IMPACT OF FINANCIAL AND INFORMATIONAL POLICIES PROMOTING ENERGY EFFICIENCY IN SMES

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Background

To overcome informational barriers **energy audits** are among others **suitable concepts** for companies to improve their knowledge about the energy consumption and energy saving potential.

However, empirical results demonstrate that often **only part of the recommendations** are implemented.

Access to capital and difficulties financing investments in energy efficiency have been identified among others as one of the most important **barriers** in literature.

Thus, policy makers established additional **financial instruments** to motivate companies to implement the recommended energy efficiency measures.

Our research therefore focuses on the **impact of two financial instruments** on the adoption behavior of companies: in the literature so far only a few empirical analyses dealt with the impact of more than one policy instrument at once.

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Research question

What is the impact of the two financial instruments (1)funding for cross-cutting technologies and (2) low-interest loan in addition to an informational instrument (energy audit) on the adoption of four generic energy efficiency measures in SMEs in Germany?

Funding for cross-cutting technologies:
Funding programme (direct subsidy) by which since 2012 the German Federal Ministry for Economic Affairs and Energy supports SMEs for an investment in energy efficient cross-cutting technologies.

Low-interest loan:
Low-interest loan administered by KfW, the German Bank of Reconstruction; accessible for investments concerning buildings, machinery and equipment in the field of energy efficiency.

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Data

- Data based on **survey** of companies in 2014 which voluntarily participated in the SME Energy Consulting Program (called “Energieberatung Mittelstand”) launched by the German Federal Ministry for Economic Affairs and Energy (Mai et al. 2014)
- Program supports SMEs to conduct an **energy audit** and thereby to improve their knowledge on energy consumption as well as on energy saving potentials; offers **financial support** for screening and detailed energy audits by qualified and independent consultants
- Our original sample consists of **1,471 observations** which all had an energy audit funded by this program
- **Sub-sample** additionally used **funding** for cross-cutting technologies and/or **low-interest loan** for the implementation of subsequent energy efficiency measures
- After removing missing values for our calculation the final sample consists of **766 observations**

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Methodological approach

- Aim: Analysis of the effects of two different financial instruments in addition to an energy audit on the adoption of energy efficiency measures in four generic energy efficiency technologies
- Two step approach: (1) t-tests, (2) propensity score matching
- Use of *matchIT* package (Ho et al. 2011) of the R statistical software (R core team 2016)

0 Control Group

- had an energy audit
- **used no policy instrument**
- n = 553

1 „Treatment“-Group

- had an energy audit
- **used low-interest loan**
- n = 81

2 „Treatment“-Group

- had an energy audit
- **used cross-cutting technologies funding (CC)**
- n = 95

37 companies used both instruments

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Results (1/4)
Descriptive statistics

- Average company size: **58 employees** (SD: 57)
- Average **energy cost share**: **7.7%** (SD: 12.9%)
- **23.9%** of the companies have implemented an **energy management system**
- **8.6%** of the companies have implemented an **environmental management system**
- **44.3%** of the companies employ an energy manager

- **66.2%** of the companies adopted energy efficiency measures in the area of **lighting**
- **29.2%** of the companies adopted energy efficiency measures in the area of **insulation**
- **35.9%** of the companies adopted energy efficiency measures in the area of **heating**
- **48.0%** of the companies adopted energy efficiency measures in the area of **heating optimization**

Results (2/4)
t-tests

	Group	N	Adoption rate	Difference in percentage points	
Lighting	Audit only	553	65.3%	**11.8**	**
	Audit & *CC*	118	77.1%		
Insulation	Audit only	553	27.0%	**15.4**	**
	Audit & *Loan*	132	42.4%		
Heating	Audit only	553	30.6%	**19.4**	***
	Audit & *Loan*	132	52.6%		
Heating optimization	Audit only	553	44.0%	**12.8**	**
	Audit & *Loan*	132	56.8%		

**** significance level p< 0.1%, **significance level p < 1%*

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Results (3/4)
Propensity score matching - Loan

Marginal effects at mean (MEM) for adopting measures

	Insulation	Heating	Heating optimization
Loan	**0.121 ***	**0.249 *****	**0.116 †**
log10 Number of employees	-0.068	0.033	0.020
EMS yes	-0.000	-0.110	-0.001
Sector Metallurgy	0.303 *	0.208	0.037
Sector Cars sales	0.487 ***	0.317 †	0.399 ***
Sector Hospitality	0.285 †	0.332 *	0.303 **
Sector Other energy intense production	0.164	0.104	-0.018
Sector Other non-energy intense prod.	0.298 †	0.101	-0.079
Sector Food trade	0.030	-0.315 *	-0.165
Sector Other trade	0.209	0.220	0.117
Sector Other services	0.169	0.175	0.083
Environmgmt yes	-0.018	0.368 ***	0.038
Enermanager yes	-0.012	-0.011	0.089

*** significance level p< 0.1%, **significance level p < 1%, * significance level p< 5%, †significance level p < 10%

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Results (4/4)
Propensity score matching - CC

Marginal effects at mean (MEM) for adopting measures

	Lighting		
CC	**0.089**		(0.843)
log10 Number of employees	0.000		(0.998)
EMS yes	-0.038		(0.851)
Sector Metallurgy	-0.011		(0.921)
Sector Cars sales	0.228	***	(0.000)
Sector Hospitality	0.256		(0.863)
Sector Other energy intense production	-0.104		(0.825)
Sector Other non-energy intense prod.	-0.068		(0.841)
Sector Food trade	-0.022		(0.897)
Sector Other trade	0.069		(0.859)
Sector Other services	-0.025		(0.877)
Environmgmt yes	0.127		(0.864)
Enermanager yes	-0.011		(0.897)

We do not find a significant effect of the CC programme on the adoption of measures regarding lighting (in addition to an energy audit)

*** significance level p< 0.1%,

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Conclusions

- **Propensity to adopt respective measures higher** for companies which made use of a low-interest loan in addition to an energy audit compared to companies which only had an energy audit (insulation: 12%, heating optimization 12 %, for heating about 25%)
- Regarding **lighting** we do **not find a significant effect** of the cross-cutting technologies programme* (in addition to an energy audit)
- Findings suggest that estimates of policy effectiveness **based on simple t-tests might be misleading**, i.e. overestimating the effectiveness regarding the adoption of energy efficiency measures for lighting, insulation and heating optimization, and underestimating the effectiveness for heating
- Financial subsidies increase adoption of energy efficiency in companies; however, these always come up with **disadvantages** (among others free-rider effects)
- Further research on the **interdependency of different policy instruments** is needed

*based on the propensity score matching technique

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Thank you for your attention!

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