Innovation and Technology Transfer for Climate Change: Indicators and Analysis

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at

Annex I Expert Group Seminar
"Working Together to Respond to Climate Change“
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OECD Research on Environmental Patents

- Development of a methodology for the identification of environmentally-preferable technologies and innovation

- Empirical assessment of the relationship between environmental policy and technological innovation, drawing upon patent data

- Initial results in three areas - renewable energy, wastewater effluent, and vehicle emissions abatement (ENV/EPOC/WPNEP(2007)5/Final): role of R&D, policy instrument choice, market factors.

- Close collaboration with the Economic Analysis and Statistics Division of the Directorate for Science, Technology and Industry

Patents as a Measure of Innovation

- Pros
  - output measure
  - quantitative/commensurable
  - widely available
- Cons
  - variable quality
  - one of many ‘protection’ strategies
  - dependent upon local conditions

Patents as a Measure of Environmental Innovation

- Possible to identify distinct ‘environmental’ innovation – i.e. under WIPO IPC scheme over 70,000 technology classifications (http://www.wipo.int/classifications/ipc/en/)
- Application-based - and thus broad population of potentially relevant classes (preferable to commodity or sectoral classifications)
- Two possible types of error – inclusion of irrelevant patents and exclusion of relevant patents from classifications selected
- Distinction between changes-production-processes and end-of-pipe investments: latter more readily identifiable but perhaps less ‘innovative’

Use of PATSTAT Database

- Use of PATSTAT database – allows for richer 'search strategies' in all environmental spheres with inclusion of abstracts
- Possible to develop more accurate indicators of eco-innovation using keyword searches
- Worldwide coverage (data from 80 national and regional patent offices – i.e. all OECD countries, BRICs, etc.)
- Time series for over 30 years, that can be revised and updated at very low cost
- Also - possibility to develop indicators of technology transfer (international patent families)
- Links with other sources of micro-data feasible (i.e. PRTRs and financial data)

IPC Hierarchy – An Example

Subdivision	Number of subdivisions	Example of an IPC code	
		Symbol	Title
Section	8	F	Mechanical Engineering; Lighting; Heating; Weapons; Blasting
Subsection	21	F0	Engines or Pumps
Class	120	F03	Machines or Engines for Liquids; Wind, Spring, or Weight Motors; Producing Mechanical Power or a Reactive Propulsive Thrust, Not Otherwise Provided For
Subclass	628	F03G	Spring, Weight, Inertia, or Like Motors; Mechanical-Power-Producing Devices or Mechanisms, Not Otherwise Provided For; or Using Energy Sources Not Otherwise Provided For
Main group	ca. 6,900	F03G 6	Devices For Producing Mechanical Power From Solar Energy….
Subgroup	ca. 62,100	F03G 6/08	With Solar Energy Concentrating Means

Sample ‘Environmental’ Patent Application

PCT WORLD INTELLECTUAL PROPERTY ORGANIZATION
International Bureau

INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 5 : F03D 7/04	A1	(11) International Publication Number:	WO 94/04820
		(43) International Publication Date:	3 March 1994 (03.03.94)

(21) International Application Number: PCT/DK93/00278

(22) International Filing Date: 26 August 1993 (26.08.93)

(30) Priority data:
1055/92 26 August 1992 (26.08.92) DK

(71)(72) Applicant and Inventor: ULLERSTED, Hans [DK/DK]; Kruslundevej 65, DK-5500 Middelfart (DK).

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(75) Inventors/Applicants *(for US only)* : HANSEN, Per [DK/DK]; Erantievænget 3, DK-5856 Ryslinge (DK). NIELSEN, Arne [DK/US]; P.O. Box 8972, Palm Springs, CA 92263 (US).

(74) Agent: K. SKØTT-JENSEN PATENTINGENIØRER A/S, Lemminggvej 223, DK-4361 Hasselager (DK).

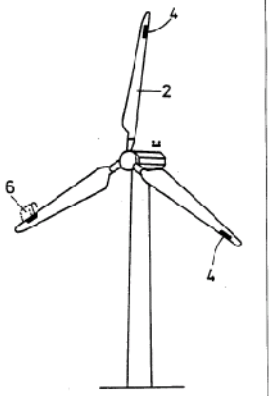
(81) Designated States: AT, AU, BB, BG, BR, BY, CA, CH, CZ, DE, DK, ES, FI, GB, HU, JP, KP, KR, KZ, LK, LU, MG, MN, MW, NL, NO, NZ, PL, PT, RO, RU, SD, SE, SK, UA, US, VN, European patent (AT, BE, CH, DE, DK, ES, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG).

Published
With international search report.
In English translation (filed in Danish).

(54) Title: WINDMILL, WING FOR SUCH A MILL, AND ADD-ON ELEMENT TO BE MOUNTED ON A MILL WING

(57) Abstract

Generally speaking, stall-regulated mill blades have a lower propulsive effect at higher than at lower temperatures because the air density at any given wind velocity is lower, the higher the temperature is. This condition is critical at the stall-wind velocity where the mill produces the maximum effect at which it is designed to perform. If the wings are regulated for maximum performance at high temperatures, then overload will occur at low temperature stall-wind velocity conditions. In consequence, the wings are normally adjusted to low temperature conditions in return for which it becomes necessary to relinquish the maximum effect at high temperatures. With the invention, an air temperature sensor (10, 16, 22, 34) is provided which by means of connected actuator means (14, 20, 32) can change the wing structure such that the wing becomes generally less effective at decreasing temperatures. Hereby it is possible to increase the effect of the mill, in that it will be able to better exploit the high wind velocity at high temperatures without incurring problems at low temperatures in terms of overload.



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Areas Currently Being Addressed

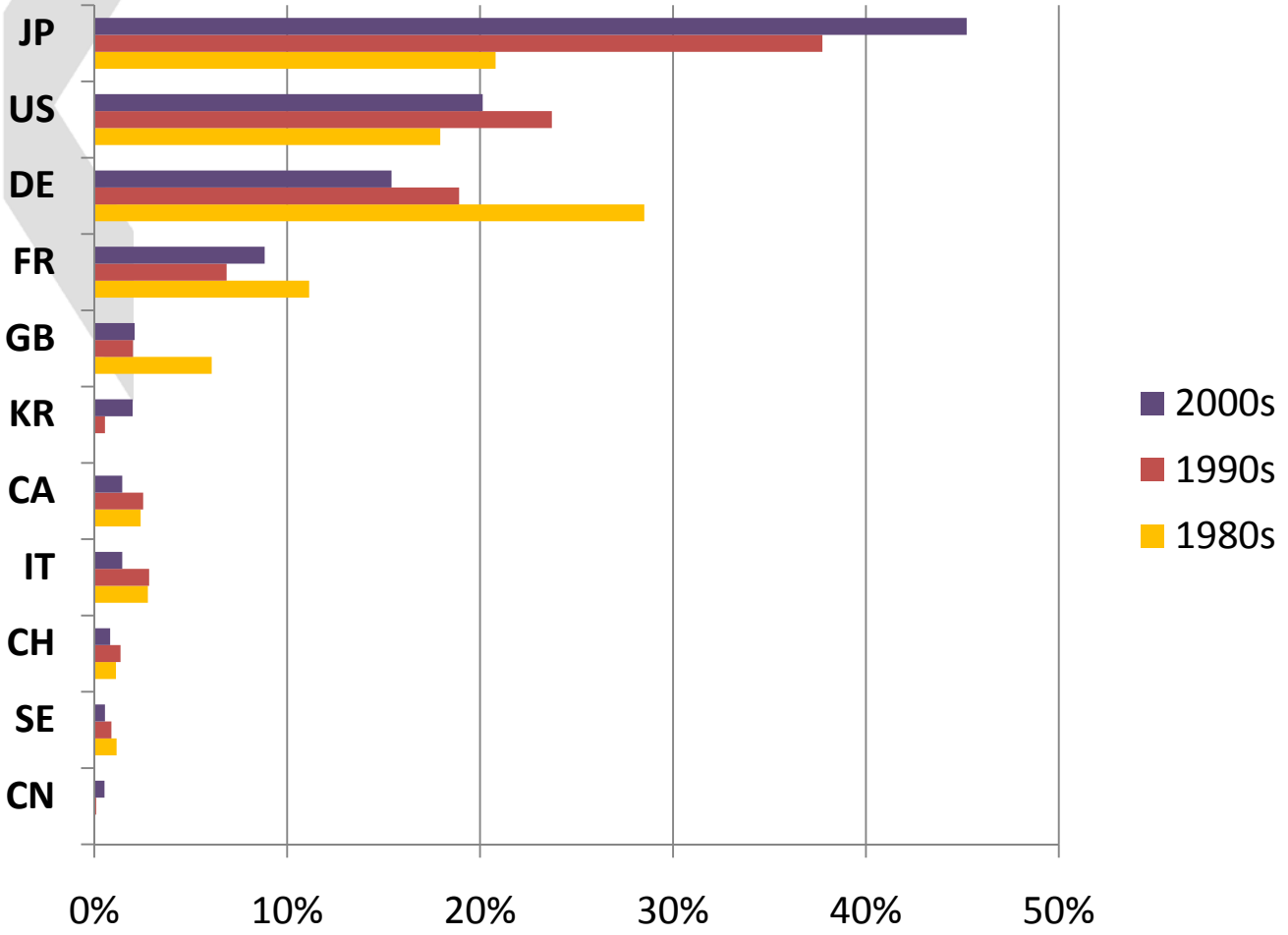
- wastewater treatment;
- sulphur and PM from vehicles;
- ‘sustainable chemistry’;
- waste management and recycling;
- air pollution abatement (Sox and Nox);
- and (perhaps) climate change technologies.

Potential Areas of Application for Climate Change

- Renewable energy (http://www.nber.org/papers/w13760)
- Vehicle fuel efficiency
- Vehicle fuel choice (e.g. hybrid vehicles)
- Building energy efficiency (e.g. insulation, heating)
- Lighting technologies
- Carbon capture and storage
- Methane capture
- Energy efficiency in manufacturing (e.g. cement)

Hybrid, Electric & Fuel Cell Vehicle Patents

(EPO, 1980-2004 – country shares)



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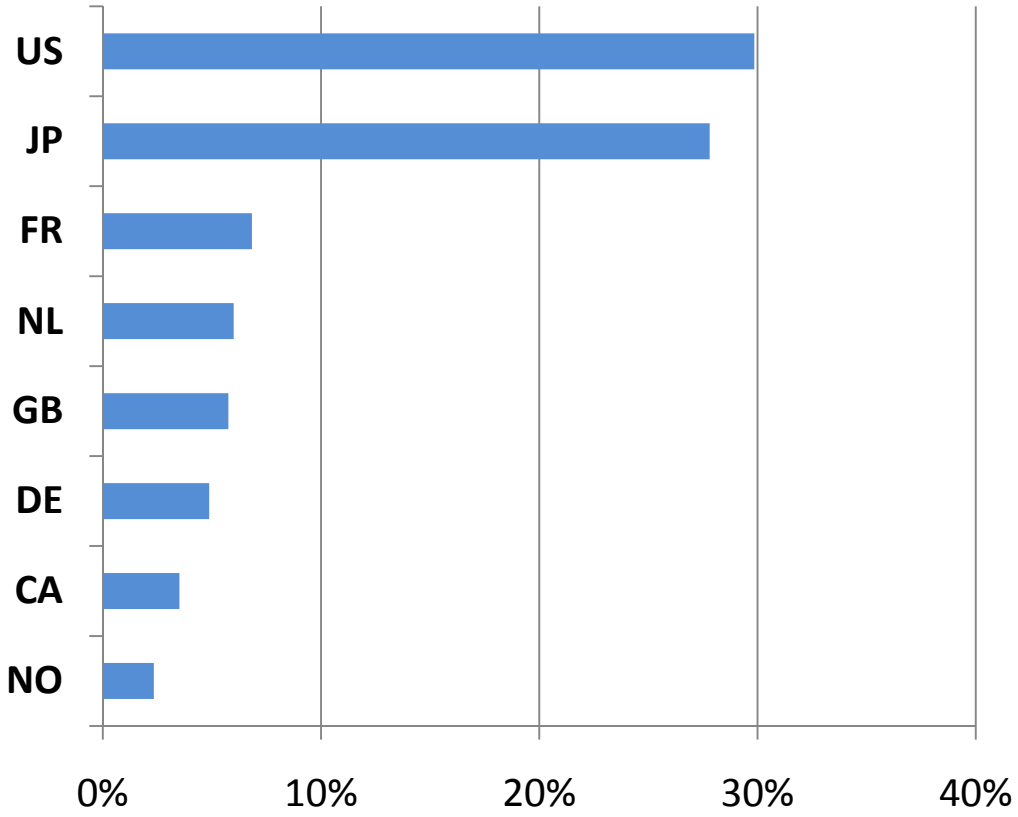
Carbon Capture Patents

(EPO, 1990-2004 – country shares)



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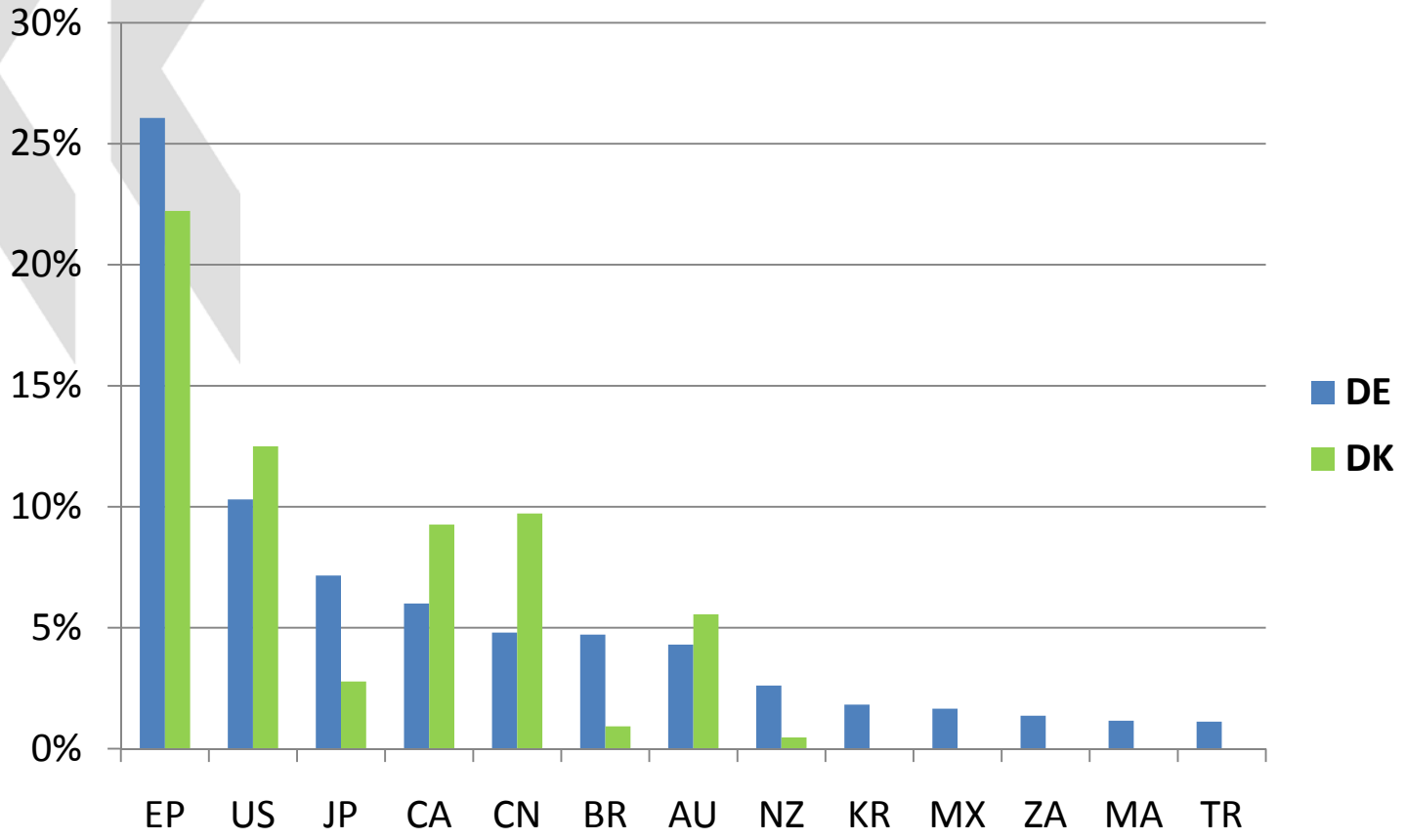
Assignees of Carbon Capture Patents

(% of Total EPO, 1990-2004)

Assignee	*Country*	*Share*
MITSUBISHI CORP	JP	14.9%
KANSAI ELECTRIC POWER CO	JP	9.0%
MARINE DESALINATION SYSTEMS	US	2.8%
PILKINGTON GLASS LTD	GB	2.1%
TOKYO SHIBAURA ELECTRIC CO	JP	2.1%
UNITED TECHNOLOGIES CORP	US	2.1%
AGENCY IND SCIENCE TECHN	JP	2.1%
ADVANCED ELECTRON BEAMS INC	US	1.7%
SHELL INT RESEARCH	NL	1.7%
AIR LIQUIDE	FR, US	1.4%
TOSHIBA KK	JP	1.4%
INST FRANCAIS DU PETROL	FR	1.4%
BOC GROUP PLC	GB	1.4%
PRAXAIR TECHNOLOGY INC	US	1.0%
TNO	NL	1.0%
GLOBAL RES TECHNOLOGIES LLC	US	1.0%
CANADA NATURAL RESOURCES	CA	1.0%
NORSK HYDRO AS	NO	0.7%

Technology Transfer: Wind Power

(1978-2004)



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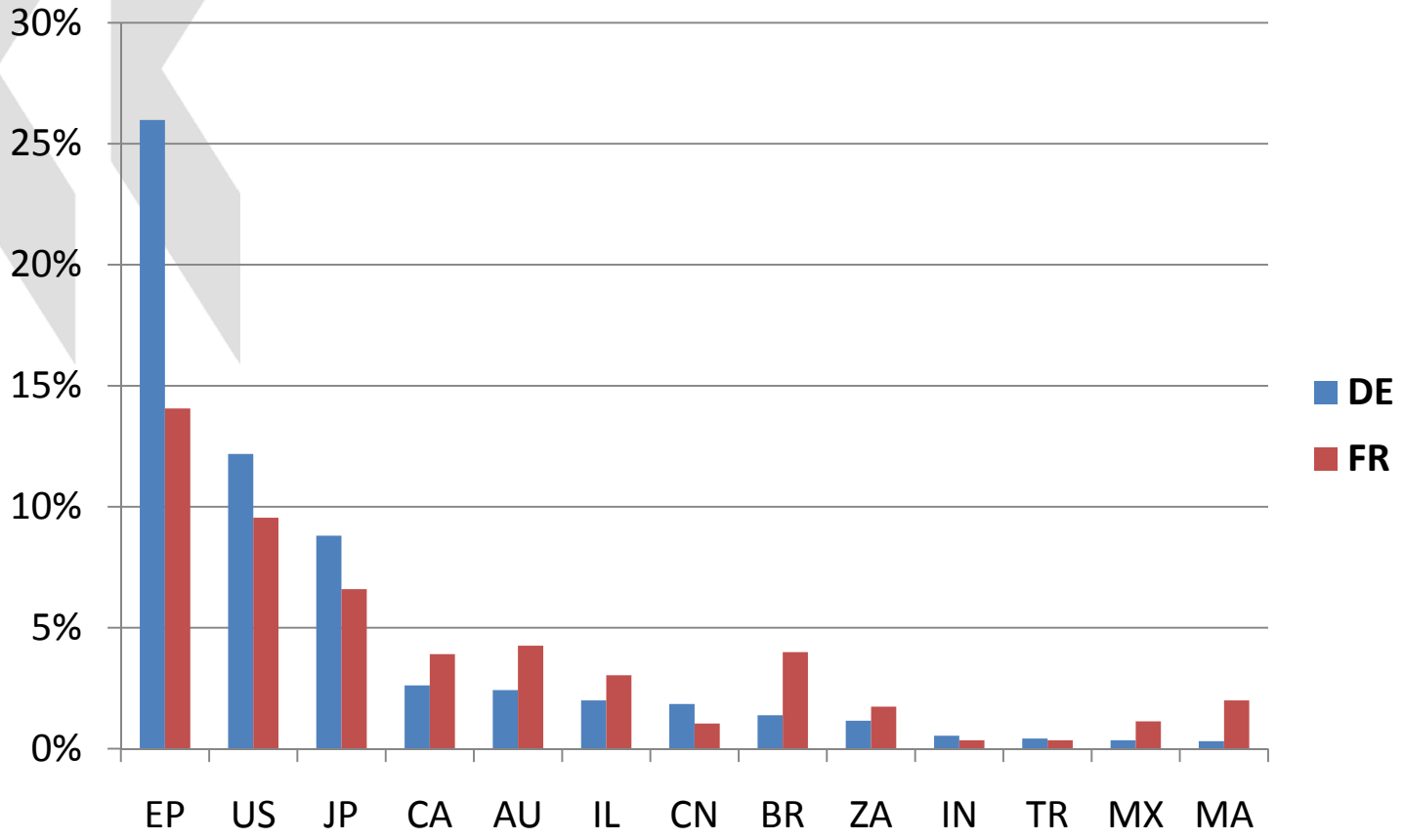
Technology Transfer: Solar Power

(1978-2004)



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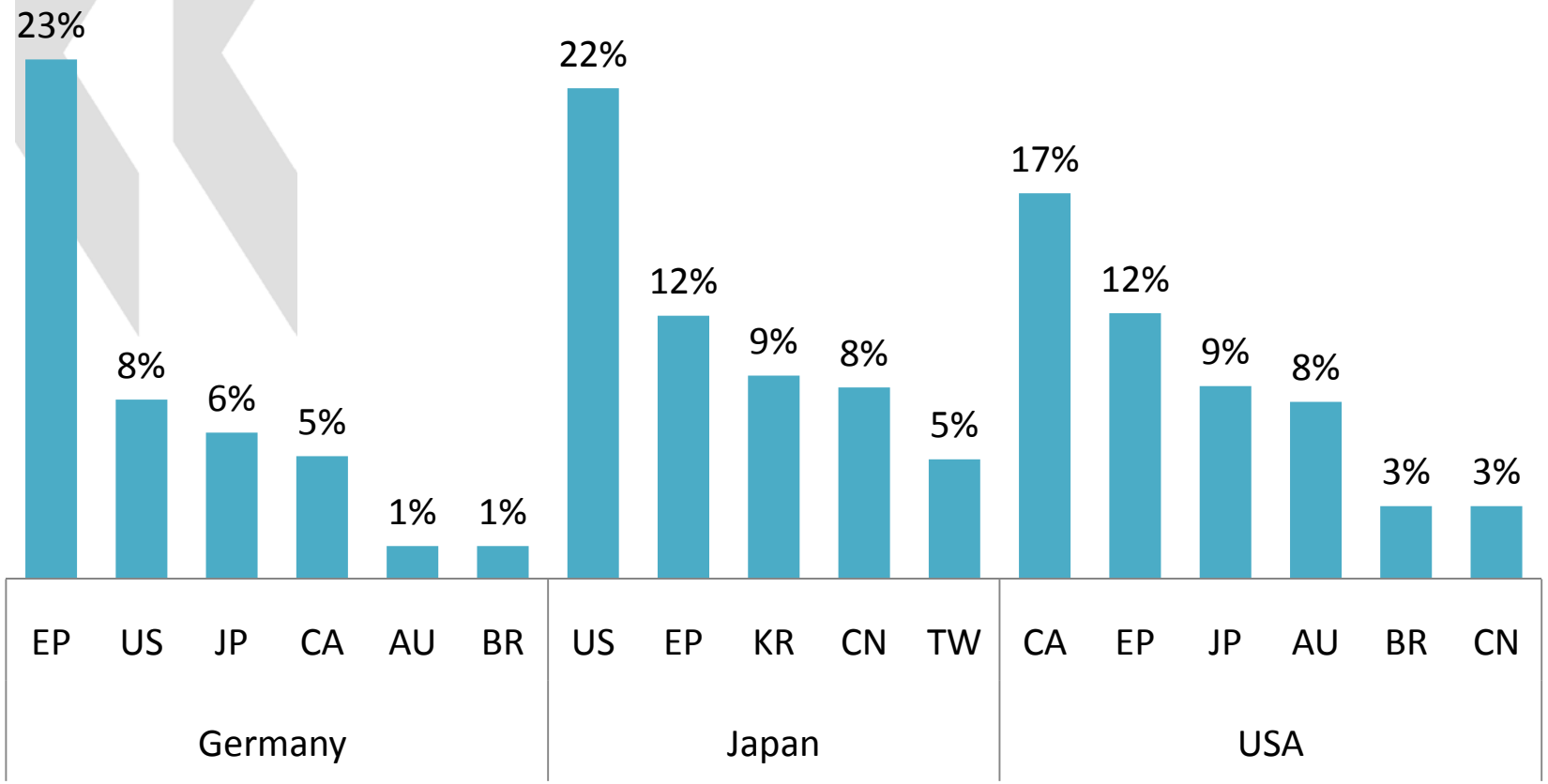
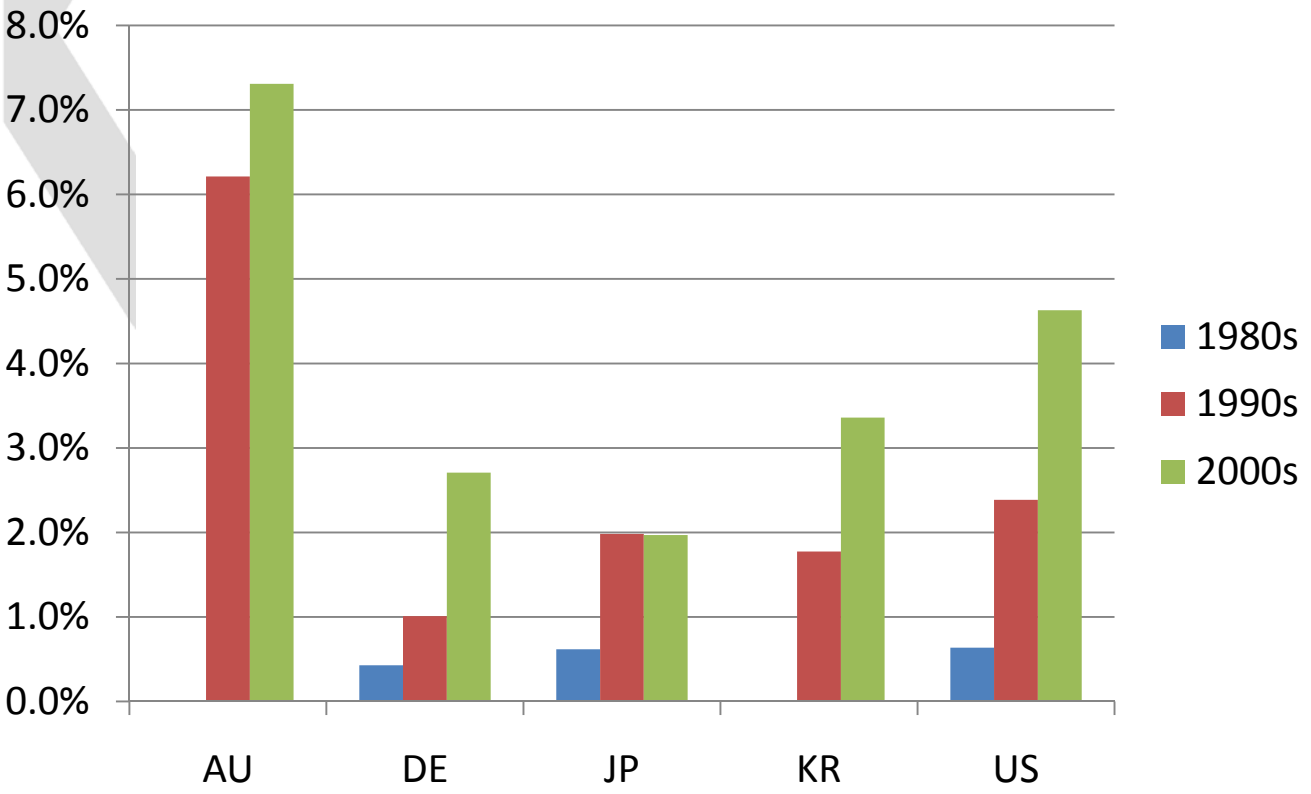
Regionalisation of Technology Transfer: Energy-Efficient Cement Manufacturing

(Top 5 recipient countries)



Transfer of Solar Power Technologies to China

(% of country's worldwide transfer)



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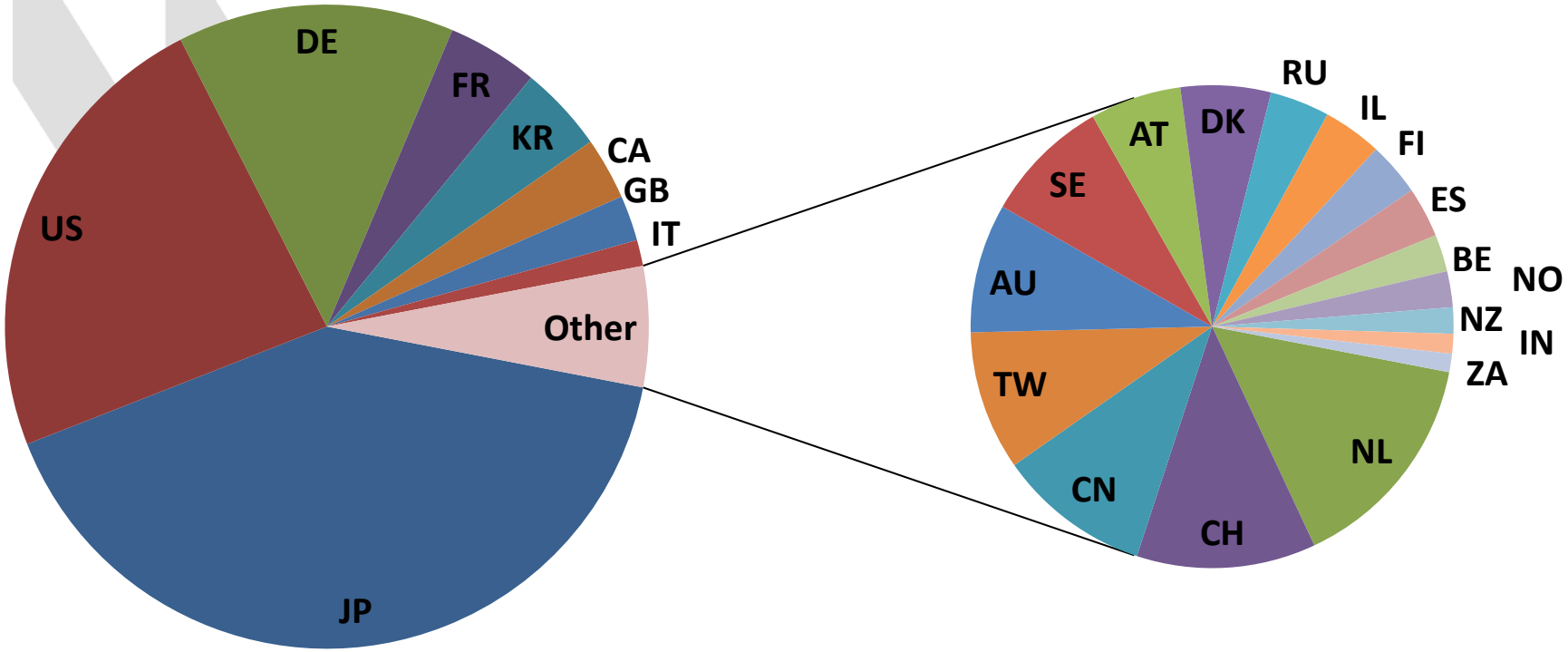
Role of Emerging Economies: Hybrid Vehicles Patents (2000-2004)



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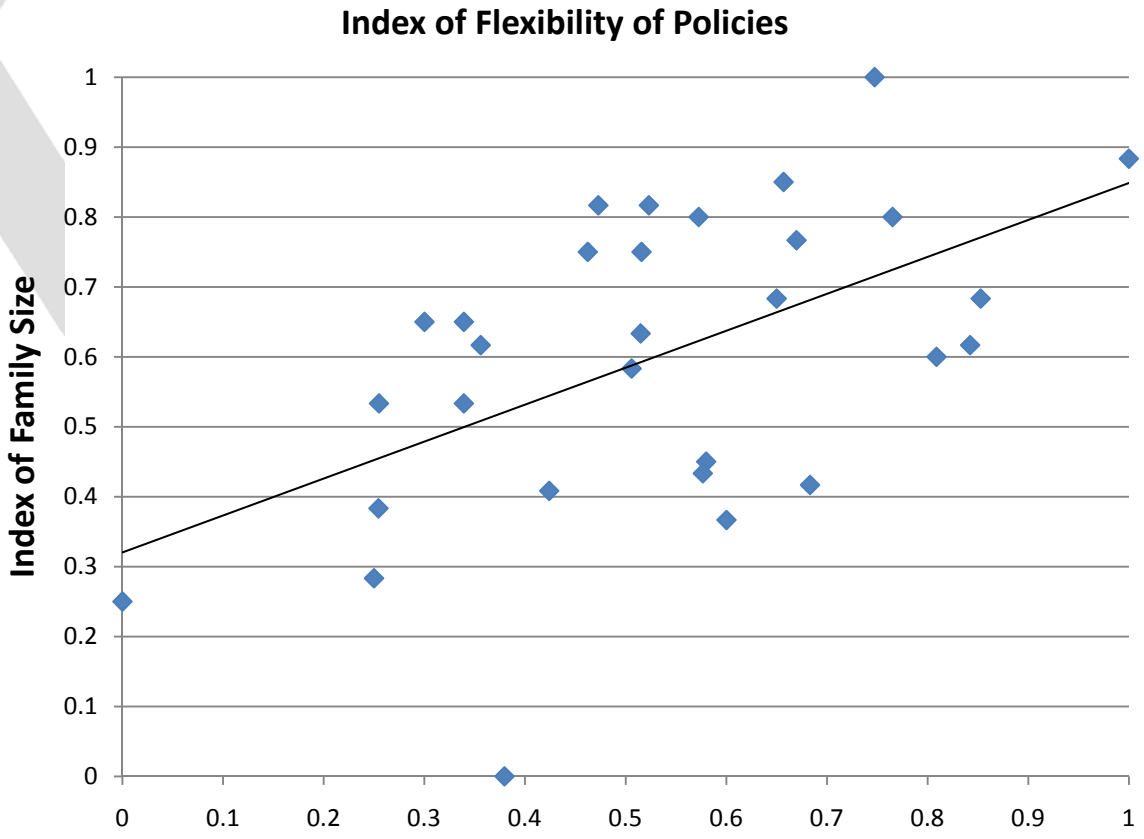
Policy Design and Technology Transfer



Next Steps

• Further assessment of the **determinants** (including policy design) of eco-innovation in different areas;

• Analyse the **role of globalisation** (technology transfer, research collaboration) in encouraging and diffusing innovations (OECD – NMC); and,

• Examine impacts of environmental innovation on **economic competitiveness** (link with financial & environmental (PRTRs) micro-data)