Promoting Environmentally-Related Innovation in Global Markets through Environmental Policy Design

Presentation by

Nick Johnstone
(Nick.Johnstone@oecd.org)

Empirical Policy Analysis Unit
National Policies Division
OECD Environment Directorate

at

Workshop on Environmental Innovation and Global Markets
Sept. 20-21 2007, Berlin

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Overview of Presentation

A) Results of work on Environmental 'Patents':

- Patent-based indicators of environmental innovation
- Environmental policy and patent counts

B) Results of Industrial Survey on Determinants of:

- Environmental R&D
- Integrated 'clean production'

OECD Research on Environmental Patents

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

- Empirical assessment of the determinants of environmental innovation; and,

- Particular focus on role of environmental policy – instrument choice and stringency.

Patents as a Measure of 'Environmental' Innovation

- Possible to identify distinct 'environmental' innovation – i.e. under WIPO IPC scheme over 60,000 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'

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

‘Environmental’ Patent Application – An Example

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/DK93/00279

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

(30) Priority data: 1059/92 — 26 August 1992 (26.08.92) — DK

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

(72) Inventors; and
(75) Inventors/Applicants *(for US only)* : HANSEN, Per [DK/DK]; Erantisvænget 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; Lemmingvej 225, DK-8361 Hasselager (DK).

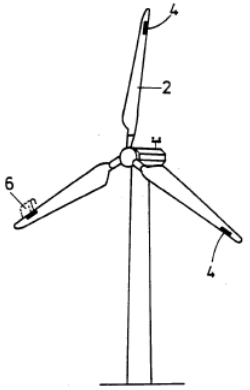
(81) Designated States: AT, AU, BB, BG, BR, BY, CA, CH, CZ, DE, DK, ES, FI, GB, HU, JP, KP, KR, KZ, LK, LU, MG, MN, MW, NL, NO, NZ, PL, PT, RO, RU, SD, SE, SK, UA, US, VN, European patent (AT, BE, CH, DE, DK, ES, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML,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

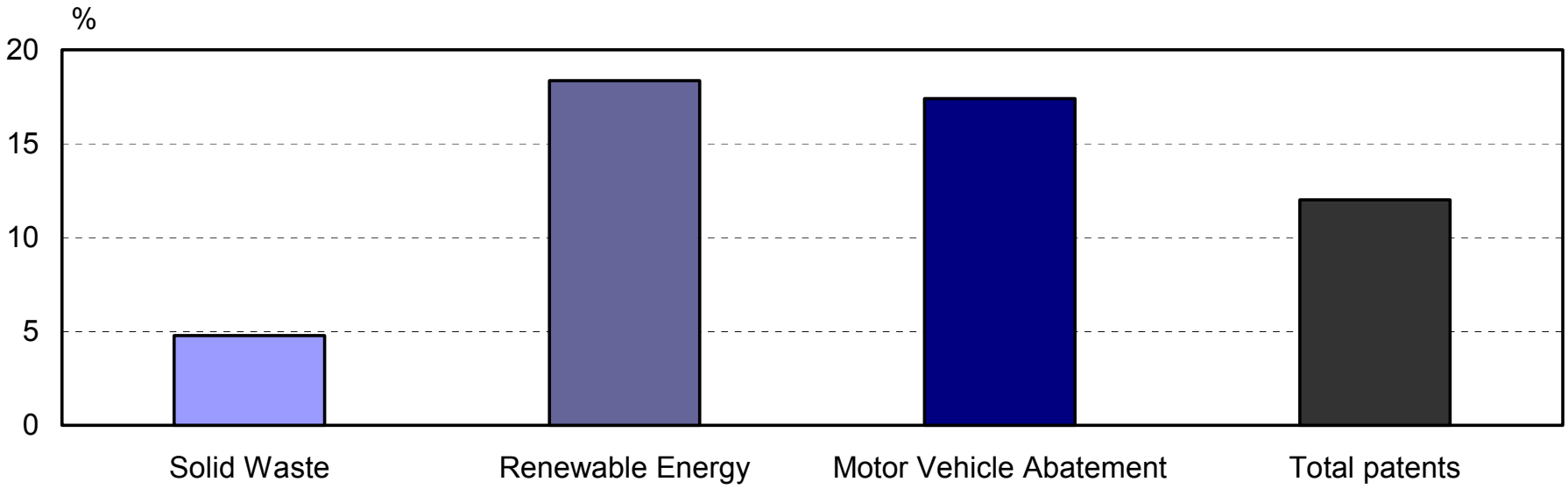
- Renewable Energy Technologies – wind, biomass, solar, etc… (ENV/EPOC/WPNEP(2007)2)

- Wastewater Effluent from the Pulp and Paper Sector (ENV/EPOC/WPNEP(2007)3)

- Motor Vehicle Emissions Abatement – post-combustion, engine design, etc… (ENV/EPOC/WPNEP(2007)4).

- Solid Waste Management – recycling, design-for-environment, prevention (report 'in preparation)

Average % Annual Growth in Patents (1995-2004)



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Main Results

- Renewable energy
  - National scientific capacity matters (and propensity to patent)
  - Quotas/obligations very effective in general, but price incentives effective for wind and solar and voluntary for waste
  - General market factors (i.e. fossil fuel price) less important, but moreso for more mature renewables
  - Very significant geographical specialisation

EPO Patent Applications for Renewables Normalized by $ GDP tr

	Wind	Solar	Geothermal	Wave-tide	Biomass	Waste	All renewables	1978-2003 Total
AT	2.50	**6.20**	**8.14**	0.67	**1.40**	**4.85**	**23.76**	110
AU	0.41	**4.41**	1.48	0.43	0.38	0.78	7.89	84
BE	**3.96**	2.12	2.29	0.21	0.58	1.22	10.39	59
CA	0.75	0.76	0.44	0.12	0.15	1.52	3.68	66
CH	2.72	**10.36**	**7.96**	0.45	0.81	**6.83**	**29.14**	138
DE	**7.20**	**6.96**	**4.97**	0.42	**1.87**	**6.29**	**27.59**	1285
DK	**23.10**	3.28	1.89	**2.99**	**1.48**	**5.81**	**38.56**	137
ES	1.27	1.08	0.14	0.68	0.00	0.11	3.28	61
FI	2.63	3.10	1.35	0.56	0.00	**4.27**	11.90	34
FR	1.44	1.54	2.84	0.29	**1.31**	1.41	8.81	267
GB	1.58	1.06	1.00	0.84	**4.30**	1.53	10.18	322
IE	**3.97**	2.14	0.00	**2.43**	0.00	0.00	8.54	14
IT	0.91	1.03	0.89	0.49	0.23	0.98	4.52	148
JP	0.54	2.48	0.72	0.15	0.27	**4.33**	8.49	656
KR	0.44	0.05	0.00	0.07	0.05	0.21	0.81	15
NL	**5.40**	**3.97**	**3.27**	0.53	1.02	3.09	17.09	161
NO	2.12	1.99	1.76	**3.41**	0.25	0.70	10.24	36
SE	**7.10**	3.36	**6.55**	**3.00**	0.79	2.19	**22.99**	109
US	0.53	0.77	0.64	0.31	1.15	1.43	4.84	925

EPO Patent Applications in Renewable Energy Technologies, Normalized by Overall Patenting Activity (1978-2003)

	Wind	Solar	Geo-thermal	Wave-tide	Biomass	Waste	All renewables
AT	0.67	**1.75**	**1.76**	0.22	**0.39**	**1.33**	**6.13**
AU	0.39	**3.75**	**0.86**	**0.42**	0.25	0.84	**6.50**
BE	**1.31**	0.69	0.61	0.06	0.17	0.44	3.28
CA	0.73	0.68	0.30	0.08	0.16	**1.38**	3.34
CH	0.29	1.15	**0.75**	0.03	0.08	0.74	3.03
DE	1.10	1.01	0.55	0.05	0.27	0.93	3.91
DK	**7.65**	1.03	0.44	**0.92**	**0.35**	**1.64**	**12.04**
ES	**2.62**	**2.29**	0.24	**1.31**	0.00	0.24	**6.70**
FR	0.37	0.39	0.60	0.07	**0.33**	0.39	2.15
GB	0.51	0.35	0.24	0.25	**1.46**	0.50	3.32
IT	0.53	0.61	0.42	0.28	0.14	0.59	2.57
JP	0.16	0.65	0.16	0.04	0.07	**1.21**	2.29
NL	1.11	0.88	0.55	0.10	0.20	0.68	3.52
NO	**1.68**	**1.41**	**1.01**	**2.39**	0.20	0.61	**7.31**
SE	1.05	0.49	**0.90**	**0.49**	0.11	0.31	3.36
TW	**1.48**	**1.19**	0.30	0.30	0.00	**1.48**	4.75
US	0.21	0.33	0.21	0.11	**0.48**	0.66	2.01

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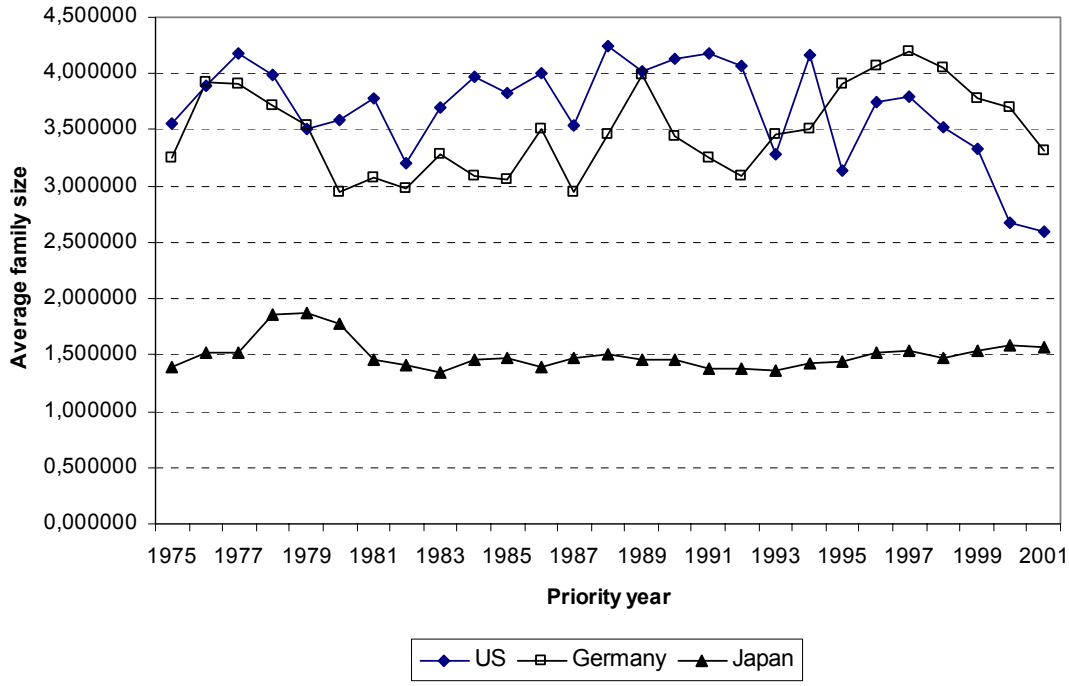
Main Results

- Motor vehicle emissions abatement
  - Tendency toward innovation with respect to integrated technologies rather than post-combustion
  - Correlates with changes in environmental policy regimes
  - Reflects potential for commercial-environmental win wins
  - Robust evidence of international technology transfer

Patent Family Size for Vehicle Emissions Abatement



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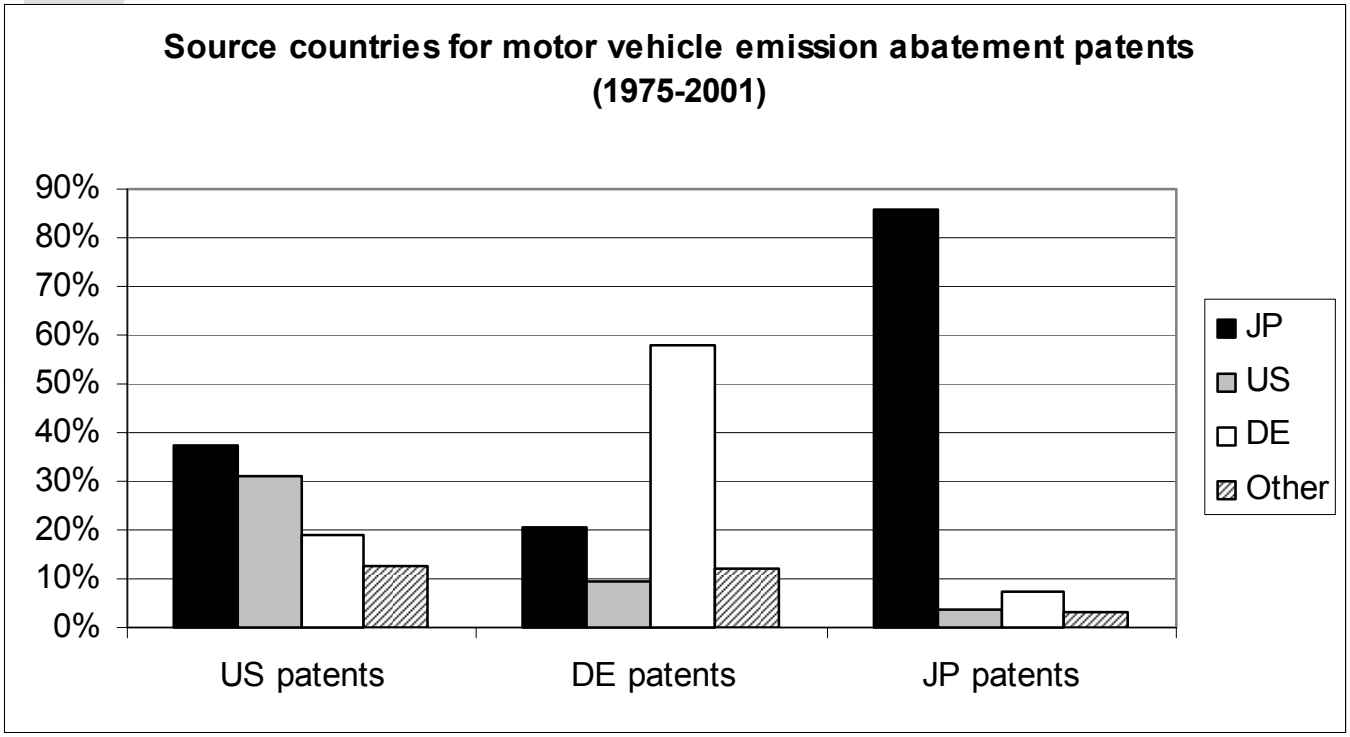
Technology Transfer of Motor Vehicle Emissions Abatement



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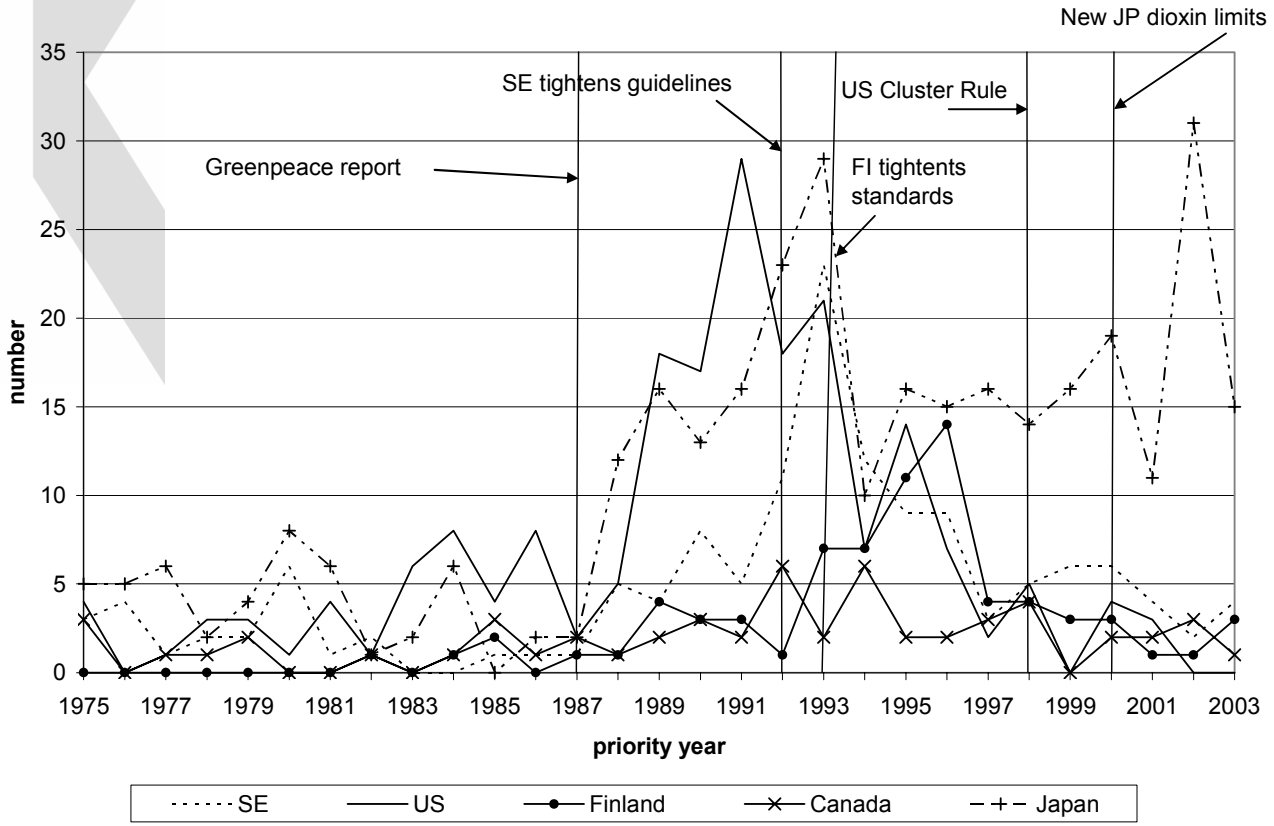
Main Results

- Pulp and paper effluent
  - Importance of consumer demand/public pressure in bringing about ECF-TCF
  - Introduction of ecolabelling and policy measures play a less important role
  - First mover advantage for the Nordic countries, particularly Sweden

First Mover Advantage for Bleaching Technologies



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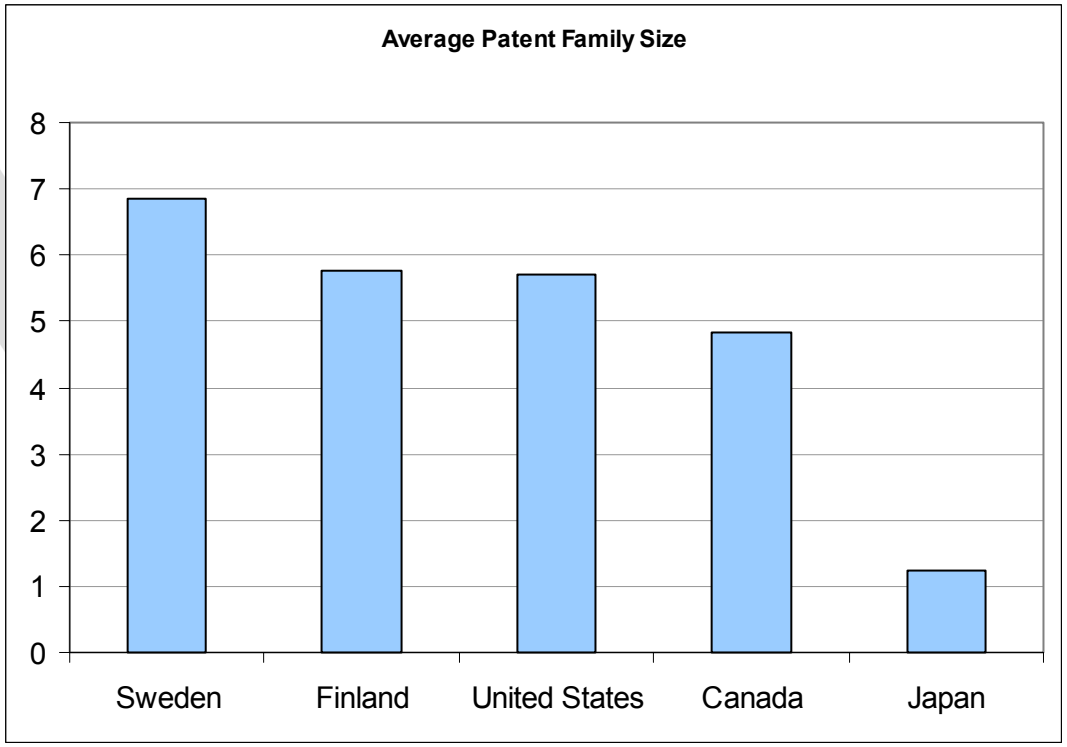
Patent Family Size for Bleaching Technologies



Further Work (1)

- Development of a more robust general 'environmental technology' indicator based upon WIPO IPC patent classifications http://stats.oecd.org/wbos/default.aspx?DatasetCode=PATS_IPC

- Sub-indicators for different thematic areas (waste management and recycling, renewable energy, wastewater treatment, air pollution abatement, climate change mitigation and sequestration, green chemistry, etc…)

- Time-series of eco-innovation from 1978 – 2005 (on-going) for all OECD and non-OECD countries

Further Work (2)

- Harmonisation of 'inventor' and 'applicant' data and link with micro-data sources, allowing for empirical work on:
  - Effect of environmental policy on eco-innovation
  - Eco-innovation and industrial competitiveness

- Examination of role of globalisation in environmental innovation through:
  - diffusion of knowledge (citation data)
  - research collaboration (co-invention data)
  - technology transfer (patent family data)

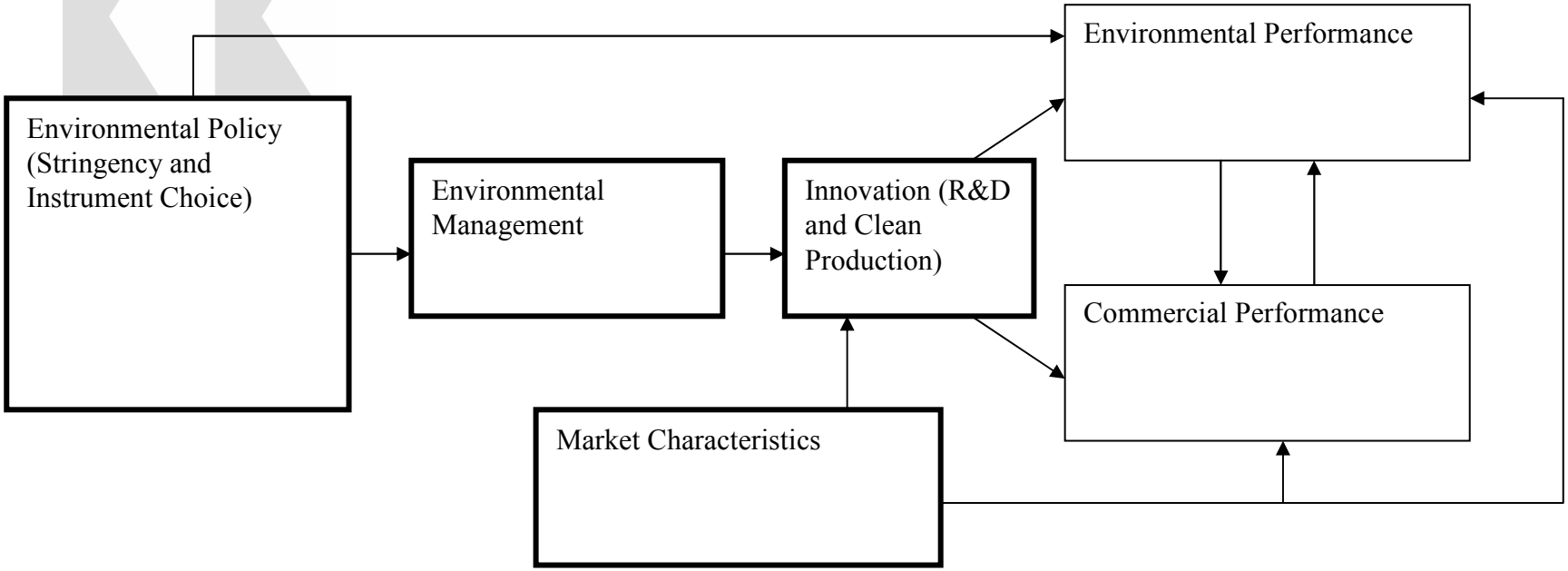
OECD Survey of Manufacturing Facilities

- Empirical assessment of public policy framework and environmental management, innovation and performance
- Observations from seven OECD countries (US, Canada, France, Norway, Hungary, Germany, Japan)
- > 4,000 facilities, 50 employees or more, all manufacturing sectors
- Rich characterisation of facility-level attributes and public environmental policy framework
- Influence of stakeholders, facility management structure and tools, commercial and economic factors

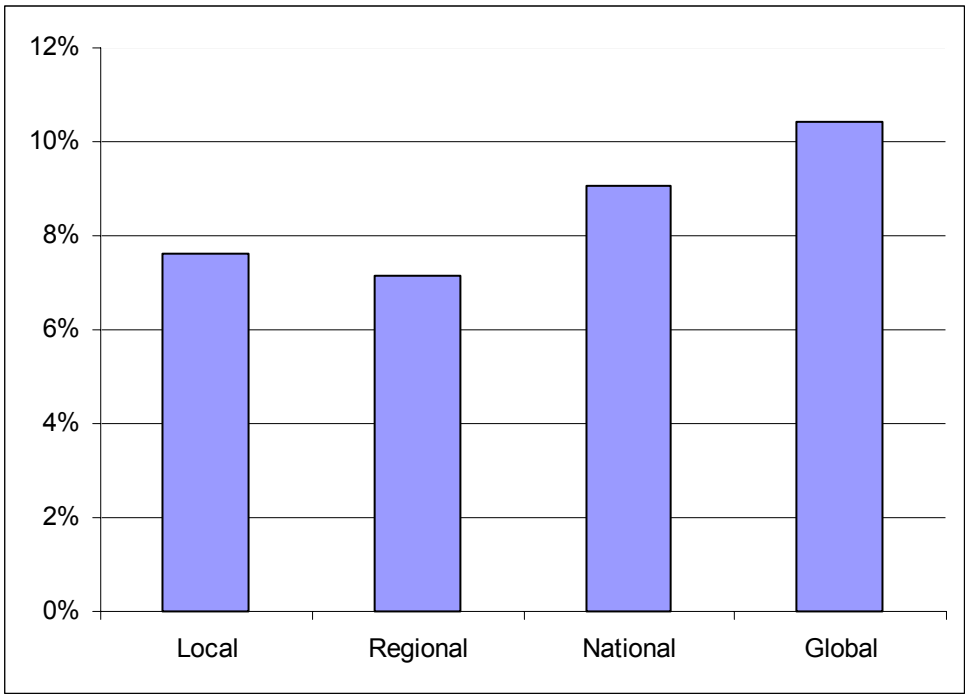
Number of Facilities in Sample

	CDN	FRA	DEU	HUN	JPN	NOR	USA	Total
50-99	76	85	351	66	661	155	96	1490
100-249	68	81	278	198	508	102	130	1365
250-499	62	39	130	101	178	36	130	676
>500	50	64	139	101	152	16	133	655
Total	256	269	898	466	1499	309	489	4186

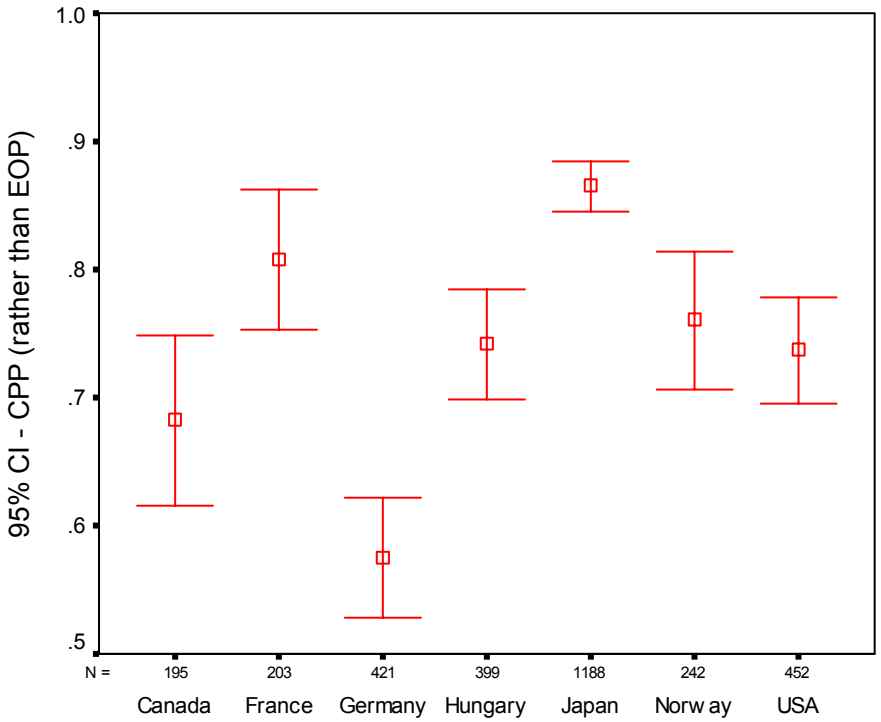
Estimation Model



Environmental R&D by Scope of Market



Integrated ‘Clean Production’



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Implications of Empirical Studies Undertaken for Innovation

R&D

- Use of 'flexible' instruments (including both economic instruments and performance standards) encourages investment in environment-related R&D
- Important intermediary role of environmental accounting in encouraging investment in R&D
- Environmental R&D is often the instrument through which the positive relationship between environmental and commercial performance arises

Clean Production

- Use of 'flexible' instruments (including both economic instruments and performance standards) encourages investment in integrated 'clean' production
- Institutional location of individual responsible for environmental matters has an important role – not in dedicated EH&S