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Meir Perez Pugatch

Author presentation:
Dr Meir Perez Pugatch (M Sc Ph D) University of Haifa in Israel specialises in the fields of intellectual property policy, management and exploitation of knowledge assets, technology transfer and entrepreneurship. He was awarded his Ph D in political economy from the London School of Economics in July 2002. Since 2005, Dr Pugatch also heads the Intellectual Property and Competition Programme of the Stockholm Network.

Solet sequi laus, cum viam fecit labor.
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BOX 5234 | SE-102 45 STOCKHOLM
Tel 08-587 898 00
info@timbro.se
www.timbro.se

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Introduction

This paper provides a broad analysis of Sweden's intellectual property (IP) performance. Based upon this analysis, it suggests possible policy directions, both at the domestic and at the supra-national levels, which can serve to enhance Sweden's IP performance.

Today, more than ever, the ability to create IP assets, to protect these assets (via intellectual property rights – IPRs) and to exploit them commercially, is pivotal to knowledge-driven economies including that of Sweden.

Far from being a mere technical or legal instrument, IP and IPRs (a more accurate distinction of these two terms is provided later in the document) are ultimately an expression of knowledge and information. More specifically the creation of new types of knowledge-based and informational-based products (such as medicines, software, hardware, telecommunications, films, music, etc) is crucially dependent on the various forms of protection provided by IPRs, such as patents, copyrights and trademarks.

Accordingly, knowledge-driven economies, such as Sweden, place great emphasis on their ability to create, exploit and protect their IP assets, both domestically and, more importantly, internationally.

This paper does the following:

Firstly, it outlines the methodological framework that guides this research.

Secondly, it provides a detailed empirical analysis of Sweden's global IP performance generally and particularly regarding patents.

Thirdly, using a SWOT-based analysis, it links empirical findings with some policy implications on the future of Sweden's IP activities.

Finally, the paper provides broad policy suggestions concerning Sweden's ability to greatly improve its IP performance.

Overall the paper finds that, thus far, Sweden's IP performance has been impressive, as well as highly beneficiary to its economic well-being. However, the paper also suggests that Sweden's IP performance is not evenly distributed across all sectors and fields of technology. For example, the paper finds some gaps between Sweden's IP performance as a whole and its performance in the ICT and biotech sectors. Other gaps can also be found between the IP performance of the private and public sectors.

The paper also suggests that Sweden should be mindful of the regional and domestic threats (and opportunities) that may affect its future IP performance.

Methodological framework and research design

General approach

Before analysing Sweden's activities and performance in the IP field it would be useful to select a particular framework on the basis of which such an analysis can take place.

Also, for the sake of this paper it is convenient to make a distinction between IP (intellectual property) and IPRs (intellectual property rights). In this paper, the former (IP) refers to the various knowledge forms that are created and that can be protected by the latter (IPRs). In other words, IP refers to the potentially exploitable knowledge assets and IPRs refer to the various modes of protection and legal expression of these assets.

An analysis of IP-related activities can be conceptualised by different economic models. It is sufficient to mention three major approaches.

The first approach considers IP-related activities from a social welfare perspective, i e it focuses on the benefits and costs to society from these activities. Such an analysis ultimately focuses on the extent to which different actions in the IP field affect society as a whole. This approach may be called the *classic approach*, as most economists (including this author) tend to use different elements or variations of this perspective when writing on IPRs. The overall framework of the classic approach is subject to the so-called structural trade-off of the IP system: that by providing incentives for innovative activities and the creation of knowledge products in the future, IPRs restrict access to existing knowledge products at present, given their monopolistic feature.[2]

A second approach, which analyses different IP-related activities, may focus on the internationalisation (or globalisation) of IP environments and their implications on various economic activities, such as trade, foreign direct investments and technology transfer. This approach, which we may frame as the *international approach*, is ultimately linked to the global IP environment in general and to the WTO agreement of trade-related aspects of intellectual property rights (TRIPS) in particular. The international approach is often linked to the North-South context – that is the analysis of the extent to which the global IP environment affects the economic and social well-being of developed and developing countries, mostly the latter.[3]

Finally, we can also choose to analyse national IP-related activities in the context of knowledge creation, knowledge exploitation and knowledge distribution. This approach, which we may term the *industrial approach*, tends to examine the extent to which the IP field may promote (or obstruct) countries' industrial and commercial capabilities, at least as far as knowledge-based products are concerned.

The analysis embodied in this paper is primarily associated with the latter industrial approach, as it broadly seeks to analyse Sweden's activities concerning the creation, commercialisation, and distribution of knowledge-based products and technologies.

Three immediate qualifications should be mentioned.

First, the distinction between the different approaches mentioned above is somewhat artificial. Clearly, any analysis of IP regimes, policies, and actions is bound to touch upon various elements that are linked and interlinked to the above perspectives.

Nevertheless, by stating at the outset which approach this paper embodies, one can provide a clearer and a more transparent structure for this work, including that which is its main gravity centre and, even more importantly, which dimensions are emphasised in this paper.

Second, it is also clear that IP-related activities are but one of many factors affecting countries' innovative and industrial capabilities. Notwithstanding the importance of a horizontal analysis that considers the impact of policy factors across the board, there is an equal merit in providing a more vertical – drill-down – analysis that focuses on different segments within a specific field, IPRs in our case.

Finally, this paper does not aim to provide a quantitative assessment of the relationship between Sweden's IP regime and its innovative and industrial capabilities. It is virtually impossible to measure or even to isolate the impact of a certain IP input on a defined innovative or industrial output. In other words, this paper does not intend to argue that an x change in Sweden's IP environment will generate a y change in its outputs.

It seeks rather to point out a broader connection between the empirical findings provided in this paper, concerning Sweden's IP performance, and possible policy actions that may sustain and strengthen its innovative and commercial base.

Research design

This paper seeks to combine two levels of analysis: the empirical level (quantitative and comparative) and the broad policy (qualitative) level.

With regard to the empirical or quantitative level, there is a need to more accurately define what it is that we want to analyse. Given that this paper is set to adopt an industrial approach, as explained above, it would be useful to divide our analysis into two major dimensions: IP creation and IP exploitation.

The term *IP creation* broadly refers to the extent to which Sweden is able to translate its innovative base into "exploitable" IPRs. In other words, an analysis of IP creation considers the amount of IP generated as an integral part of a country's ability to create applicable knowledge that has the potential to be translated into new technologies and products.[4]

Factors associated with this dimension may be treated as input factors and include the following:

- **Amount of IP generated** – both in absolute terms and relatively to other countries.
- **Distribution of IP generated** – across different fields of technology.
- **Internationalisation of IP activities** – in terms of ownership of IP abroad and partnerships both between Sweden-based and foreign-based entities.

At this point, it should be noted that using IP measurements in general, including measurements of patenting activities, as a proxy for innovation and knowledge-creation is somewhat problematic. For example, given the challenges that national patent systems currently face, the absolute number of patents granted in a given country does not necessarily accurately reflect the level, and, more important the quality of innovation in that country.[5] Nevertheless, a sensible use of IP measurements, especially in conjunction with other measurements, can certainly allow us to draw some broad policy conclusions on the scope, level and direction of innovation and of innovative activities in a given country.

The term *IP exploitation*, on the other hand, broadly refers to the extent to which Sweden is able to translate the IP potential of Sweden-based entities into industrial and commercial results. Factors associated with this dimension may be considered as *output factors* and include the following:

- **Volume and share of GDP of IP-related transactions** – including international transaction of knowledge-based products (such as from royalties and license fees).
- **Public-private partnerships** (including joint ventures and spin-off companies) aimed at exploitation and commercialisation of IP assets.
- **Enforcement of IP rights** – among other things as measured by the level of counterfeiting.

The second level of analysis is dedicated to a more qualitative discussion. Relying on the empirical findings that are outlined in this paper, it seeks to draw some broad policy conclusions and to offer some recommendations on Sweden's IP environment.

Here it is useful to adopt a "quasi" SWOT-based analysis. A SWOT analysis is a popular tool (and widely used), particularly in business and management studies, aimed at an analysis of the Strengths, Weaknesses, Opportunities, and Threats of a particular project or a business venture (hence SWOT). SWOT analysis may also be used on different organisational units – ranging from the corporate unit to the country-level.

Surprisingly, there has been little use of the SWOT analysis tool in the IP field in general and in research that concerns a national IP environment in particular. Arguably, a SWOT analysis may be particularly useful for this research for two major reasons. First, it can help us to provide a broad-based analysis on the positive and negative aspects of Sweden's IP environment. Second, it may also lead to more policy-orientated conclusions and recommendations.

Empirical analysis

Strengths

Amount of IP generated by Swedish nationals

There are several indicators associated with the amount of IP generated in a given country.[6] Yet, the most straightforward indicator refers to the ownership of patents as measured by innovators' nationality.

In terms of general patenting activities, different data suggest that Sweden is one of the leading European countries (though not THE leader) in this field. This trend is consistent across the global, US, and European levels.

The use of data based on triadic patent families is probably the most effective and accurate way of measuring global patenting activities.

The OECD's *Compendium of Patent Statistics* (2005) measures countries' performances based on *triadic patent families*.[7] The term *triadic patent families* broadly refers to a set of patents (originating from the priority filing date) granted to the European, the Japanese, and US patent offices (EPO, JPO and USPTO).[8] According to the OECD, the use of triadic families with regard to patent statistics has two significant advantages. First, it improves the international comparability of patent-based indicators. Second, patents in the family are considered to be "high-value" patents, as it is assumed that the patentee will only take on the additional costs and the delay related to the extension of the protection to other countries if it is deemed worthwhile.[9]

Data extracted from the OECD *Compendium of Patent Statistics* suggest that in 2002 Sweden was among the leading patenting countries, with a global share of 1.7 % of triadic patents.[10] In absolute terms, Sweden is ranked 7th among the leading countries following the US (35.6 %), Japan (25.6 %), Germany (14.1 %), France (4.8 %), the UK (4 %) and the Netherlands (1.9 %).[11]

Also, between 1991 and 2002, Sweden was able to maintain and even to increase (by more than 1 %) its global standing as regards its patenting activities (see table 1).

Table 1: Share of countries in total Triadic patent families 2002[1]

%	1991	2002	Triadic Patent Families, 2002	Changes in shares of countries/economies[2], 1991–2002
World	100.00	100.00	51 502	
OECD	98.93	98.04	50 494	
United States	34.17	35.58	18 324	1.41
European Union	30.66	31.49	16 217	0.83
Japan	29.68	25.62	13 195	-4.06
Germany	12.28	14.12	7 271	1.83
France	5.95	4.75	2 447	-1.20
United Kingdom	4.18	3.97	2 045	-0.22
Netherlands	1.90	1.88	966	-0.02
Switzerland	2.41	1.79	924	-0.62
Sweden	1.31	1.74	896	0.43
Italy	2.21	1.63	840	-0.58
Canada	0.92	1.28	661	0.37
Korea	0.31	1.22	630	0.91
Finland	0.54	1.15	594	0.61
Belgium	0.80	0.77	397	-0.03
Australia	0.52	0.71	367	0.19
Israel	0.36	0.64	328	0.28
Austria	0.58	0.55	282	-0.03
Denmark	0.35	0.42	216	0.07
China	0.04	0.28	144	0.24
Spain	0.24	0.23	120	0.00
Norway	0.20	0.21	106	0.01
Chinese Taipei	0.06	0.20	102	0.14
Singapore	0.07	0.16	85	0.10
India	0.03	0.15	78	0.12
Ireland	0.09	0.12	60	0.03
Russian Federation	0.13	0.11	59	-0.01
New Zealand	0.06	0.08	41	0.02
South Africa	0.06	0.07	38	0.02
Brazil	0.02	0.07	36	0.05
Hong Kong, China	0.05	0.06	32	0.01
Hungary	0.07	0.05	27	-0.02
Luxembourg	0.03	0.04	21	0.01
Mexico	0.02	0.03	15	0.01
Czech Republic	0.03	0.02	12	-0,01
Poland	0.03	0.02	9	-0.01
Turkey	0.00	0.02	9	0.02

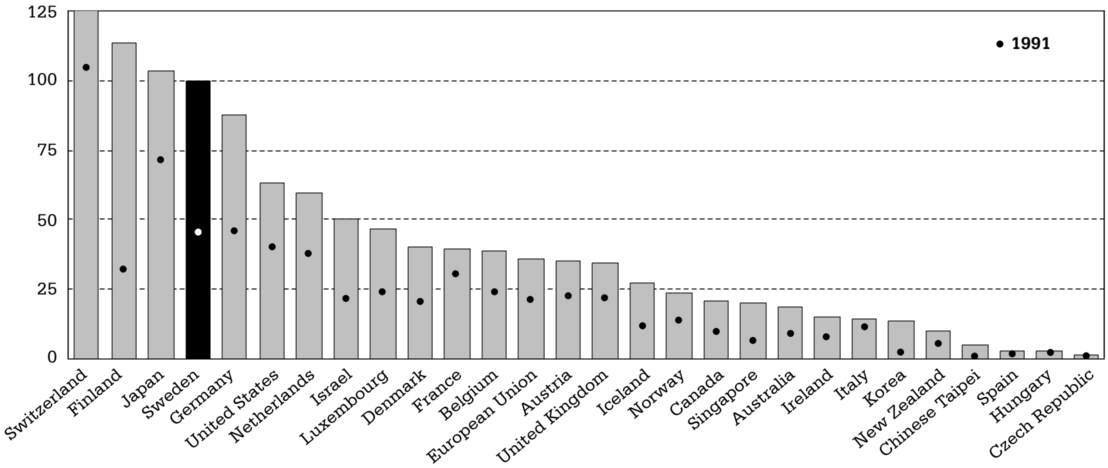
Argentina	0.02	0.02	8	0.00
Iceland	0.01	0.02	8	0.01
Greece	0.02	0.01	7	0.00
Portugal	0.01	0.01	6	0.00
Chile	0.00	0.01	4	0.00
Romania	0.00	0.00	2	0.00
Malta	0.00	0.00	1	0.00
Latvia	0.00	0.00	0	
Slovak Republic	0.00	0.00		
Cyprus	0.01	0.00		
Estonia	0.00	0.00		
Lithuania	0.00	0.00		
Slovenia	0.01	0.00		

Note: Patent counts are based on the inventor's country of residence, the earliest priority date and fractional counts.
1. Patents all applied for at the EPO, USPTO and JPO. Figures for 2000 to 2002 are estimates.
2. The graph only covers countries/economies with more than 20 triadic patent families in 2002.

* Calculations and compilation are based on OECD's Patent database, December 2005.[12]

In relative terms Sweden's global patenting position is even stronger. When comparing patents to population ratio (patents divided by million population) Sweden was ranked 4th in the world in 2002, following Switzerland, Finland and Japan (see Figure 1).[13]

Figure 1: Triadic patent families per million population, 2002 & 1991



Source: OECD Patent database, December 2005.

At the European and US levels, in 2002 Sweden's share of the total patenting activities stood at 1.8 % of EPO patents and 0.8 % of the USPTO patents (tables 2&3).

Table 2: Share of countries in EPO patents 2002*

%	1991	2002	Patent applications to the EPO, 2002	Changes in shares of countries (1991–2002)
Total	100.00	100.00	110,640	
OECD	98.44	96.59	106,867	
EU15	44.62	44.29	48,998	-0.33
European Union	44.81	44.65	49,403	-0.16
United States	29.06	27.31	30,215	-1.75
Germany	18.76	19.06	21,090	0.30
Japan	19.67	17.45	19,306	-2.22
France	8.25	6.54	7,233	-1.71
United Kingdom	5.75	4.76	5,265	-1.00
Italy	3.80	3.72	4,120	-0.08
Netherlands	2.39	3.10	3,432	0.71
Switzerland	2.65	2.32	2,567	-0.33
Korea	0.28	1.98	2,186	1.70
Sweden	1.53	1.76	1,952	0.23
Canada	0.92	1.50	1,656	0.58
Belgium	0.99	1.14	1,260	0.15
Austria	1.09	1.12	1,237	0.03
Finland	0.69	1.11	1,232	0.42
Australia	0.67	0.86	949	0.19

* Calculations and compilation based on OECD's Patent database, December 2005.

Table 3: Share of countries in USPTO patents 2002*

%	1991	2002	Changes in shares of countries (1991–2002)
Total	100.00	100.00	
OECD	97.89	95.09	
EU15	17.06	14.91	-2.15
European Union	17.15	14.96	-2.19
United States	53.39	55.55	2.16
Japan	22.53	18.60	-3.93
Germany	6.95	6.54	-0.41
Chinese Taipei	1.05	2.98	1.93
Korea	0.99	2.29	1.30
United Kingdom	2.59	2.18	-0.40

France	2.99	2.12	-0.87
Canada	2.00	2.10	0.10
Italy	1.25	0.91	-0.34
Sweden	0.78	0.78	0.00
Switzerland	1.10	0.74	-0.36
Netherlands	0.87	0.74	-0.13
Israel	0.35	0.58	0.22
Australia	0.49	0.57	0.07
Finland	0.38	0.55	0.17

* Calculations and compilation based on OECD's Patent database, December 2005.

Additional data regarding the strength of Sweden's patenting activities can be found in the *European Innovation Scoreboard 2005* (EIS), which, among other things, uses a different set of IP indicators to measure innovation outputs.[14]

The 2005 EIS Report includes a new category – Output Intellectual Property – which consists of EPO patents per million population, USPTO patents per million population, triadic patent families per million population, community trademarks per million population and new community designs per million population.

The EIS aims to provide a more comprehensive approach of comparing countries' ability to capture various forms of IPRs (in this case patents trade-marks and designs).

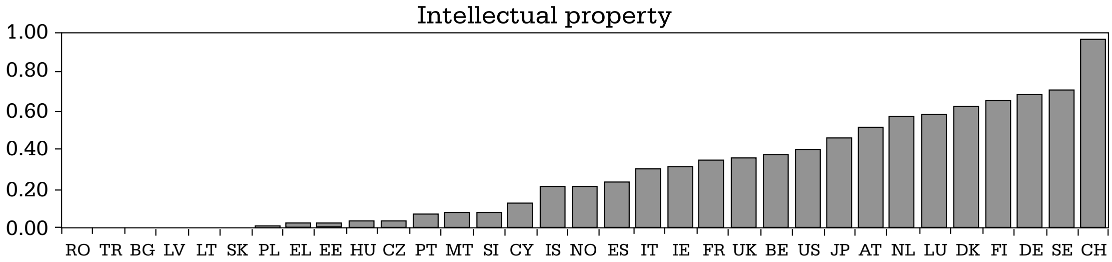
Generally, the EIS Report makes a distinction between four groups of countries in Europe:[15]

- leading countries;
- countries with average performance;
- countries that are catching up;
- countries that are losing ground.

Accordingly, Sweden is ranked among the four leading countries in Europe, together with Germany, Finland, and Denmark.

In terms of IPR performance (as measured by the above indicators), the EIS Report ranks Sweden second in Europe, after Switzerland (Figure 2).

Figure 2: EIS Report ranks Sweden 2nd in Europe in terms of IPR performance



Source: *The EIS Report 2005*.

Internationalisation of IP activities by Swedish nationals

The ability of nationals of one country – for example Sweden – to own IP assets generated in other countries, can provide an additional indication of the global IP performance of that country.

This feature is particularly important to countries with relatively small markets (such as Sweden) that wish to exploit their innovative potential in the major markets, such as the US.

Table 4 suggests that Swedish nationals have a relatively high share of patents generated abroad. Close to 30 % of the inventions owned by Swedish nationals were made abroad. Sweden is ranked seven among the countries with the highest share of inventions made abroad.

Table 4: Domestic ownership of inventions made abroad (based on EPO applications)*

%	1990–92	2000–02	Average Increase
World total	10.8	15.8	46.49 %
OECD Total	10.5	15.4	46.69 %
European Union (15)	5.4	8.4	55.12 %
European Union	5.3	8.1	53.01 %
Luxembourg	71.1	79.7	11.99 %
Switzerland	35.6	48.7	36.88 %
Ireland	42.9	48.0	11.88 %
Netherlands	40.0	33.9	-15.20 %
Singapore	26.7	31.3	17.47 %
Belgium	23.0	30.0	30.41 %

Sweden	13.6	28.1	106.55 %
Austria	16.7	27.8	66.72 %
Canada	24.0	26.9	12.24 %
Finland	9.7	25.6	164.34 %
China	12.5	22.6	80.49 %
Norway	19.9	22.2	11.73 %
France	10.3	19.7	90.57 %
United Kingdom	17.8	18.6	4.71 %
Denmark	17.7	17.8	0.89 %

* Calculations and compilation based on OECD's Patent database, December 2005.

It should be noted however, that the internationalisation of patenting activities may sometimes lead to reduced patenting activities in the country of origin and may even imply a shift in R&D operations. To this extent, this shift can become a potential threat on the level of R&D and patenting activities that take place in Sweden. This in turn means, that if Sweden is to maintain the level of its domestic patenting activities, the internationalisation of patent activities by its own nationals should be offset by the increase in the R&D and patenting activities of foreign nationals operating in Sweden. However, as discussed later in this document, this does not appear to be the case as the decline in Sweden's patenting activities seems to be caused by both Swedish and foreign nationals.

In other words, the internationalisation of patenting activities can prove to be a double-edged sword.

Volume of IP-related transactions and share of IP-related transactions of GDP

One of the most acceptable ways of measuring the volume of IP-related transactions is to examine royalties and license fees.

The term royalties and licence fees broadly refers to the "the exchange of payments and receipts between residents and non-residents for the authorised use of intangible, non-produced, non-financial assets and proprietary rights (such as patents, copyrights, trademarks, industrial processes, franchises, etc) and with the use, through licensing agreements, of produced originals or prototypes (such as manuscripts and films)."[16]

For the purpose of this project I have extracted and compiled data from the OECD Services Statistics on International Trade in Service – Royalties and Licence Fees – for the years 1994-2004. The data suggest that over the last decade Sweden has been one of the biggest net beneficiaries from IP related transactions among the OECD countries. Sweden has been able to increase its net balance of IP-related transactions from US $157 million in 1993 to over $1 billion in 2003 (table 5).

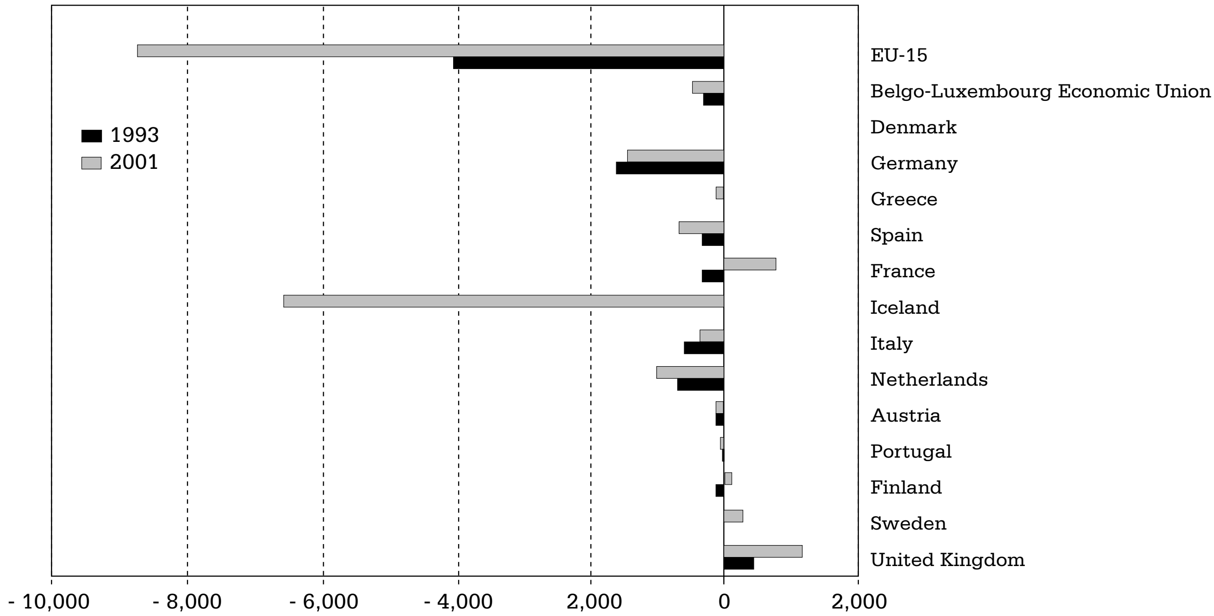
Table 5: Intellectual property transactions – royalties and licence fees 1993 – 2004 (Million US$)*

		1993	1994	1995	1996	1997	1998	1999	2001	2002	2003	2004
OECD	Net				5108	5917	3812	5957	8118	5156	5088	4552
	Credits				58889	61137	64627	71360	78129	75782	81570	92880
	Debit				53781	55220	60815	65403	70011	70626	76482	88328
EU-15	Net	-6344	-6105	-8296	-11107	-10152	-13363	-12144	-11336	-12704	-12699	-17304
	Credits	11932	14015	15607	18034	18425	19269	20790	20906	20546	22611	27280
	Debit	18276	20120	23903	29141	28577	32632	32934	32242	33250	35310	44584
Germany	Net	-2374	-2107	-2806	-2506	-2504	-2298	-2018	-2675	-2197	-1374	-996
	Credits	2058	2398	3131	3378	3225	3340	3121	2919	3299	3784	4241
	Debit	4432	4505	5937	5884	5729	5638	5139	5594	5496	5158	5237
Finland	Net	-238	-246	-331	-398	-409	-307	275	320	53	-44	-115
	Credits	89	76	59	66	94	106	648	883	585	559	500
	Debit	327	322	390	464	503	413	373	563	532	603	615
France	Net	-342	-375	-465	-768	-430	-383	-300	266	716	1432	1494
	Credits	1455	1527	1855	1885	2044	2331	1982	2313	2604	3326	3930
	Debit	1797	1902	2320	2653	2474	2714	2282	2047	1888	1894	2436
Italy	Net	-1112	-1089	-731	-1065	-415	-850	-819	-636	-864	-742	-1181
	Credits	466	634	876	679	1165	732	556	555	438	527	514
	Debit	1578	1723	1607	1744	1580	1582	1375	1191	1302	1269	1695
Ireland	Net	-1325	-1821	-2592	-3315	-3969	-6026	-6528	-7413	-9500	-10728	-15910
	Credits	66	90	132	100	118	172	416	509	248	280	205
	Debit	1391	1911	2724	3415	4087	6198	6944	7922	9748	11008	16115
UK	Net	1236	1369	1839	329	657	422	1306	1528	1696	1765	2513
	Credits	3397	3974	4692	6635	6791	7072	8239	8154	8166	8672	9886
	Debit	2161	2605	2853	6306	6134	6650	6933	6626	6470	6907	7373
Sweden	Net	157	391	-41	55	80	186	258	367	630	620	1054
	Credits	746	1151	789	889	934	1154	1408	1282	1512	1517	2325
	Debit	589	760	830	834	854	968	1150	915	882	897	1271
US	Net	16663	20860	23370	24633	24067	24391	26563	26765	24158	24984	28178
	Credits	21695	26712	30289	32470	33228	35626	39670	43233	40696	44219	48227
	Debit	5032	5852	6919	7837	9161	11235	13107	16468	16538	19235	20049
Japan	Net	-3330	-3113	-3416	-3151	-2310	-1563	-1671	-778	-659	-583	1287
	Credits	3863	5180	6026	6671	7306	7379	8173	10230	10441	10420	12274
	Debit	7193	8293	9442	9822	9616	8942	9844	11008	11100	11003	10987

* Calculations and compilation based on OECD *Statistics on International Trade in Services*, 2005, vol 2.

Similar findings are reported by Eurostat, suggesting that Sweden is one of the few net beneficiaries in Europe from IP related transactions (figure 3).[17]

Figure 3: Royalties and license fees trade balance with external EU partners (1993, 2001) - Euro Million



Source: Eurostat, November 2003.

More importantly, Sweden seems to have the highest ratio of trade in IP-related products as a share of GDP among OECD members (table 6). Between 1992 and 2001 Sweden has almost tripled the share of its IP-related transactions as a share of GDP (from 0.25 % in 1991 to 0.66 %).[18]

Generally, exports of royalties and licence fees are becoming increasingly important over time in knowledge-based economies. In the EU, these exports increased from 0.09 % of the EU GDP in 1992 to 0.15 % of GDP in 2001 (table 6). Member states contributing most to this increase during this period include Germany, France, Ireland, Finland, Sweden, and the UK. However, the relative importance of EU royalties and licence fees exports is still substantially lower than its main partners, i e the US (0.38 % of GDP in 2001) and Japan (0.25 % of GDP in 2001).

That IP-related transactions represent a high share of GDP in Sweden suggests that Sweden has obtained a relatively high level of specialization in this field (though, as explained later in this paper, this specialization seems to be linked to the private sector and not to tech-transfer activities that are based on private-public partnerships).

Table 6: Share of exports[1] of royalties and license fees in GDP

	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
European Union	0.09 %	0.09 %	0.10 %	0.10 %	0.12 %	0.13 %	0.13 %	0.14 %	0.16 %	0.15 %
BLEU[2]	0.36 %	0.43 %	0.43 %	0.20 %	0.23 %	0.25 %	0.26 %	0.29 %	0.31 %	0.36 %
Denmark	-	-	-	-	-	-	-	-	-	-
Germany	0.10 %	0.11 %	0.11 %	0.13 %	0.14 %	0.15 %	0.16 %	0.15 %	0.15 %	0.17 %
Greece	-	0.00 %	0.00 %	0.00 %	0.00 %	0.00 %	0.02 %	0.01 %	0.00 %	0.01 %
Spain	0.02 %	0.03 %	0.04 %	0.03 %	0.04 %	0.04 %	0.04 %	0.06 %	0.08 %	0.06 %
France	0.12 %	0.11 %	0.11 %	0.12 %	0.12 %	0.15 %	0.16 %	0.14 %	0.18 %	0.20 %
Ireland	0.07 %	0.13 %	0.16 %	0.20 %	0.14 %	0.15 %	0.20 %	0.43 %	0.54 %	0.34 %
Italy	0.04 %	0.05 %	0.06 %	0.08 %	0.06 %	0.10 %	0.06 %	0.05 %	0.05 %	0.04 %
Netherlands	0.48 %	0.59 %	0.63 %	0.57 %	0.59 %	0.58 %	0.64 %	0.61 %	0.58 %	0.45 %
Austria	0.06 %	0.06 %	0.06 %	0.06 %	0.08 %	0.09 %	0.05 %	0.06 %	0.09 %	0.07 %
Portugal	0.02 %	0.03 %	0.03 %	0.02 %	0.02 %	0.02 %	0.04 %	0.02 %	0.03 %	0.02 %
Finland	0.06 %	0.08 %	0.08 %	0.05 %	0.05 %	0.08 %	0.08 %	0.51 %	0.74 %	0.48 %
Sweden	0.25 %	0.54 %	0.54 %	0.32 %	0.33 %	0.38 %	0.46 %	0.56 %	0.53 %	0.66 %
United Kingdom	0.33 %	0.38 %	0.38 %	0.41 %	0.56 %	0.51 %	0.52 %	0.55 %	0.55 %	0.57 %
United States	0.31 %	0.31 %	0.31 %	0.36 %	0.41 %	0.40 %	0.40 %	0.39 %	0.40 %	0.38 %
Japan	0.08 %	0.11 %	0.11 %	0.11 %	0.14 %	0.17 %	0.19 %	0.18 %	0.21 %	0.25 %

[1] Partner extra-EU for the EU and partner world for the EU Member States, the USA and Japan.
[2] Belgo-Luxembourg Economic Union.

Moreover, the fact that Sweden benefits quite significantly from IP-related transactions may also contradict the view expressed by some experts that Sweden tends to invest too much in R&D (or that Sweden is "too innovative") and that such investment is not sufficiently translated into industrial outputs and economic returns.

For example, such a view was expressed by Anthony Arundel & Hugo Hollanders in the European Innovation Scoreboard 2005 Report:

> "As with Finland, Sweden could be over-investing in innovation, since its per capita GDP is less than would be expected. Its main challenge is to extract higher living standards out of its large investments in innovation. This could require improvements to innovation applications, particularly to high-tech services, although Sweden is already 52 % above the EU average. Sweden also has below average exports of high technology products that reflect its industry structure and which would take a long time to change."[19]

This view, which is by no means an isolated one, should be seen in the wider context of the so-called Swedish "paradox" (of quite slow long-term economic growth compared to very high R&D-spending, primarily by industry).

Yet, the above findings suggest that Sweden is able to benefit substantially from IP related transactions, and that from a commercial IP perspective, Sweden's R&D activities and innovation may be considered a contributing factor to its overall economic strength.

Piracy rates as a proxy for enforcement

The ability to exploit IP-based products in any territory is also crucially dependent on the enforcement of IPRs in that territory. Admittedly, any discussion on the enforcement of IPRs would probably require a much broader and more detailed analysis than the one offered in this document. Suffice it to say that enforcement of IPRs consists of multiple components, such as the civil remedies and criminal penalties provided by the law, the scope and strength of policy actions, the level of knowledge and quality of the Courts, existing educational programmes that focus on the social, legal and economic importance of enforcement and many other elements.

One possible way of measuring the level of enforcement in a given country is to look at piracy rates. Clearly, different IP-based industries, such as the clothing, pharmaceutical, entertainment and software, suffer from different types of piracy. As such, it is difficult to draw conclusions regarding the overall piracy rates of a given country by looking at just one or two sectors.

Nevertheless, it is a known fact that the software industry, because of the volatile nature and "copyability" of its products (not least because of the growing use of downloading via the Internet), is one of the industries most vulnerable to piracy. Therefore, data on piracy rates in this sector may provide some valuable insight into the general state of piracy and consequently of the enforcement of IPRs in different countries, even if this information is only partial.

The Business Software Alliance (BSA) and IDC Global Software annually publish their studies on global piracy in the software sectors[20]. In their studies of 2003 and 2004, the BSA and IDC examined operating systems and consumer applications. Generally, the BSA/IDC methodology of calculating piracy rates in each country is based on the following phases:

1. Calculating total *Software Base* – the total amount of software, legitimate and pirated, installed during the year. This figure is obtained by multiplying the number of PCs receiving new software during the year by the average number of software packages per PC that were installed in 2004.

2. Calculating total *Pirated software* – the difference between paid-for or legitimate packaged software units and the total software base.

3. Calculating total *Piracy Rate* – the percentage of the total packaged software base that is pirated.

4. Calculating total *Value of Pirate Software* – this is the retail value of pirated software. It is calculated using the size of the legitimate software market and the piracy rate. The actual formula is: Value of Pirated Software = (Legitimate Market)/(1 – Piracy Rate) — Legitimate Market.

According to the 2003 and 2004 figures of the BSA/IDC report, Sweden has the lowest piracy rate in Europe (27 % and 26 % respectively) and the fourth lowest piracy rate in the world (figures 4&5). Average EU piracy rates are estimated at 35 %, while the average rates of the US and Japan were 21 % and 28 % respectively.

Figure 4: Software piracy ranking according to the BSA & IDC Global Software Piracy Study (2004)

20 Countries With the Highest Piracy Rates			20 Countries With the Lowest Rates		
	2004	2003		2004	2003
Vietnam	92 %	92 %	United States	21 %	22 %
Ukraine	91 %	91 %	New Zealand	23%	23 %
China	90 %	92 %	Austria	25 %	27 %
Zimbabwe	90 %	87 %	Sweden	26 %	27 %
Indonesia	87 %	88 %	United Kingdom	27 %	29 %
Russia	87 %	87 %	Denmark	27 %	26 %
Nigeria	84 %	84 %	Switzerland	28 %	31 %
Tunisia	84 %	82 %	Japan	28 %	29 %
Algeria	83 %	84 %	Finland	29 %	31 %
Kenya	83 %	80 %	Germany	29 %	30 %
Paraguay	83 %	83 %	Belgium	29 %	29 %
Pakistan	82 %	83 %	Netherlands	30 %	33 %
Bolivia	80 %	78 %	Norway	31 %	32 %
El Salvador	80 %	79 %	Australia	32 %	31 %
Nicaragua	80 %	79 %	Israel	33 %	35 %
Thailand	79 %	80 %	UAE	34 %	34 %
Venezuela	79 %	72 %	Canada	36 %	35 %
Guatemala	78 %	77 %	South Africa	37 %	36 %
Dominican Republic	77 %	76 %	Ireland	38 %	41 %
Lebanon	75 %	74 %	Portugal	40 %	41 %

The report also estimates that software industry losses in Sweden due to piracy are more than US$ 300 million annually.

Moreover, the BSA estimates that a 10 % cut in Sweden's piracy rates will result in a US$ 3.5 billion increase in annual revenues (from US$ 12 billion to US$ 15 billion) and in the creation of 6,000 new high-tech jobs.[21]

Figure 5: Software piracy losses – BSA & IDC Global Software Piracy Study (2004)

Piracy of $ 100 million or more			
	$ M		**$ M**
United States	$ 6,645	Sweden	$ 304
China	3,565	Denmark	226
France	2,928	South Africa	196
Germany	2,286	Norway	184
United Kingdom	1,963	Indonesia	183
Japan	1,787	Thailand	183
Italy	1,500	Turkey	182
Russia	1,362	Finland	177
Canada	889	Taiwan	161
Brazil	659	Malaysia	134
Spain	634	Czech Republic	132
Netherlands	628	Austria	128
India	519	Hungary	126
Korea	506	Saudi Arabia	125
Australia	409	Hong Kong	116
Mexico	407	Argentina	108
Poland	379	Ukraine	107
Belgium	309	Greece	106
Switzerland	309		

Weaknesses

The previous section has highlighted Sweden's strength both in terms of the ability to secure IP protection as well as to engage in successful IP-related activities.

Nevertheless, in this paper it is also assumed that a country's ability to provide a robust and supportive platform for IP creation and exploitation is also dependent upon the extent to which such activities are taking place across the board. In other words, a country demonstrating a strong IP performance at the national level, cannot in itself lead to the conclusion that this country is performing well or evenly in all sectors and in all fields of technology.

National performance is, among other things, influenced by the level of IP activities across different sectors and fields of technology, and is also influenced by the degree of concentration of IP activities within a specific sector or field of technology.

The following questions may be raised:

- Are there any fields of technology in which the IP performance of a given country is weaker as compared with its overall performance?

- Are there any fields of technology that are characterized by a relatively high degree of IP concentration, and which may affect the degree of competition in that field?

- Are there any sectors in which the IP performance of a given country is weaker/ stronger compared with its overall performance?

In this context, a more detailed analysis of Sweden's IP activities exhibits some structural weaknesses. These are discussed below.

Relative decline of patenting activities in a knowledge-intensive (high-tech) sector – ICT and biotechnology

IP-related activities in the knowledge-intensive sectors (henceforth the high-tech sector) are gaining dominance worldwide, reflecting the growing importance of the so-called knowledge and informational economies.

Patenting activities in the ICT sector (ICT = information and communication technologies), such as in telecommunications, consumer electronics, computers etc, are increasing, both in terms of volume and in terms of the share of these activities in the overall patenting activities of nations.

According to the OECD, ICT-related patents have grown much more rapidly than overall patent applications to the EPO. Between 1991 and 2000, ICT-related patents grew by an annual average of 7.6 %, while overall EPO patent applications grew by 5.7 %.[22] Moreover, 34.5 % of all EPO patent applications filed to the EPO in 2002 were ICT-related patents, representing a 6.2 % increase from the 1991 level.[23]

Biotechnology patents have also grown more rapidly than overall patent applications at the EPO. Between 1991 and 2000, biotech applications grew by an annual average of 8.3 % a year, while total EPO patent applications grew by 5.7 %. The rate of increase in biotechnology patents accelerated from 1994 onwards.[24]

From 2000 onwards there is an evident decline in patenting activities in the high-tech sector among the OECD countries, both at the European and the US levels. This in turn suggests that the reasons for this decline are probably related mostly to external factors, such as the "burst" of the 2000 bubble of the dot-com industries.

An analysis of various data sources (Eurostat, EPO, USPTO) suggests that compared with its overall patenting performance Sweden may be underperforming in the high-tech sector in general and in the ICT and biotech fields in particular.

In terms of patenting activities in the high-tech sector as a whole (which includes categories such as computer and automated business equipment, micro-organism and genetic engineering, aviation, communication technology, semiconductors and laser), it appears that Sweden's patenting activities have been declining quite significantly since 1999.

Between 2000 and 2003, Swedish high-tech patent applications to the EPO, in terms of applications per million population, declined by almost 75 %, from 924 applications in 2000 to 249 application in 2003 (table 7).

Similarly, Sweden experienced a significant decline in the number of high-tech patents per million population granted by the USPTO, from 433 high-techs in 1998 to 23 patents in 2002 (table 8).

In terms of ICT patents granted by the EPO in 2002, Sweden is ranked 12th (table 9). Also, compared with other countries, Sweden's share of ICT-based patents as a percentage of its total patenting activities is relatively low. Approximately 30 % of Sweden's patents are ICT based, slightly above the EU average (29 %), and below the US, Japan, the UK, Ireland, the Netherlands and Finland (table 10).

Following the general trend in the high-tech sector, Swedish ICT applications to the EPO declined significantly. Between 2000 and 2003 Swedish patent applications in communication technologies (in terms of applications per million population) declined by roughly 70 %, from 526 applications in 1998 to 155 applications in 2003 (table 11). Sweden has also experienced a dramatic decline in the number of communication technology patents granted by the USPTO, from 285 patents per million population in 1997 to 4 patents per million population in 2002 (table 12).

Table 7: High-tech patent applications to the EPO by priority year at the national level; total number, per million population*

	1995	1996	1997	1998	1999	2000	2001	2002	2003
European Union (15)	4362.71	5470.64	6840.24	8292.09	10479.31	11985.89	12104.25	10975.72	5110.2
Denmark	75.95	105.03	130.19	171.43	208.60	249.60	256.00	210.30	102.52
Germany	1310.29	1809.29	2230.06	2761.89	3375.30	3920.08	3882.99	3682.79	1773.69
Spain	31.48	51.53	64.66	92.92	126.57	146.65	165.29	159.78	79.13
France	719.29	857.03	1098.32	1352.42	1691.31	1780.05	1886.65	1827.83	962.19
Ireland	24.07	27.60	36.41	47.77	83.15	97.39	111.69	92.30	25.78
Italy	236.01	273.32	286.70	319.78	343.24	445.38	401.74	478.44	244.44
Netherlands	356.30	502.70	591.91	743.95	921.76	1185.99	1574.42	1101.64	406.83
Austria	68.42	64.40	84.64	93.26	140.21	147.56	195.77	217.16	112.75
Finland	251.19	359.88	474.95	560.47	804.14	776.29	768.42	702.57	301.07
Sweden	302.70	382.96	603.63	594.41	780.89	924.47	688.07	564.73	249.53
United Kingdom	842.41	927.36	1058.96	1323.87	1702.59	2037.96	1895.74	1635.13	708.21
Norway	23.50	35.19	67.50	44.43	60.04	102.78	100.97	89.69	34.34
Switzerland	115.50	169.25	197.35	263.26	348.26	433.32	443.50	392.76	187.33
United States	6394.40	7645.07	8988.82	10247.92	13849.79	16576.18	14544.50	13957.51	6064.50
Japan	3025.38	3561.71	3921.46	4093.08	4906.68	6329.04	5765.73	6255.17	3219.90

* Calculations and compilation based on information from Eurostat, *Statistics in Focus : Science and Technology,* 2005.

Table 8: High-tech patents granted by the USPTO by priority year at the national level; total number, per million population*

	1995	1996	1997	1998	1999	2000	2001	2002	2003
European Union (15)	3261.23	3998.73	4572.80	4406.41	3803.95	2541.86	1464.42	514.26	59.61
Denmark	66.25	79.00	98.01	88.08	69.90	55.10	20.36	7.17	1.00
Germany	909.50	1179.71	1295.54	1338.69	1136.29	907.16	560.37	211.08	15.45
Spain	24.43	40.83	57.69	47.59	53.32	32.89	49.75	11.53	5.14
France	581.82	671.94	819.11	799.22	718.28	382.40	221.04	71.88	7.53
Ireland	17.60	18.92	28.16	36.91	50.05	40.52	22.26	9.28	1.00
Italy	178.23	239.79	250.99	247.91	218.63	168.81	100.22	35.20	3.00
Netherlands	248.76	255.46	260.02	228.25	174.67	146.94	68.48	12.64	5.16
Austria	45.14	44.05	68.94	65.23	55.20	49.45	25.18	6.17	0.90
Finland	199.42	281.11	336.22	300.02	230.76	106.39	63.71	31.58	2.33
Sweden	227.64	313.46	433.89	370.08	327.00	158.57	56.89	23.08	1.79
United Kingdom	671.08	779.03	809.70	768.89	693.97	432.45	218.91	78.47	14.39
Norway	16.27	22.32	39.81	30.36	13.66	21.20	9.83	3.50	-
Switzerland	89.63	125.33	131.04	138.60	121.96	87.97	53.92	15.60	2.87
United States	15724.21	19114.68	23622.87	24693.08	23223.66	18469.42	11962.16	6640.12	1386.9

* Calculations and compilation based on information from Eurostat, *Statistics in Focus : Science and Technology*, 2005.

Table 9: Share of countries in ICT patents granted by the EPO for 2002*

	Number of EPO Patents 2002	% Share
Total	38,145	
OECD	36,945	
European Union	14,299	
EU 15	14,222	
United States	11,070	37.28 %
Japan	8,571	29.02 %
Germany	5,290	22.47 %
France	2,308	13.87 %
United Kingdom	1,824	6.05 %
Netherlands	1,681	4.78 %
Korea	1,259	4.41 %
Finland	708	3.30 %
Italy	691	1.86 %
Canada	683	1.81 %
Switzerland	616	1.79 %
Sweden	596	1.62 %
Belgium	326	1.56 %
Israel	326	0.85 %
Australia	295	0.85 %

* Calculations and compilation based on the OECD Patent Database, December 2005.

Table 10: ICT-related patents as a percentage of the national total (EPO)*

	1991	2002
European Union	19.6	28.9
World total	28.2	34.5
Singapore	48.4	66.3
Korea	43.2	57.6
Finland	31.7	57.5
Netherlands	34.0	49.0
China	18.3	45.6
Japan	45.9	44.4
Ireland	27.0	42.6
Canada	20.5	41.2
Israel	35.0	37.9
United States	31.4	36.6
Chinese Taipei	17.3	34.9
United Kingdom	23.3	34.6
France	24.3	31.9
Australia	15.8	31.1
Norway	18.4	30.9
Sweden	18.3	30.5
Russian Federation	15.2	25.9
Belgium	14.3	25.9
Germany	17.3	25.1
Denmark	9.6	24.9

* Calculations and compilation based on the OECD Patent Database, December 2005.

Table 11: Communication technology patent applications to the EPO by priority year at the national level; total number, per million population*

	1995	1996	1997	1998	1999	2000	2001	2002	2003
European Union (15)	2028.18	2552.46	3284.63	4029.05	5001.65	5602.22	5490.88	4959.52	2297.20
Denmark	19.33	29.75	36.43	60.20	81.62	85.05	113.36	81.57	47.81
Germany	522.10	784.37	1018.04	1327.44	1506.19	1635.53	1572.87	1482.09	754.03
Spain	11.33	12.50	21.17	43.33	41.00	51.60	74.04	69.39	33.67
France	295.45	340.73	470.67	596.05	712.71	814.75	866.95	852.18	464.18
Ireland	8.33	14.37	21.23	19.60	43.14	32.58	47.51	31.03	5.83
Italy	72.05	64.25	82.92	108.97	117.03	165.85	183.42	192.98	94.28
Netherlands	173.10	238.23	276.33	333.01	436.04	616.43	774.73	540.28	147.39
Austria	27.67	26.87	32.92	37.65	64.17	50.56	79.54	99.86	58.55

Finland	212.80	310.59	416.94	511.30	659.57	630.64	576.50	516.99	195.16
Sweden	217.30	276.50	424.59	405.97	526.01	560.22	380.13	288.97	155.72
United Kingdom	395.64	416.62	422.92	525.23	721.87	862.59	731.42	676.78	292.13
Norway	5.00	16.17	36.43	23.30	28.07	39.95	43.05	28.92	18.67
Switzerland	34.05	64.08	67.42	96.01	140.17	155.75	155.00	143.55	79.04
United States	2024.91	2674.23	3016.77	3570.94	4567.56	5043.54	4421.08	4298.32	1860.89
Japan	1061.77	1329.46	1503.11	1585.96	1874.00	2343.15	2095.16	2281.99	1218.21

* Calculations and compilation based on information from Eurostat, *Statistics in Focus : Science and Technology*, 2005.

Table 12: Communication technology patents granted by the USPTO by priority year at the national level; total number, per million population*

	1995	1996	1997	1998	1999	2000	2001	2002	2003
European Union (15)	1316.62	1716	1798.18	1609.69	1265.1	558.55	185.51	59.32	7
Denmark	9.92	18.17	24.43	27.83	24.88	15.48	6.86	1.67	0.5
Germany	288	430.05	422.72	393.21	254.73	104.34	31.13	11.05	-
Spain	6.25	8	7.5	14.67	14.9	4	1.5	0.25	-
France	218.22	267.26	306	264.35	207.2	77.35	18.95	3.5	-
Ireland	4.5	5.93	11.74	10.96	21.12	13.75	5.78	1.5	-
Italy	32.25	38.62	39.67	40.13	22.12	12.75	7.33	0.33	1
Netherlands	110.15	113	95.83	77.87	52.96	32.9	11	3	2.5
Austria	17.75	17.33	23.83	26.5	20.28	14.33	6.83	1.5	
Finland	159.12	241.13	270.9	246.22	183.02	72.63	48.88	24.18	1
Sweden	149.22	214.63	288.5	231.48	206.6	86.28	21.75	4	0.5
United Kingdom	285.05	330.93	272.9	243.92	232.55	110.06	22.5	7.67	1.5
Norway	3	5.83	16.08	9.5	6.5	10.2	-	1	-
Switzerland	19.55	42.12	35.36	40.18	46.31	27.45	4.67	2.83	-
United States	4330.63	5233.12	6232.6	6318.94	5779.6	3850.24	1668.46	706.01	90

* Calculations and compilation based on information from Eurostat, *Statistics in Focus : Science and Technology*, 2005.

An analysis of Sweden's biotech-based patenting activities also suggests a relative weakness both at the European and the US levels.

At the European level (i e at the EPO), Sweden has a relative weakness in its ability to obtain biotech patents. Sweden belongs to the second tier group of patenting countries and ranked 11th (table 13). It should be noted that compared to the 1990s, the share of biotechnology patents as a percentage of the national total of Swedish patents granted by the EPO, has increased from 2.7 % in 1991 to 4.7 % in 2002 (table 14). However, a more detailed analysis of Swedish biotech patent applications to the EPO in the fields of micro-organism and genetic engineering indicates an overall stagnation in recent years. Between 1992 and 2003, the level of patent applications to the EPO was an annual number of 10 to 15 patents per million population (table15).

At the US level, Sweden's patenting position as regards biotech patents is also weaker compared with its overall performance. According to the Swedish Agency for Innovation Systems (Vinnova), the Swedish share of biotech patents granted by the USPTO between 1987 and 2001 was less than 1 %, and significantly below the leading countries, i e the US (64 %), Japan (11.4 %), Germany (4.6 %), the UK (3.6 %), France (2.9 %) and Canada (2.6 %).[25] Since 1999 biotech patens granted to Swedish nationals by the USPTO (in the fields of microorganism and genetic engineering) has declined from 25 patents per million population in 1999 to 5 patents per million population in 2002 (table 16).

Moreover, Sweden's IP activities in the fields of the life sciences are characterized by a relatively high degree of concentration. With regard to the pharmaceutical field, Swedish patenting activities are dominated by AstraZeneca and Pharmacia, with 32 % and 16 % of the patents respectively.[26] Moreover the big pharmaceutical companies hold more than 20 % of the patents in biotechnology.[27]

Table 13: Share of countries in biotechnology patents granted by the EPO for 2002*

	Number of EPO Patents 2002	% Share
Total	5,876	
OECD	5,628	
European Union	2,025	
EU 15	2,004	
United States	2,342	39.85 %
Japan	813	13.83 %
Germany	797	13.56 %
United Kingdom	330	5.61 %
France	271	4.62 %
Netherlands	149	2.53 %
Canada	136	2.32 %
Switzerland	103	1.75 %
Australia	100	1.70 %
Denmark	99	1.69 %
Sweden	93	1.59 %
Italy	78	1.34 %
Israel	73	1.25 %
Belgium	67	1.14 %
Korea	54	0.91 %

* Calculations and compilation based on OECD's Patent Database, December 2005.

Table 14: Biotechnology patents as a percentage of the national total (EPO): selected countries/economies*

	1991	2002
European Union	3.0	4.1
World total	4.1	5.3
New Zealand	2.1	12.9
Denmark	13.3	11.2
Australia	8.8	10.5
China	9.0	9.1
Israel	8.5	8.5
Canada	6.7	8.2
Brazil		8.1
Russian Federation	6.6	8.0
United States	6.5	7.8
Norway	0.8	7.6
India	19.9	6.6
United Kingdom	5.2	6.3
Singapore		5.6
Belgium	7.0	5.3
Sweden	2.7	4.8

* Calculations and compilation based on OECD's Patent Database, December 2005.

Table 15: Biotechnology (micro-organism and genetic engineering) patent applications to the EPO by priority year at the national level, per million population *

	1995	1996	1997	1998	1999	2000	2001	2002	2003
European Union (15)	4.877	5.253	7.164	8.448	9.732	9.878	9.665	8.559	3.400
Denmark	18.313	21.605	25.198	28.830	29.198	31.882	27.397	27.457	10.493
Germany	5.621	6.289	8.269	10.455	13.173	16.410	17.009	15.042	5.431
Spain	0.514	1.158	1.187	1.242	1.963	2.170	2.427	2.393	1.162
France	5.416	5.581	6.989	9.157	10.083	9.739	9.586	7.408	3.091
Ireland	3.835	3.826	2.518	4.750	4.796	5.126	9.575	5.945	-
Italy	1.503	1.555	2.346	2.086	2.137	1.985	1.873	2.376	1.102
Netherlands	9.652	11.312	15.034	16.191	15.239	18.828	12.975	13.946	4.771
Austria	3.883	4.059	4.384	5.409	7.061	6.678	9.465	6.006	2.701
Finland	7.847	6.458	6.482	6.340	9.697	8.915	9.660	6.631	3.751
Sweden	5.311	5.169	8.497	9.541	10.333	13.483	11.601	15.137	5.460
United Kingdom	6.814	7.007	11.240	11.600	12.640	10.239	9.730	8.448	3.470

Norway	3.210	2.666	4.644	3.352	5.775	7.581	5.960	10.402	2.748
Switzerland	-	13.444	14.175	14.117	17.294	19.277	17.672	17.111	6.564
United States	9.738	12.004	15.430	16.421	17.038	21.878	18.652	16.678	5.812
Japan	4.154	5.359	5.015	5.605	7.429	8.851	9.152	11.087	4.566

* Calculations and compilation based on information from Eurostat, *Statistics in Focus : Science and Technology*, 2005.

Table 16: Biotechnology (micro-organism and genetic engineering) patents granted by the USPTO by priority year at the national level; total number, per million population*

	1996	1997	1998	1999	2000	2001	2002	2003
European Union (15)	524.73	472.03	543.98	465.15	334.11	221.66	77.47	11.59
Denmark	47.75	50.69	57.04	36.55	26.72	24.48	4.00	-
Germany	145.94	134.60	142.58	138.84	118.52	83.35	22.73	4.75
Spain	6.19	11.51	9.87	3.00	2.54	2.29	5.35	-
France	92.61	71.80	74.70	82.39	58.05	37.32	13.35	3.67
Ireland	2.20	1.79	0.83	2.17	0.71	4.30	-	-
Italy	22.09	16.83	16.49	9.95	13.13	6.41	4.08	-
Netherlands	56.72	37.90	55.33	29.84	11.71	11.41	3.03	-
Austria	8.35	8.17	13.77	8.69	7.67	7.15	4.25	0.67
Finland	7.15	11.85	9.63	4.50	6.00	2.86	-	-
Sweden	18.68	13.73	19.92	24.78	17.90	6.03	4.78	1.00
United Kingdom	103.61	92.37	116.1	94.06	60.22	25.56	14.7	1.50
Norway	3.27	4.10	5.00	5.00	2.33	1.25	2.50	-
Switzerland	26.15	28.78	40.62	23.10	16.30	11.37	3.96	-
United States	1533.52	1694.62	2107.34	1741.38	1647.59	1320.59	961.57	213.68

* Calculations and compilation based on information from Eurostat, *Statistics in Focus : Science and Technology*, 2005.

Ongoing decline in domestic and international use of the domestic IP protection via the Swedish Patent and Registration Office (PRV)

According to PRV data, there has been a steady decline in the volume of patenting activities in Sweden since 2001:

> "The slackening of activity in the patent field (in both national and international patent applications), observed initially in 2001, continued in 2004, although at a slightly slower pace than in 2003. The decline was evident in all areas of technology, but was most pronounced in telecommunications and IT."[28]

In 2004 there was more than a 10 % and 14 % decrease in the number of national and international patent applications submitted to the PRV respectively compared with the previous year (table 17).

The PRV attributes the decline in patenting activities to the "general economic downturn and to the transfer of development resources in industry away from Sweden." The PRV also argues that "part of the decline is explained by the fact that major enterprises with their own facilities for monitoring technological developments are increasingly making European or international patent applications directly." It further concludes: "This may in the long term have the effect of making patent protection in Sweden less attractive."[29]

With regard to trademarks, here there are some mixed trends. The total number of trademark applications received in 2004 was 13,937, which represents a slight increase compared to the 13,463 trademark applications received in 2003.

In 2004, on the one hand, there was an evident increase (13 %) in the number of national trademark applications (8,667 applications compared to the 7,689 applications in the previous year).

On the other hand, there has been a decrease in the number of international applications submitted to the PRV – 5,270 applications in 2004 compared to 5,774 applications in the preceding year.

With regard to the increase in national trademark activities, the PRV argues that "the growth in the number of national trademark applications has remained firm and is strongly linked to growth in the economy. A similar trend is evident in several European countries. The trend is most pronounced in small and medium-sized enterprises."[30]

It should be noted that, to a certain extent, this explanation seems to contradict the explanation provided by the PRV regarding the decrease in national patenting activities.

With regard to the decrease in international trademark activities, the PRV attributes this decrease to the changes that are taking place in the trademark field: "Both the Patent and Trademark Office (PTO) in the USA and the OHIM have signed up to the Madrid Protocol. The link between the OHIM and the Madrid Protocol offers trademark applicants three options for protecting their rights in Europe. This will cause international companies to review their trademark protection strategies. The lower level of international trademark applications (Madrid applications) is probably a consequence of this development."[31]

Table 17: International and national patent and trademark activities at the PRV *

	2003	2004	% Change
National patent applications received	3619	3230	-10.7 %
National patent applications decided	6234	5556	-10.9 %
International patent applications received	6358	5185	-18.4 %
Novelty examination applications received on behalf of EPO	1635	1232	-24.6 %
Novelty examination applications decided on behalf of EPO	1612	1017	-36.9 %
National trademark applications received	7689	8667	12.7 %
National trademark applications decided	8695	8668	-0.3 %
International trademark applications received	5774	5270	-8.7 %
International trademark applications decided	10280	8070	-21.5 %

* Calculations and compilation based on the the PRV "Annual Overview 2004".

Weak IP performance by the public sector

Before discussing the IP performance of the public sectors in Sweden it is important to briefly place them in the wider context of technology transfer. Since the 1980s there is a growing emphasis on the manner in which public and government research bodies are able to utilise and disseminate their knowledge and technologies by transferring them to the private sector.

In a dramatic policy move during the 1980s the US passed legislation that sought to encourage the transfer and utilisation of technologies from public and federal bodies to the private sector. These policies are known as the Bayh-Dole Act (or in its formal name the Patent and Trademark Law Amendments Act of 1984) and the Stevenson-Wydler Act (or the Federal Technology Transfer Act of 1986). The core of the Bayh-Dole Act was to transfer IP ownership over the results of federally funded research from the US federal government to the respective public bodies that carry out this research (most notably universities).

These Bayh-Dole and Stevenson-Wydler Acts brought about an explosion of innovative activities aimed at exploiting the knowledge arising from US-based government and public research bodies.

Before 1980, fewer than 250 patents were issued to U S universities each year, and discoveries were seldom commercialised for the public benefit. In contrast, between 1993 and 2000, these universities were granted some 20,000 patents (almost 4,000 patents were issued in 2003) and more the 3,000 new companies were established. These activities generated an income of more than US$ 1.2 billion to academic and government institutions alone.[34]

It is also a known fact that the EU has not yet managed to successfully turn R&D investment into commercial output, and that it still struggles with finding the appropriate pan-European framework to encourage technology transfer collaboration between the public and the private sectors.[35]

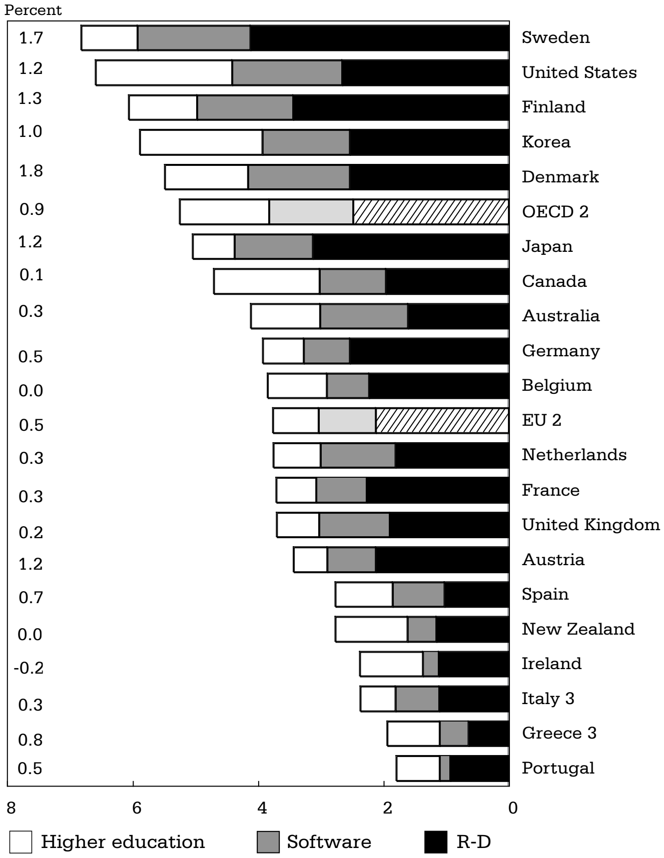
With regard to Sweden, there seems to be a significant volume of literature, such as that by Henrekson & Rosenberg (2001) and Goldfarb & Henrekson (2003), suggesting that Sweden's academic and research institutions are unable to sufficiently translate their extensive R&D base into commercial inputs.[36]

Generally speaking, Sweden is consistently among countries with the highest level of R&D/GDP (ranked first in the world in 2002, figure 5). Henderson and Rosenberg also report that R&D conducted in the university sector is, as a share of GDP, consistently the highest in Sweden (table 18).

With regard to the creation and exploitation of IP assets by the Swedish public sector, since 2000 there have been numerous reports suggesting that Sweden is underperforming in this area and there are various government initiatives aimed at solving this problem.

For example, in 2002, Vinnova received a special mandate from the Government to draw up proposals for better conditions for exploitation of research results. The report (*Vinnforsk*), was presented in April 2003. Vinnova suggested forming a programme to increase the ability of universities and university colleges to support the researchers in the process of technology transfer and commercialisation activities.[37] Also, in 2002 the Bennet & Jonsson Group presented the report "The future of Swedish Industry".[38] The group consisted of representatives from industry (mostly the multinational companies) and labour unions and proposed measures in 15 fields that would support the competitiveness of Swedish industry and generate economic growth. One field concerned the issue of how to improve the Swedish innovation system and the need for collaborative research between universities and industry in various technologies.

Figure 6: Investment in Knowledge as a share of GDP (2002)



Source: *OECD Science, Technology and Industry Scoreboard*, 2005.

Table 18: Henrekson, M & Rosenberg, N (2001), Total R&D expenditures and in the university sector as a percentage of GDP in Sweden, the US and the OECD, 1981–1997

	Sweden		The US		OECD weighted		OECD unweighted	
	Total	Univ.	Total	Univ.	Total	Univ.	Total	Univ.
1981	2.29	0.69	2.42	0.35	2.09	0.36	1.52	0.32
1983	2.55	0.77	2.66	0.35	2.25	0.37	1.63	0.34
1985	2.89	0.79	2.87	0.37	2.43	0.37	1.77	0.35
1987	2.99	0.86	2.82	0.41	2.44	0.40	1.84	0.37
1989	2.94	0.90	2.73	0.42	2.43	0.40	1.87	0.38
1991	2.89	0.79	2.81	0.40	2.49	0.41	1.93	0.41
1993	3.39	0.87	2.61	0.40	2.38	0.43	1.98	0.43
1995	3.59	0.79	2.54	0.39	2.34	0.42	2.01	0.43
1997	3.85	0.83	2.71	0.39	2.40	0.39	2.07	0.41

Note: Due to data limitations OECD is defined as the following 15 countries: Canada, Denmark, Finland, France, Germany, Iceland, Ireland, Italy, Japan, Netherlands, Norway, Spain, Sweden, the UK, and the US. Source: OECD, *Basic Science and Technology Statistics* on diskette, 1997; OECD, *Main Science and Technology Indicators*, No 1, 1999; OECD, *Main Economic Indicators*, January 1999.

Source: Henrekson & Rosenberg 2001.

It is quite surprising that, to the best of this author's knowledge, and despite the above initiatives, there is little systematic and empirical research concerning the extent to which academic and government institutions in Sweden are able (or unable) to generate IP assets and to engage in successful tech-transfer activities that are based on the commercialization of IPRs. And although there is sufficient data on the level and characteristics of Swedish public sector R&D activities (including in the area of scientific publications), there seems to be little research about the number of patents or other IPRs stemming from the private sectors, or about the degree of commercialization such as via licensing of spin-offs.

Nevertheless, existing research (as well as the above reports) suggests that the ability of Swedish-based academic and government institutions to generate IP assets and to successfully commercialize these assets is rather low.

For example economist Roger Svensson, who analyzed the commercialization of patents in the Swedish medicine & hygiene sector, finds that "a surprisingly low share (10 %) of the inventions was discovered at universities or in firms close to universities, although 1/3 of total R&D is undertaken at universities in Sweden."[39]

It should be noted that there are some reports, such as the *Self-Evaluation Report of the Värmland Region*, which argue that the number of patents and licenses generated by Swedish universities is increasing.[40] However the data included in this report are rather vague and do not allow more concrete conclusions.

One of the most outstanding issues in the commercialization of Swedish IP assets deriving from the public sector is the issue of ownership. Under the Swedish law, researchers at Swedish universities have exclusive owner-ship of intellectual property rights deriving from their research. This element of Swedish IP law, the IP ownership by the individual rather than by the academic institution, seems to be in sharp contrast to the Bayh-Dole principles. Indeed, most of the OECD countries assign the IP ownership (over IP assets deriving from government funded R&D) to the respective academic institutions and not to the researchers (table 19).

Table 19: Ownership of IP at public research organizations (PROs) in OECD and non-member countries

	Universities			Non-university PROs		
	Institution	Inventor	Government	Institution	Inventor	Government
Australia	*			*		
Austria	*			*		
Belgium	*			*		
Canada	*			*		
Denmark	*			*		
Finland		*		*		
France	*			*		
Germany	*			*		
Iceland		*		*		
Ireland	*			*		
Italy		*				*
Japan		*		*		
Korea	*			*		
Mexico	*			*		
Netherlands	*			*		
Norway	*			*		
Poland	*			*		
Russia			*			*
South Africa	*			*		
Spain	*			*		
Sweden		*		*		
Switzerland	*			*		
United Kingdom	*			*		
United States	*			*		

Source: *Turning Science into Business – Patenting and Licensing at Public Research Organizations*. Paris: OECD, 2003, Table 1.2.

As discussed later in the document, it is possible that the non-grant of IP ownership to Swedish universities is having a negative impact on the ability of these universities to engage in successful exploitation of IP assets via tech transfer activities with the private sector.

Key Findings and policy implications based on SWOT analysis

This section aims to link the empirical data concerning Sweden's IP performance (input and output) with the broader policy spectrum of Sweden's IP environment.

As suggested at the beginning of this paper, it may be useful to adopt a "quasi" SWOT-based analysis to achieve this outcome. The term quasi refers to the fact that the SWOT analysis used in this section does not fully match a SWOT analysis in the "classical" sense (though arguably there are many prototypes and models of SWOT). Suffice it to say that a traditional SWOT analysis tends to make a structural distinction between the strength and weakness (SW) components on the one hand and the threats and opportunities components (TO) on the other hand. SW components usually refer to the internal aspects of the entity (on which a SWOT analysis is applied), such as its human capital, organizational structure, areas of expertise, management team, culture etc. TO components usually refer to economic, political, and social developments that are taking place outside the organization and which are likely to impact its performance.

While taking into account the advantages of the above distinction, this section does not necessarily follow it, insofar that it does not seek to analyze all of the SWOT factors associated with Sweden's IP environment. Rather it seeks to use a SWOT framework to identify key elements (internal and external) associated with Sweden's IP performance.

Strengths

Overall, Sweden is a global leader (and one of Europe's most dominant players) in the ability to translate innovative capabilities into IP assets, most notably patents.

In absolute terms (for the year 2002 based on triadic patent families data) Sweden was ranked 7th among the leading patenting countries globally, following the US (35 %), Japan (35.6 %), Germany (14.1 %), France (4.8 %), the UK (4 %) and the Netherlands (1.9 %). In relative terms (patents divided by million population), Sweden's global patenting position is even stronger. Sweden was ranked 4th in the world in 2002, following Switzerland, Finland, and Japan.

The various empirical findings also indicate that Sweden's IP performance is manifested across the different regional and supra-national levels, including Europe, the US and Japan.

Not only does Sweden have a considerable global competitive advantage in its ability to translate innovative potential into IP assets, but Sweden's ability to benefit from the exploitation of these IP assets is even more apparent.

Sweden has been one of the few net beneficiaries in Europe (and globally) from IP related activates (as measured by income from license fees and royalties). Moreover, over the past decade Sweden has been able to significantly increase its net balance from IP related activities (from US$ 150 million in 1993 to more than US$ 1 billion in 2003).

Sweden is ranked first among the OECD countries in terms of IP-related activities as a share of GDP. Between 1992 and 2001 Sweden almost tripled the share of its IP-related transactions as a share of GDP (from 0.25 % in 1991 to 0.66 %). In other words, IP related activities are a significant component in Sweden's economy.

Finally, Sweden has one of the lowest piracy rates, which in turn suggests that its enforcement mechanism, as well as cultural awareness of the need to protect IPRs is relatively strong, at least in that dimension. Sweden has the lowest software piracy rate in Europe (27 % and 26 % respectively) and the fourth lowest piracy rate in the world. That said, it is estimated that software industry losses in Sweden due to piracy are more than US$ 300 million annually. Furthermore, the BSA argues that a 10 % decrease in Sweden's piracy rates will result in a US$ 3.5 billion increase in annual revenues (from US$ 12 billion to US$ 15 billion) and in the creation of 6,000 new high-tech jobs.

Weaknesses

Despite its impressive IP performance, Sweden suffers from certain inherent weaknesses, some of which are structural.

In terms of IP performance, compared to its overall global position, Sweden may be underperforming in the high-tech sector in general and in the ICT and biotechnology fields in particular.

Sweden is ranked 12th in the world in terms of ICT patents granted by the EPO in 2002. Also, compared with other countries, Sweden's share of ICT-based patents as a percentage of its total patenting activities is relatively low.

A similar though slightly less significant trend can be seen in the biotechnology sector, where Sweden seems to belong to the second tier group of patenting countries (ranked 11th). The Swedish share of patents granted in the US is less than 1 %, and significantly below the leading countries, i e the US (64 %), Japan (11.4 %), Germany (4.6 %), the UK (3.6 %), France (2.9 %) and Canada (2.6 %).

Since 1999, like other OECD countries, Sweden's ability to capture high-tech IP assets (such as computer and automated business equipment, micro-organism and genetic engineering, aviation, communication technology, semiconductors and laser) seems to decline significantly. Between 2000 and 2003, Swedish high-tech patent applications to the EU and the US declined by more than 75 % on average. In the biotechnology sector, Sweden seems to be experiencing a relative stagnation at the European level and a visible decline of patent applications in the US.

Moreover, Sweden's IP activities in the life sciences are characterized by a relatively high degree of concentration. Swedish patenting activities are dominated by the big pharmaceutical companies, which hold almost 50 % of pharmaceutical patents and 20 % of biotechnology patents.

In terms of structural weakness, Sweden seems to have a visible problem in the ability of academic and government institutions to generate IP assets and to engage in the successful exploitation of these assets. This weakness is particularly striking given the high level of R&D invested in the academic institutions in Sweden. Some scholars find that as little as 10 % of the patents in Sweden may be attributed to Swedish universities (including their spin-off companies).

One of the most outstanding issues in the commercialisation of Swedish IP assets deriving from the public sector is the issue of ownership. Under Swedish law, researchers at Swedish universities have exclusive ownership of IPRs deriving from their research. This element of Swedish IP law seems to be in sharp contrast to the common approach among OECD countries, which assign ownership (over IP assets deriving from government funded R&D) to the respective academic institutions rather that to the researchers (so called Bayh-Dole principles).

Opportunities

Several policy initiatives in Sweden and in Europe provide an opportunity for further strengthening of Sweden's IP performance.

Domestically, Sweden should exploit the current wave of initiatives aimed at increasing the volume and quality of collaboration and technology transfer between the public and the private sectors.

The Vinnova report (*Vinnforsk*) of Spring 2003 left the question of ownership untouched. It seems that there is merit in a renewed examination of this report to seriously consider re-shaping Sweden's entire IP framework in the public sector, and among other things to make it more in line with the US-style Bayh-Dole principles (i e the grant of IP ownership to the academic institutions rather than to their employees).

At the regional level there are several policy opportunities that Sweden should support and actively promote.

The first opportunity derives from the launch of a new **"Public Consultation on Patent Policy in Europe."**[41] On January 16th, the European Commission initiated a public consultation asking industry and other stakeholders for their views on the future of patent policy in Europe.

The Commission is also seeking views on the European patent system in general and what measures could be taken to improve it. The three key areas for consultation will therefore be:

1) The Community patent.
2) How the current patent system in Europe could be improved.
3) The possible areas for harmonisation.

On its website the Commission writes that it is "committed to boosting the competitiveness of EU industry and improving the framework conditions in which it operates. To this end, industrial property, which includes patents, has been identified as one of the seven major cross-sectoral policy initiatives in the Commission's new industrial policy."

The re-launch of the public consultation presents a new opportunity for Sweden and other countries to push forward initiatives for harmonisation, such as the CIID and the Community Patent.

The second opportunity lies with the so-called **"London Agreement"** or the **Agreement on the application of Article 65 of the Convention on the Grant of European Patents of 17 October 2000.**[42]

The Parties to the Agreement undertake to waive, entirely or largely, the requirement for translations of European patents to be filed in their national language. According to the London Agreement countries would have to choose one of the official languages of the EPO (English, French or German) as a "prescribed language" in which European patents would have to be translated in order to come into force in their country.

Currently, once a European patent is granted, the patent must be translated within three months (or six months for Ireland) from the date of grant into an official language of each country in which the patentee wants patent protection. If the translation of the European patent is not provided to the national patent office within the prescribed time limit, the patent "shall be deemed to be void ab initio in that State." (Art 65 EPC).

This in turn leads to high translation costs for patent holders. Ten countries have signed the agreement: Denmark, France, Germany, Liechtenstein, Luxembourg, Monaco, The Netherlands, Sweden, Switzerland and The United Kingdom. Yet to come into force, the Agreement needs to be ratified by at least eight additional countries, including France, Germany, and the United Kingdom.

The London Agreement, once accepted, provides an excellent opportunity for reducing patent costs in Europe. Sweden should not only ratify the agreement but should also be a strong advocate for its implementation.

The third opportunity is **The European Commission's new strategy for the Enforcement of Intellectual Property Rights in Third Countries, dated October 2004.**

The European Commission has adopted a new strategy for the Enforcement of Intellectual Property Rights in Third Countries. The Strategy was first introduced in June 2004 and officially announced in October 2004 by the former Trade Commissioner, Pascal Lamy.[43]

The Strategy aims to more vigorously protect the interests of European rights holders in third countries. It proposes to identify priority countries where enforcement actions should be concentrated. The strategy also emphasises the need to provide technical assistance to third countries fighting counterfeiting.

According to the new Strategy, the European Commission will not hesitate to trigger all bilateral and multilateral sanction mechanisms against any country involved in systematic violations. Among other things the European Commission proposes to make more active use of the EC's Trade Barriers Regulation (TBR) mechanism in cases where the IP interests of European right holders are compromised.

Given the global threat of piracy on the economic performance of IP-driven countries, Sweden should be a strong supporter of active implementation of this initiative.

It should be noted that during its EU Presidency in 2001, Sweden organised and hosted an international conference on Counterfeiting and Piracy, which highlighted the need for a much tougher approach by the EU.[44]

In this context, Sweden should consider pro-actively supporting the adaptation of the US-based STOP Initiative – Strategy Targeting Organized Piracy (STOP!) – in the EU.[45]

Threats

Threats (and opportunities) on Sweden's IP performance are linked to internal and external levels.

Internally (or domestically), there are at least two significant threats that need to be taken into account.

The first is the visible decline of patenting activities in Sweden. According to the Swedish Patent Office (PRV) there has, since 2001, been a steady decline in the volume of patenting activities in Sweden, by both Swedish and foreign nationals.

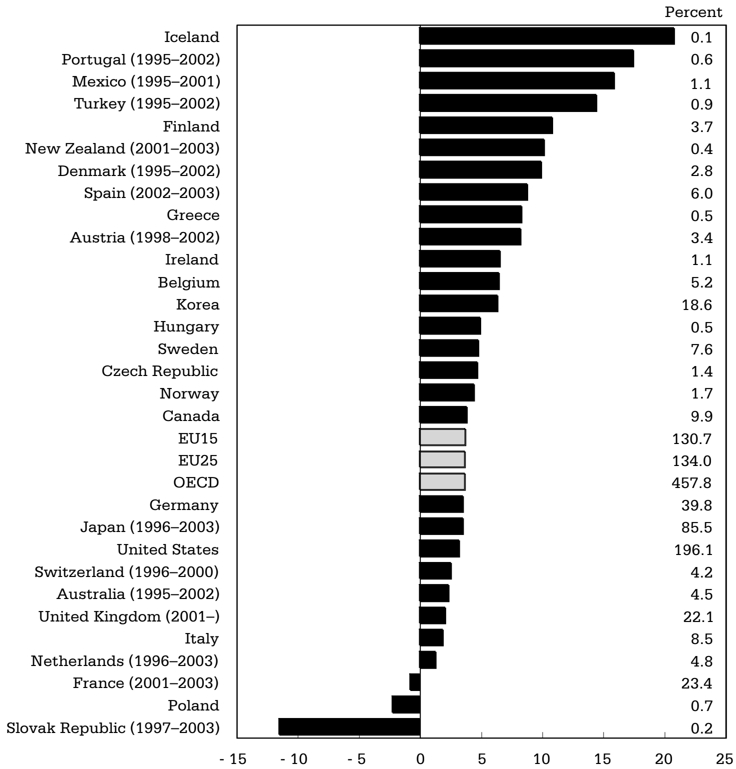
In addition, empirical evidence suggests that there is also an evident increase in the volume of IP activities of Swedish nationals outside Sweden. Approximately 30 % of the inventions owned by Swedish nationals are made abroad.

This in turn may imply that the internationalisation of patenting activities by Swedish nationals is taking place at the expense of domestic patenting operations.

Furthermore, if we assume that there is a link between the level of R&D and the level of patenting activities, then the combination of reduced patenting activities in Sweden and the internationalisation of patenting activities by Swedish nationals may pose a threat to the volume and quality of R&D operations in Sweden directed towards the future creation of IP assets.

Currently there are no signs suggesting that there is indeed a reduction in the overall investment in R&D in Sweden (which remains one of the highest in the world). However, OECD figures suggest that growth in Business R&D (which, as described before, seems to be the main driver for IP creation in Sweden), is relatively moderate, certainly compared to the high added value that this channel of R&D creates (figure 7).

Figure 7: Growth of business R&D, 1995-2003 – Annual average growth rate (USD PPP of 2000)



Source: OECD *Science, Technology and Industry Scoreboard* 2005 : *Towards a knowledge-based economy.*

The second visible threat is the lack of sufficient output from public research institutions in Sweden. As noted earlier, the IP performance of academic entities in Sweden is rather weak.

Today, however, public-private partnerships aimed at IP creation, particularly in the life sciences (and especially in the biotechnology field), are becoming increasingly dominant in the advanced economies.

For example, today the large pharmaceutical multinational companies are actively seeking to license-in proprietary technologies that stem from universities and research centres.

Swedish authorities (especially Vinnova) attribute great importance to these types of public private collaborations, such as via the creation of "Foundations for Technology Transfer" (Teknikbrostiftelser), located in the seven major university cities in Sweden.[46]

Nevertheless, in the absence of the transfer of IP ownership to the relevant institutions, it is possible that these initiatives will not meet their full potential. As such, over the medium and long run a low IP output by academic and research institutions in Sweden may also have a negative impact on the overall performance of the private sector in Sweden.

Externally, there are again at least two major threats.

The first threat is the lack of IP harmonisation at the EU level. The two recent echoing failures are the patenting of computer-implemented inventions and the unsuccessful attempt to establish Community Patents.

With regard to computer-implemented inventions (or more simply inventions that link hardware and software), according to the PRV, patents on such inventions may be granted in Sweden:

> "When it comes to computer programs, patents are not granted on the program, but rather on the connection to the technical solution, that is, the function, method, or process that results from running the program on the computer.
> Programs that control physical processes, process physical signals, or control communication can also be patented. Computer programs that control operating systems are patentable." <www.prv.se/english/patents/computer_programs.html>.

This in turns means that for Swedish nationals any pan-European harmonisation towards the grant of patents to the above inventions is likely to boost patenting activities.

Unfortunately today this is not the case.

The initiative to harmonise the EU's approach to the patentability of computer-implemented inventions, can be dated to 2000, when the European Commission published the results of its first major (commissioned) study – The Economic Impact of Patentability of Computer Programs.[47] In this study the authors found that "the patentability of computer program-related inventions has helped the growth of computer program-related industries in the (United) States, in particular the growth of SMEs and independent software developers into sizeable indeed major companies." Their overall conclusion was that "to address the difference between the scope of protection in the U S and Europe it would be necessary to either amend the implementing regulations (rules 27 and 29) or to give a broader interpretation to technical contribution. Little did the authors know (or perhaps they did…) that such a colossal war would develop over the meaning, interpretation and manifestation of these two words "technical" and "contribution."

Following a series of consultations (dating back to 1997), the European Commission in July 2002 issued its proposed directive on the patentability of computer-implemented inventions – later (notoriously) known as the CIID.[48] On 17&18 of May 2004 the Council of the European Union struggled and managed to reach a political agreement on a Common Position on the CIID.[49] However, on July 6, 2005 the European Parliament rejected the CIID. Six hundred and forty eight out of 680 MEPs present voted in favour of a multiparty proposal to reject the Commission's draft proposal.

Thus the failure to secure a harmonised approach towards the CIID is likely to negatively affect IP driven countries that permit the use of such inventions, including Sweden.

A similar problem exists with regard to the Community Patent. There are some powerful reasons to insist on having a Community Patent.

First, it will cut costs. Today, patent protection in just eight European countries costs about EURO 50,000, around five times more than in the US or Japan. The Commission estimates that a Community Patent could cut these costs by half to about EURO 25,000 for 25 Member States (although this would still be more than the US or Japan). A survey commissioned by the European Patent Office in 2004 found that the total cost of having a Euro-direct patent granted is on average EURO 24,100 for a European company. By comparison, it costs EURO 10, 250 for a US company to have a USPTO patent granted and a Japanese company will pay EURO 5,460 to receive a JPO patent.[50]

Secondly, a Community Patent would accelerate the pace of patent harmonisation within the Single Market. It would create, among other things, a centralised fast-track system for patent applications (very much like the European Agency for Evaluation of Medicinal Products – EMEA).

Thirdly, a Community Patent could greatly improve the ability of SMEs to protect and exploit their patents cost-effectively.

Fourthly, the creation of a central (and specialised) Community Patent Court will increase business transparency and certainty in the European patent system, particularly in the long run.

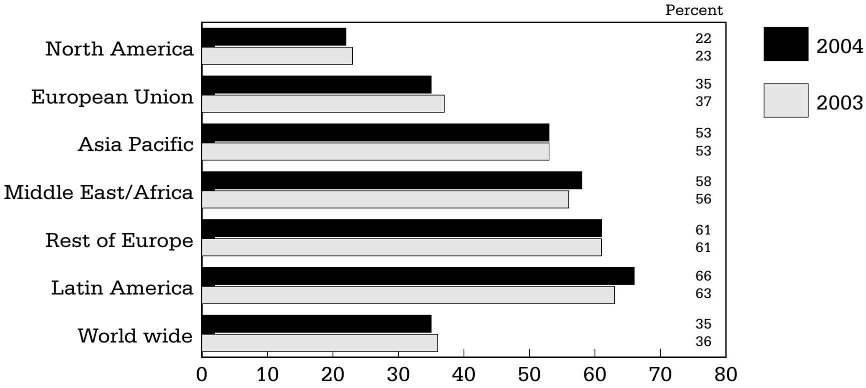
Yet, the above remains to a large extent a theoretical exercise. The Commission had to make some significant political compromises in the course of its considerable efforts to persuade the relevant institutional actors to reach a consensus on the subject. These in turn led to some serious problems with the current proposal. Translation is one aspect that could undermine the entire economic rationale of the proposed Community Patent. The requirement to translate all patent claims into all EU languages creates excessive and burdensome costs, especially on SMEs. The business community is also very concerned about the level of expertise and the detailed operability of the Community Patent Court.

Therefore, for a nation that is as IP-driven as Sweden, the lack of patent harmonisation seriously hampers the ability of Swedish nationals to fully exploit their IP potential.

The second and much more straightforward external threat to Sweden's IP performance is the level of global counterfeiting. According to BSA figures, the average rate of counterfeiting ranges from 22 % in North America (EU average is 35 %) to 66 % in Latin America (figure 8).

As discussed above, Sweden is one of the most prominent beneficiaries of IP-related activities. Therefore, the high level of piracy rates outside Sweden poses a direct threat to its ability to fully exploit the commercial potential of its IP assets.

Figure 8: Global Piracy Rates – BSA & IDC Global Software Piracy Study (2004)



Broad policy suggestions

The empirical findings and the SWOT-based analysis of the paper lead to the following broad policy suggestions:

1. A robust IP environment in Sweden (in terms of the ability to create IP assets, to protect them with various forms of IPRs, to exploit them commercially and to enforce these rights) should be treated as a strong enabling factor in Sweden's economy.

2. Sweden's R&D efforts should be directed even further towards the creation of IP assets. In other words, the high levels of R&D in Sweden, including those in the public sector, should be directed more towards the creation of applicable and exploitable knowledge. When investment in R&D and in knowledge creation in Sweden is translated into exploitable IP assets, Sweden will benefit from significant and visible commercial returns.

3. More emphasis should be placed on policy factors and legislative initiatives that would seek to boost the IP performance of the ICT and biotech sectors in Sweden. These efforts should focus both on the domestic and the European levels.

4. Given the non-optimal IP performance by the public sector, Sweden should consider entirely revising its IP framework in the public sector. The most urgent aspect is the issue of IP ownership in public institutions, such as the Universities. Sweden should consider adopting the Bayh-Dole framework, i e to transfer IP ownership to the relevant academic institutions rather than to their employees (including Faculty members).

5. IP developments and policy-design at the EU level have a direct effect on its IP performance. Consequently Sweden should become more active at the EU level and deal with both the threats and the opportunities discussed in this paper, namely the lack of harmonisation (such as the cases of the computer-implemented inventions and the Community Patent) and the level of piracy.

6. Specifically, Sweden should support, promote and even lead initiatives at the pan European level aimed at:

- Re-introducing the computer-implemented inventions Directive (CIID).
- Creating a cost-effective Community Patent.
- Implementing the London Agreement.
- Combating piracy both in Europe and abroad.

Notes

1. ”Praise ever follows when toil has made the way.”

2. For an excellent overview of this approach see Hindley 1971.

3. For an overview of the international approach see Maskus 2000.

4. The distinction between basic and applied knowledge is a follows: Basic research is defined as “experimental or theoretical work undertaken primarily to acquire new knowledge of the underlying foundations of phenomena or observable facts, without any particular application or use in view.” Applied research is defined as an “original investigation undertaken in order to acquire new knowledge … directed primarily towards a specific practical aim or objective.” The Frascati Manual 1993.

5. See Jaffe & Lemer 2004.

6. Here it is worth noting again, that the term IP refers to the range of knowledge-based and informational-based technologies and products that can be potentially protected and exploited by the various types of IPRs.

7. OECD 2005a.

8. Ibid, p 46.

9. Ibid, pp 8-9.

10. Ibid.

11. Ibid.

12. See OECD Work on Patents, homesite.

13. OECD 2005a, p 16.

14. The EIS Report, 2005, p 9.

15. Ibid, p 12.

16. OECD 2005b, p 22.

17. Eurostat 2003.

18. Ibid.

19. Arundel & Hollanders 2005, p 136.

20. *2004 Global Software Piracy Study*.

21. BSA Sweden 2005.

22. OECD, 2005a, p 19.

23. Ibid.

24. Ibid, p 21.

25. Sandström & Norgren 2003, p 38-39.

26. Ibid, pp 40-42.

27. Ibid.

28. PRV 2005, pp 5-6.

29. Ibid, p 6.

30. Ibid, p 15.

31. Ibid, p 13.

32. A more extensive discussion on this issue can be found in Pugatch 2005.

33. For Bayh-Dole see: US Code, Title 35, Chapter 18 (USC35, 200-212); US Code, Title 15, Chapter 63 (USC15, 3701-3714).

34. AUTM.

35. For a recent discussion on the possible actions the EU might take to improve its tech-transfer performance see Garner 2006.

36. Henrekson & Rosenberg 2001, pp 207-231; Goldfarb & Henrekson 2003, pp 639-658.

37. For an overview of these initiatives see European Trend Chart on Innovation 2004; Vinnforsk 2003.

38. Bennet & Johnsson 2002.

39. Svensson 2002.

40. *Self-Evaluation Report of the Värmland Region* 2006.

41. For more information see European Commission 2006.

42. For an explanation of the London Agreement see the EPO Website.

43. European Commission 2004; Tradoc 2005.

44. See Bodström 2001.

45. See USINFO 2004.

46. See European Trend Chart on Innovation 2004, op cit.

47. Hart, Holmes & Reid 2000, p 5.

48. See CIID 2002 for the original proposal; for the last version, see Rocard 2005.

49. *Official Journal of the European Union* 2005.

50. European Commission 2000.

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