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MORE ON FINNISH PATENTING ACTIVITY

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ABSTRACT: Finnish patenting activity in the period 1963-87 is analysed in the light of the US patent statistics. The Finnish patenting activity is compared to that of all the countries whose nationals were granted at least 100 patents in the US during the period under survey. In the comparison - using the total number of US patents in relation to population as an activity indicator - Finland is ranked 12th among the 45 countries. Looking at the development of patenting activity over time shows that Finnish patenting has been growing very fast. The number of patents per year was more than six times higher in the 1980s than in the 1960s. That was the fastest growth in Western Europe and fourth fastest among the world's market economies.

KEY WORDS. Patenting, technological change, Finland

MORE ON FINNISH PATENTING ACTIVITY
George F. RAY

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Introduction and retrospect

In Discussion Paper No 263 (dated 13.06.1988) Finnish patenting activity was analysed in a number of ways. The analysis was based on patents granted to foreign nationals in the United States, on the following grounds:

- Patenting - and particularly to have a patent granted in the US - is a costly exercise; it follows that a patent constitutes an invention or innovation worth protecting and promoting.

- Therefore information on Finnish patents granted in the US - this being the largest and most sophisticated market in the world (noted of the rigorous examination to which patent applications are submitted) will reflect the innovative activity of Finnish industry and science insofar as it is embodied in patentable processes or products.

In the discussion paper quoted the analysis followed two aims: to put Finnish activity in the Nordic context by means of Nordic inter-country comparison and to assess its sectoral pattern, the latter enabling us to estimate the relative technological advantage (or the opposite) of altogether 33 sub-branches of Finnish industry.

The objective of this paper is to significantly extend the panorama: to put Finnish activity into a world (as distinct from the limited Nordic) setting, thus providing useful additional information related to Finland's place in this specific 'league'.

The method

Our starting point is given by the US patent statistics from which annual data have been collected in the databank of the Science Policy Research Unit at the University of Sussex covering 25 years to 1987 (i.e. 1963-87) and concerning the annual number of patents granted to foreign nationals in the US. Every single country in the world is listed whose nationals submitted to - and had been eventually granted patent by - the US patent Office.

The crude figures have first been amalgamated into 'decades', that is the periods 1963-69, 1970-79 and 1980-87. The next step was to calculate the number of patents per year (given the different length of the 'decade'-periods). Although these already indicate the upward or downward tendency of patenting activity in any of the countries, for the sake of simplicity they have been converted into index numbers based on the first of the three periods.

Finally, in order to allow for the very different sizes of the long list of countries covered, the number of patents per million of the population was calculated, permitting a direct comparison among countries of an indicator of their patenting activity.

Table 1. Number of patents granted in the US, 1963-87, by country

Country	Total number of patents				Number of patents per year				1963-9=100		Per million population	
	1963-1969	1970-1979	1980-1987	1963-1987	1963-1969	1970-1979	1980-1987	1963-1987	1970-1979	1980-1987	1980-1987	1963-1987
EC-12												
Belgium	1149	2803	1954	5906	164	280	244	236	171	149	198	600
Denmark	671	1563	1256	3490	96	156	157	140	162	164	245	681
France	9486	21493	17944	48923	1355	2149	2243	1957	159	166	333	910
Monaco	22	44	39	105	3	4	5	4	133	167	(1500)	(4038)
Germany	23806	55558	50374	129738	3401	5556	6297	5190	163	186	817	2104
Greece	45	103	55	203	6	10	7	8	167	117	6	21
Ireland	47	187	201	435	7	19	25	17	271	357	59	128
Italy	3000	7271	6957	17228	429	727	870	689	169	203	123	305
Luxembourg	34	124	207	365	5	12	26	15	240	520	569	1003
Netherlands	3227	6582	5676	15485	461	658	710	619	143	154	401	1095
Portugal	25	42	28	95	4	4	4	4	100	100	3	10
Spain	297	799	581	1677	42	80	73	67	190	174	15	45
UK	17356	28910	18900	65166	2479	2891	2363	2607	117	95	334	1152
EFTA												
Austria	950	2587	2318	5855	136	259	290	234	190	213	307	776
Finland	184	885	1354	2423	26	89	169	97	342	650	283	507
Norway	354	889	696	1939	51	89	87	78	175	171	170	475
Sweden	3671	8111	6285	18067	524	811	786	723	155	150	756	2174
Switzerland	6007	13111	9660	28778	858	1311	1207	1151	153	141	1529	4554
Liechtenstein	83	154	130	367	12	15	16	15	125	133	(5000)	(14115)
Other OECD												
Australia	795	2206	2482	5483	114	202	310	219	193	272	169	373
Canada	5928	12105	9662	27695	847	1210	1208	1108	143	143	402	1152
Japan	8032	53910	86076	148018	1147	5391	10759	5921	470	938	737	1267
New Zealand	95	259	383	737	14	26	48	29	186	343	123	237
Centrally planning												
Bulgaria	15	181	178	374	2	18	22	15	900	1100	20	42
Czechoslovak.	492	1049	352	1893	70	105	44	76	150	63	23	124
German Dem.Rep.	-	121	438	559	-	12	55	22	..	458 [a]	26	33
Hungary	150	566	880	1596	21	57	110	64	271	524	82	149
Poland	91	285	174	550	13	29	22	22	223	169	5	15
Romania	58	236	46	340	8	24	6	14	300	75	2	15
USSR	494	3801	1862	6157	71	380	233	246	535	328	7	23
China	32	71	40	143	5	7	5	6	140	100	..	..
Yugoslavia	24	72	89	185	3	7	11	7	233	367	4	8
Latin America												
Argentina	135	239	148	522	19	24	18	21	126	95	5	18
Brazil	98	185	204	487	14	19	25	19	136	179	2	4
Colombia	29	51	31	111	4	5	4	4	125	100	1	4
Mexico	502	490	311	1303	72	49	39	52	68	54	4	19
Venezuela	63	49	109	221	9	5	14	9	56	156	7	15
Asia												
Hong Kong	51	132	206	389	7	13	26	16	186	371	41	77
India	67	154	80	301	10	15	10	12	150	100	..	..
Israel	276	805	1234	2315	39	80	154	93	205	395	318	597
Philippines	25	74	33	132	4	7	4	5	175	100	1	3
South Korea	9	63	259	331	1	6	32	13	600	3200	7	9
Taiwan	-	171	1122	1293	-	17	140	52	-	824 [a]	70[b]	81[b]
South Africa	336	717	692	1745	48	72	87	70	150	181	24	61

Source: Science Policy Research Unit (Univ. of Sussex) databank, based on US patent statistics, US Department of Commerce, Patent and Trademark Office, Washington.

(a) GDR and Taiwan: based on 1970-9. (b) Taiwan population estimated.

International comparison

The results of this exercise are shown in table 1. This includes all countries whose nationals were granted at least 100 patents[1)] in the US during the 25 year period. (A simple list of the countries with less than 100 patents in the 25 years in appended.) The indicators are

- the total number of patents for the three periods and the 25 years;
- the number of patents per year in the same way;
- index numbers of the number of patents for the second and third periods, based on the first;
- and the number of patents per million population for the 1980s and for the whole 25 years.

The data of table 1 can be further analysed from several angles. Nine countries had more than 10.000 patents granted over the 25-year period (table 2); two of them, Japan and Germany were over 100.000 each. These same countries remained the strongest patentholders in the 1980s; indeed, not even their ranking changed much. Apart from Japan, the four large West European countries and Canada, the list also contains three relatively smaller countries: Switzerland, Sweden and the Netherlands. With just over 2400 patents in 25 years, Finland was far from this top league.

The picture changes however, when we turn from the absolute number of patents to those adjusted for the size of the countries (measured here by population size). Altogether 14 countries were granted more than 500 patents in the 25 years per million population - eight of them more than 1000 and another six between 500 and 999. Finland was the last in this leading group, with 507 patents per million Finns. The other relatively smaller countries - apart from those mentioned in the previous paragraph - were Luxembourg, Austria, Denmark, Belgium and Israel. Changing the period to the 1980s improves the ranking of Finland from the 14th to the 12th place. Considering that all countries of the world (apart of course from the USA) have been included into this evaluation, the 12th - or even the 14th - place for Finland appears respectable indeed. (Table 3.)

Even more favourable appears in this context the development of Finnish patenting activity over time. The number of patents per year in the 1980s was 6 1/2 times as high as the same number in the 1960s for Finland. This was the fastest growth in Western Europe and the fourth fastest among the world's market economies, surpassed only by Japan, South Korea and Taiwan. (Table 4 and Chart 1.)

1) If the cut-off point is put at 500 (=20 per year) the same table would be 17 lines shorter.

Table 2. The largest holders of US patents

Country	1963-87		1980-87	
	number of patents[a]	ranking	number of patents[a]	ranking
Japan	148.0	1	86.1	1
Germany	129.7	2	50.4	2
UK	65.2	3	18.9	3
France	48.9	4	17.9	4
Switzerland	28.8	5	9.7	6
Canada	27.7	6	9.7	5
Sweden	18.1	7	6.3	8
Italy	17.2	8	7.0	7
Netherlands	15.5	9	5.7	9

Source: table 1. (a) Thousands.

Table 3. Countries with the highest number of patents per million of population

Country	1963-87		1980-87		Country	1963-87		1980-87	
	No a	Rank	No a	Rank		No a	Rank	No a	Rank
(i) More than 1000 patents a					500-999 patents a				
Switzerland	4554	1	1529	1	France	910	9	333	9
Sweden	2174	2	756	3	Austria	776	10	307	11
Germany	2104	3	817	2	Denmark	681	11	245	13
Japan	1267	4	737	4	Belgium	600	12	198	14
UK	1152	5	334	8	Israel	597	13	318	10
Canada	1152	6	402	6	Finland	507	14	283	12
Netherlands	1095	7	401	7					
Luxembourg	1003	8	569	5					

Source: table 1. (a) Number of patents per million of population.

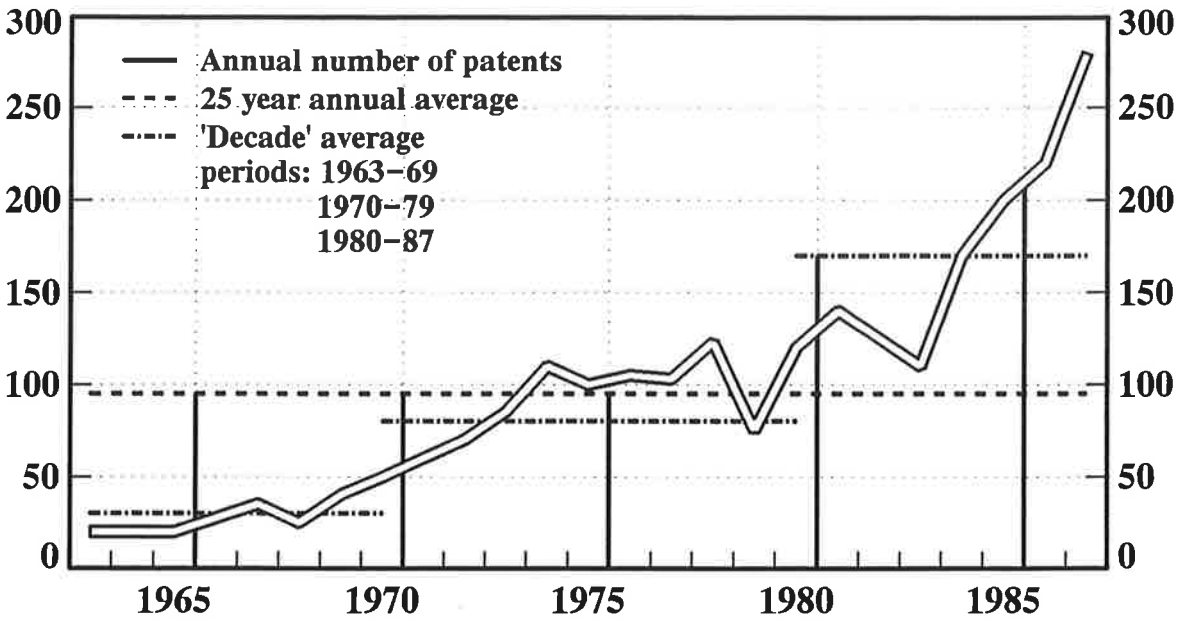
Table 4. Countries with the fastet growing patenting activity

Number of patents per year, 1963-69=100

Market economies:	1970-79	1980-87	Centrally planning economies:	1970-9	1980-7
South Korea	600	3200	Bulgaria	900	1100
Taiwan	..	824 a	Hungary	271	524
Japan	470	938			
Finland	342	650			
Luxembourg	240	520			

Source: table 1. (a) 197-79=100.

Chart 1. Finnish patents granted in the US, 1963-87



Source: Science Policy Research Unit (Univ. of Sussex) databank, based on US patent statistics, US Department of Commerce, Patent and Trademark Office, Washington.

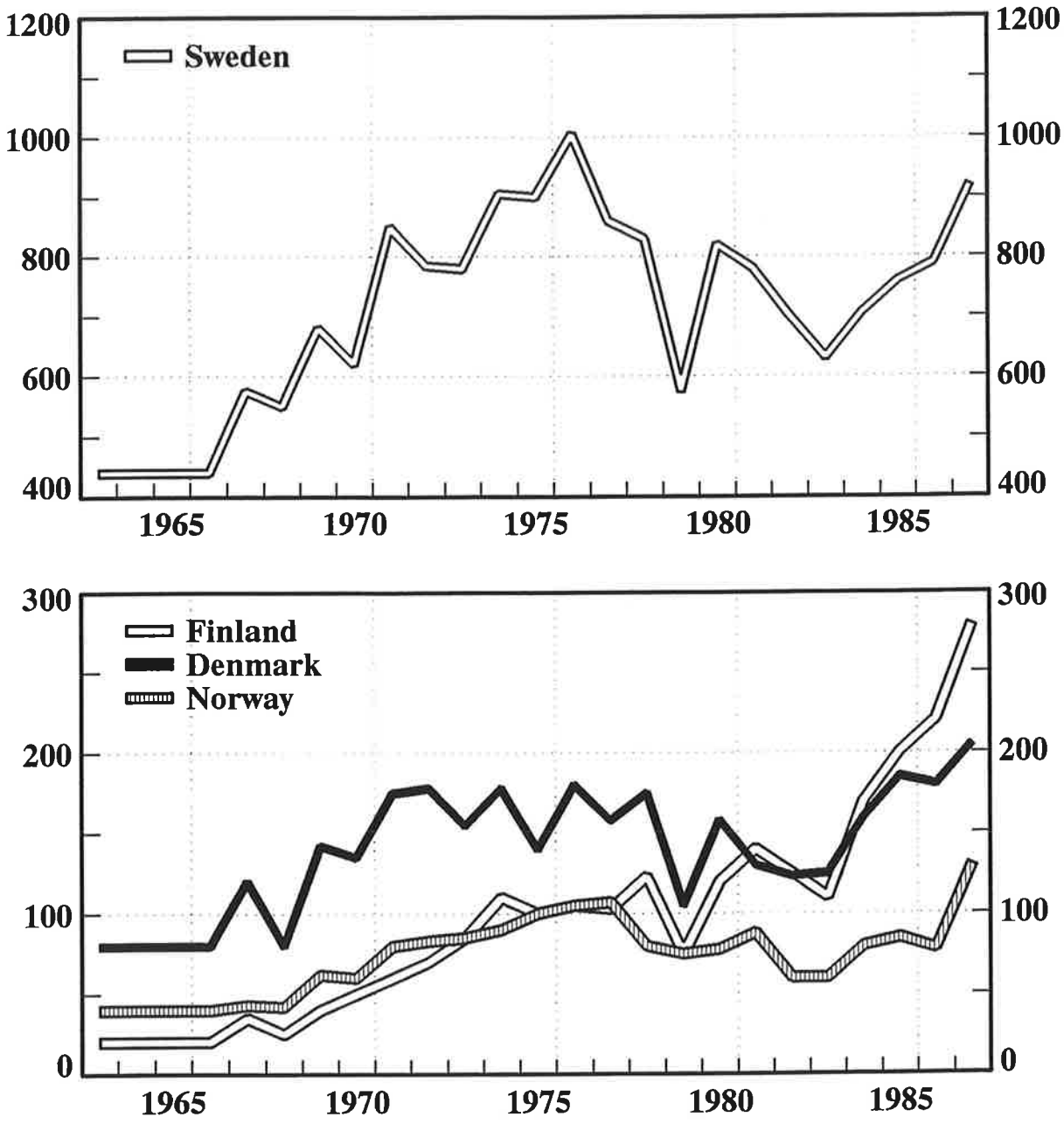
Finnish patenting activity has shown a fairly consistent upward trend over the whole 25-year period; this is particularly noticeable when compared with the same data of other Nordic countries, as in Chart 2.

Limitations

Because of the nature of patenting system it is reasonable to treat patent statistics as indicating the level of inventive/innovative activity and the outcome of research and development work in any country. It is also important, however, that we should point to the limitations and shortcomings of indictors based on patent statistics. Two particular aspects deserve special mention in this context.

The first is simple and concerns chiefly the centrally planning countries. It is well known that during the period studied here, the quarter-century to 1987, they have been suffering from chronic scarcity of hard currency. It is possible (and indeed, likely) that this currency shortage might have adversely affected their international patenting, which is not only costly, but costly in hard currency. But for this deterrent they might have patented perhaps more, coming out more favourably in this international comparison.

Chart 2. Patents granted to the Nordic countries in the US, 1963-87



Source: Science Policy Research Unit (Univ. of Sussex) databank, based on US patent statistics, US Department of Commerce, Patent and Trademark Office, Washington.

The second point is more complicated. Patenting provides certain protection but has never been obligatory. Practices - whether or not to take out a patent for anything worth considering - may vary greatly by company (or individual) and of course also by country.

In this context it is worth quoting a recent study[1)] conducted in Switzerland - the country with the relatively (i.e. relative to population size) highest number of patents. This was based on a survey among 358 Swiss firms in 127 (four-digit) industries in 1988.

The findings of the survey were, briefly, as follows:

- Patents were viewed by R&D executives and other interviewees as an effective means for protecting the competitive advantages of new technology in chemical (including the pharmaceutical) industries, in synthetics, and in some cases of the machinery and metal processing industries. Elsewhere they were considered less effective.

- For new processes (other than the above) the most effectie means of appropriation or protection was believed to be lead time; and for new products superior sales and service efforts.

- Finally, the ability of competitors to "invent around" (i.e. modified imitation) was seen by the interviewees as the most important constraint on the effectiveness of patents.

Whilst all this may truly reflect the views of the firms interviewed, the fact remains that the Swiss are leaders in international patenting and their activity does not seem to have noticeably declined, indeed the number of patents granted to Switzerland in 1987, the last year of observation, was the fourth highest in the 25-year time series of Swiss data.

It follows from the report cited that there must have been inventions or innovations by Swiss firms for which no international patent was taken out. The number of such cases is impossible to assess or estimate. The same is true of all other countries. Moreover, the willingness to patenting - or in the opposite direction: to refrain from it - may be different by country. But this is something that will never be known, because after patenting probably the second best protection of any novelty is secrecy. Its implementation may be difficult and doubtful but its statistical measurement seems practically impossible.

With all these limitations and shortcomings it is nevertheless believed that international patents - their number as analysed and internationally compared - do reflect to an extent any country's scientific/technological level, the success of its research and development effort. It may not be a foolproof indicator, it may not be the indicator, but it is certainly one of the indicators in that particular area of activity.

1) N. Harabi, Role of patents in theory and practice - empirical evidence from Switzerland. Paper presented at the annual conference of the European Association for Research in Industrial Economics, held in Budapest, August 1989. University of Berkeley, California, mimeo. 1989.

Acknowledgement:

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APPENDIX

Countries with less than 100 US patents in 25 years (1963-87)**

Americas	Asia	Africa	Europe	Other
(i) 50-99 patents				
Bahamas	Iran	Marocco	-	-
West Indies	Singapore	*		
Chile	Indonesia			
Peru	*			
*				
(ii) less than 50 patents				
Bolivia	Lebanon	Egypt	Iceland	French
Cuba	Cyprus	Zambia	Turkey	Polynesia
Dominican Rep.	Burma	Kenya	Andorra	Greenland
Ecuador	Thailand	Tunisia	*	New Guinea
Guatemala	Syria	Mauretania		Brit.Virg.
Haiti	Malaysia	Cameroon		Islands
Honduras	Saudi Arabia	Malagasy		Norfolk
Trinidad	Sri Lanka	Ethiopia		Island
Panama	Pakistan	Nigeria		*
Nicaragua	S. Vietnam	Uganda		
Uruguay	Jordan	Algeria		
Salvador	Kuwait	Tanzania		
Paraguay	Iraq	Libya		
Costa Rica	Bahrain	Sudan		
Jamaica	Arab Emirates	Ivory Coast		
Barbados	Brunei	Malawi		
Antigua	*	Zimbabwe		
Netherl. Antilles		Liberia		
Belize		Senegal		
Brit.W.Indies		Guinea		
Cayman Isl.		Chad		
Guyana		Zaire		
*		Mauritius		
		*		

** Source: as for table 1.

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