Resource efficiency and competitivenesss
-
an empirical analysis using German innovation data

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In-Stream Workshop Prague
April 7 2011

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Umwelt, Innovation, Beschäftigung

Instrumente zur Förderung von Umweltinnovationen

Bestandsaufnahme, Bewertung und Defizitanalyse

Bundesministerium
für Umwelt, Naturschutz
und Reaktorsicherheit

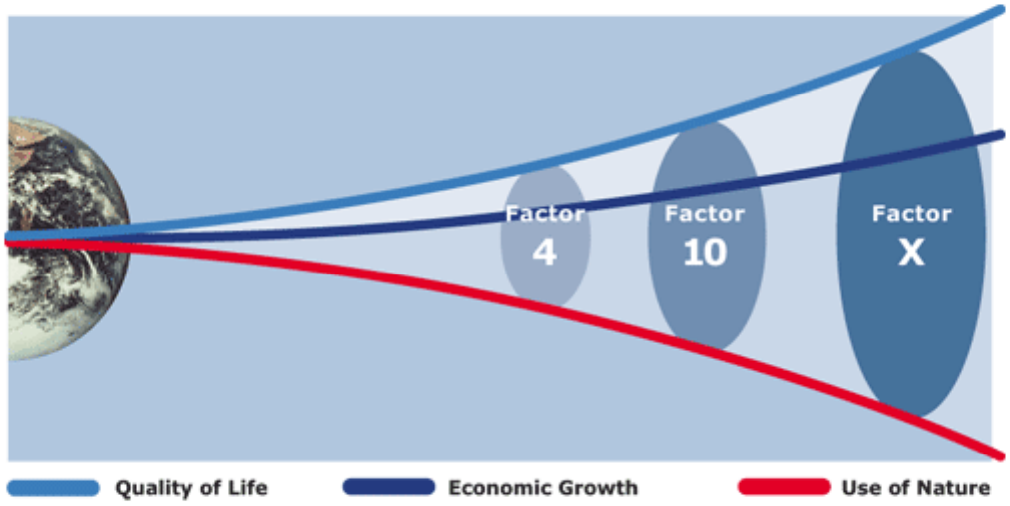
Umwelt
Bundes
Amt
Für Mensch und Umwelt

Fields of action

Fields of action	Product lines					
Energy production and storage	Power plant technologies	Renewable energies	Energy storage technologies	Fuel cell technologies		
Energy effiency	Building services engineering	Energy efficient appliances	Energy efficient procedures and production processes	Energy efficient industrial cross-sectional technologies	Energy services	
Resource and Material effiency	Ecodesign	Resource and material efficient production processes		Renewable resources		
Sustainalbe Mobility	Drive engineering	Automotive engineering and design	Transport infrastructure	Emission reduction in transport	Transport concepts and management	Green fuel
Recycling management, Waste	Material recycling	Energy recovery / thermal recycling	Disposal	Recycling management/ innovative production		
Sustainable Water economy	Water supply	Reduction of water consumption and element input	Sewage disposal	Flood protection	Water economy services	

Material Efficiency and Resource Conservation (MaRess)

Environmental damage caused by the extraction and exploitation of resources, the associated emissions and the disposal of waste, all lead directly to environmental problems, and as a result, also to social and economic problems. Other factors, such as the insecurity of supplies, the scarcity of resources, the resulting international conflicts, and high and/or volatile raw materials prices, can also lead to strong economic and social dislocation in every country on Earth. Competitive disadvantages arising from the inefficient use of resources endanger the development of businesses and jobs. Increasing resource efficiency is also more and more frequently becoming a key issue in national and international politics. Against this background, the German Environment Ministry and the Federal Environment Agency tasked 31 project partners, under the direction of the Wuppertal Institute, with the research project "Material Efficiency and Resource Conservation" (MaRess).



The Network Resource Efficiency

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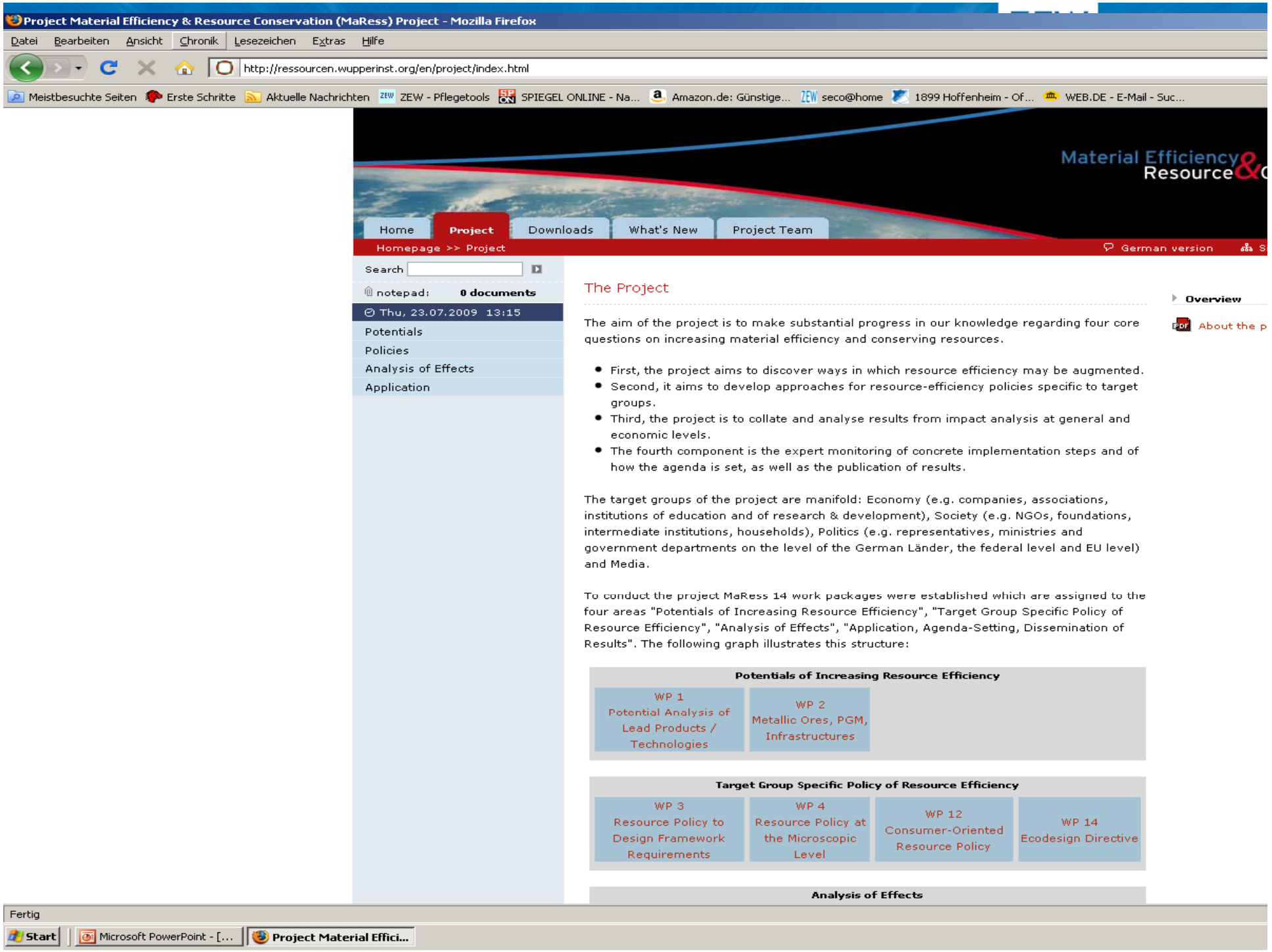
Project Material Efficiency & Resource Conservation (MaRess) Project - Mozilla Firefox
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Potentials
Policies
Analysis of Effects
Application
The Project
The aim of the project is to make substantial progress in our knowledge regarding four core questions on increasing material efficiency and conserving resources.
First, the project aims to discover ways in which resource efficiency may be augmented.
Second, it aims to develop approaches for resource-efficiency policies specific to target groups.
Third, the project is to collate and analyse results from impact analysis at general and economic levels.
The fourth component is the expert monitoring of concrete implementation steps and of how the agenda is set, as well as the publication of results.
The target groups of the project are manifold: Economy (e.g. companies, associations, institutions of education and of research & development), Society (e.g. NGOs, foundations, intermediate institutions, households), Politics (e.g. representatives, ministries and government departments on the level of the German Länder, the federal level and EU level) and Media.
To conduct the project MaRess 14 work packages were established which are assigned to the four areas "Potentials of Increasing Resource Efficiency", "Target Group Specific Policy of Resource Efficiency", "Analysis of Effects", "Application, Agenda-Setting, Dissemination of Results". The following graph illustrates this structure:
Potentials of Increasing Resource Efficiency
WP 1 Potential Analysis of Lead Products / Technologies
WP 2 Metallic Ores, PGM, Infrastructures
Target Group Specific Policy of Resource Efficiency
WP 3 Resource Policy to Design Framework Requirements
WP 4 Resource Policy at the Microscopic Level
WP 12 Consumer-Oriented Resource Policy
WP 14 Ecodesign Directive
Analysis of Effects
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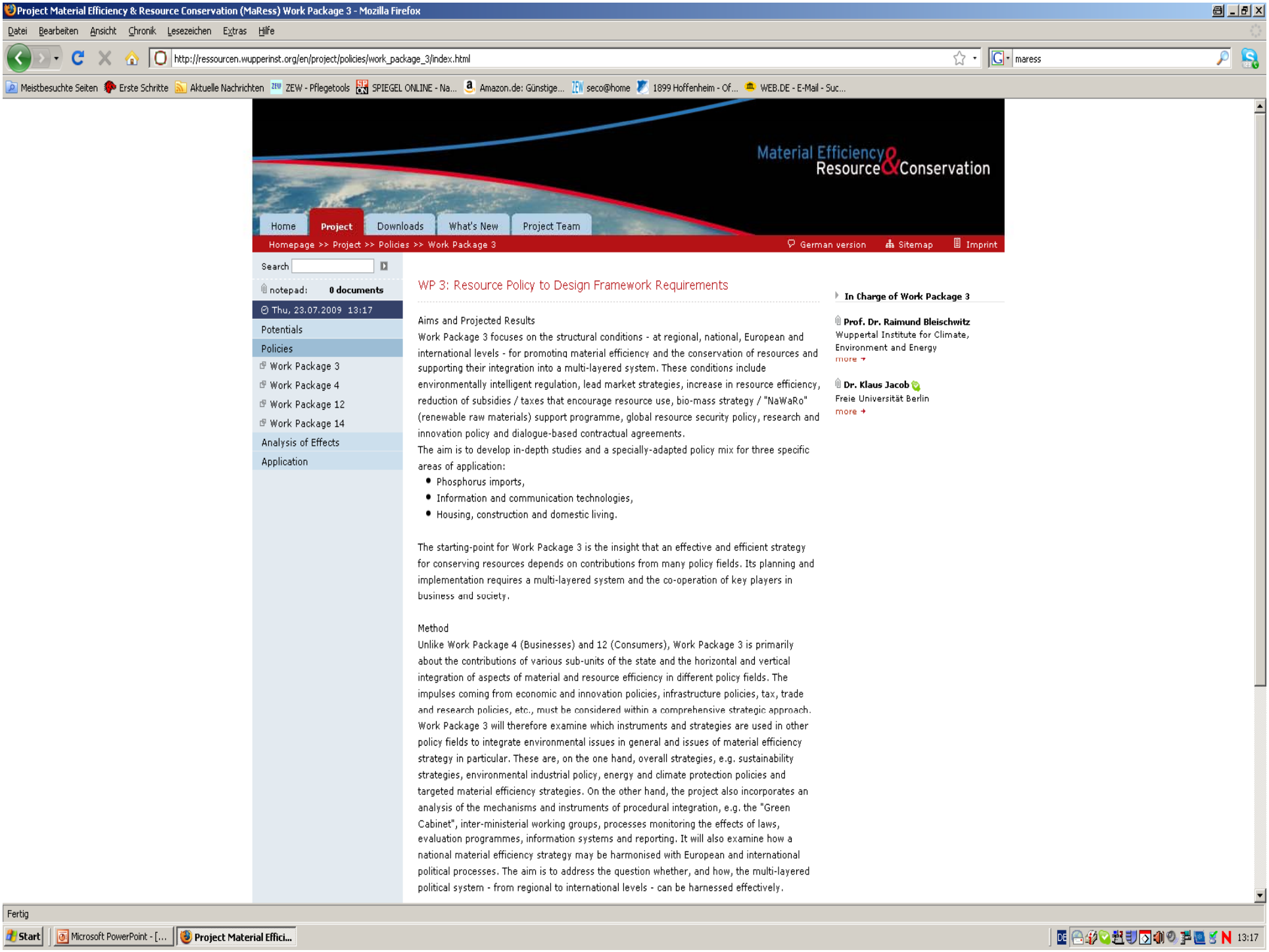
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Potentials
Policies
Work Package 3
Work Package 4
Work Package 12
Work Package 14
Analysis of Effects
Application
WP 3: Resource Policy to Design Framework Requirements
Aims and Projected Results
Work Package 3 focuses on the structural conditions - at regional, national, European and international levels - for promoting material efficiency and the conservation of resources and supporting their integration into a multi-layered system. These conditions include environmentally intelligent regulation, lead market strategies, increase in resource efficiency, reduction of subsidies / taxes that encourage resource use, bio-mass strategy / "NaWaRo" (renewable raw materials) support programme, global resource security policy, research and innovation policy and dialogue-based contractual agreements.
The aim is to develop in-depth studies and a specially-adapted policy mix for three specific areas of application:
Phosphorus imports,
Information and communication technologies,
Housing, construction and domestic living.
The starting-point for Work Package 3 is the insight that an effective and efficient strategy for conserving resources depends on contributions from many policy fields. Its planning and implementation requires a multi-layered system and the co-operation of key players in business and society.
Method
Unlike Work Package 4 (Businesses) and 12 (Consumers), Work Package 3 is primarily about the contributions of various sub-units of the state and the horizontal and vertical integration of aspects of material and resource efficiency in different policy fields. The impulses coming from economic and innovation policies, infrastructure policies, tax, trade and research policies, etc., must be considered within a comprehensive strategic approach. Work Package 3 will therefore examine which instruments and strategies are used in other policy fields to integrate environmental issues in general and issues of material efficiency strategy in particular. These are, on the one hand, overall strategies, e.g. sustainability strategies, environmental industrial policy, energy and climate protection policies and targeted material efficiency strategies. On the other hand, the project also incorporates an analysis of the mechanisms and instruments of procedural integration, e.g. the "Green Cabinet", inter-ministerial working groups, processes monitoring the effects of laws, evaluation programmes, information systems and reporting. It will also examine how a national material efficiency strategy may be harmonised with European and international political processes. The aim is to address the question whether, and how, the multi-layered political system - from regional to international levels - can be harnessed effectively.
In Charge of Work Package 3
Prof. Dr. Raimund Bleischwitz
Wuppertal Institute for Climate, Environment and Energy
more
Dr. Klaus Jacob
Freie Universität Berlin
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VOLUME 59, ISSUE 5

Increasing Energy and Resource Efficiency through Innovation An Explorative Analysis Using Innovation Survey Data

Rammer, Christian; Rennings, Klaus

Year: 2009 Volume: 59 Issue: 5 Pages: 442-459

Abstract: Energy and resource efficiency innovations (EREIs) are often seen as win-win opportunities for both the economic and the environmental performance of firms. It is thus worth asking how the innovation activities and performance of firms with regard to energy and resource efficiency look like: Do EREI firms follow distinct innovation strategies? Do EREIs spur or limit innovation success? And what are the particular features of EREI firms compared to conventional innovators? Using German innovation data, we find that EREIs are determined by a larger set of technology-push and market-pull factors. On the supply side, R&D budgets, research infrastructure and networking with other firms are important factors of influence, while on the demand side increased productivity and cost reductions are decisive, as well as improved product quality. On the other hand, EREIs are complex activities which also need regulatory incentives. Although EREIs are not more successful compared to conventional in-novations, they contribute substantially to the economic success of firms.

JEL classification: Q01, Q55, O31, O33

Keywords: resource efficiency, energy efficiency, environmental innovations, innovation surveys

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Motivation

Energy and resource efficiency innovations
(hereafter: EREIs)
are seen as win-win opportunities

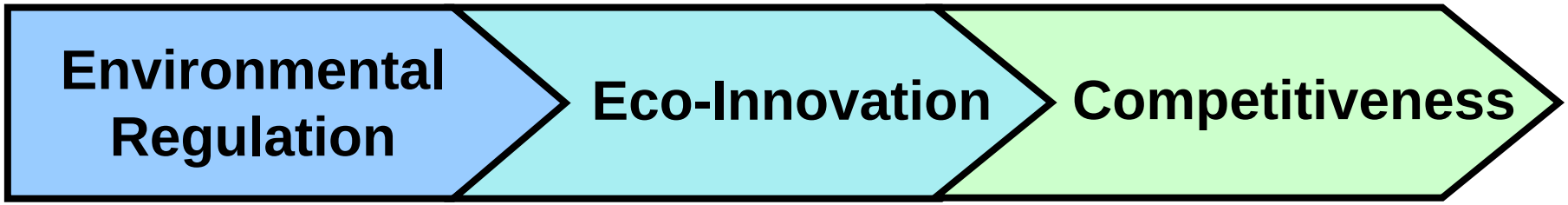
German sustainable development strategy
➢Goal: Doubling resource efficiency until 2020
compared to the reference year 1994

Between 1994 and 2007
resource productivity increased only by 35%

➢ Thus additional efforts are needed
to reach this goal (Statistisches Bundesamt, 2008)

➢Goal: identify determinants for EREIs

The Porter Hypothesis



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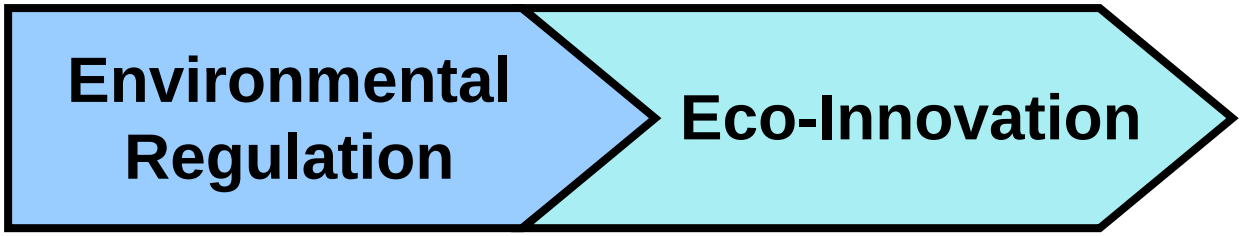
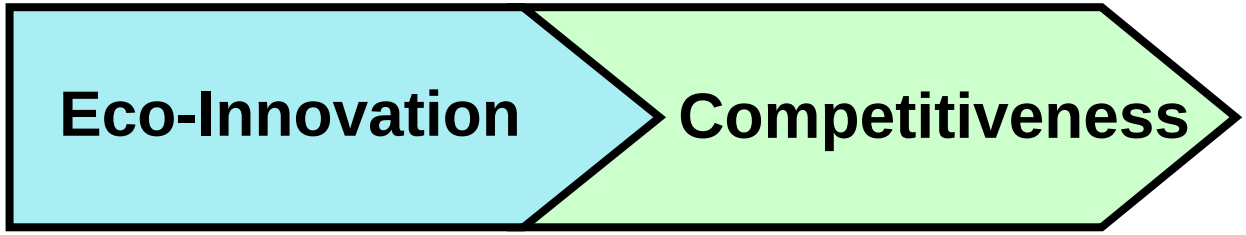
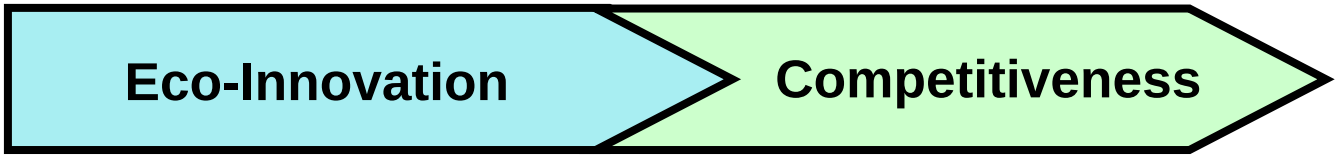




Empirical Evidence from Firm Surveys



Lanoie et al. (2007), GAEL Working Paper (OECD survey with 4200 manufacturing facilities)

- Weak Porter Hypothesis: Positive
- Strong Porter Hypothesis: Positive
- However: Positive effect does not outweigh cost of environmental regulation, total effect is negative

However, what we test:

Strong Porter Hypothesis might be especially relevant for EREIs

- ➢ Energy and material costs = partially private good
- ➢ Increase competitiveness, stimulate resource- and cost-efficient production

Added value of our paper

- Lack of technology-specific firm data

- Empirical evidence on the specific determinants of energy and material efficiency innovations is scarce

Questions of our paper:

- Innovation performance of German firms with regard to EREIs
- How do energy and material costs influence their innovation behaviour?
- And what are the distinctive features of EREI firms compared to conventional innovators?

Definition environmental innovation, EREIs

- EREIs:
  In contrast to other environmental innovations, such as technologies to reduce noise, they are – at least partially – a private good since they reduce the costs firms have to pay for the use of energy and materials

- However, the "double externality problem" (Rennings, 2000) still exists, since EREIs firstly produce general innovation spillovers and secondly reduce environmental burdens (such as climate change), i.e. a technological environmental external effect

- Thus it may be expected that there are **some private incentives** for innovators to take energy and resource efficiency measures. The size of these incentives, however, **may be small**, perhaps too small to invest, if efficiency will probably merely increase by some additional percent after implementing the innovation

Methodology I

- EREI firm: has introduced a new product or process that has significantly reduced the use of material or energy.

- We use German innovation survey data (MIP, CIS 2005) to measure the number of firms with EREIs in an economy, their distribution by sectors and their characteristics compared to other innovators.

- Matching approach: compares two groups of firms which are almost identical except for one feature, which in our case is the introduction of an EREI or any other type of innovation.

Methodology II

- For every firm from the group of firms with EREIs in our sample, we choose another firm which should be as similar as possible in terms of size (number of employees), industry (two-digit economic sectors), location (Western or Eastern Germany) and the type of innovation introduced (product innovator, process innovator).

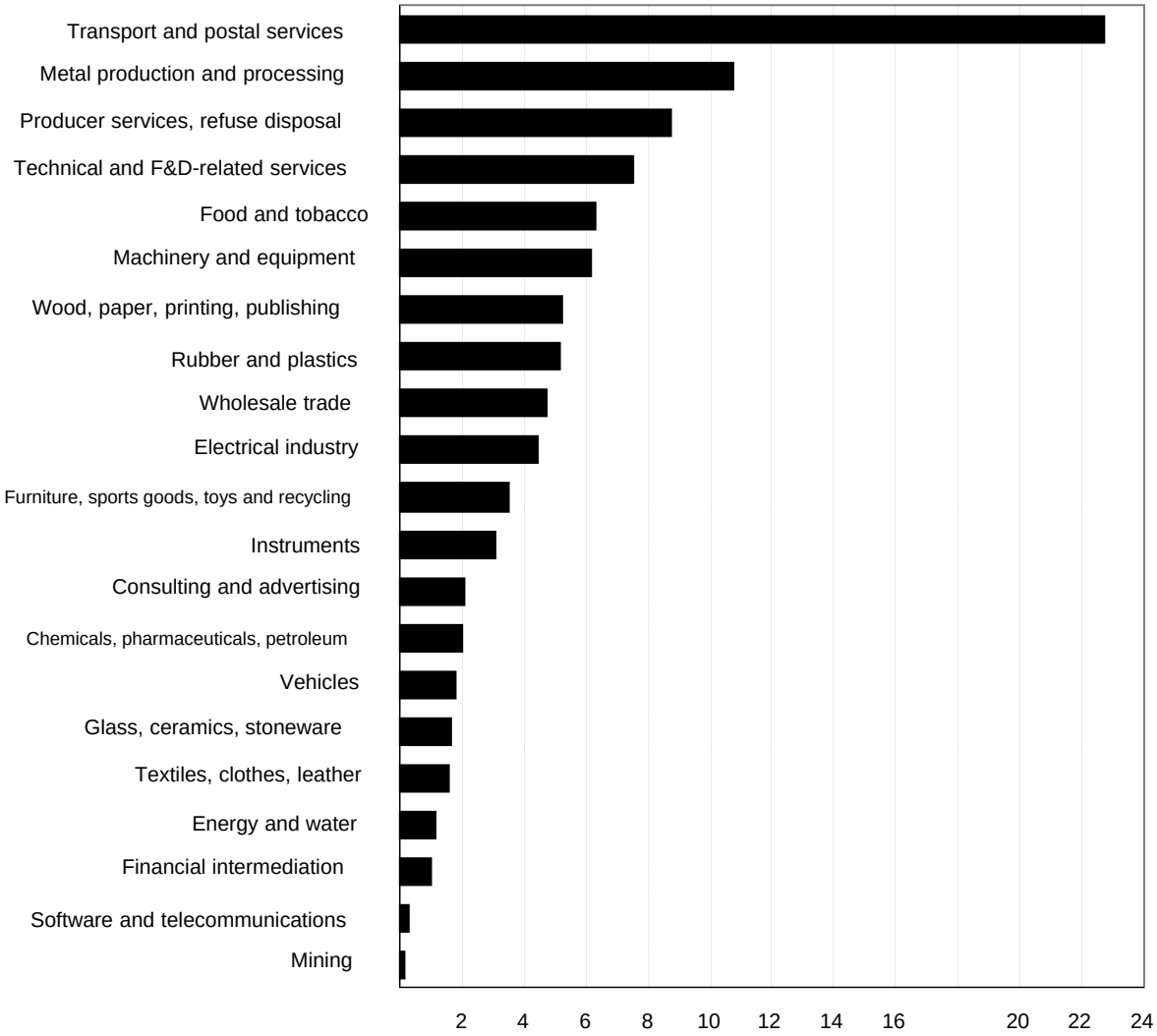
- In the following, we compare mean values of innovation indicators for the group of firms with EREIs and the group of matched firms.

- We apply two alternative definitions of firms with EREIs:
  1. as above (cuts in material or energy costs per unit were a highly important effect of the innovation).
  2. includes also firms that regarded this effect of innovation as relevant but only to a medium extent.

Data: Mannheim Innovation Panel (MIP)

- Part of the Community Innovation Survey (CIS), carried out on a biannual basis
- MIP 2005: focuses on firms with 5 or more employees from manufacturing and selected service sectors
- Gross sample: around 30.000 firms
- Valid responses: 5,476 (response rate of 20%)
- Non-response survey confirmed representativity of the sample
- EREIs: In the period 2002-2004, 3% of all German firms introduced innovations which significantly increased energy and/or material efficiency
- In total: proximately 6,600 firms in Germany (within the industries covered by the innovation survey and having 5 or more employees) may be classified as EREIs

Distribution of "environmentally efficient innovators" by industry in Germany 2004



Sector as a percentage of all firms who in 2002-2004 introduced new products and/or processes which had significant effects on cuts in material or energy costs per unit/procedure. Note: Firms having at least 5 employees in the sectors 10-41, 51- 60-67, 72-74, 90 in Germany.
All figures are extrapolated to the total firm population in Germany. Source: ZEW, Mannheim Innovation Panel, Survey 2005

Mean values of variables on firm performance, innovation input, innovation activities and innovation output for EREI firms and firms from a control group

	Sample 1 - EREI (core)					Sample 2 - extended EREI				
	EREI	CG	α		t value	EREI	CG	α		t value
Propensity score before matching	0.104	0.071	0.033	10.43	***	0.314	0.243	0.071	15.31	***
Propensity score after matching	0.104	0.103	0.001	0.25		0.314	0.315	-0.001	-0.12	
Firm performance										
Profit margin (OS)	3.60	3.71	-0.11	-0.59		3.70	3.64	0.06	0.59	
Share of exports in total sales (%)	23.9	24.9	-1.0	-0.37		24.0	21.0	3.0	2.13	**
Sales per employee (m€)	0.441	0.340	0.101	2.77	***	0.388	0.413	-0.024	-0.72	
Innovation input										
Innovation expenditure in total sales (%)	7.8	6.0	1.8	1.37		8.0	7.7	0.3	0.32	
R&D expenditure in total sales (%)	4.4	2.2	2.2	2.10	***	4.0	3.2	0.8	1.29	
Firms with continuous in-house R&D (%)	56.3	49.0	7.3	1.47		53.0	45.8	7.2	2.70	***
Innovation output										
Share of sales with new products (%)	20.4	23.3	-2.9	-1.23		22.7	22.5	0.3	0.20	
Share of sales with new products (%)	6.5	4.6	2.0	1.76	*	6.7	6.0	0.7	0.89	
Share of firms having introduced quality improving process innovation (%)	55.7	45.5	10.2	2.10	**	50.3	45.1	5.3	2.02	**
Cost savings due to process innovation (%)	6.5	3.6	2.9	3.56	***	5.4	3.1	2.2	5.11	***

Importance of information sources										
Own enterprise (LS)	2.63	2.48	0.15	2.13	**	2.53	2.42	0.11	2.99	***
suppliers (LS)	1.89	1.74	0.15	1.89	*	1.86	1.68	0.18	4.17	***
customers (LS)	2.12	2.14	-0.02	-0.26		2.15	2.11	0.04	0.84	
competitors (LS)	1.66	1.48	0.17	2.04	**	1.64	1.50	0.14	3.06	***
universities (LS)	1.17	0.96	0.21	2.19	**	1.09	0.88	0.21	4.44	***
public research institutes (LS)	0.72	0.54	0.18	2.40	**	0.70	0.52	0.18	4.66	***
Fairs, exhibitions, conferences (LS)	1.71	1.53	0.19	2.29	**	1.62	1.46	0.16	3.84	***
scientific publications (LS)	1.53	1.32	0.21	2.66	***	1.51	1.29	0.22	5.62	***
industry associations (LS)	1.07	0.78	0.29	3.60	***	1.01	0.83	0.18	4.36	***
Firms cooperating in innovation										
With own enterprise group (%)	20.8	14.2	6.6	1.86	*	15.8	8.9	6.9	4.15	***
With suppliers (%)	22.1	13.7	8.4	2.34	**	18.2	12.1	6.1	3.38	***
With customers (%)	23.9	15.9	8.0	2.13	**	18.7	11.8	6.8	3.79	***
Importance of obstacles to innovation										
too high economic risk (LS)	1.72	1.53	0.19	1.85	*	1.74	1.70	0.04	0.71	
Lack of external funding (LS)	1.34	1.11	0.23	2.00	**	1.31	1.18	0.14	2.35	**
uncertain demand (LS)	1.20	1.03	0.17	1.81	*	1.25	1.12	0.13	2.72	***
regulations (LS)	1.34	0.99	0.35	3.37	***	1.31	1.08	0.23	4.09	***
red tape (LS)	1.28	0.94	0.34	3.11	***	1.24	1.01	0.23	3.98	***
Lack of partners (LS)	0.95	0.67	0.28	3.14	***	0.92	0.78	0.13	2.86	***

Results I

- Firms with EREIs are more productive, i.e. sales per employee are approximately 15% higher.
- EREIs: Process innovations are more strongly aimed at cost reduction.
- EREIs more often aim at and achieve an improvement in the quality of processes.
- Firms with EREIs achieve higher rationalisation effects in their process innovations: Average unit cost reduction makes up 6.4% and thus exceeds the value of the comparison group by 2.2 percentage points (i.e. by approximately 50% of the average unit cost reduction realised by other innovators).
- EREIs perceive innovation barriers more intensely,especially legislation/regulation, bureaucratic burden and lack of co-operation partners, but also to the availability of appropriate financial sources to fund innovation activities.

Results II

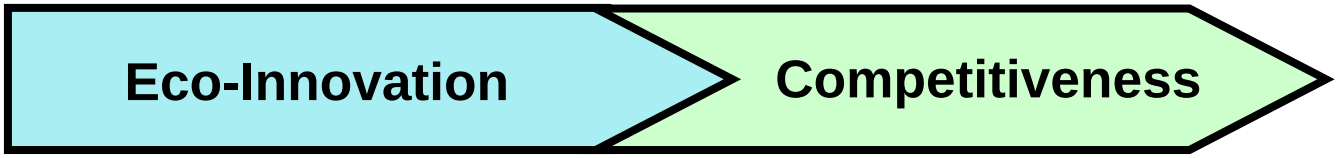
- Firms with EREIs more often use suppliers, universities, non-university research institutes and industry associations as a source of information for their innovations

- Moreover, they more often introduce knowledge management systems and innovative marketing improvements in the field of design and packaging

- No difference between firms with EREIs and other innovators regarding:
  - share of innovation and R&D expenditure in sales
  - success of product innovations
  - overall economic success of the firm
  - human capital
  - public funding as good as for other innovators

➢ when it comes to support of innovation, there is no preference for, but also no "discrimination" against EREIs.

Empirical Evidence from Innovation Surveys



Rennings and Rammer (2009), CJEF

- Eco-efficient process innovations:
  Increase productivity, quality of processes, turnover, rationalization and cost reduction of processes
- Eco-efficient product innovations: No difference in success to non-environmental innovations

- ➢ Porter is right when saying that resource efficiency is part of total productivity
- ➢ But this does not say that environmental regulation does not impose any cost to firms

Share of environmentally efficient innovators in European firms in selected countries, by sectors

	GER	CZE	FRA	BEL	NED	SWE	POL	AUT	FIN	ESP	ITA	NOR
Mining	1.2	NA	**8.4**	NA	6.3	7.8	2.3	NA	NA	1.0	1.2	1.8
Food	**10.2**	·6.9	5.2	·5.5	6.7	9.0	2.9	NA	·6.5	3.2	1.6	1.9
Tobacco	NA	0.0	NA	NA.	NA	NA	**25.0**	NA	NA	16.7	NA	NA
Textiles	2.3	4.6	·5.3	8.6	6.3	·5.3	4.3	8.7	**12.3**	1.9	0.9	·1.1
Clothing	1.9	**5.8**	4.3	0,0	NA	NA	1.5	NA	3.9	0.9	0.1	0.0
Leather	1.7	NA	1.9	NA	NA	NA.	3,7	NA	**6.7**	0.5	1.0	n.v.
Wood	3.1	·3.7	2.3	·3.3	NA	4.8	3.9	0.0	0.0	2.8	1.9	**5.6**
Paper	6.5	4.0	7.2	3.4	7.3	6.5	**8.1**	5.1	8.1	3.5	0.3	8.0
Printing / Publishing	4.	3.5	5.7	**6.0**	5.7	4.4	3.5	NA	5.2	4.3	2.3	0.0
Petroleum	NA	NA	14.3	NA	**17.4**	NA	4.9	NA	NA	7.1	NA	NA
Chemicals / Pharmaceuticals	·6.	**11.9**	11.3	11.8	9.5	·8.4	9.2	NA	3.6	5.7	4.8	11.4
Rubber and plastics	9,0	9.0	10.1	7.4	9.1	**10.8**	6.8	7.3	4.1	3.4	3.8	0.9
Glass, ceramics, stoneware.	5.1	9.0	**11.8**	1.9	NA	4.1	4.0	4.6	0.6	2.3	2.1	1.5
Metal production	11.5	9.1	**11.8**	7.7	·9.6	6.6	11.4	NA	8.2	4.9	3.1	7.3
Metal processing	**9.8**	7.0	4.6	3.2	4.6	6.7	3.9	·2.0	2.9	1.8	1.6	2.1
Machinery and equipment	5.6	**9.4**	6.4	6.6	8.9	4.3	4.6	3.4	3.9	2.4	1.8	3.9
Computers	2.3	**15.7**	5.1	NA	9.5	NA	1.3	NA	0.0	3.2	2.3	0.0
Electrical engineering	9.1	4.1	7.2	**9.7**	NA	6.1	5.1	4.8	4.6	3.5	3.4	7.1
Electronics / Media technology	6.6	5.8	7.5	1.9	NA	**10.0**	6.7	NA	4.9	6.4	2.3	4.4
Instruments	**8.4**	8.1	4.5	2.6	NA	NA	3.7	2.0	0.0	5.3	3.5	1.1
Automobile industry	**12.1**	10.2	10.8	8.5	8.4	7.9	5.8	NA	5.2	6.0	2.5	3.2
Other vehicles	8.6	**9.5**	6.4	0.0	NA	NA	4.0	NA	2.2	4.4	2,0	0.7
Furniture, sports goods, toys	**7.9**	6.1	7.3	6.6	5.0	3.3	4.6	NA	4.5	3.0	1.3	5.2
Recycling	**14,7**	5.7	NA	6.0	NA	NA	1.0	NA	0.0	5.4	0.5	3.4
Energy and Water	5.9	NA	8.0	NA	·5.3	5.2	**9.4**	NA	NA	1.7	2.0	0.0
Energy	9.5	·4.0	8.1	NA	5.3	NA	**9.8**	NA	0.6	1.4	NA	0.0
Water	2.0	NA	7.8	NA	NA	NA	**8.8**	NA	NA	2.0	NA	NA
Wholesale Trade	5.1	·2.5	4.4	**·5.4**	2.6	1.3	0.8	2.0	·1.6	2.0	1.0	0.5
Transport and postal services.	**7.1**	3.9	3.2	3.5	1.8	1.4	1.5	1.6	1.2	1.2	0.9	1.0
Financial intermediation	0.7	2.9	**3.6**	0.5	1.7	NA	1.6	1.1	1.8	2.0	1.8	0.9
Software and telecommunications	0.5	2.8	**4.9**	1.5	4.8	·1.0	3.2	0.0	2.5	3.0	0.7	1.2
Technical services	3.3	2.2	5.1	1.6	**5.2**	2.9	0.9	1.0	0.0	3.9	1.6	0.5
Industry *	7.4	6.8	6.2	5.2	6.8	5.9	4.2	3.7	3.7	2.8	1.8	2.6
Services **	4.9	2.9	4.2	3.9	2.7	1.4	1.1	1.6	1.4	1.9	1.0	0.7
Total	6.2	5.3	5.2	4.5	4.4	3.5	3.0	2.6	2.6	2.4	1.6	1.6

NA: value not available; * sector 10-41, i.e. excluding the building industry; ** sector 51, 60-67, 72, 74.2, 74.3. The highest values in a sector are in bold print. Firms that in 2002-2004 introduced new products and/or processes which had significant effects on cuts in material or energy costs per unit/procedure as a percentage of all firms. Note: Firms having at least 10 employees. All figures are extrapolated to the total firm population.

Source: Eurostat: CIS4 – Calculations by the ZEW.

Analysis at the European Level?

- CIS 2005 is now available for Europe
- Analysis would be possible to do for all EUU member states
- Interesting for European Resource Policy?

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ZEW Discussion Papers

Increasing Energy and Resource Efficiency Through Innovation – An Explorative Analysis Using Innovation Survey Data

Rennings, Klaus und Christian Rammer (2009), *Increasing Energy and Resource Efficiency Through Innovation – An Explorative Analysis Using Innovation Survey Data* , ZEW Discussion Paper No. 09-056, Mannheim. Download

Umweltinnovationen tragen zur Verbesserung der Umwelteigenschaften von Produkten und Prozessen bei, und erhöhen gleichzeitig ihre Ressourceneffizienz. Dies gilt insbesondere für Energie- und Ressourceneffizienz-Innovationen (im Folgenden: EREIs), die als Win-Win-Optionen gelten. Die deutsche Nachhaltigkeitsstrategie hat zudem die Verdopplung der Ressourceneffizienz bis 2020 bezogen auf das Referenzjahr 1994 als Ziel ausgegeben. Zwischen 1994 und 2007 stieg die Ressourcenproduktivität allerdings lediglich um 35%, so dass sich zusätzlicher Handlungsbedarf ergibt. Es stellen sich eine Reihe von Fragen: Wie performieren Firmen bezüglich ihrer Energie- und Materialeffizienz? Was unterscheidet EREIs aus Sicht der Firmen von anderen Innovationen? Welche Auswirkungen haben EREIs auf den Unternehmenserfolg? Dieses Papier steuert zu der Diskussion eine Auswertung des deutschen Innovationspanels 2005 bei. In den Jahren 2002 bis 2004 haben rund 6.600 Firmen in Deutschland EREIs eingeführt. Es lassen sich statistisch signifikante Unterschiede zwischen Firmen mit EREIs und anderen Innovatoren feststellen: EREI-Firmen sind beispielsweise produktiver, d.h. die Umsätze pro Mitarbeiter sind ungefähr 15% höher. Ihre Prozessinnovationen verfolgen in stärkerem Ausmaß das Ziel der Kostenreduktion, denn steigende Energie- oder Materialeffizienz ist c.p. mit geringeren Stückkosten verbunden. Interessanterweise ist mit EREIs öfter das Ziel der Qualitätsverbesserung von Prozessen verbunden, das auch erreicht wird. Dies bedeutet, dass erfolgreiche Anstrengungen im Bereich EREI auch die Produktcharakteristika verändern. Effizientere Prozesse können höhere Qualitätsstandards erfüllen und verbessern so die Produktqualität. EREI Firmen erreichen ebenfalls höhere Rationalisierungseffekte durch ihre Prozessinnovationen. Dies zeigt, dass ein klarer Anreiz für EREIs in der Realisierung von Kostenreduktionen besteht. Darüber hinaus werde Innovationsbarrieren von Firmen mit EREIs stärker wahrgenommen. Es kann die Schlussfolgerung gezogen werden, dass – wie erwartet – EREIs von vielen Faktoren beeinflusst werden. Auf der Angebotsseite sind F+E Budgets, Forschungsinfrastruktur und Netzwerke mit anderen Firmen wichtige fördernde Einflüsse. Firmen mit EREIs weisen zudem eine hohe Produktivität, höhere Kostenreduktionen sowie eine höhere Produktqualität auf. EREIS sind komplexe Aktivitäten, die regulatorischer Unterstützung bedürfen. Keinen Unterschied gibt es in der finanziellen Förderung von EREIs im Vergleich zu anderen Innovationen. Zwar sind EREIS nicht erfolgreicher als andere Innovationen, aber auch nicht weniger: somit leisten sie einen substanziellen Beitrag zum ökonomischen Erfolg der Firmen.

Keywords: Resource efficiency, energy efficiency, environmental innovations, innovation surveys

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