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DETERMINANTS OF RESIDENTIAL PHOTOVOLTAIC ADOPTION INTENTION - A META-ANALYSIS

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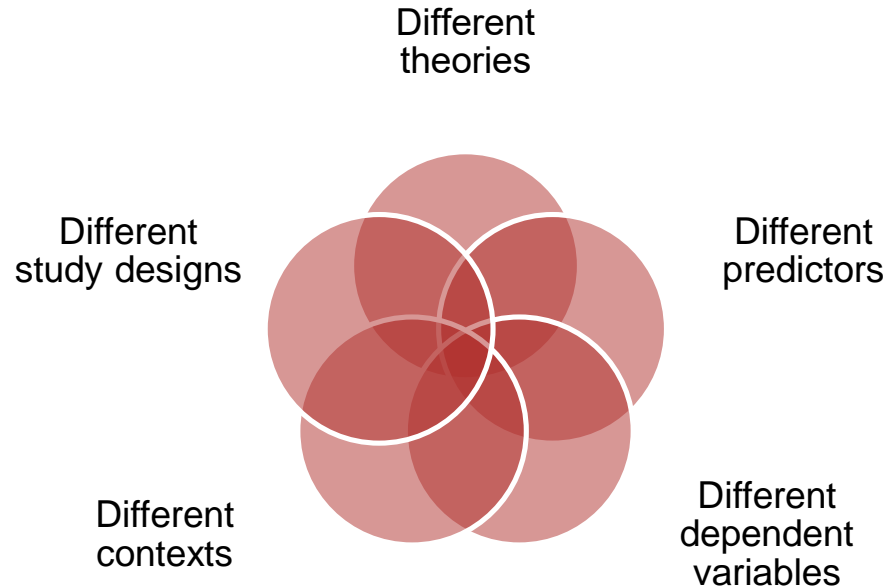


Motivation & Objective

WHY A META- ANALYSIS ON RESIDENTIAL PV ADOPTION INTENTION?

MOTIVATION

META ANALYSES PROVIDE A MECHANISM TO OBJECTIVELY SYNTHESIZE DATA ACROSS STUDIES



- In 173 studies on residential PV adoption, [1] find 333 predictors
 - Single studies are subject to issues related to
 - Statistical power
 - Validity and reliability
 - Contextuality
- Single studies provide no solid base for conclusions about effects of predictors

OBJECTIVE

REVEAL PATTERNS OF RELATIONSHIPS AMONG PREDICTORS AND RESIDENTIAL PV ADOPTION

- ❖ Determine point estimates of relationships between predictors and intention
- ❖ Assess the suitability of an (extended) Theory of Planned Behavior framework
- ❖ Derive implications to enhance future aggregation of scientific evidence

Methodology

WHAT DID WE DO?



METHODOLOGY

USE MASEM TO SYNTHESIZE AND ANALYZE THE SYSTEMATICALLY SELECTED LITERATURE

Meta-analytic structural equation modeling (MASEM) [2, 3, 4]:

1. Literature research
2. Literature selection
3. Code literature
4. Pool correlations (Random effect model, inverse variance weighing, REML method)
5. Estimate SEMs

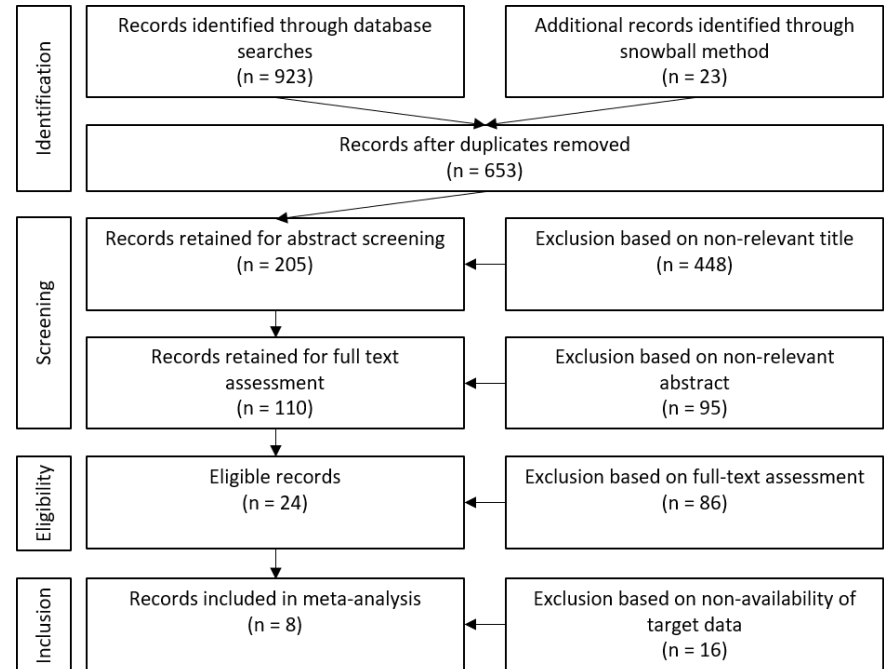


Figure 1: Flow chart describing literature selection. Source: Own illustration

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	A	B	C	D	E	F	G	H	I	J	K	L	M
1	no	author	year	country	n	envcon	novseek	bar	ben	sn	gen	edu	inc
2	1	Sun et al.	2020	Taiwan	300	0,631689204	0,75		0,765247931				
3	2	Claudy et al.	2013	Ireland	254			-0,266966639	0,340293929				
4	3	Rai and Beck	2015	Texas	522	0,187	0,324		0,349	0,416025147			
5	4	Chen	2014	Taiwan	203	0,639736524	0,4						
6	5	Arroyo and Carre	2019	Mexico	72	0,046		-0,153			-0,028	0,265	0,442
7	6	Parkins et al.	2018	Canada	2065	0,048			0,101	-0,009391759	0,011665175	-0,002107285	
8	7	Aziz et al.	2017	Malaysia	211	0,354		0,097	0,562	0,397		-0,048	0,142
9	8	Wolske et al.	2017	USA	904	0,324442842	0,32439929	-0,116964222	0,530695705	0,384114384			

Figure 2: Input table for correlations between intention and predictors.
Source: Own calculations

Results

**POOLED
CORRELATION
TABLE AND SEM's**

POOLED CORRELATION TABLE

	INT	EC	NS	BA	BE	SN	GEN	EDU
EC	.343** (.382), N=7							
NS	.475** (.46), N=4	.445** (.187), N=4						
BA	-.111 (.306), N=4	-.172* (.397), N=3	-.015 (.13), N=1					
BE	.53** (.334), N=5	.693** (.366), N=4	.636** (.458), N=3	-.185** (.102), N=3				
SN	.326** (.291), N=4	.283** (.293), N=4	.504** (.752), N=2	-.104 (.528), N=2	.491** (.429), N=3			
GEN	-.01 (.084), N=2	.049** (.082), N=2	0 (0), N=0	-.038 (.463), N=1	0 (0), N=0	-.059** (.086), N=1		
EDU	.046 (.287), N=3	.047 (.126), N=3	0 (0), N=0	-.035 (.234), N=2	-.006 (.27), N=1	.068** (.082), N=2	-.086** (.084), N=2	
INC	.183 (.499), N=3	.15** (.219), N=3	0 (0), N=0	.002 (.333), N=2	.085 (.687), N=1	.037 (.189), N=2	-.096** (.084), N=2	.194 (.508), N=3

Upper number: Pearson's r with significance level (*: $p < .1$; **: $p < .05$); Number in brackets: Width of 95% CI; N: Number of studies

INT Intention; EC Environmental concern; NS Novelty Seeking; BA Barriers; BE Benefits; SN subjective norm; GEN Gender; EDU Education; INC Income

Figure 3: Pooled correlation table.

Source: Own calculations

POOLED CORRELATION TABLE

DETERMINE POINT ESTIMATES OF RELATIONSHIPS BETWEEN PREDICTORS AND INTENTION

	INT	EC	NS	BA	BE	SN	GEN	EDU
EC	.343** (.382), N=7							
NS	.475** (.46), N=4	.445** (.187), N=4						
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- Strongest correlation between intention and benefits
- No correlation between intention and income and barriers
- Benefits strongly correlated with environmental concern, novelty seeking and subjective norm

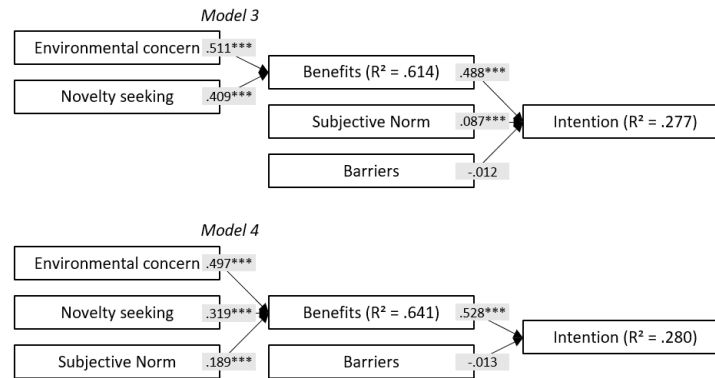
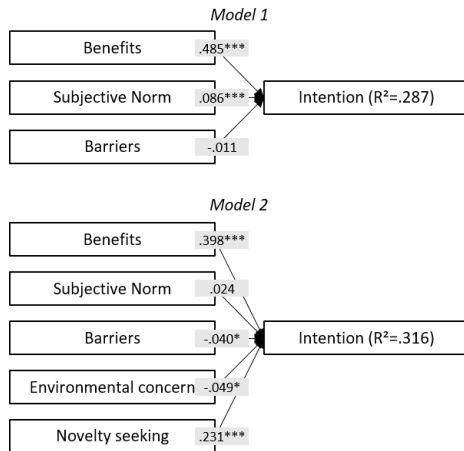
Upper number: Pearson's r with significance level (*: p<.1; **: p<.05); Number in brackets: Width of 95% CI; N: Number of studies

INT Intention; EC Environmental concern; NS Novelty Seeking; BA Barriers; BE Benefits; SN subjective norm; GEN Gender; EDU Education; INC Income

Figure 3: Pooled correlation table.
Source: Own calculations

RESULTS OF STRUCTURAL EQUATION MODELLING

ASSESS THE SUITABILITY OF AN (EXTENDED) THEORY OF PLANNED BEHAVIOR FRAMEWORK



* p<.1; ** p<.05; *** p<.01

- Useful to limited extent
- Suggestion to use a modified version of TPB:
 - attitudes operationalized as benefits
 - attitudes explained by environmental concern, novelty seeking, and subjective norms

	N	Chi ² (LR test model vs. saturated)	df	CFI	TLI	RMSEA, 90% CI	SRMR	AIC	BIC	CD
Model 1	1640	0	0	1.000	1.000	.000 [0]	.000	17,556.435	17,578.044	.287
Model 2	1714	0	0	1.000	1.000	.000 [0]	.000	25,789.611	25,822.290	.316
Model 3	1714	222.595 (p = .000)	4	.910	.797	.179 [.159 – .199]	.048	26,014.206	26,052.332	.618
Model 4	1714	113.798 (p = .000)	4	.964	.920	.127 [.107 – .147]	.039	25,905.409	25,943.535	.641

Figure 4: Results of structural equation modeling.

Source: Own calculations

Discussion & Conclusion

PROBLEMS, PLAUSIBILITY AND PROPOSITIONS

PROBLEMS

DUE TO HETEROGENEOUS LITERATURE BODY, SYNTHETIZATION RESULTS ARE LIMITED

- Small study sample
 - No consistent use of predictors
 - Different contexts
- Limited informative value

PLAUSIBILITY

RELATIONS BETWEEN INCOME, BARRIERS AND INTENTION MUST BE ANALYZED MORE THOROUGHLY

1. Correlation Income – Intention

- [7] and [8] both find positive effects of income on intention

- Considerations preceding intentions less concrete? [9]
- Role of policy schemes? [10, 11]
- Biased samples?

2. Correlation Barriers – Intention

- Smaller than correlation in meta-analyses on pro-environmental behavior [3, 4]
- Reasons for outlier can't be analyzed due to missing information

PROPOSITIONS – FOR FUTURE RESEARCH

DERIVE IMPLICATIONS TO ENHANCE FUTURE AGGREGATION OF SCIENTIFIC EVIDENCE

Systematization of research is crucial for more meaningful derivations:

- Use consistent predictors
- Use consistent measures for adoption
- Collect contextual variables
- Comply with reporting standards

PROPOSITIONS – FOR POLICY-MAKERS

- Enhance benefits instead of reducing barriers
- Focus on environmental benefits and innovativeness
- Innovativeness plays particularly large role in regions with low diffusion rates
- Consider tailoring strategies to consumer segments of like-minded people



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THANK YOU FOR YOUR ATTENTION!

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