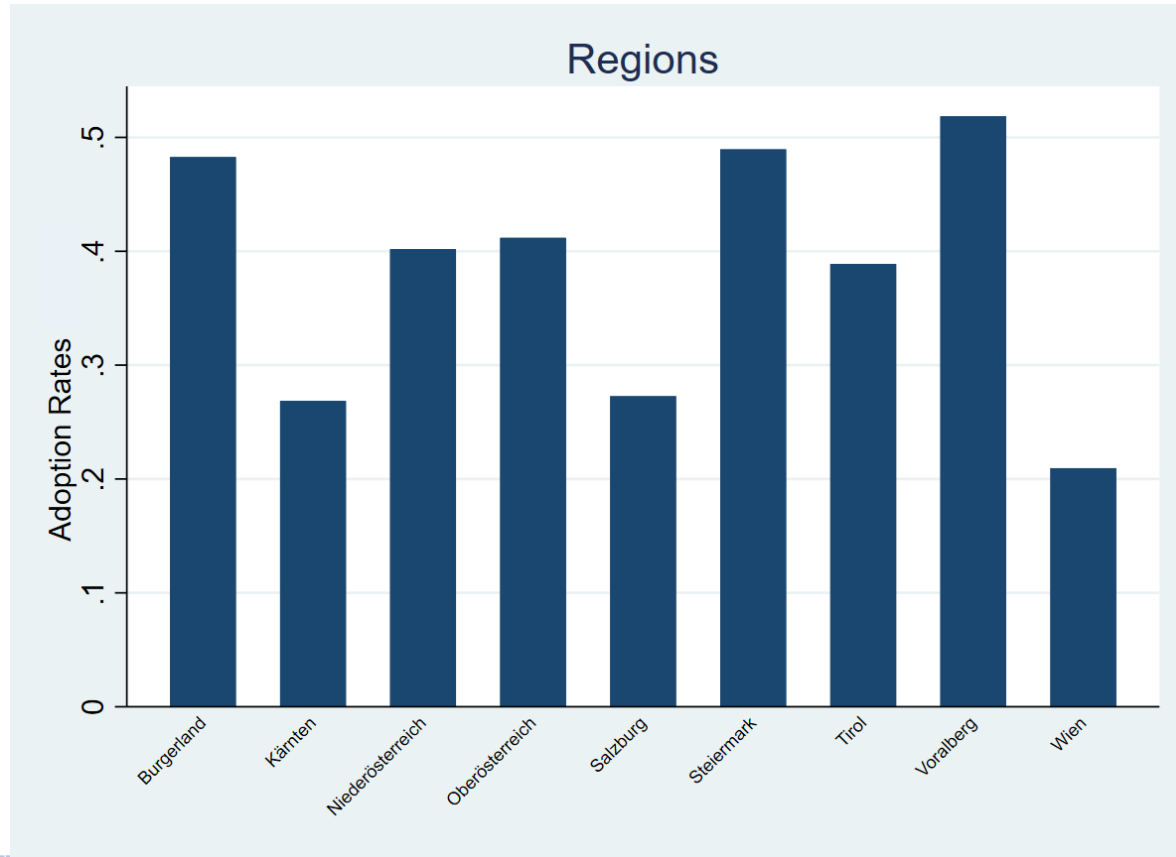
Screening questions ensured a representative sample and household head responsible for energy-related decisions, **separate sections** for adopters & non-adopters

- PV adopters: **Investment decision, utilization, complementary technologies**
- Non-adopters: **Potential interest, perceived barriers**
- **Socio-demographic data** collected (income, education, employment status)

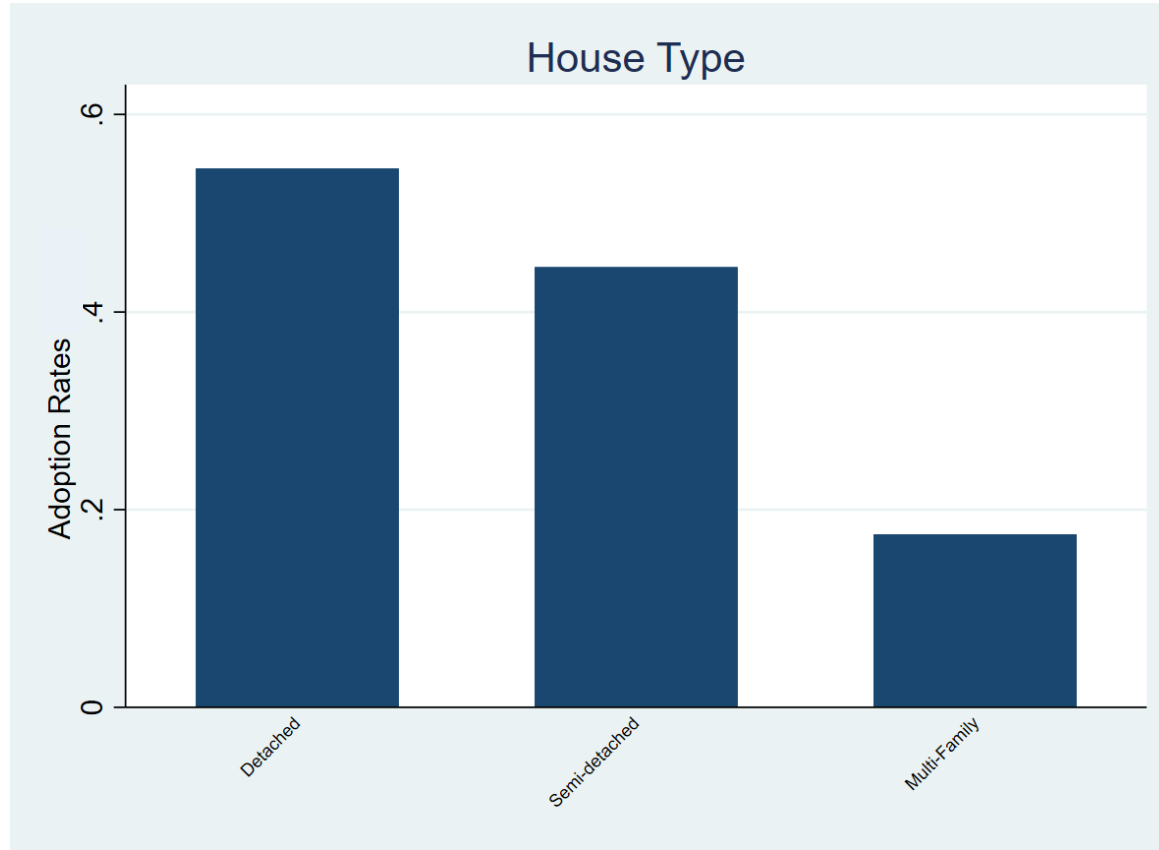
Key Question:

What are the **barriers and motivators** behind household PV adoption?

Share of PV Adopters Across Regions

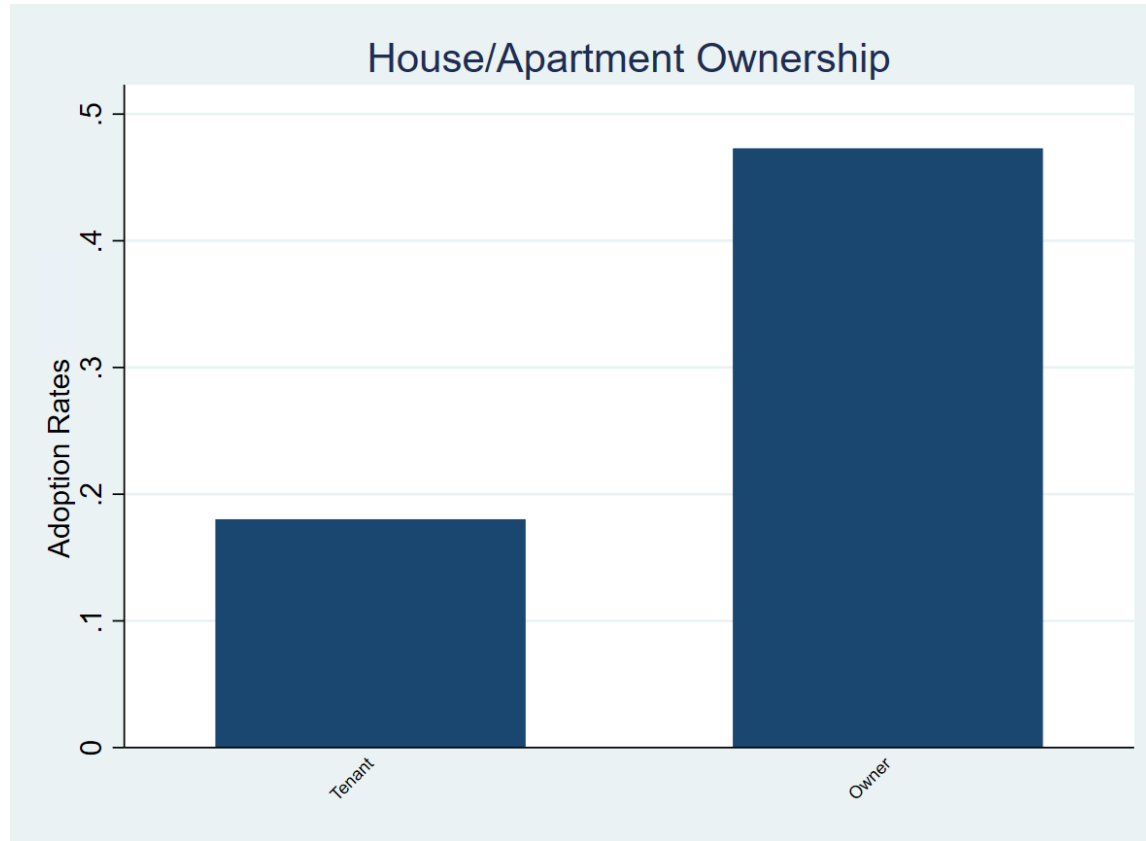


Share of PV Adopters by House Type

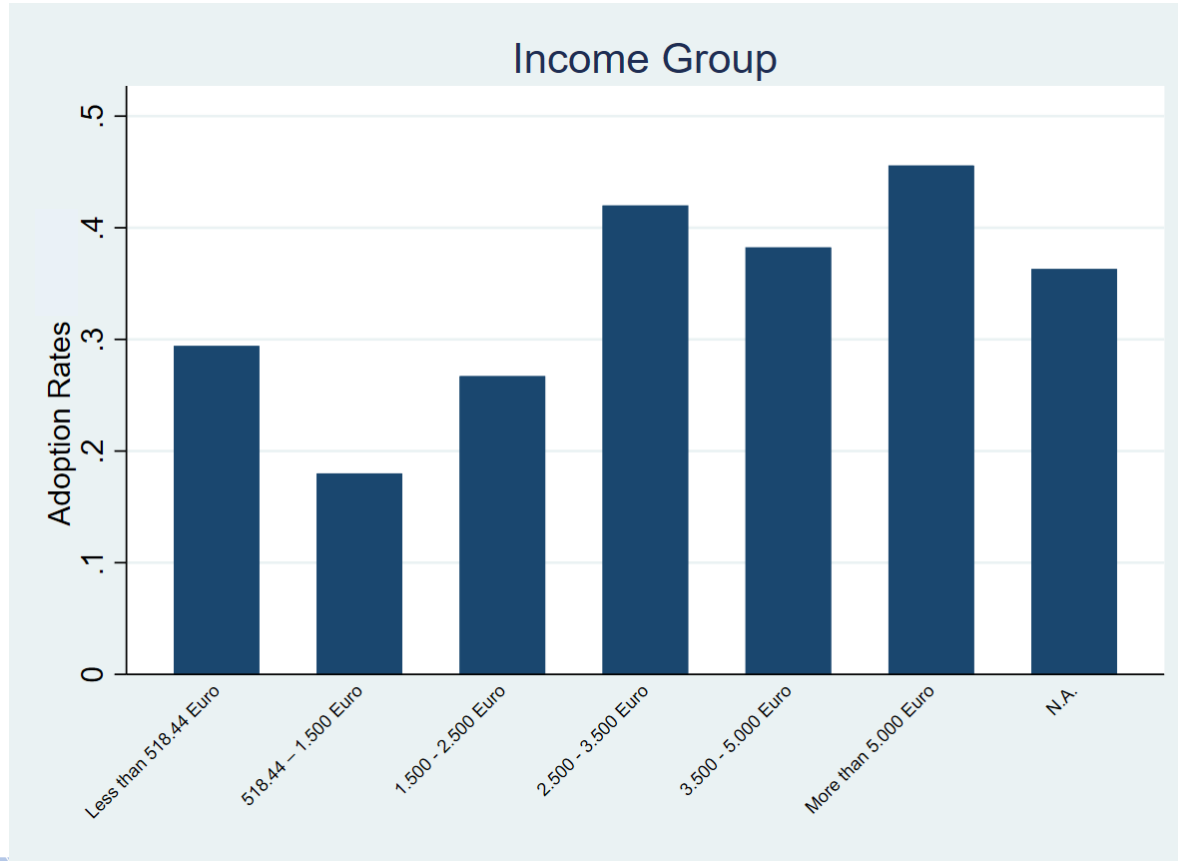


Share of PV Adopters by Occupant Status

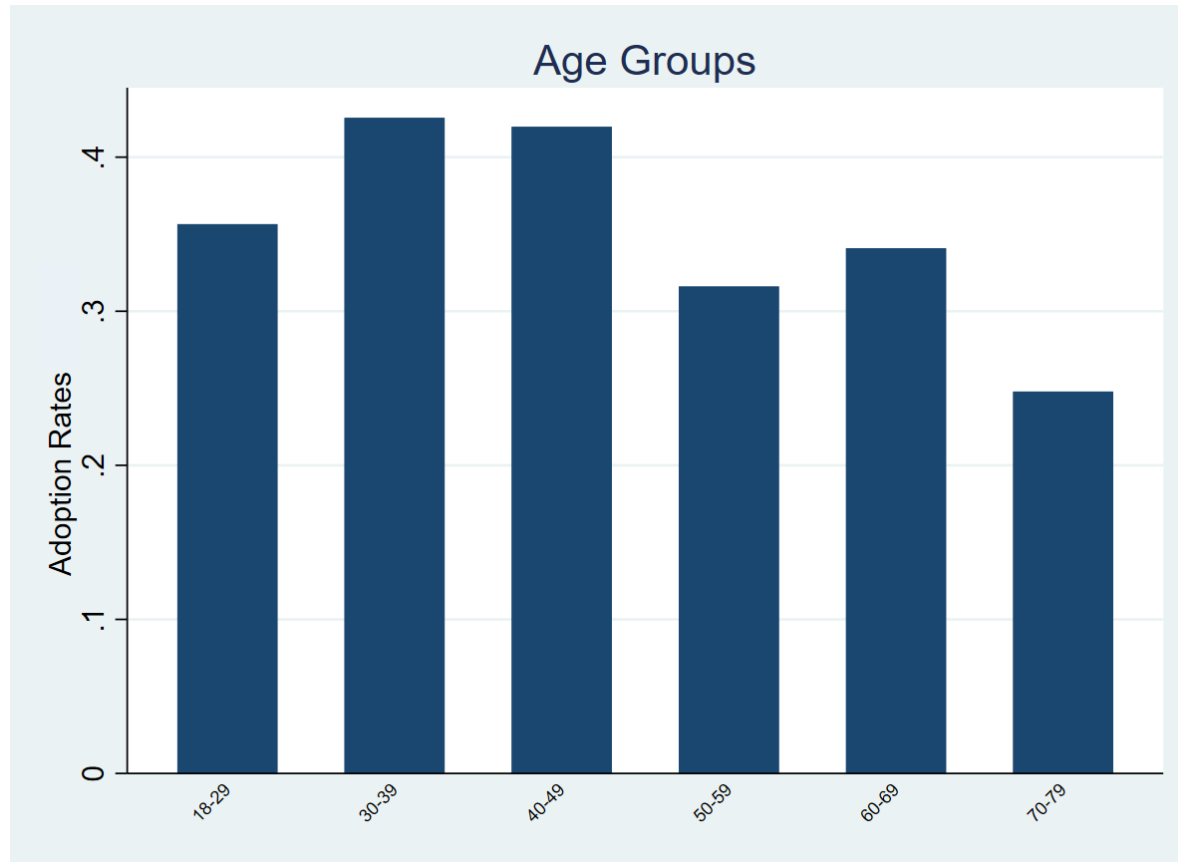
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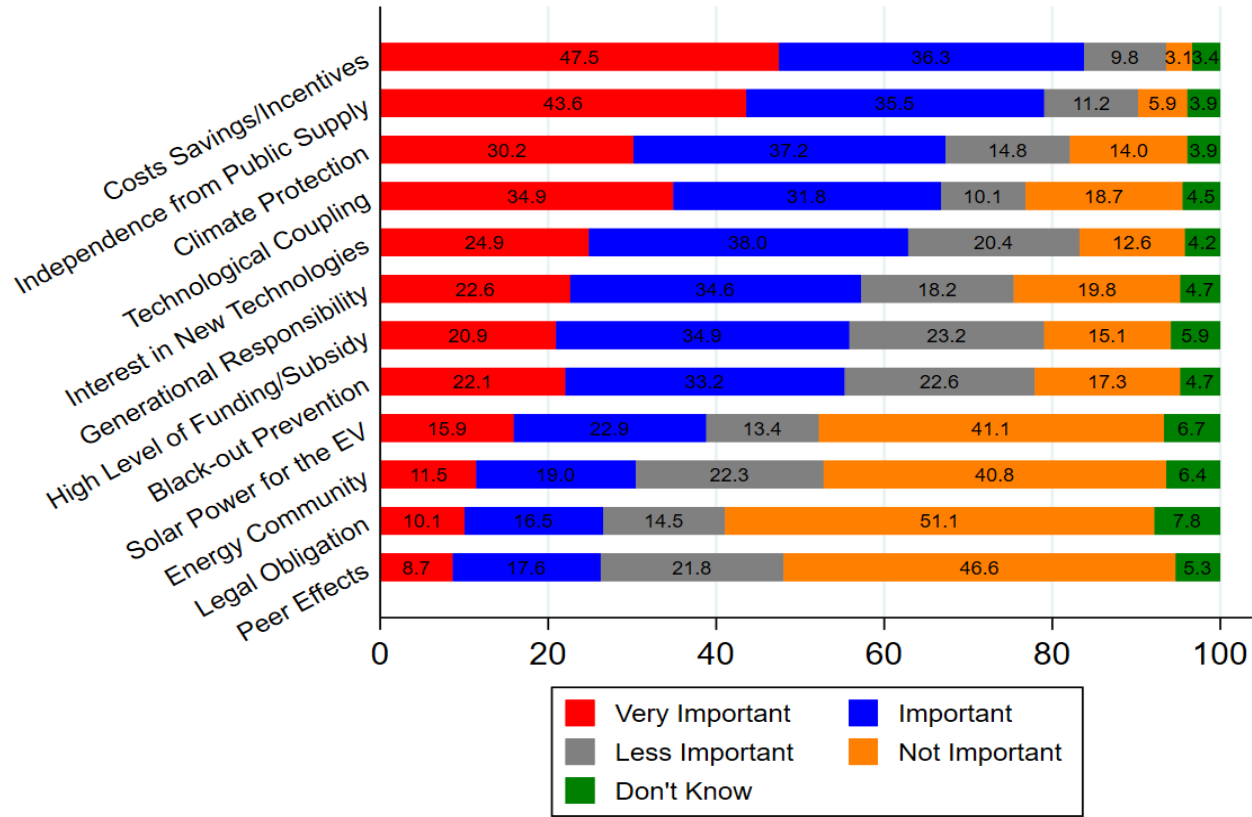
Share of PV Adopters by Income Groups



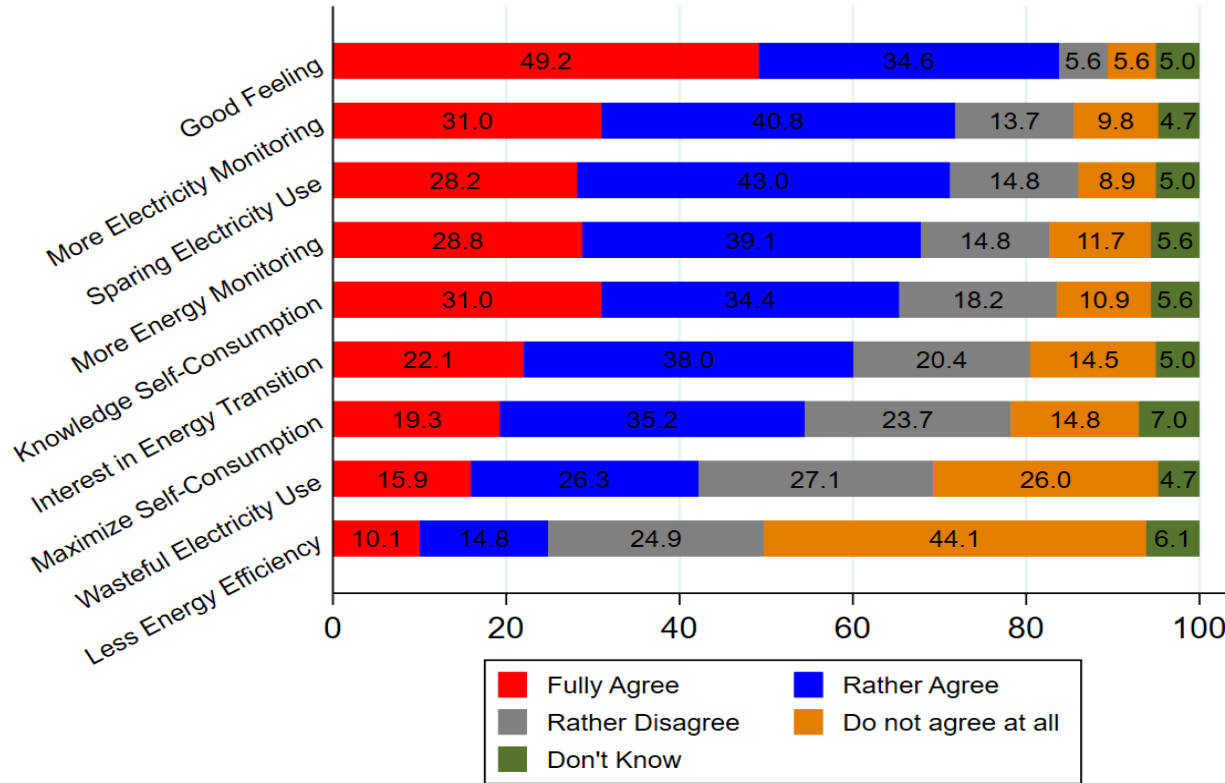
Share of PV Adopters by Age Groups



Perceived Relevance of Motivations for PV Adoption

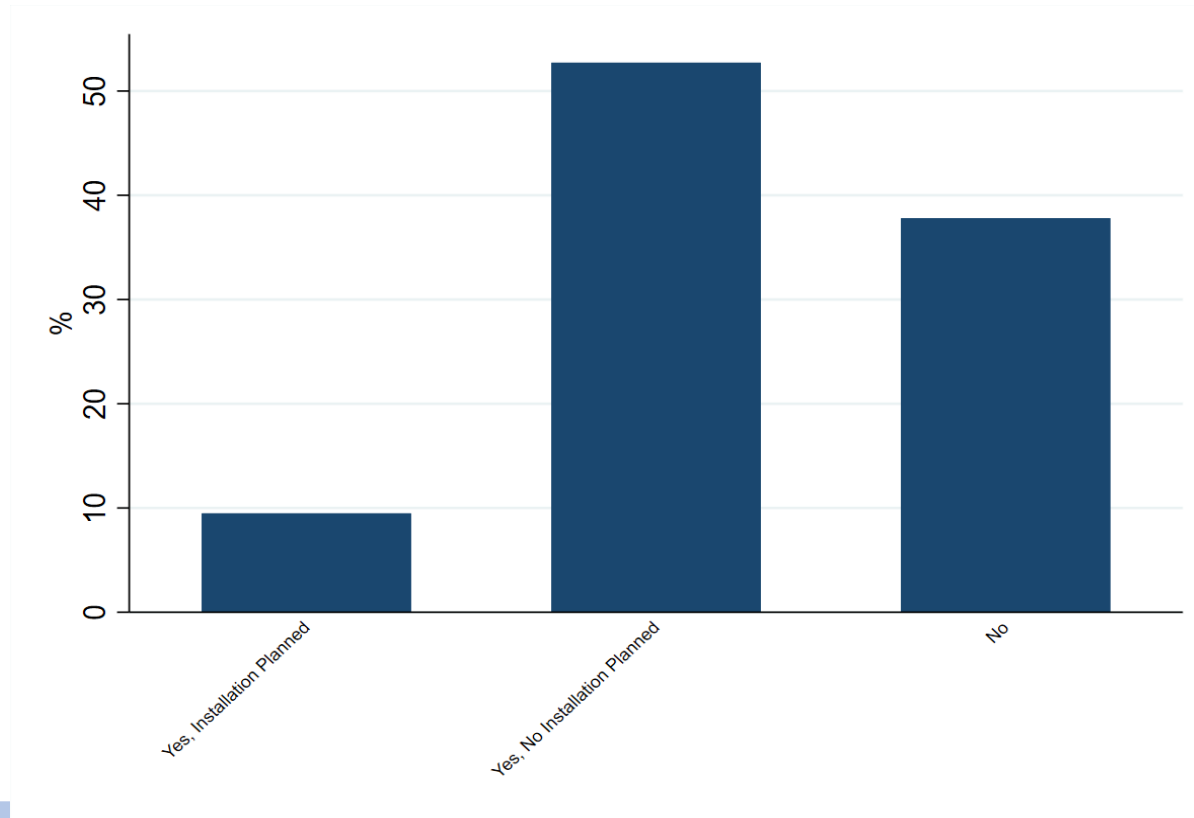


Perceived Self-Assessment After PV Adoption

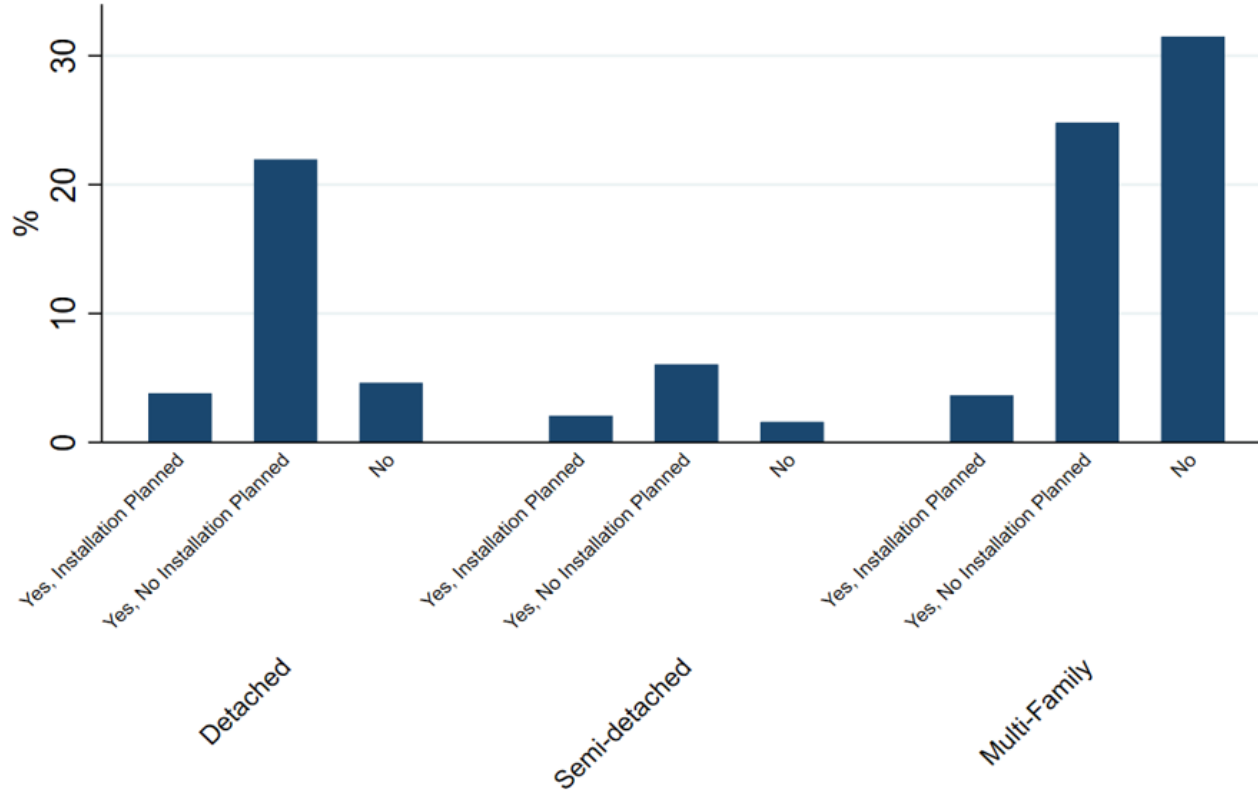


Thought of Installing a PV System?

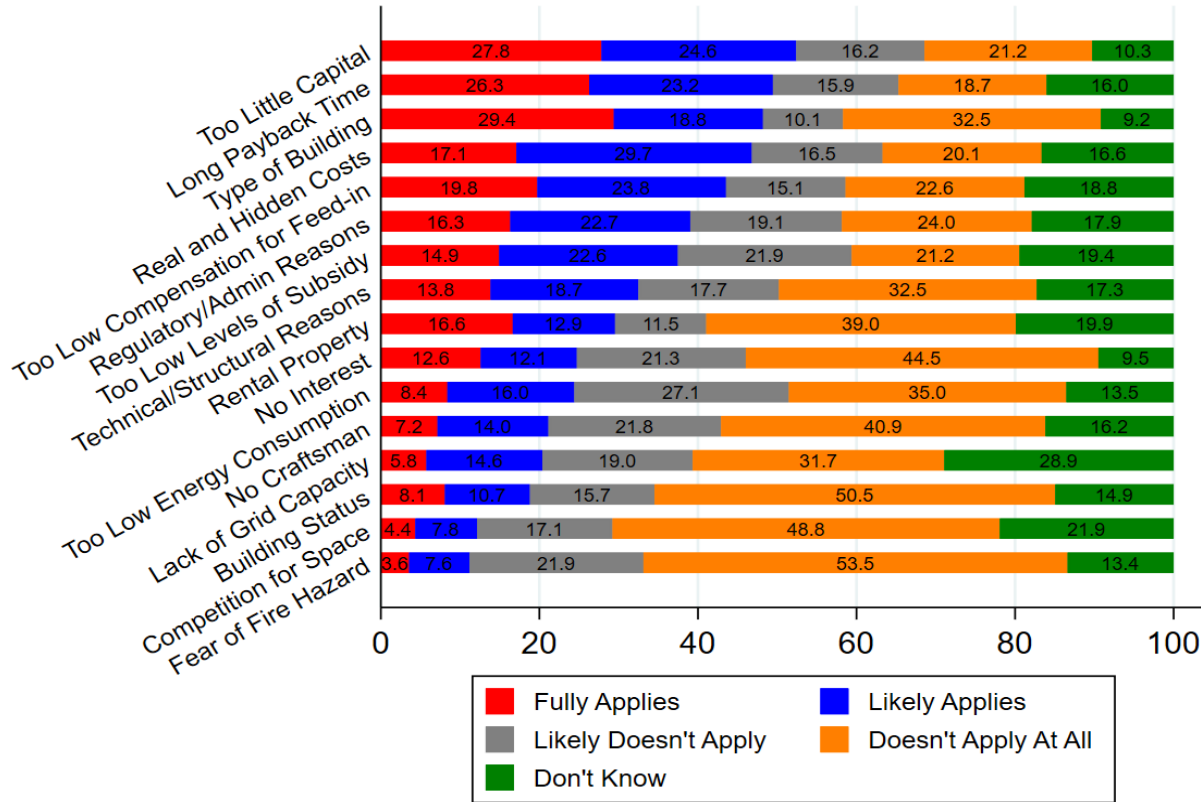
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Thought of PV Installations by House Types



Perceived Relevance of Barriers for Non-Adopters



Conclusions

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- PV Adoption is Uneven Across Regions
 - Urban areas like **Vienna** have **lower adoption rates**, likely due to **multi-family housing, ownership complexity, and regulatory barriers**.
 - Rural regions show **higher adoption**, benefiting from **detached homes with easier PV integration**.
- Housing Type Plays a Major Role
 - **Detached houses** have the highest adoption rates, while **multi-family buildings** face **administrative and technical challenges**.
 - **Shared energy communities** remain a niche solution but could be key for urban adoption.
- Financial & Psychological Factors Matter
 - **Non-adopters** cite **high upfront costs, long payback times, and low feed-in tariffs** as key deterrents.
 - **Feeling good about sustainability and energy independence** is a strong motivator for adopters.

Thank you very much for your attention!

Dr. Ayse Tugba Atasoy

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Diskussion

Diskussion: Haushaltscharakteristika

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- Was haben Sie erwartet?
- Was hat Sie überrascht?
- Gibt es aus Ihrer Sicht weitere relevante Charakteristika?

Diskussion: Haushaltscharakteristika

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- Welche Haushaltscharakteristika sind aus Ihrer Sicht am relevantesten?



Diskussion: Motive und Barrieren

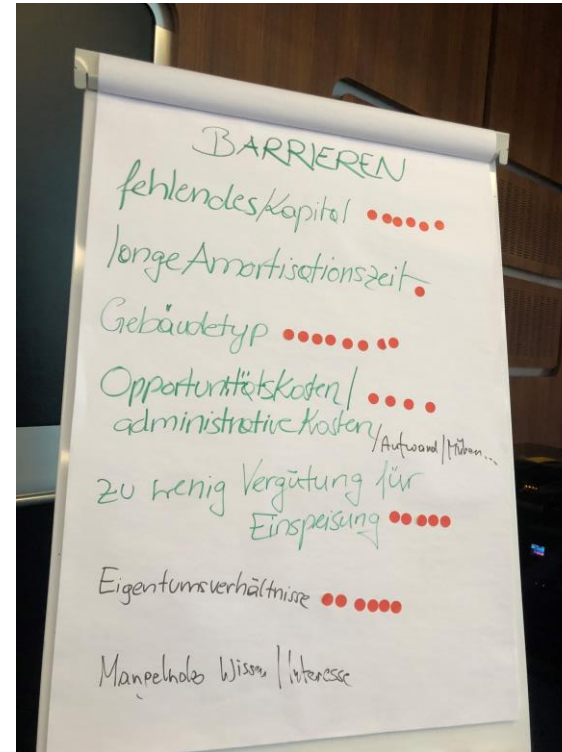
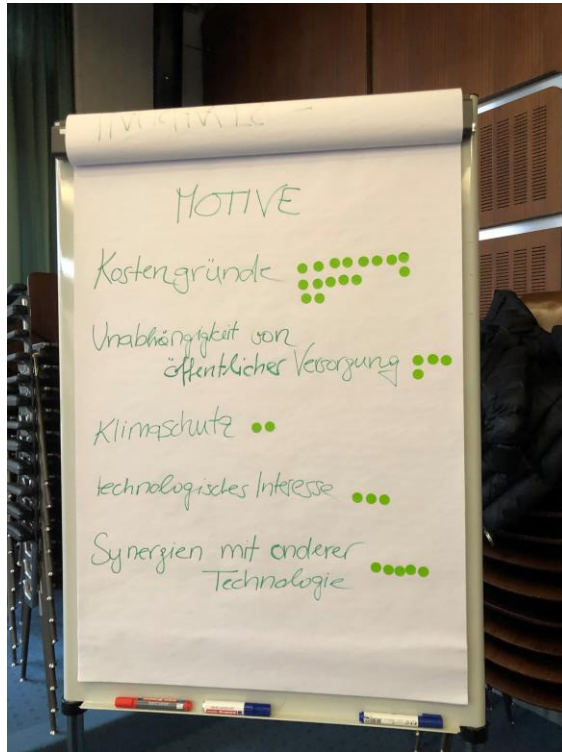
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- Was haben Sie erwartet?
- Was hat Sie überrascht?
- Gibt es aus Ihrer Sicht weitere relevante Motive und Barrieren?
- Welche Motive und Barrieren sind aus Ihrer Sicht am relevantesten?

Diskussion: Motive und Barrieren

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- Welche Motive und Barrieren sind aus Ihrer Sicht am relevantesten?



Ausblick

Finale Auswertung der Umfrage

Entwicklung von Prosument:innen Szenarien

Analyse mit dem Diffusionsmodell

Analyse mit dem makroökonomischen Modell

Entwicklung von Politikempfehlungen

Nächster
Stakeholder-
Workshop:
Jänner 2026

Technologie-Diffusions-Modell

FutuRES-PV

WP4: Technology Diffusion Model

25.02.2025

Prof. Dr. Reinhard Madlener

Kagan Yüksel, M. Sc.

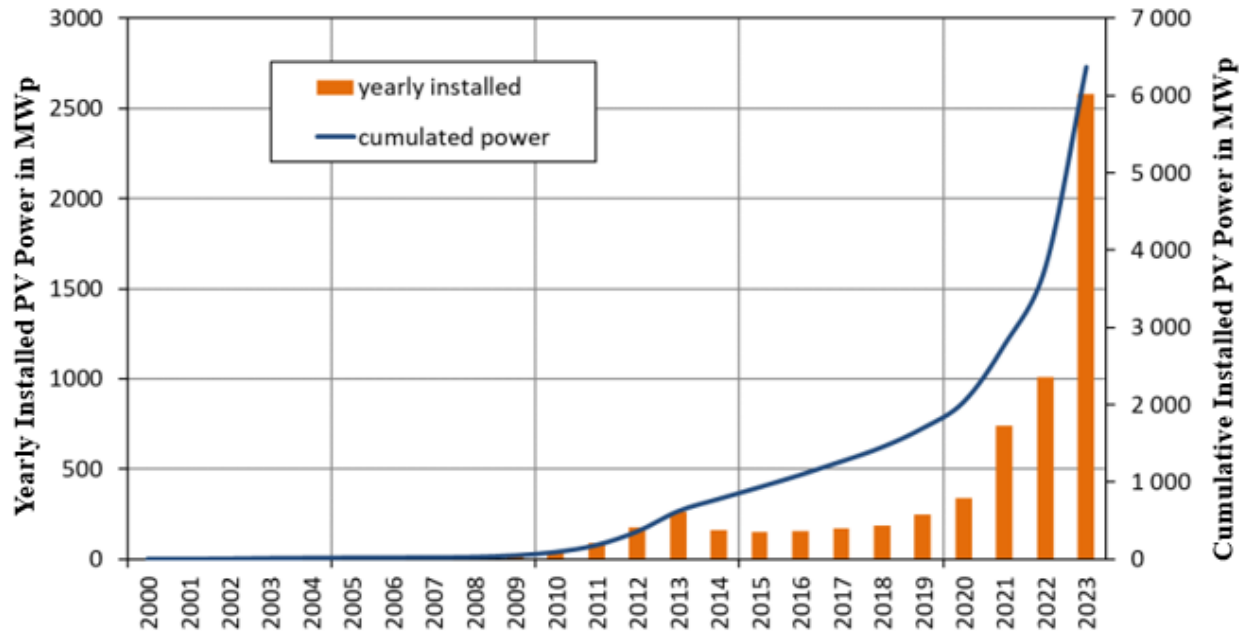
Agenda

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1. Introduction
2. Overview of Agent-Based Modeling
3. Preliminary Results
4. Modifications in Progress

Introduction

- Forecasting the diffusion of residential Photovoltaic systems in Austria: An Agent-Based Modeling Approach

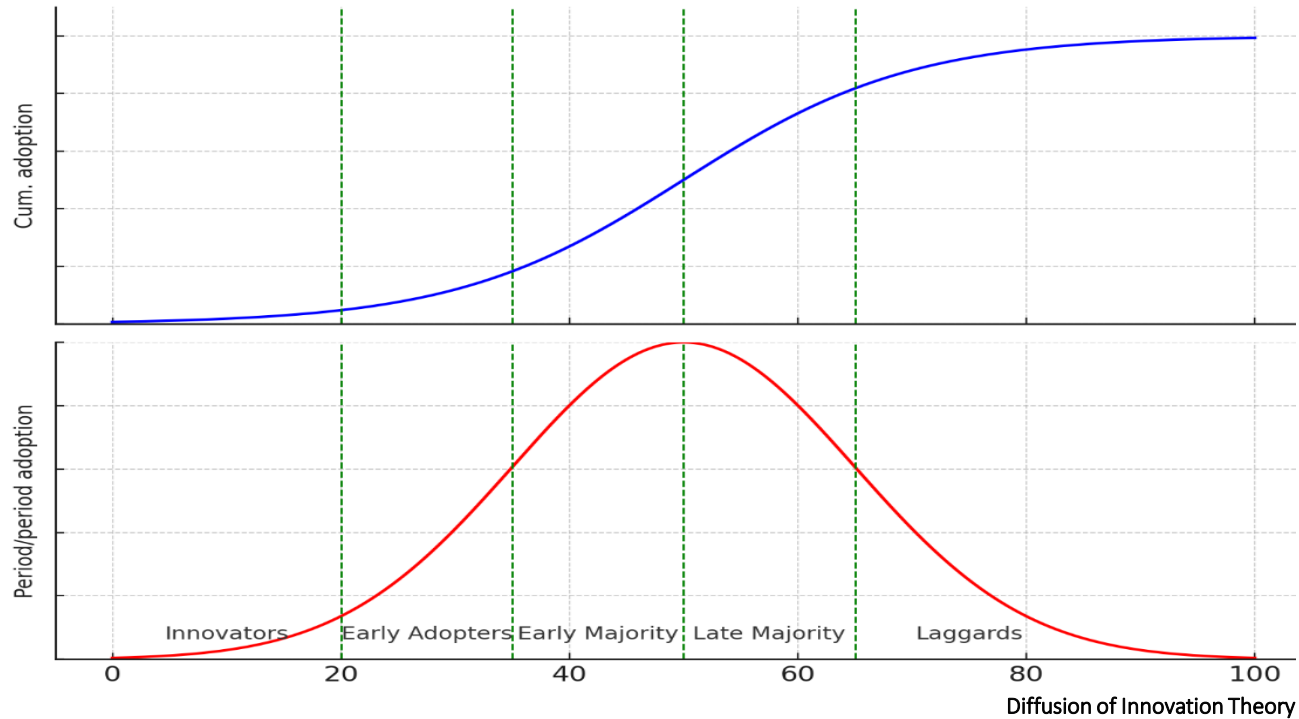


Yearly Installed PV Power in Austria
Source: Biermayr (2023)

Introduction

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■ Technological Diffusion and Agent-Based Modeling



Source: Own Illustration based on Rogers (1962)

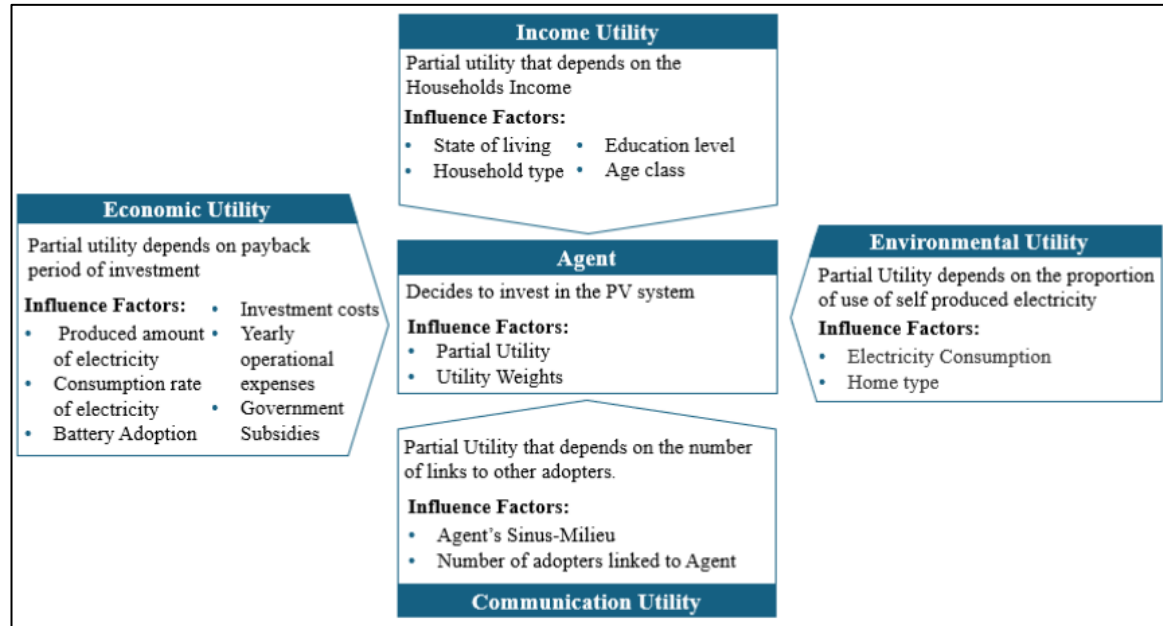
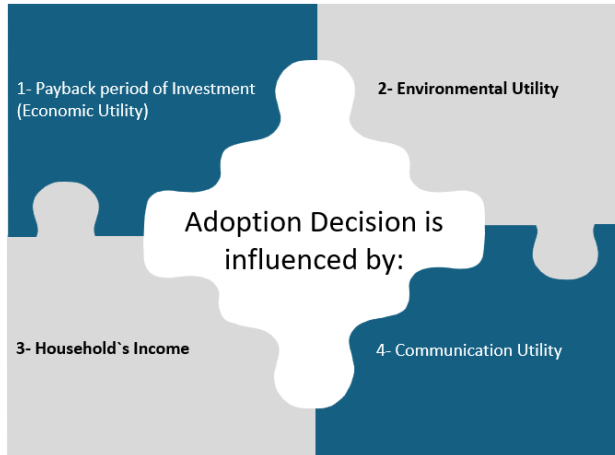
Introduction

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Year	Feed-in Tariff [€-Ct/kWh]	Average Wholesale Electricity Selling Price [€-Ct/kWh]	Capital Incentives [€/kWp]		Capital Incentives on Batteries [€/kW]
	5-10 kWp		< 5 kWp	5-10 kWp	
2008	39.99	7.28	2800	0	0
2009	39.98	4.72	2500	0	0
2010	38.00	4.66	1300	0	0
2011	38.00	5.66	1100	0	0
2012	27.60	4.87	800	0	0
2013	18.12	4.02	200	200	0
2014	12.50	3.53	200	200	0
2015	12.50	3.23	200	200	0
2016	8.24	2.70	275	375	0
2017	7.91	3.33	275	375	0
2018	7.91	4.45	250	250	500
2019	7.67	5.10	250	250	500
2020	7.67	3.99	250	250	200
2021	0.00	7.80	285	250	200
2022	0.00	33.43	285	285	200
2023	0.00	16.87	285	285	200

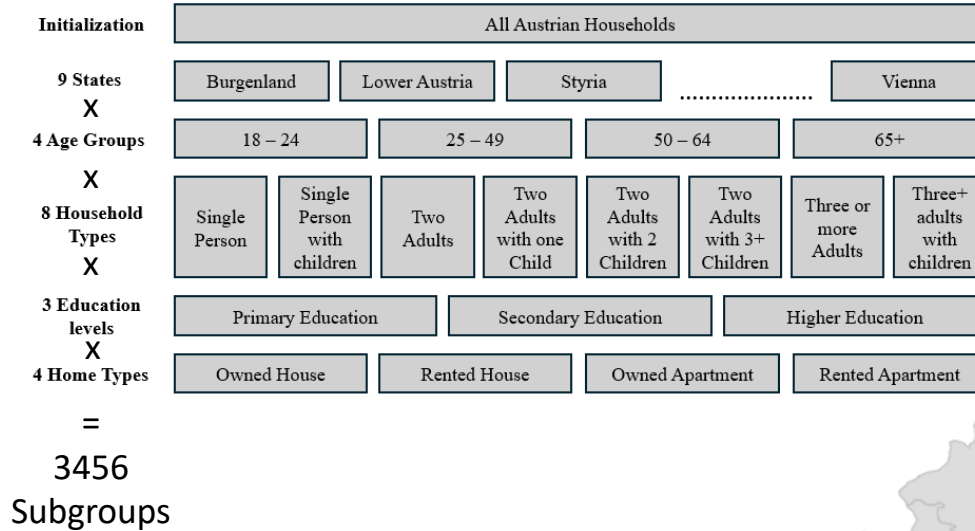
Overview of Agent-Based Modeling

Adoption Decision is Influenced By Four Factors:



Overview of Agent-Based Modeling

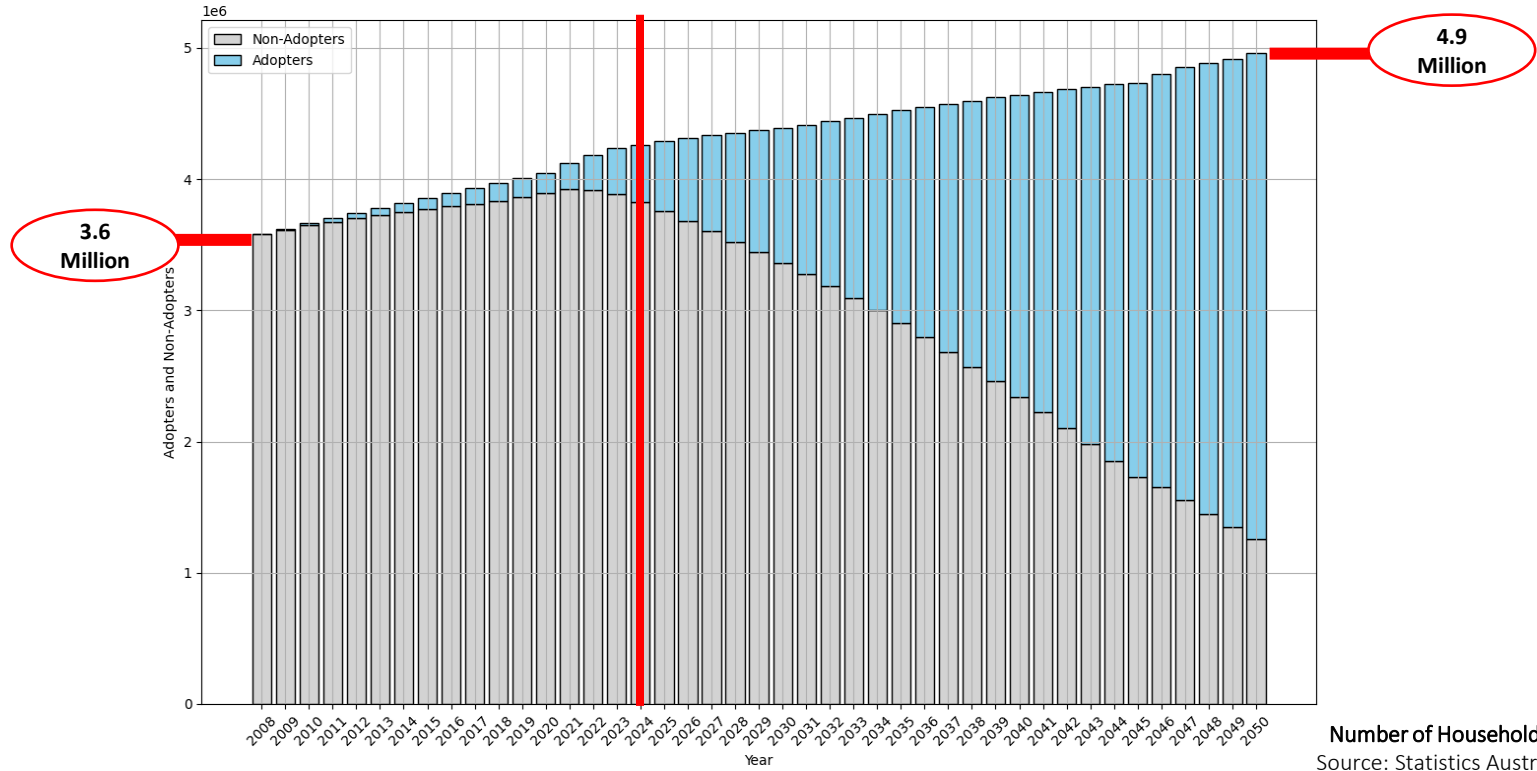
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Example Agent	
General Attributes:	<ul style="list-style-type: none"> State: Vienna Age class: 25-49 Household type: Two Adults Education level: Secondary Education Home type: Rented House Year: 2015
Individual Attributes:	<ul style="list-style-type: none"> Sinus Milieu: Post Materialist Household Income: 31,000 €/a Electricity Consumption: 3500 kWh/a Electricity Production: 3000 kWh/a

Overview of Agent-Based Modeling

- Dynamic and growing population (number of households)



Number of Households per Year
Source: Statistics Austria (2023a)

Overview of Agent-Based Modeling

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- **Economic Utility considers:**
 - Investment costs
 - Capital incentives
 - Feed-in tariffs
 - Savings from self-generated electricity
 - Administrative and Maintenance costs

Overview of Agent-Based Modeling

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- **Environmental Utility considers:**
 - Electricity consumption of household – assumed to be quite high
 - Consumption covered by the renewable generation
 - Household type
 - Logarithmic probability distribution of household consumption

Number of inhabitants	Mean [kWh/a]	Median [kWh/a]	Standard Deviation
1	3,225	2,957	1,416
2	4,836	4,528	1,844
3	5,850	5,561	2,019
4+	6,113	5,568	2,197

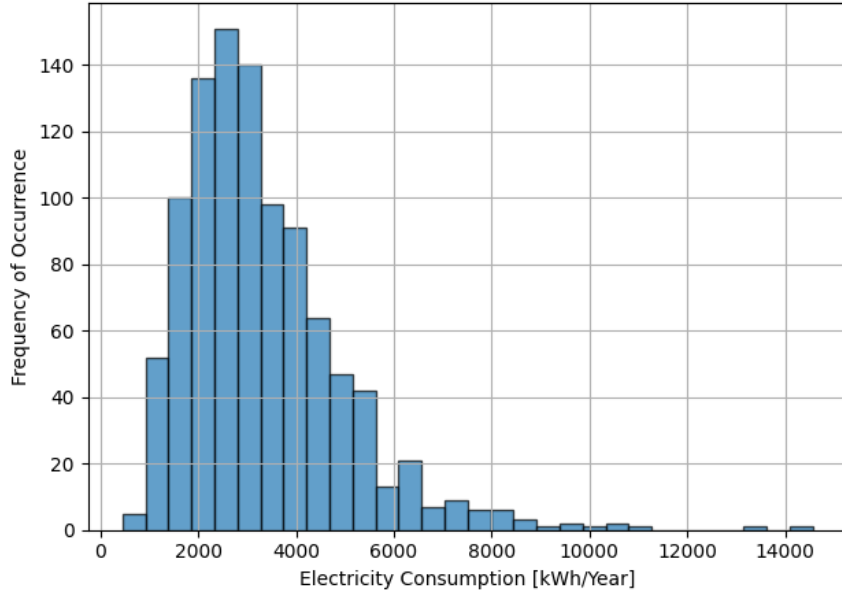
Electricity Consumption by Household Size (Source: Odyssee-Mure, 2022)

State	Owned House	Owned Apartment	Rented House	Rented Apartment
Burgenland	66%	3%	9%	22%
Carinthia	47%	8%	12%	33%
Lower Austria	55%	8%	8%	29%
Upper Austria	44%	9%	18%	29%
Salzburg	34%	17%	27%	22%
Styria	44%	12%	16%	28%
Tyrol	36%	18%	25%	21%
Vorarlberg	39%	17%	24%	20%
Vienna	5%	15%	45%	35%

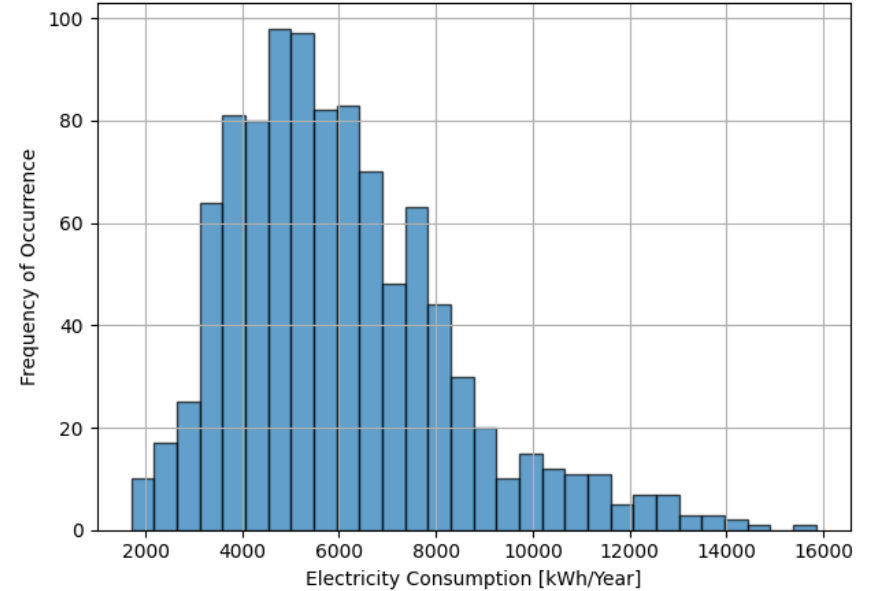
Home Type Distribution (Source: Statistics Austria, 2023)

Overview of Agent-Based Modeling

Logarithmic Distribution of Electricity Consumption of a 1 Person Household



Logarithmic Distribution of Electricity Consumption of a 4 Person Household



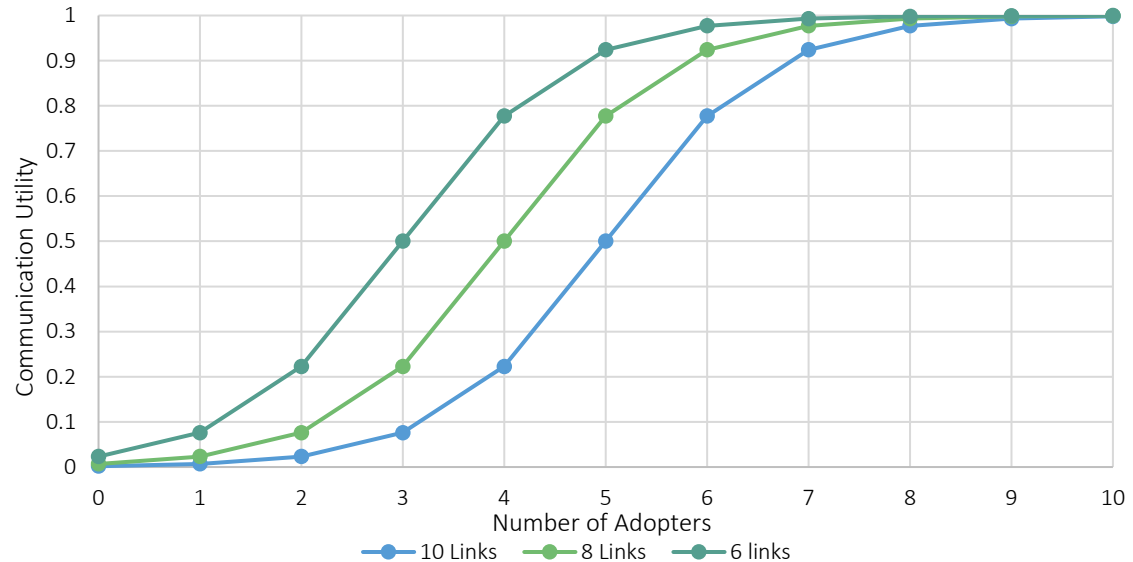
Logarithmic Probability Distribution of Electricity consumption
Data Source: EUROSTAT (2023)

Overview of Agent-Based Modeling

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■ Communication Utility considers:

- Interpersonal communication model
- Higher communication utility – social circle containing more adopters



Communication Utility
Source: Own illustration

Preliminary Results

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■ Three Scenarios (PV Prices):

- Baseline
 - CAGR of PV prices (-6.8%)
- Pessimistic
 - CAGR of PV prices (-3%)
- Optimistic
 - CAGR of PV prices (-9%)

■ Three Scenarios (PV Regulations):

- Baseline
 - Expiration of Zero-Tax Policy at the end of 2025
 - Moderate decline of financial support
- Pessimistic
 - Complete cessation of incentives for PV systems from 2026
- Optimistic
 - Continued support of the Zero-Tax Policy

Preliminary Results

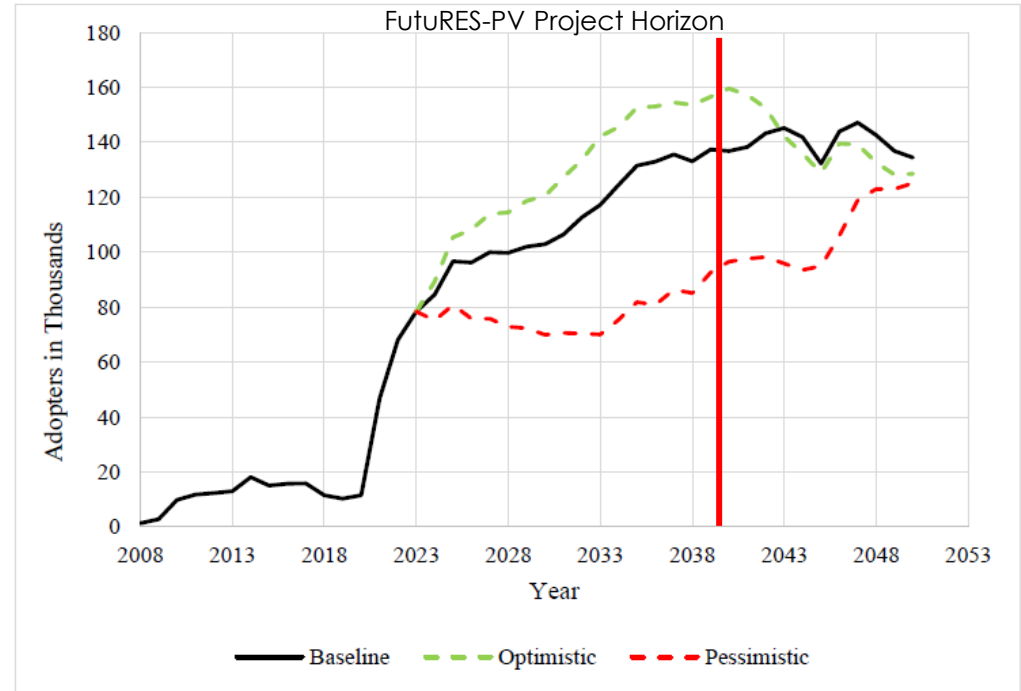
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■ Pessimistic:

- Slower decline of prices
- Adoption relatively low
- Less favourable financial situation – slow growth rate

■ Optimistic:

- Substantial increase in PV demand
- Deceleration in 2040s – market saturation & shrinking pool of potential adopters
- Most early and mid-market segments already transitioned

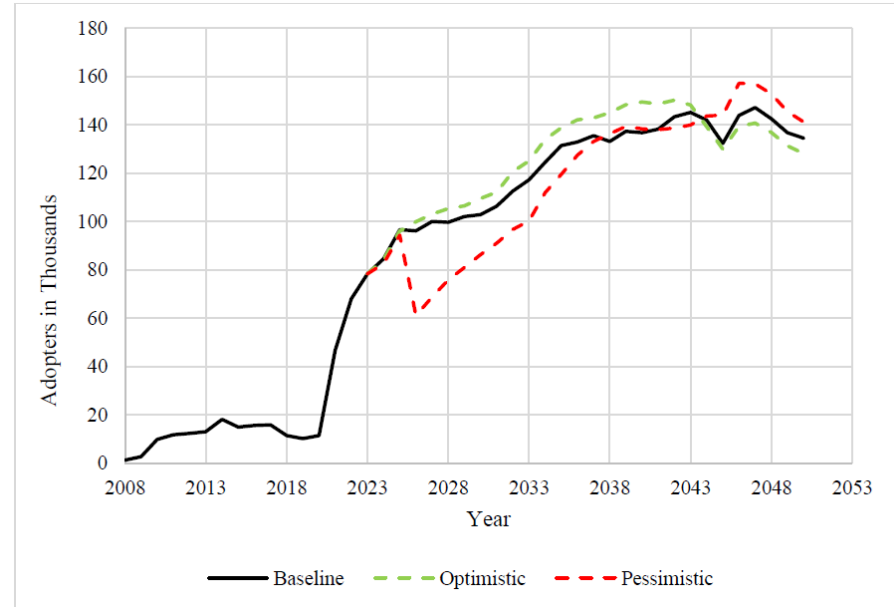


Scenario Analysis of Adoption based on Future PV System Price

Preliminary Results

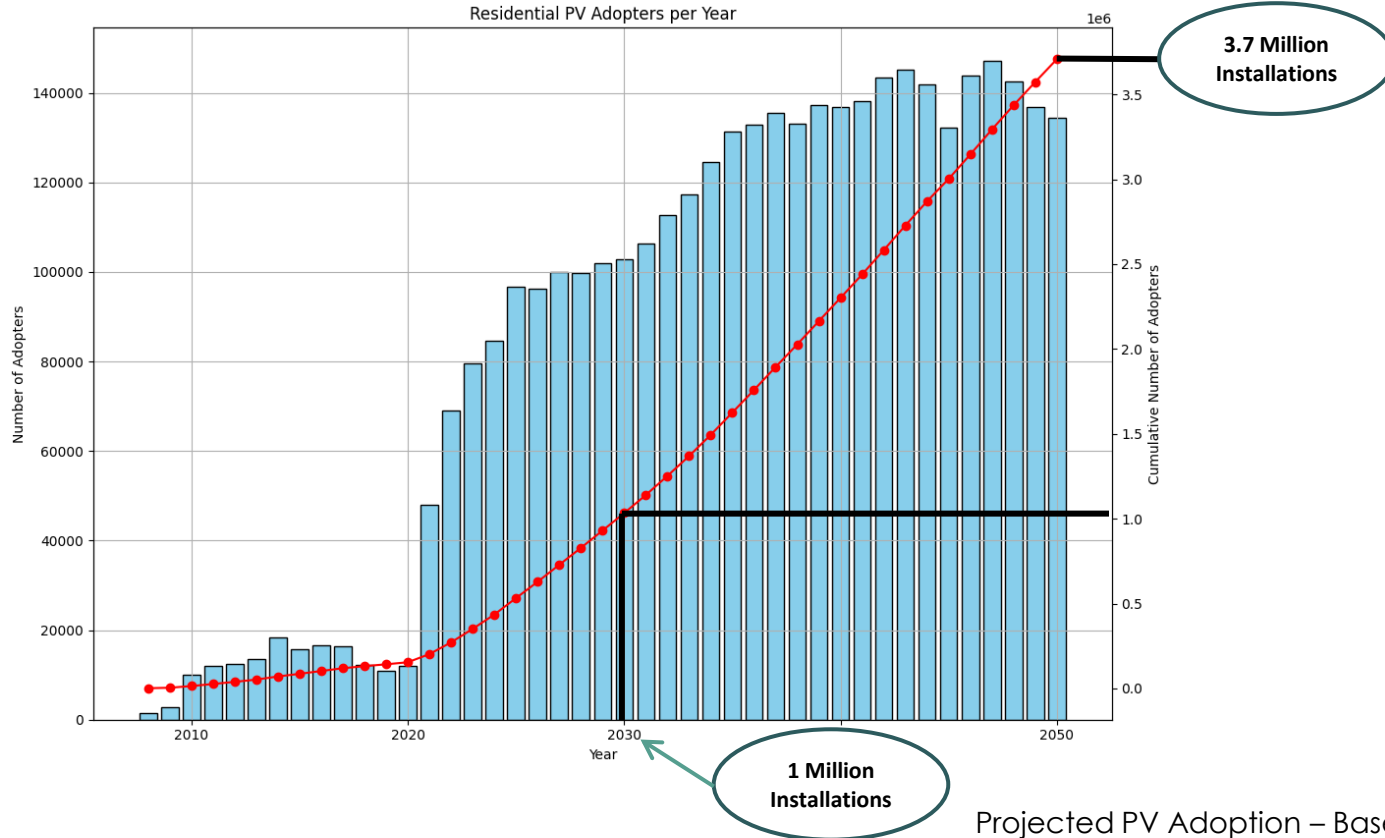
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- **Optimistic:**
 - Highly correlated with Baseline
 - Dip in 2040s – large group of potential adopters re-entering market
- **Pessimistic:**
 - Sudden short-term dip in adoption
 - Late convergence – potential adopters delaying investment decisions
 - Impact of incentives diminishing over time as costs decline



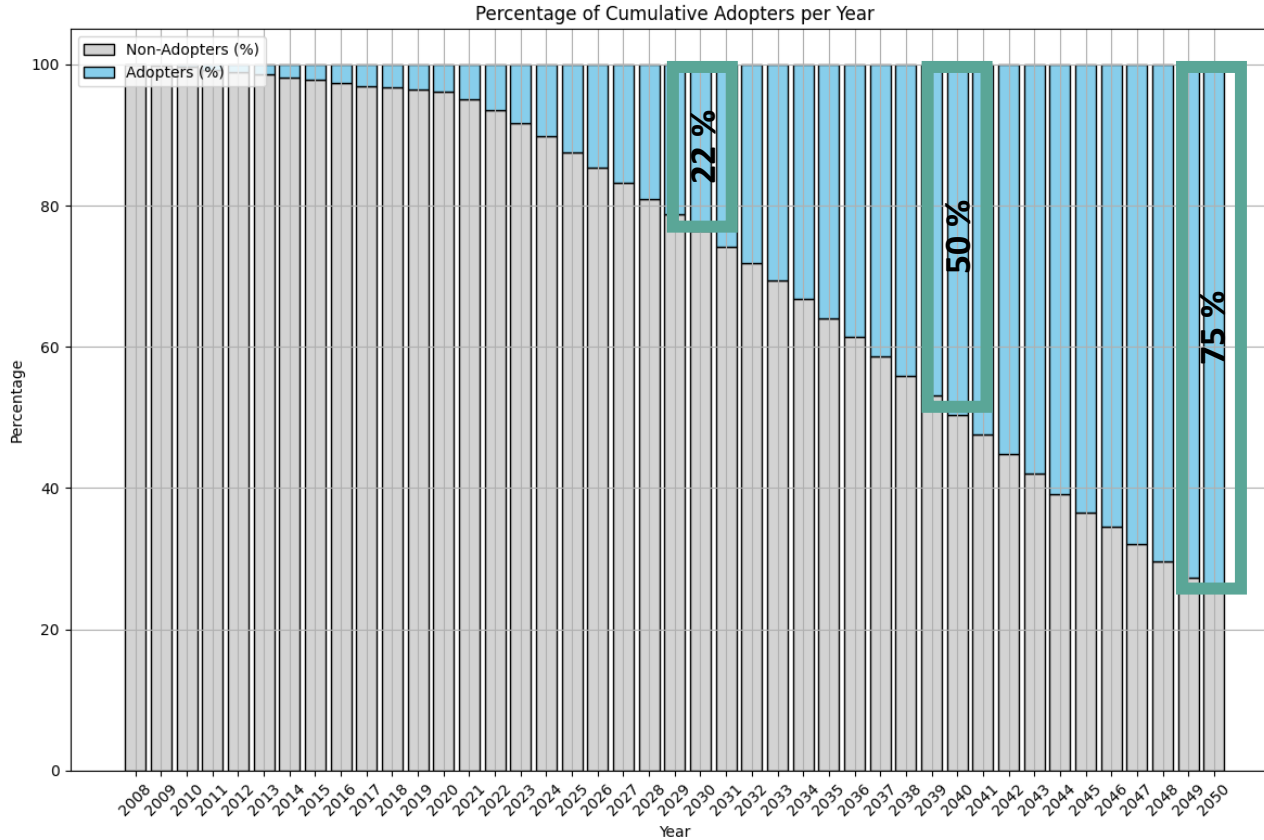
Scenario Analysis of Adoption based on Future Incentives

Preliminary Results

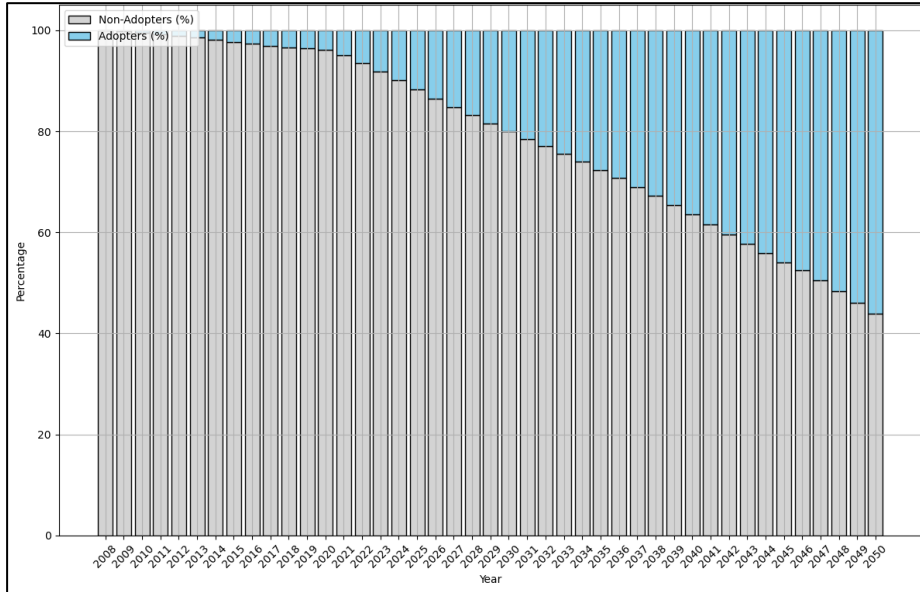


Projected PV Adoption – Baseline Scenario

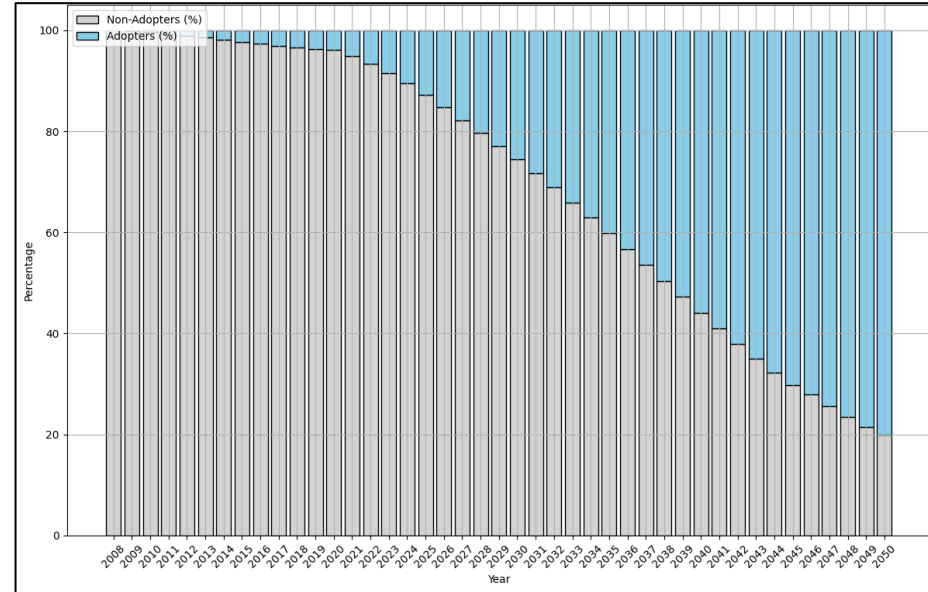
Preliminary Results



Preliminary Results

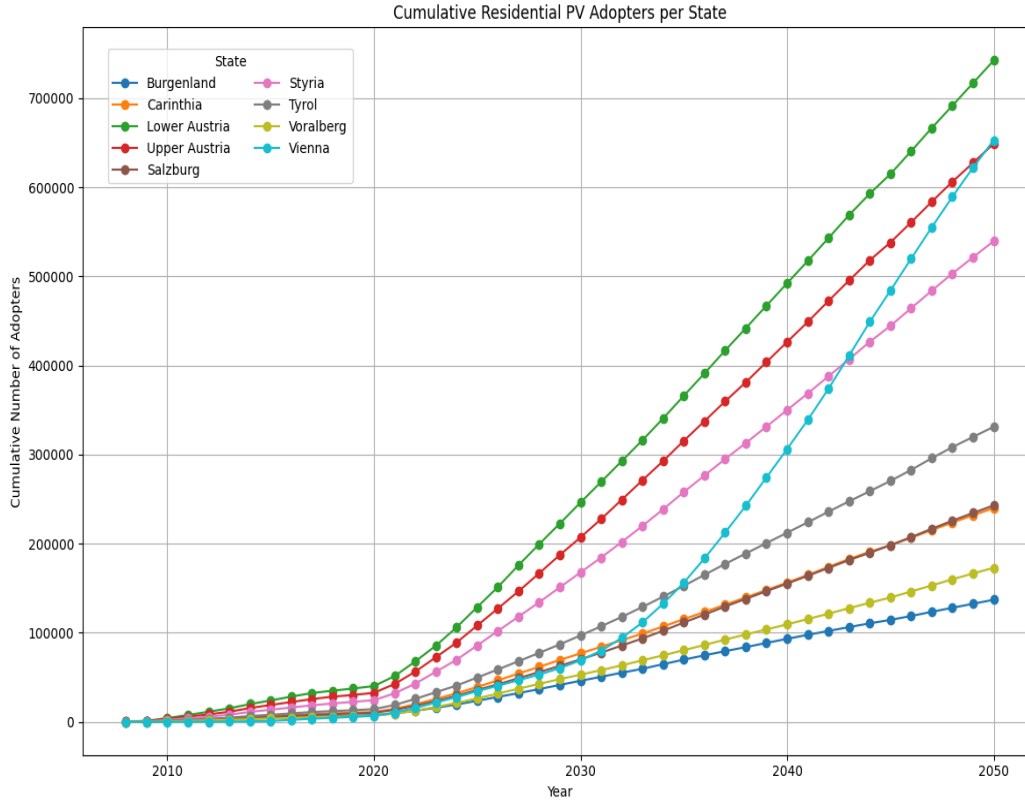


Cumulative PV Adoption – Pessimistic PV Price Scenario



Cumulative PV Adoption – Optimistic PV Price Scenario

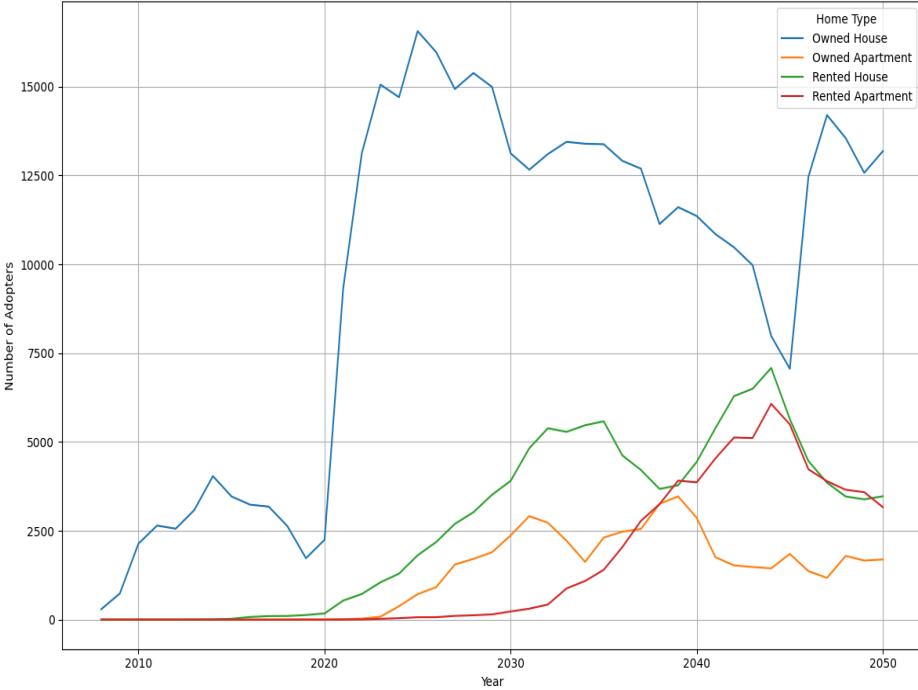
Preliminary Results



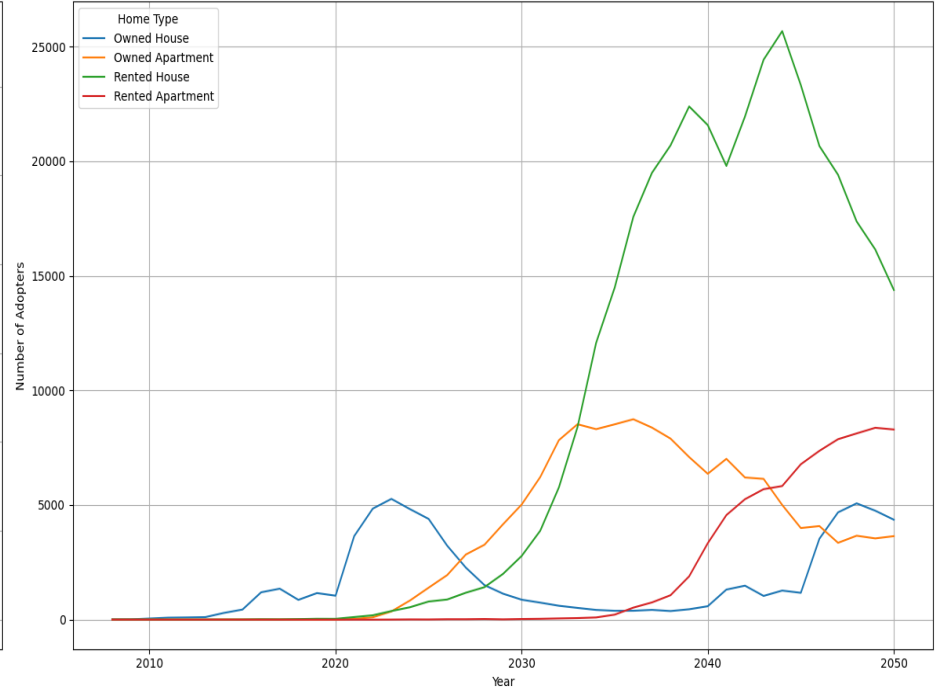
Cumulative Adopters by State – Baseline Scenario

Preliminary Results

Adoption per Home Type per Year in Upper Austria



Adoption per Home Type per Year in Vienna



Adoption Per Home Type in Different States – Baseline Scenario

Modifications in Progress

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- Sensitivity analysis for the PV price level (PV cost data from AIT)
- Further calibration using Survey Results
- Addition of an ML-Based Approach
- Potentially improving regional insights
 - Contingent upon the availability of more data from OeMAG



Thank you for your kind
attention. Any questions?

Contact:

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FutuRES-PV

Thank you!

This project is funded by the Klima- und Energiefonds and carried out within the Austrian Climate Research Program (ACRP)

