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The Value of Danish Patents – Evidence From a Survey of Inventors*

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Abstract: This report summarizes the findings of the Danish "PatVal" survey of European inventors and contrasts these findings to the results of the PatVal surveys for Germany, France, Italy, Spain, the Netherlands and Great Britain ("EU6" countries). Main results are that (i) Danish patents are more economically valuable than the average of EU6 patents, (ii) the most valuable Danish patents are economically more valuable than the patents of any of the EU6 countries, (iii) both differences, however, fade out if patents from the leading four Danish patenting firms are taken out of the analysis, (iv) Danish firms make less often use of strategic patenting than the EU6 countries, (v) Danish inventors are less likely to receive a monetary compensation for their invention than inventors from the EU6 countries, (vi) Danish patents are commercialized to a larger extent than patents in any of the EU6 countries and, in that vein, are (vii) more often used for licensing or for starting a new firm than in most EU6 countries

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1. Introduction

Denmark, like most European countries, regards itself as a "knowledge-based economy".[1] Research and Development (R&D) and innovation are hence of key importance to the Danish economy. This report casts a spotlight on what academics think are the most important ingredients of innovative performance. It contains key figures on research input and the innovative performance of Denmark in comparison to the following six European countries (hereafter referred to as "EU6" countries): France, Germany, Italy, the Netherlands, Spain and the United Kingdom.

The report summarizes key findings of the Danish "PatVal" project, a European-wide survey of inventors that was funded by the European Commission. The main aim of the survey was to assess the economic value of European patents but it also contained questions on issues that are central to the processes that eventually lead to a patented invention, namely: (i) *personal characteristics of the inventors* like gender, age, education or inventors' employment history, (ii) *characteristics of the invention process* like the number of co-inventors and their relationship to the inventor in question, research cooperation, types of interactions with other during the innovation process, the use of alternative knowledge sources (like customers or scientific literature), to what extent the patented invention was the outcome of targeted research or sources of research funding, (iii) *inventor rewards* associated with the invention and (iv) *use of patents* like licensing or firm startup.

Denmark participated in the second round of the PatVal project that was conducted in 2005, it lead to information on a total of 495 unique patent grants. Research groups from the EU6 countries collected their national PatVal data in a first round in 2003 and 2004. The first round gathered data on 9,017 unique patent grants at the European Patent Office (EPO) with priority dates (the date at which an invention was first filed for patent protection) between 1993 and 1997.

The results of the first PatVal wave are summarized by Gambardella et al. (2005), and this report draws heavily on the earlier publication. It in particular uses its figures to compare the Danish data with the EU6 data. Hungary and Sweden also participated in the second round of the PatVal project but research reports have not been released yet.

The results of this report can be summarized as follows:

(i) The economic value of Danish patents is higher than the average value of patents from the EU6 countries;
(ii) The most valuable Danish patents are economically more valuable than the most valuable patents from any of the EU6 countries;
(iii) Danish firms make less often use of strategic patenting than the EU6 countries;
(iv) Danish inventors are less likely to receive a monetary compensation for their invention than inventors from the EU6 countries, and if they do receive a monetary compensation it tends to be transitory;
(v) Danish patents are commercialized to a larger extent than patents from any of the EU6 countries;

[1] Denmark's Prime Minister Anders Fogh Rasmussen for example welcomes visitors to the Danish Exporter's website with the words "The Danish economy is a knowledge-based economy founded on an efficient and flexible work force." (http://www.danishexporters.dk/scripts/danishexporters/-foreword.asp?landekode=GB)

(vi) Danish patents are more often used for licensing or for starting a new firm than patents from most EU6 countries.

Moreover, there are (vii) more female inventors in Denmark than on the EU6 average, (viii) more inventors with completed tertiary education in Denmark than in any other EU6 country while the share of inventors with a PhD is comparatively low and (ix) less research co-operations with external partners in Denmark than in the EU6 countries. (x) Danish firms tend to interact with more research partners but with each of them to a lesser extent than EU6 country firms in the invention process. There is also a substantial variation in the use of different types of interactions. (xi) The most important sources for innovation in Denmark are customers and suppliers as well as the scientific literature. This is also true for the EU6 where, however, the patent literature plays an equally important role. Just like in the EU6 countries most Danish patents are (xii) offsprings of targeted research. Compared to the EU6 countries a substantial share of patents arises, however, from coincidence in Denmark.

There are no differences between Danish patents and EU6 patents with respect to (i) inventor age – most inventors were between 30 and 40 years old at the time of the invention, (ii) employment type at the time of the invention – most inventors were dependently employed with large firms, (iii) job changes – most inventors never changed their job after the invention, (iv) research funding – most inventions were financed by internal sources and (v) inventor rewards to the invention – most inventors consider prestige, reputation and job satisfaction as motivating factors.

2. Methodological issues

The Danish PatVal project initially started out with information on 1,146 granted patents that were invented by 1,492 unique inventors. This data was received from the main PatVal contractor, Scuola Superiore Sant'Anna (SSSUP), Italy. It was selected from the universe of all patent applications at the European Patent Office (EPO) according to the following criteria: (i) priority date 1993-1997, (ii) at least one Danish inventor and (iii) patent application received a grant.

The Danish PatVat team matched all but 208 unique inventor addresses with current address information. These unmatched 208 unique inventors, which correspond to a total of 152 unique patents, are lost in the analysis. In other words, 10.2 percent of all patent grants in question are lost since current address information was not available. A total of 495 inventors did return the questionnaire. Given a total number of unique patents with current inventor address of 1,284, this translates to a response rate of 43.2%. Another relevant response rate is 49.5%, the ratio of the number of completed questionnaire responses to the 991 unique patent grants for which address data was obtained which.

A technical documentation by Kaiser (2005) explains the sampling and address search procedures in detail. The field work was contracted out to the polling institution Jysk Analyse.

The questionnaire, which is attached in Appendix A, was thoroughly tested before, during and after the first PatVal wave and was translated into Danish. See Gambardella et al. (2005) for a documentation of pre-testing and post-testing efforts of the first PatVal round.

The technical report of the Danish PatVal team (Kaiser 2005) discusses a number of additional methodological issues like the way current address material was obtained, comments on the survey by the inventors approached, response patterns dependent on the

number of inventions by an individual inventor (inventors of more than one patent were less likely to respond than inventors of just one patent) and the importance of particularly patenting active firms.
The survey was conducted between August 2005 and September 2005. Inventors were first approached by telephone and, if they indicated their willingness to participate in the survey, they were sent a written questionnaire. Inventors were also welcome to fill out an online version of the survey.
The 1,146 granted patents on which the Danish team received information from SSSUP were drawn from a sampling frame (e.g. all granted patents with at least one inventor with a Danish address and priority dates between 1993 and 1997) of 1,476 patents. The sampling population received from SSSUP hence is quite close to the sampling frame.
The PatVal project attempted to over-sample economically valuable patents which were defined as patents that received at least one citation ("forward citation") or were opposed. Both forward citations and opposition are commonly used indicators for patent value.[2] Table 2.1 displays the size of the sampling frames in the six European countries (EU6) and Denmark and also informs about the share of opposed and cited patents.[3]

Table 2.1 Composition of the population of 1993-1997 patents (sampling frame), by country

Group	DE	ES	FR	IT	NL	UK	DK	EU6
Opposed Patents	7.2%	4.2%	5.3%	5.1%	4.7%	3.9%	9.5%	5.6%
Not opposed and cited	34.2%	19.0%	18.8%	25.3%	13.8%	11.5%	39.6%	22.9%
Others (not opposed and not cited)	58.6%	76.8%	75.9%	69.6%	81.4%	84.6%	50.9%	71.5%
Total	15,595	814	14,287	6,205	3,955	8,222	1,476	49,078

Note: EU6 includes Germany, Spain, France, Italy, the Netherlands and the United Kingdom.
Sources: DE, ES, FR, IT, NL and UK - Gambardella et al. (2005); DK - Danish PatVal project.

The characteristics of the sampling frame as shown in Table 2.1 should be compared to the characteristics of the sampling population. Table 2.2 thus redisplays the information contained in Table 2.1 for the data received from SSSUP.

Table 2.2 Composition of target patents for the full scale survey (sampling population), by country

Group	DE	ES	FR	IT	NL	UK	DK	EU6
Opposed Patents	10.0%	4.2%	12.8%	12.7%	4.7%	4.0%	10.7%	8.4%
Not opposed and cited	50.8%	19.0%	46.0%	62.8%	13.8%	11.4%	38.3%	35.5%
Others (not opposed and not cited)	39.2%	76.8%	41.2%	24.5%	81.4%	84.6%	51.0%	56.1%
Total	10,500	815	5,842	2,500	3,955	7,846	1,146	31,458

Sources: DE, ES, FR, IT, NL and UK - Gambardella et al. (2005); DK - Danish PatVal project.

A comparison between Table 2.1 and Table 2.2 shows that patents that received citations or were opposed are indeed overrepresented in the EU6 data so that, to the extent that citations and oppositions are value correlates, the PatVal survey results have to be interpreted with caution. There is, however, no evidence for such a bias for the Danish data, possibly since the sampling population almost coincides with the sampling frame.
Very small differences in the distribution of potentially valuable patents exist between the sampling population and the sample (the eventual PatVal data) as Table 2.3 shows. This is true both for the Danish data and the EU6 data.
If patent citations and patent opposition are indeed valid "value correlates", then Table 2.2 and Table 2.3 already suggest that Danish patents are economically more valuable

[2] Forward citations are considered by Trajtenberg (1990), patent opposition is discussed by Harhoff and Reitzig (2004).
[3] The Danish PatVal team used to OECD-EPO patent citation data base (Webb et al. 2005) to generated the figures displayed in Table 2.1.

than the EU6 average: they are more likely to receive citations and they are more likely to be opposed. Section 6.2, that discusses the value assessments of the inventors, shows that Danish inventors indeed come to a higher value assessment than their counterparts in the EU6 countries.

Table 2.3 Dataset (sample) composition by Country

	DE	ES	FR	IT	NL	UK	DK	EU6
Opposed Patents	10.0%	4.5%	11.7%	10.1%	6.5%	3.6%	10.5%	8.6%
Not opposed and cited	51.8%	16.0%	26.6%	48.2%	14.0%	12.5%	38.3%	34.6%
Others (not opposed and not cited)	38.2%	79.5%	61.7%	41.8%	79.5%	83.9%	50.5%	56.8%
Total	3,346	269	1,486	1,250	1,124	1,542	495	9,017

Sources: DE, ES, FR, IT, NL and UK - Gambardella et al. (2005); DK - Danish PatVal project.

Table 2.4 contains an overview of the PatVal sample sizes in the EU6 countries and Denmark. It shows that the response rate is particularly high in Denmark. It is lower, however, than expected by the Danish PatVal team. One reason for that, also articulated in the inventors' free text comments, may be that some of the inventions were made up to eleven years ago.

Table 2.4 Full scale survey (sample) response rates

Group	DE	ES	FR*	IT	NL	UK	DK	EU6
Number of contacted patents	10,215	815	4,199	1,857	2,594	7,846	991	27,531
Number of responses (patents)	3,346	269	1,486	1,250	1,124	1,542	495	9,017
Response rate (in relation to the number of contacted	32.8%	33.0%	35.4%	67.3%	43.3%	19.7%	50.0%	32.8%

* Number of responses by inventors.

Sources: DE, ES, FR, IT, NL and UK - Gambardella et al. (2005); DK - Danish PatVal project.

Table 2.5 shows the size of the PatVal data sets by country. Even though Denmark is substantially smaller than Spain it accounts for a larger share of PatVal survey information since the response rate for Spain was fairly low.

Table 2.5 Size of the final PatVal-EU datasets

Country	N. questionnaires	%	N. patents	%
Germany	3,346	34.5%	3,346	35.2%
Spain	270	2.8%	269	2.8%
France	1,651	17.0%	1,486	15.6%
Italy	1,250	12.9%	1,250	13.1%
Denmark	495	5.1%	495	5.2%
Netherlands	1,157	11.9%	1,124	11.8%
UK	1,542	15.9%	1,542	16.2%
Total	9,711	100%	9,512	100%

It is well known that the importance of patents to protect inventions differs across technology fields. Cohen et al. (2000) for US manufacturing firms for example show that secrecy, lead-time advantages and investments in complementary assets are on average more important than patents. For the chemical and pharmaceutical industry, patents are still the most important protection mechanism.

They also claim that, apart from the mere protection of innovations that are exploited internally, licensing, cross-licensing and other strategic reasons are also important motives to patent. Industries where the propensity to patent is high are also those where the "strategic use" of patents is important (Anand and Khanna, 2000; Cohen et al., 2000;

Grindley and Teece, 1997; Hall and Ziedonis, 2001; Arora et al., 2001; Cesaroni, 2003). The economic value of patents might hence depend on technology fields.

Table 2.6, therefore, displays the distribution of patents across five main technology sectors. Table 2.7 shows the country distribution of patents by using a more disaggregated technological classification. The main technology classes were defined according to the ISI-INIPI-OST patent classification which is based on EPO's International Patent Classification (IPC) system classes.[4] The table shows that most Danish patents, just as in the EU6 countries, are in Mechanical Engineering. Again just like in the other countries, Process Engineering comes in second. A difference between Denmark and the EU6 countries is the high importance of patents in Chemistry and Pharmaceuticals. This is due to a few and particularly patenting active pharmaceutical and chemical firms. Denmark's most important patenter, Novo Nordisk A/S, a pharmaceutical firm, for example has been the employer of 10.7% of the patent inventors in the Danish PatVal data. The Top 10 PatVal inventor employers account for 40.2% of the patents.

Table 2.6 Macro-technological classes by country, in %

Technological Class	DE	ES	FR	IT	NL	UK	DK	EU6
Electrical engineering	13.3%	10.5%	15.5%	16.0%	23.4%	16.7%	8.3%	15.8%
Instruments	10.3%	6.7%	11.0%	8.4%	10.7%	14.9%	11.3%	10.9%
Chemistry, Pharmaceuticals	19.2%	20.5%	15.6%	16.2%	20.5%	20.1%	23.6%	18.5%
Process engineering	25.4%	27.2%	25.4%	26.3%	25.5%	21.7%	28.3%	24.9%
Mechanical engineering	31.9%	35.1%	32.5%	33.1%	19.9%	26.6%	28.5%	29.8%
Total	100%	100%	100%	100%	100%	100%	100%	100%

Note: patents have been classified according to the ISI macro classes.

Sources: DE, ES, FR, IT, NL and UK - Gambardella et al. (2005); DK - Danish PatVal project.

[4] Technology-oriented classification system is jointly elaborated by Fraunhofer Institute of Systems and Innovation Research (ISI), the French Patent Office (INIPI) and the Observatoire des Science et des Techniques (OST). It distinguishes among 30 technologies and 5 higher-level technology areas based on the IPC. For the concordance between ISI-INIPI-OST technological classes and EPO IPC classes see Hinze *et al*. (1997).

Table 2.7 Technological classes by country, in %

	DE	ES	FR	IT	NL	UK	DK	EU6
Electrical devices, electrical engineering, el	8.0%	6.7%	7.8%	6.8%	8.3%	6.3%	384.0%	7.5%
Audio-visual technology	1.2%	0.4%	1.3%	1.3%	5.2%	2.7%	141.0%	2.0%
Telecommunications	2.1%	3.0%	3.2%	2.8%	6.5%	3.4%	121.0%	3.2%
Information technology	1.0%	0.4%	2.5%	3.0%	2.5%	4.0%	162.0%	2.2%
Semiconductors	1.0%	0.0%	0.7%	2.1%	1.0%	0.4%	20.0%	1.0%
Optics	1.6%	0.0%	1.4%	1.4%	2.9%	3.1%	0.0%	1.9%
Analysis, measurement, control technology	6.3%	4.1%	5.4%	3.9%	5.0%	8.4%	667.0%	6.0%
Medical technology	2.0%	2.6%	3.5%	2.6%	2.6%	2.9%	465.0%	2.6%
Organic fine chemistry	6.7%	8.6%	5.7%	5.5%	3.8%	6.8%	990.0%	6.1%
Macromolecular chemistry, polymers	7.0%	4.1%	2.5%	5.4%	6.1%	3.0%	101.0%	5.1%
Pharmaceuticals, cosmetics	1.4%	2.2%	3.4%	1.4%	1.3%	2.3%	323.0%	1.9%
Biotechnology	0.3%	0.0%	1.0%	0.6%	2.1%	0.9%	283.0%	0.8%
Materials, metallurgy	3.6%	4.9%	4.9%	2.5%	2.4%	2.8%	343.0%	3.4%
Agriculture, food chemistry	0.4%	2.2%	1.2%	1.0%	3.4%	1.8%	424.0%	1.3%
Chemical and petrol industry, basic materia	3.4%	3.4%	1.8%	2.3%	3.7%	5.3%	242.0%	3.3%
Chemical engineering	3.0%	3.0%	4.4%	2.1%	3.4%	3.5%	626.0%	3.2%
Surface technology, coating	1.6%	2.2%	1.2%	1.5%	0.9%	1.8%	81.0%	1.5%
Materials processing, textiles, paper	5.5%	3.7%	4.9%	7.9%	4.5%	4.6%	424.0%	5.4%
Thermal processes and apparatus	2.2%	1.5%	2.0%	2.6%	2.9%	1.2%	263.0%	2.1%
Environmental technology	2.2%	1.1%	0.9%	1.1%	1.7%	1.6%	242.0%	1.6%
Machine tools	4.1%	4.5%	3.0%	6.3%	1.3%	2.1%	202.0%	3.5%
Engines, pumps, turbines	3.0%	2.2%	2.0%	3.4%	1.2%	4.2%	626.0%	2.8%
Mechanical Elements	5.8%	2.2%	4.2%	3.1%	2.4%	4.0%	465.0%	4.3%
Handling, printing	7.9%	9.3%	5.9%	10.1%	7.4%	6.1%	646.0%	7.5%
Agricultural and food processing, machiner	1.6%	3.0%	3.2%	1.1%	5.3%	1.3%	465.0%	2.2%
Transport	8.6%	6.7%	7.4%	6.1%	4.2%	5.8%	242.0%	7.0%
Nuclear engineering	0.4%	0.0%	0.7%	0.5%	0.3%	0.6%	0.0%	0.5%
Space technology w eapons	0.6%	1.1%	1.7%	0.3%	0.1%	0.3%	0.0%	0.6%
Consumer goods and equipment	3.9%	10.8%	6.8%	7.7%	4.0%	4.4%	384.0%	5.2%
Civil engineering, building, mining	3.8%	6.0%	5.5%	3.6%	3.9%	4.6%	667.0%	4.3%
	100%	100%	100%	100%	100%	100%	100%	100%

Sources: DE, ES, FR, IT, NL and UK - Gambardella et al. (2005); DK - Danish PatVal project.

The high importance of few but very patent active firms may influence the survey results, in particular with respect to patent value since the most patent active firms are also large so that for example finding comparatively high patent values for Denmark may simply reflect a large firm effect. Large firms are likely to conduct an effective IPR policy which in turn increases patent value.

The patent value analysis hence distinguishes between the “Top 4” Danish patenting firms and the rest. Table 2.7 provides an overview of the importance of patenting active firms in the sample and in the sampling frame. It shows that the three most active firms, Novo Nordisk, Danfoss and Velux, are slightly overrepresented in the sample.

Table 2.7 An overview of the 10 most important inventor employees ("sample" figures) and the 10 most important patent assignees ("sampling frame" figures)

	Sample			Sampling frame		
Inventor's employer	Rank	# of patents	in percent	Rank	# of patents	in percent
NOVO NORDISK A/S	1	53	10.7	1	121	8.2
DANFOSS A/S	2	36	7.3	2	60	4.1
HALDOR TOPSØE A/S	3	27	5.5	4	55	3.7
VELUX A/S	4	19	3.8	3	55	3.7
MAN B&W DIESEL A/S	5	14	2.8	9	27	1.8
ROCKWOOL INTERNATIONAL A/S	6	13	2.6	5	49	3.3
COLOPLAST A/S	7	12	2.4	7	33	2.2
NIRO ATOMIZER A/S	8	9	1.8	16	11	0.7
NKT A/S	9	8	1.6	39	5	0.3
LEGO A/S	10	8	1.6	22	9	0.6
Novozymes A/S	13	5	1.0	6	36	2.4
BOREALIS A/S	-	0	0.0	8	32	2.2
F L Smidth & Co. A/S	36	2	0.4	10	23	1.6
		495	100.0		1,476	100.0

Source: own calculations based on the Danish PatVal data.

3. Inventor characteristics

This Section takes a closer look at the inventor characteristics gender, age, educational background, type of employment when it was filed for patent protection, and the number of times the inventor changes employers after the invention.

3.1. Gender distribution of inventors

Table 3.1 shows that only 2.82 % of the inventors are female on the EU6 average. The share of female inventors is substantially higher in Denmark where it is 6.26 %. This could be related either to a higher response rate or to the fact that there are indeed more female inventors in Denmark than there are in most of the EU6 countries. In order to check if differences in response rates are decisive the Danish team checked the inventor names in the sampling population data by hand in order to characterize inventors by gender. It turned out that 10.4 % of all inventors were female, e.g. more than the 6.3 % that responded to the survey. That, in fact, indicates that the Danish sample contains fewer female inventors than the sampling population. A likely cause for this difference is that female inventors might have married and changed names so that it was not possible to trace their current address.

The relatively high share of female inventors mirrors the high Danish female labor force participation rate.

Table 3.1 Female inventors as % of all inventors

	Share female inventors
DE	1.6%
ES	8.2%
FR	5.3%
IT	2.7%
NL	2.1%
UK	2.6%
DK	6.3%
EU6	2.8%

Sources: DE, ES, FR, IT, NL and UK - Gambardella et al. (2005); DK - Danish PatVal project.

3.2. Age distribution of inventors

Table 3.2 displays the age of the inventors in Denmark and the EU6. Age is calculated as 1999 minus the inventor's year of birth. The table shows that Danish inventors are more or less as old as in the EU6 countries. Some differences exist, however, in the young ages (where there are fewer inventors in Denmark) and in the old ages (where there are more in Denmark). The age span between 41 and 50 years is the period where inventors are most productive, the age spans 31 and 40 years as well as 51 to 60 years are runners up.

Table 3.2 does not calculate age in a particularly meaningful way since the more relevant information is inventors' age at the time of the invention, i.e. the age at priority date. Such information is not available for the EU6 countries. This is why Table 3.3 contains information for Denmark only. Even though age as calculated in Table 3.2 is upward biased, the broad picture remains unchanged: productivity is highest between 31 and 40 years, followed by the ages 41 to 50 years and, by some distance, ages 51 to 60 years.

Table 3.2 Age of inventors								
	DE	ES	FR	IT	NL	UK	DK	EU6
<=30	2.7%	11.1%	6.0%	5.6%	6.5%	5.1%	2.2%	4.8%
31-40	31.4%	32.9%	27.8%	30.5%	36.7%	26.7%	27.1%	30.6%
41-50	27.2%	28.2%	36.4%	33.0%	33.5%	38.4%	32.9%	32.3%
51-60	32.0%	21.0%	25.0%	25.3%	21.1%	24.2%	25.3%	26.9%
61-70	6.3%	5.6%	4.0%	5.3%	2.1%	5.1%	10.5%	5.0%
>70	0.4%	1.2%	0.8%	0.4%	0.2%	0.7%	2.0%	0.5%
	100%	100%	100%	100%	100%	100%	100%	100%
Sources: DE, ES, FR, IT, NL and UK - Gambardella et al. (2005); DK - Danish PatVal project.								

Table 3.3 Age of inventors at priority date		
	DK	
	Share	Number
<=30	9.0%	42
31-40	34.5%	162
41-50	28.8%	135
51-60	17.9%	84
61-70	3.8%	18
>70	6.0%	28
	100%	469
Sources: DE, ES, FR, IT, NL and UK - Gambardella et al. (2005); DK - Danish PatVal project.		

3.3. Education of inventors

On average three quarters of the EU6 inventors hold a tertiary education degree as shown in Table 3.4. This share is as high as 85.5% in Denmark. The share of inventors with a PhD is lower than in any of the EU6 countries, however. This matches well with the observation that the share of employees with a post-tertiary education in Denmark is one of the lowest in the OECD (Hougaard Jensen et al. 2003).

Table 3.4 Share of inventors with tertiary education and Ph.D degree								
	DE	ES	FR	IT	NL	UK	DK	EU6
Tertiary	85.3%	83.2%	65.3%	56.7%	83.1%	80.4%	85.5%	76.9%
PhD	35.2%	25.0%	22.5%	3.1%	20.6%	32.0%	16.8%	26.0%
Sources: DE, ES, FR, IT, NL and UK - Gambardella et al. (2005); DK - Danish PatVal project.								

3.4. Employment of inventors

While there are quite considerable differences between Denmark and the EU6 countries with respect to gender and education, Denmark differs little with respect to the inventor's employment at the time the patented invention was made as shown in Table 3.5. A total of 87.4 % of the inventors were dependently employed (EU6 average: 89.2 %), 9.5 % were self-employed (EU6 average: 7.8 %) and 3.1 % were in "other" occupations (EU6 average: 3 %). Some Danish inventors indicated that they were Master's students at the time of the invention.

Table 3.5 Inventors' employment position when the research leading to the patent was performed								
	DE	ES	FR	IT	NL	UK	DK	EU6
Dependent	91.9%	81.1%	85.9%	82.7%	93.1%	90.5%	87.4%	89.2%
Self-employed	6.8%	9.1%	10.1%	8.7%	6.0%	8.2%	9.5%	7.8%
Other	1.3%	9.8%	4.0%	8.5%	1.0%	1.3%	3.1%	3.0%
Sources: DE, ES, FR, IT, NL and UK - Gambardella et al. (2005); DK - Danish PatVal project.								

Small differences between Denmark and the EU6 countries also exist with respect to the size of the employer at the time the invention was made as shown in Table 3.6. Most inventors were employed by a large firm (more than 250 employees), followed by Small-

and-Medium-sized firms (less than 250 employees), public research institutions and "other" entities. The fact that large firms dominate in Denmark reflects the high importance of few large and very patent active firms as discussed in Section 2. The industry structure in Denmark is in general characterized by Small-and-Medium-sized firms.

Table 3.6 Inventors' employment position when the research leading to the patent was performed

	DE	ES	FR	IT	NL	UK	DK	EU6
Large firms	77.7	48.3	65.0	63.4	63.7	59.0	62.6	67.8
Small/Medium firms	14.2	34.2	23.5	29.4	20.3	25.9	25.9	21.2
PRI	3.4	7.0	6.7	2.6	6.7	8.2	4.4	5.2
Other	1.9	3.1	2.8	3.0	1.5	4.4	5.3	2.6

Sources: DE, ES, FR, IT, NL and UK - Gambardella et al. (2005); DK - Danish PatVal project.

3.5. Post invention employment

Most inventors never left the employer they had at the time of the invention as shown in Table 3.7. This is so both in Denmark, where 71.1 % of the inventors stayed with the employer they had at the time of the invention, and in the EU6 countries, where the average is 77.5%. Denmark does, however, belong to the countries with the more mobile inventors with only UK inventors and inventors from the Netherlands being slightly more mobile. Labor mobility, in particular of highly educated labor, is high in Denmark (Werwatz et al. 1999) so that the high inventor mobility might be a reflection of this fact. There is empirical evidence for a positive relation between inventor productivity and mobility (Klepper 2001; Zucker et al. 1998) so that more labor mobility may go along with higher productivity. Investigating this issue further is on the agenda of the PatVal project.

Table 3.7 Number of times the inventors changed employer after the invention

	DE	ES	FR	IT	NL	UK	DK	EU6
0	83.1%	88.8%	82.3%	75.4%	69.9%	65.3%	71.1%	77.5%
1	11.0%	9.7%	11.8%	16.6%	18.2%	23.4%	17.2%	14.8%
2	4.1%	1.5%	4.1%	6.4%	7.3%	7.3%	7.4%	5.3%
3	1.4%	0.0%	1.2%	1.0%	1.9%	3.0%	2.3%	1.6%
More than 3	0.4%	0.0%	0.6%	0.7%	2.7%	0.8%	2.1%	0.8%
Total	100%	100%	100%	100%	100%	100%	100%	100%

Sources: DE, ES, FR, IT, NL and UK - Gambardella et al. (2005); DK - Danish PatVal project.

4. Characteristics of the invention process

It has long been argued that innovation becomes more and more complex so that inventors are forced to pool their resources in order to achieve scientific progress (Galbraith 1952). A total of 57.8% of the patents in the Danish PatVal data indeed have at least one co-inventor as shown in Table 4.1. The share of co-invented patents hence is slightly below the EU6 average which is 62.6%. Kaiser et al. (2005) show that the number of co-invented patent applications steadily increased in Denmark between 1978 and 2002.

Table 4.1 Share of patents with more than one inventor

DE	ES	FR	IT	NL	UK	DK	EU6
64.8%	42.9%	63.7%	59.9%	66.7%	59.3%	57.8%	62.6%

Sources: DE, ES, FR, IT, NL and UK - Gambardella et al. (2005); DK - Danish PatVal project.

Many of those co-inventors may of course be employed by the same organization. Table 4.2 distinguishes between in-house cooperation and external cooperation. It shows that

the share of external co-operations is much smaller in Denmark, where it is 11.6% than in any of the EU6 countries, where the average is 23.9%. Note that these numbers are conditional on there being at least two inventors. One way to interpret this apparent difference between Denmark and the EU6 countries is that most research in Denmark is undertaken by large private firms where external co-operation may be less needed.

Table 4.2 Share of patents where one or more co-inventors are affiliated to organizations other than the inventor's primary employer

DE	ES	FR	IT	NL	UK	DK	EU6
23.8%	21.9%	19.3%	16.0%	23.9%	35.5%	11.6%	23.9%

Sources: DE, ES, FR, IT, NL and UK - Gambardella et al. (2005); DK - Danish PatVal project.

While the share of external collaborators in an inventive process that are eventually listed on the patent application is low in Denmark relative to the EU6 countries, the fraction of patents that emerged from formal or informal cooperation is higher in Denmark than in the EU6 countries (except for the Netherlands) as shown in Table 4.2.

How does a low share of external co-inventors go along with the high share of patents that were developed through external cooperation? One way to explain this phenomenon is that the importance of customers and suppliers is high in Denmark (see Table 4.5 and Table 4.6). While they may contribute significantly to the invention, they are unlikely to actually generate the invention and hence will not become co-inventors. By contrast, inventive input by public research would probably lead to co-invention rather than just cooperation. Public research does rank low on the list of important sources of innovation as shown in Table 4.5 and Table 4.6.

Three quarters of those co-operations are formal, both in Denmark and on the EU6 average. The high share of patented inventions that are generated through cooperation is in accordance with data from the EU-wide Community Innovation Survey (EU Commission 2005) that shows that 15.8% of all innovating Small-and-Medium-Sized Enterprises were involved in a research co-operation in Denmark. This number is only higher in Finland where it is 20%. The share patents emanating from formal collaborative agreements is 83.6% in Denmark which compares to a EU6 fraction of 74.6% which indicates that non-market mediated knowledge flows between researchers play a less important role in Denmark than in the EU6 countries.

Table 4.3 Share of patents developed through a formal or informal collaboration between the employer organisation and other partners

DE	ES	FR	IT	NL	UK	DK	EU6
13.3%	19.5%	22.7%	21.9%	34.5%	23.3%	30.2%	20.5%

Sources: DE, ES, FR, IT, NL and UK - Gambardella et al. (2005); DK - Danish PatVal project.

Table 4.4 elaborates further on the issue of research collaboration. It shows the inventors' responses to a set of questions on the importance of different types of interaction with others. The questions were answered on a five point scale and the table displays means and standard deviation of the responses. The table shows that "arms' length" interaction where it typically took less than one hour to reach the other's office or location was most important, followed – by a large distance – by unaffiliated organizations that were hard to get in touch with. Danish inventors' interactions differ considerably from the interactions of the EU6 countries. They used on average four out of three interactions to a lesser extent than the EU6 average but the use of interaction tends to vary (as measured by the

standard errors) considerably more than in the EU6 countries. In other words: Danish inventors tend to interact with a multitude of different ways and their use of interactions varies considerably.

Table 4.4 Average importance of the interactions between the inventor and other people

Forms of Interactions	DE	ES	FR	IT	NL	UK	DK	EU6
typically took less than one hour to reach the other people's office or location	**2.9** *1.9*	**3.5** *1.8*	**3.2** *1.8*	**2.5** *1.9*	**3.3** *1.9*	**3.2** *1.8*	**2.9** *1.9*	**3.0** *1.9*
typically took more than one hour to reach the other people's office or location	**1.1** *1.6*	**2.9** *2.2*	**1.4** *1.7*	**1.1** *1.7*	**1.2** *1.7*	**1.7** *1.8*	**1.0** *1.5*	**1.3** *1.7*
less than one hour to reach the other people's office or location	**0.7** *1.3*	**0.7** *1.5*	**1.4** *1.7*	**0.6** *1.2*	**0.9** *1.5*	**1.0** *1.4*	**0.9** *1.5*	**0.9** *1.5*
Other (unaffiliated) organisations, and it typically took more than one hour to reach the other people's office or location	**1.3** *1.8*	**0.9** *1.6*	**1.5** *1.8*	**1.1** *1.7*	**1.3** *1.8*	**1.5** *1.8*	**1.1** *1.7*	**1.3** *1.8*

Note: Average values. Standard deviations are in italics
Scale adopted: 0=no interactions; 1=not important, 5=very important.
Sources: DE, ES, FR, IT, NL and UK - Gambardella et al. (2005); DK - Danish PatVal project.

While differences in the importance of innovation input with respect to the use of sources of different immediate accessibility exist between Denmark and in the EU6 countries, there are no marked differences in the use of different sources of innovation like universities, non-public research laboratories, conferences etc. as shown in Table 4.5 The two most important sources both in Denmark and the EU6 countries are scientific literature and customers/users. Innovation hence seems to be both customer-driven and directed by recent academic advances. The only major difference between Denmark and the EU6 countries is in the use of the patent literature that scores equally high as customers and sciences in the EU6 countries but is of slightly less importance in Denmark. This might relate to the generally lower relative patenting activity of Danish firms compared to other OECD countries (Kaiser et al. 2005) – a lesser direct use of patents goes along with a lesser indirect use of patents.

These figures also show that there is little cooperation in particular between universities and public research institutions with private sector companies. The Danish government has implemented a number of measures to improve public-private co-operations since 2001, like special tax deductions on co-operative research or special leave schemes for public sector employees.

Table 4.5 does, however, certainly contain bad news for the Danish prioritization of so-called Approved Public Research Institutions ("Godkendte Teknologiske Institutter"): non-public research laboratories have least importance as sources for innovation.

Table 4.5 Share of inventors who rated "important" the use of the following sources of innovation

	DK	EU6
University labs	18.1%	21.5%
Non univ public labs	9.6%	12.8%
Technical Confer & Workshops	33.6%	36.2%
Scientific literature	60.0%	57.1%
Patent literature	51.6%	57.0%
Customers/users	60.3%	62.5%
Suppliers	27.6%	31.1%
Competitors	35.2%	47.3%

Note: Share of inventors who assigned at least 3 to the importance of each source of knowledge on a scale 0-5 (0=not used, 5=very important).
Scale adopted: 0=no interactions; 1=not important, 5=very important.
Sources: DE, ES, FR, IT, NL and UK - Gambardella et al. (2005); DK - Danish PatVal project.

Table 4.6 draws a slightly more detailed picture of the importance of different sources of innovation by showing the means and standard deviation of the inventor responses that were again given on a five-point scale.

Table 4.6 Average level of importance of sources of innovation by country								
	DE	ES	FR	IT	NL	UK	DK	EU6
University labs	1.2	0.9	1.2	0.6	1.4	1.2	0.9	1.2
	1.6	*1.6*	*1.6*	*1.4*	*1.8*	*1.7*	*1.5*	*1.6*
Non university public labs	0.9	0.6	0.9	0.3	1.0	0.7	0.6	0.8
	1.4	*1.4*	*1.4*	*1.0*	*1.4*	*1.2*	*1.3*	*1.3*
Technical Confer & Workshops	2.0	1.2	1.5	1.4	1.6	1.6	1.5	1.7
	1.8	*1.6*	*1.7*	*1.7*	*1.6*	*1.7*	*1.7*	*1.7*
Scientific literature	2.7	2.4	2.4	2.5	2.4	2.5	2.5	2.6
	1.8	*2.0*	*1.9*	*2.0*	*1.7*	*1.9*	*1.9*	*1.9*
Patent literature	2.8	2.8	2.6	2.1	2.4	2.6	2.4	2.6
	1.9	*1.8*	*1.9*	*1.9*	*1.7*	*2.0*	*1.9*	*1.9*
Customers/users	3.3	2.5	2.4	2.6	2.8	2.8	2.8	2.9
	1.9	*2.0*	*2.0*	*2.0*	*1.9*	*2.0*	*2.1*	*2.0*
Suppliers	1.6	1.3	1.7	1.0	1.6	1.7	1.3	1.6
	1.7	*1.5*	*1.8*	*1.6*	*1.6*	*1.8*	*1.7*	*1.7*
Competitors	2.4	1.9	2.4	1.7	2.0	1.9	1.7	2.2
	1.9	*1.7*	*2.0*	*1.8*	*1.7*	*1.8*	*1.8*	*1.9*
Note: Average values. Standard deviations are in italics.								
Scale adopted: 0=not used, 5=very important.								
Sources: DE, ES, FR, IT, NL and UK - Gambardella et al. (2005); DK - Danish PatVal project.								

Another important question of the PatVal survey was how the invention was generated. Was it the outcome of targeted research? Or rather pure coincidence? The inventor responses, displayed in Table 4.7, indicate that both in Denmark and in all EU6 countries targeted research lead to the invention, as indicated by 44.4% of the Danish inventors and by 38.2% of the average of the EU6 inventors. The other end of the spectrum, coincidence, comes in second with 22.5% of the Danish inventors and 13.9% of the EU6 inventors indicating it as the scenario that best describes the process that lead to the invention. All other scenarios are of substantially less importance in Denmark and also on the EU6 average.

Table 4.7 Scenario that best describes the innovative process (share of inventors)								
	DE	ES	FR	IT	NL	UK	DK	EU6
The invention was the targeted achievement of a research project	29.7	57.6	44.0	37.0	40.8	45.8	44.4	38.2
The invention was an expected by-product of a research project, not directly related to the main target of the project	16.8	6.4	5.6	13.1	10.5	7.0	8.1	11.6
The invention was an unexpected by-product of a research project, not directly related to the main target of the project	16.7	3.2	3.2	5.8	16.6	11.6	8.1	11.6
The idea for the invention was directly related to the inventor's normal job (which is not inventing), and was then further developed in a (research) project	14.2	23.2	34.6	25.4	16.7	16.4	15.0	20.2
The idea for the invention came from pure inspiration/creativity or from your normal job (which is not inventing), and was not further developed in a (research or development) project (was patented without further research or development costs)	20.5	3.6	3.7	17.6	6.9	14.1	22.5	13.9
Other	2.3	6.0	9.0	1.1	8.4	5.2	1.9	4.6
Total	*100.0*	*100.0*	*100.0*	*100.0*	*100.0*	*100.0*	*100.0*	*100.0*
Sources: DE, ES, FR, IT, NL and UK - Gambardella et al. (2005); DK - Danish PatVal project.								

Another way of looking at the sources of innovation is to analyze the sources of funding. Table 4.8 does exactly that. It shows that the by far most important source of funding was internal funds by the patent applicant as indicated by 81.3% of the Danish inventors and 89.4% of the EU6 inventors. All other types of funding played a rather subordinate role.

Table 4.8 Types of financing of the research leading to the patent (share of inventors in %)								
	DE	ES	FR	IT	NL	UK	DK	EU6
Internal funds of the patent applicant (including his subsidiaries)	94.0	90.8	91.7	88.0	77.9	87.3	81.3	89.4
Funds from any other unaffiliated organization joining the project	3.3	2.4	3.6	2.4	13.1	3.8	2.5	4.6
Funds from financial intermediaries of any kind (banks, other financial institutions, etc.)	0.4	1.2	1.6	2.4	1.4	1.3	3.3	1.2
Government Research Programmes or other government funds	5.4	23.1	10.2	9.5	11.2	9.8	10.0	8.7
Other	4.7	2.4	1.6	7.0	4.4	8.1	12.7	5.2
Note: Multiple responses allowed.								
Sources: DE, ES, FR, IT, NL and UK - Gambardella et al. (2005); DK - Danish PatVal project.								

The issue of "strategic patenting" is receiving heightened attention from academics and policy makers alike. One of the less well-studied forms of – possibly – strategic patenting is the production of "intertwined patents". These are patents that belong to a group of patents that crucially depend on one another technically or in terms of economic value. "Patent fences", where firms wishing to protect a core invention by patenting substitutes to this core invention, are one particular form of intertwined patents and are discussed in Schneider (2005). Intertwined patents also relate back to the "targeted research" scenario that most inventors indicated as best describing the process that lead to the invention since, even if the very first invention might have been a coincident, the follow-up patents may be results of targeted research.
Table 4.9 displays the shares of intertwined patents in Denmark and in the EU6 countries. The table shows that intertwined patents are of least importance in Denmark and Spain where around 32% of all patents belong to a group of intertwined patents. The shares are substantially higher in all other countries leading to an EU6 average of 44.9%. This may indicate that Danish inventors (or rather the corresponding applicants) do not to use patents strategically, or at least not as strategic as in competing economies. This is echoed in Table 6.3 that shows that blocking patents rank low in the inventors' list of important reasons to patent.

Table 4.9 Share of patents that are part of a group of intertwined patents

DE	FR	IT	NL	UK	DK	EU6
46.2%	43.0%	42.7%	53.8%	41.2%	31.5%	44.9%

Sources: DE, ES, FR, IT, NL and UK - Gambardella et al. (2005); DK - Danish PatVal project.

5. Inventor compensation

The rewards for innovation differ considerably across organizations and countries. Variations in inventor rewards between countries are often due to differences in legislation. Germany for example passed a law that defines formal rules to reward successful inventors in 1957 ("German Employees' Inventions Act" – "Arbeitnehmererfindergesetz") that is still in place. The US Bayh-Dole Act of 1984 enables universities to require that their employees disclose their inventions in order to prepare a patent application and define the distribution of rights between the university as the funding institution and government (see, e.g. Mowery et al., 2001).
Denmark acquitted a similar law in 2000 ("Lov om opfindelser ved offentlige forskningsinstitutioner") that gives universities the right to take over the property right from the inventors. Inventors are also obliged to commercialize their invention.
It is, based on such substantial legal differences, unsurprising that the share of inventors who received a monetary reward for their invention varies considerably across countries as shown in Table 5.1. Germany's inventors are most likely to receive a monetary compensation, 61.3% of them were rewarded monetarily for their patent. Spain, where 14.8% received monetary reward, ranks last. Denmark (19.1%) and the Netherlands (17.5%) also rank low on the monetary rewards ladder.

Table 5.1 Inventors who received a monetary compensation for their patents (%)							
DE	ES	FR	IT	NL	UK	DK	EU6
61.3%	14.7%	n.a.	23.1%	17.5%	28.2%	19.1%	41.7%
Note: France is not included due to the high number of missing values on this variable.							
Sources: DE, ES, FR, IT, NL and UK - Gambardella et al. (2005); DK - Danish PatVal project.							

The by far largest share of monetary rewards is transitory rather than permanent as shown in Table 5.2. This is true both for Denmark and the EU6 countries. A one-off payment is hence preferred over monthly installments paid until retirement.

Table 5.2 Types of monetary rewards (%)								
Reward type	DE	ES	FR	IT	NL	UK	DK	EU6
Permanent	3.9%	18.9%	8.8%	17.0%	15.5%	8.0%	10.0%	7.2%
Transitory	92.5%	78.4%	88.7%	77.7%	78.4%	88.3%	85.6%	89.0%
Both	3.7%	2.7%	2.5%	5.3%	6.2%	3.6%	4.4%	3.8%
Note: Percentage computed on the inventors who received some monetary compensation.								
Sources: DE, ES, FR, IT, NL and UK - Gambardella et al. (2005); DK - Danish PatVal project.								

Apart from national legislation, these apparent differences in monetary inventor compensation of course also stem from different approaches of individual organizations with respect to their policies to reward inventors. Companies that provide monetary rewards are also those that place great attention to an efficient management of patent portfolios, and hence have strong incentives to motivate potential inventors. Given that most Danish inventors were employed with a large private company at the time of their invention, it seems that those firms have either found other ways to motivate inventors or that they believe that rewarding inventors is not worthwhile.

Monetary rewards in a high-tax country like Denmark with a marginal tax rate of 66 for annual incomes of more than DKK 304,800 (around 40,000 Euros) may indeed not set particularly strong incentives. Monetary rewards, consequently, rank lowest in the Danish inventors' assessment of different ways of rewarding patented inventions. Most important to Danish inventors is prestige and reputation, closely followed by the satisfaction of showing that something is technically possible. Danish inventors thereby differ only little from the EU6 countries where reputation and satisfaction also rank high, but in reverse order. Benefits in terms of working condition as a reward by the employer are less important than reputation and satisfaction but are still considerably more important than the other three devices to reward inventors. There are small differences between Danish inventors and average inventors from the EU6 countries.

Table 5.3 Average level of importance of rewards for the invention								
Rewards	DE	ES	FR	IT	NL	UK	DK	EU6
	3.0	2.1	3.6	3.0	2.7	3.0	2.5	3.1
Monetary rewards	*1.4*	*1.4*	*1.3*	*1.4*	*1.4*	*1.4*	*1.4*	*1.4*
Career advances and opportunities for new/better jobs	2.7	2.6	3.3	3.1	2.9	3.3	2.6	3.0
	1.3	*1.4*	*1.3*	*1.3*	*1.3*	*1.3*	*1.4*	*1.3*
Benefits in terms of working condition as a reward by the employer	3.7	3.3	2.9	3.1	3.2	3.7	3.2	3.4
	1.2	*1.4*	*1.2*	*1.3*	*1.2*	*1.2*	*1.2*	*1.3*
Satisfaction to show that something is technically possible	4.1	4.1	4.1	4.0	4.1	3.9	3.7	4.0
	1.1	*1.2*	*1.1*	*1.1*	*1.0*	*1.2*	*1.2*	*1.1*
	4.0	3.9	3.9	3.9	3.9	4.0	3.9	3.9
Prestige/reputation	*1.1*	*1.2*	*1.2*	*1.2*	*1.2*	*1.1*	*1.2*	*1.1*
Innovations increase the performance of the organisation the inventor works for	3.0	2.2	1.9	2.8	2.2	2.4	2.6	2.6
	1.4	*1.3*	*1.2*	*1.3*	*1.2*	*1.3*	*1.4*	*1.4*
Note. Scale: 1=not important, 5=very important. Standard deviations in italics.								
Sources: DE, ES, FR, IT, NL and UK - Gambardella et al. (2005); DK - Danish PatVal project.								

6. Patent use and patent value

6.1. Patent use

Many patents that are granted are never used commercially and, as a consequence, never generate economic returns. Such non-use of patents leads to a highly skewed distribution of economic patent value as described in the introductory section. Commercially unused patents are discussed in some length by Palomeras (2003) as well as Rivette and Kline (2000), who show that "sleeping patents" are often owned by large firms that may use patents for strategic reasons. Sun Microsystems and IBM for example calculate the difference in the number of patent grants every year and determine the amount of licensing fee based on this crude patent count.[5]
Table 6.1 shows that a narrow majority of patents in fact is commercially or industrially used. The EU6 average is 54.5%. Patent use is lowest in the UK where it is 48.8% and highest in Denmark (67.8%) and France (66.7%). Both countries also have a relatively high share of patents that emerged from targeted research.

Table 6.1 Share of patents used for commercial or industrial purposes

DE	ES	FR	IT	NL	UK	DK	EU6
53.5%	57.7%	66.7%	60.5%	51.8%	48.8%	67.9%	54.5%

Note: France shows a high number of missing values on this variable (about 15.5% for France against 2.3% on average for the other 5 EU6 countries and 3.43% in Denmark).

Sources: DE, ES, FR, IT, NL and UK - Gambardella et al. (2005); DK - Danish PatVal project.

A total of 13.4% of all commercially used patents is licensed out (or "externally" used) as shown in Table 6.2. Denmark is the country with the highest share of licensed patent grants, 18.0%. Germany is the country where patent licensing is least used, the corresponding patents share is 10.8%. The high share of licensed patents may be caused by many (possibly intertwined) reasons: (i) Danish firms may be too small to internally reap their benefits from the invention, (ii) Danish patents are relatively more valuable, (iii) Danish patents are more professionally managed, and/or (iv) Danish patents are purposely generated to be licensed out later on. Table 6.3 partly reflects the latter assertion: licensing as a motive for patenting is more important in Denmark than the average in the EU6 countries.

Table 6.2 Share of licensed patents

DE	ES	FR	IT	NL	UK	DK	EU6
10.8%	15.9%	14.9%	11.4%	16.1%	17.9%	18.0%	13.4%

Sources: DE, ES, FR, IT, NL and UK - Gambardella et al. (2005); DK - Danish PatVal project.

Another way to commercially exploit patents is to use them as a basis for starting a new company. The UK and Denmark with shares of 9.7% and 8.7% of patents used for that purpose rank highest while France and Germany rank lowest with shares of 2.7% and 1.63%, respectively. This is shown in Table 6.3. The EU6 average is 5.1%. The high rate of entrepreneurial activity is somewhat surprising since Denmark did not possess a Venture Capital market at the time the PatVal patents were applied for, and since entrepreneurial activity in Denmark is fairly low (but rapidly growing) compared to other European countries.

[5] Personal correspondence with Senior Lecturer Michael Kölling, University of Canterbury.

Table 6.3 Share of patents used to start a new company							
DE	ES	FR	IT	NL	UK	DK	EU6
2.7%	9.3%	1.6%	6.0%	4.7%	9.7%	8.7%	5.1%
Sources: DE, ES, FR, IT, NL and UK - Gambardella et al. (2005); DK - Danish PatVal project.							

Table 6.4 provides yet another look at the importance of commercialization of patents for Danish inventors. Commercial exploitation of patents was the most important reason for patenting in Denmark, a finding that meets well with the high share of licensed patents and the large share of commercially or industrially exploited patents. It is also the most important motive in the EU6 countries. For Danish inventors, the level of importance is, however, considerably higher than in any EU6 country except for the UK where it is equally important as in Denmark. Almost as important both in Denmark and in the EU6 countries is the prevention of imitation. This original motive for patent protection scores much higher in Denmark than in the EU6 countries.

Danish inventors consider blocking competitors as the third most important motive. This coincides with the EU6 countries but the absolute importance of that motive is again substantially higher.

Danish inventors prioritize both the commercial exploitation of patents and the prevention from imitation. The latter is a precondition for the former. The creation of "blocking patents" also ranks high on Danish inventors' motive list.

Table 6.4 Average level of importance of reasons to patent								
	DE	ES	FR	IT	NL	UK	DK	EU6
	3.6	4.1	3.9	3.6	3.7	4.2	4.3	3.8
Commercial exploitation	*1.6*	*1.4*	*1.5*	*1.8*	*1.7*	*1.3*	*1.2*	*1.6*
	2.2	2.7	1.7	1.5	1.9	2.5	2.3	2.1
Licensing	*1.3*	*1.7*	*1.4*	*1.5*	*1.8*	*1.7*	*1.5*	*1.5*
	1.9	1.5	2.1	1.4	1.7	2.0	1.9	1.8
Cross-licensing	*1.2*	*1.3*	*1.6*	*1.4*	*1.8*	*1.5*	*1.3*	*1.4*
	4.0	3.8	3.6	3.6	3.3	3.7	4.2	3.8
Prevention from imitation	*1.4*	*1.6*	*1.6*	*1.8*	*1.8*	*1.6*	*1.2*	*1.6*
	2.5	3.5	3.3	3.4	3.4	3.5	4.0	3.0
Blocking patents	*1.5*	*1.6*	*1.7*	*1.9*	*1.8*	*1.6*	*1.4*	*1.7*
	2.2	2.9	2.2	2.2	1.8	2.6	2.5	2.3
Reputation	*1.3*	*1.7*	*1.6*	*1.8*	*1.7*	*1.6*	*1.3*	*1.6*
Note. Scale: 0=not at all important; 1=not important, 5=very important. Standard deviations in italics.								
Sources: DE, ES, FR, IT, NL and UK - Gambardella et al. (2005); DK - Danish PatVal project.								

6.2 Patent value

The PatVal survey asked inventors to report the minimum price at which the owner of the patent would have sold the patent rights (if she had been able to) given all information available at the time she responded to the questionnaire. Since the data collection periods for the EU6 survey and the Danish survey differ, the EU6 data are based on a smaller information set than the Danish data. The data collection for the EU6 survey did, however, take place 6-7 years after the year of application so that it is not to be expected that the information sets differ substantially.

Table 6.5 displays the distribution of patent value. As discussed in Section 2, the Danish PatVal inventors were to a large extent employed by the most patent intensive firms. Given that those very patenting active firms also belong to the countries' largest firms and that large firms tend to follow a more sophisticated IPR policy than small firms, it seems possible that the finding of high economic values of Danish patents is merely a "big firm effect". This is why Table 6.5 shows patent value figures for the entire sample, the "Big4" firms and the non-Big4 firms along with the data for the EU6 average.

Table 6.5 shows that there are quite considerable differences between the EU6 patents and the Danish patents. The distribution of patent value in Denmark is bimodal: there are

relatively many (relative to the EU6 average) patents with little economic value, relatively fewer patents with intermediate value and relatively many patents that are economically very valuable. Denmark hence possesses both relatively many patents that are economically not valuable and patents that are economically very valuable.
This indicates that the best IPR policies of Danish firms indeed are better than the IPR policies of firms from the EU6 countries. It also indicates, however, that the worst IPR policies of Danish firms are worse than the IPR policies of the EU6 countries.
Once the Big4 patenters are, however, taken out of the analysis, the value distribution of Danish patents is very similar to the value distribution of the EU6 average. The economic value of the Big4 Danish patenters, of course, ranks even higher above the value of any of the EU6 countries.

Table 6.5 Distribution of the patent value (Euro)

	DK	DK-big 4 only	DK w/o big 4	EU6
Less than 30.000	11.4%	16.5%	9.2%	7.9%
30.000 to 100.000	11.1%	10.4%	11.7%	17.4%
100.000 to 300.000	16.7%	11.3%	18.7%	20.6%
300.000 to 1ml	18.1%	11.3%	20.6%	21.8%
1ml to 3ml	14.6%	11.3%	15.8%	15.5%
3ml to 10ml	13.0%	14.8%	12.3%	9.6%
10ml to 30ml	7.2%	8.7%	6.7%	3.7%
30ml to 100ml	4.4%	9.6%	2.5%	2.0%
100ml to 300ml	1.9%	3.5%	1.3%	0.8%
More than 300ml	1.6%	2.6%	1.3%	0.8%

Sources: DE, ES, FR, IT, NL and UK - Gambardella et al. (2005); DK - Danish PatVal project.

While there is no published separate data for each of the EU6 countries, such figures exist for the most valuable patents, patents with an economic value of more than 30 mio. Euros. These figures are displayed in Table 6.6 which shows that economically top valued patents play a substantially more important role in Denmark than in any EU6 country.

Table 6.6 Distribution by country of the top valued patents

DE	ES	FR	IT	NL	UK	DK	EU6
4.9%	9.0%	5.5%	5.4%	8.2%	10.0%	15.1%	7.2%

Sources: DE, ES, FR, IT, NL and UK - Gambardella et al. (2005); DK - Danish PatVal project.

By differentiating between the Big4 patenters and the other patents, the same picture arises as before: once the Big4 patenters are taken out of the analysis, the value differences become substantially smaller.

Table 6.7 Distribution by country of the top valued patents

DK	DK-big 4 only	DK w/o big 4	EU6
15.1%	24.4%	11.7%	7.2%

Sources: DE, ES, FR, IT, NL and UK - Gambardella et al. (2005); DK - Danish PatVal project.

The same general patterns of the economic value distribution arise for intertwined patents as displayed in Table 6.8: Danish patents are more valuable than the EU6 patents on average but that difference disappears once the Big4 patenters are taken out of the analysis.

Table 6.8 Distribution of the value of groups of intertwined patents (Euro)

	DK	DK-big 4 only	DK w/o big 4	EU6
Less than 30.000	6.8%	10.0%	5.2%	2.0%
30.000 to 100.000	7.7%	2.5%	10.4%	3.6%
100.000 to 300.000	4.3%	2.5%	5.2%	7.3%
300.000 to 1ml	7.7%	7.5%	7.8%	12.6%
1ml to 3ml	10.3%	10.0%	10.4%	18.2%
3ml to 10ml	13.7%	12.5%	14.3%	19.2%
10ml to 30ml	18.8%	17.5%	19.5%	15.5%
30ml to 100ml	11.1%	15.0%	9.1%	9.5%
100ml to 300ml	10.3%	15.0%	7.8%	6.1%
300ml to 1bl	5.1%	2.5%	6.5%	2.8%
1bl to 3bl	0.9%		1.3%	1.6%
More than 3 billion	3.4%	5.0%	2.6%	1.8%

Sources: DE, ES, FR, IT, NL and UK - Gambardella et al. (2005); DK - Danish PatVal project.

6. Conclusions

This report summarizes the results of the Danish "PatVal" project, a survey of European inventors. It also compares the Danish results with the existing findings of the surveys for Germany, France, Italy, Spain, the Netherlands and Great Britain ("EU6" countries).

The report finds some marked differences between the characteristics of Danish patents compared to patents from the EU6 countries. The most important differences certainly concern the economic value of patents, where the survey finds that the share of most valuable patents is substantially higher in Denmark than in any of the EU6 countries. It is also shown that Danish patents are more valuable than the EU6 average. These, from a Danish point of view, positive differences do, however, fade out once the four most patent-active firms are taken out of the analysis. Once this is done, there are no differences in the economic value of Danish patents compared to EU6 patents. This indicates a particularly effectively conducted IPR policy of those four most patent active firms.

Other results of this report can be summarized as follows: (i) Danish patents are economically more valuable than the average of EU6 countries, (ii) the most valuable Danish patents are more valuable than any of the EU6 countries, (iii) Danish firms make less often use of strategic patenting than the EU6 countries, (iv) Danish inventors are less likely to receive a monetary compensation for their invention than inventors from the EU6 countries and if they do receive a monetary compensation it tends to be transitory, (v) Danish patents are commercialized to a larger extent than in any of the EU6 countries and (vi) Danish patents are more often used for licensing or for starting a new firm than in most EU6 countries.

Moreover, there is less research co-operations with external partners in Denmark than in the EU6 countries. (x) Danish firms tend to interact with more research partners and with each of them to a lesser extent than EU6 country firms in the invention process. (xi) The most important sources for innovation in Denmark are customers and suppliers as well as

the scientific literature. This is also true for the EU6 where, however, the patent literature plays an equally important role. Just like in the EU6 countries most Danish patents are (xii) offsprings of targeted research. Compared to the EU6 countries a substantial share of patents arises, however, from coincidence in Denmark.

There are no differences between Danish patents and EU6 patents with respect to (i) inventor age – most inventors were between 30 and 40 years old at the time of the invention, (ii) employment type at the time of the invention – most inventors were dependently employed with large firms, (iii) job changes – most inventors never changed their job after the invention, (iv) research funding – most inventions were financed by internal sources and (v) inventor rewards to the invention – most inventors consider prestige, reputation and job satisfaction as motivating factors.

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EUROPEAN INVENTORS' SURVEY 2005

Dette spørgeskema er en del af et forskningsprojekt, hvis hensigt er at forbedre vores viden om udviklingsprocessen, incitamenterne og belønningerne til de europæiske opfindere, og værdien af deres patenter.

Dette er kritiske spørgsmål for den europæiske samfundsøkonomi i dag, hvilket også er fremhævet i det medfølgende brev fra Europa-Kommissionen, der støtter dette initiativ.

Spørgeskemaet, hvilket tager cirka 15 minutter at udfylde, er blevet fremsendt til cirka 30.000 opfindere i ni europæiske lande: Danmark, England, Frankrig, Holland, Italien, Spanien, Sverige, Tyskland og Ungarn.

Du er blevet udvalgt blandt de opfindere i disse lande, der er angivet på et eller flere patenter, som er blevet bevilget af det Europæiske Patent Kontor med prioritetsdato i årene 1993-1997.

Ifølge persondataloven vil dine informationer ikke blive gjort offentligt tilgængelige i et omfang, der kan afsløre din identitet. Ligeledes vil enkeltheder fra din besvarelse ikke blive afsløret for din(e) nuværende eller tidligere arbejdsgiver(e).

Vi værdsætter din hjælp i forbindelse med udfyldelsen af dette spørgeskema. Vi vil informere dig om vores væsentligste forskningsresultater ved hjælp af projektets hjemmeside, der er under konstruktion.

Forskningsgruppen, der varetager denne spørgeskemaundersøgelse, er sammensat af de ni nedenstående enheder. I Danmark står Jysk Analyse for kontakten til deltagerne på vegne af Syddansk Universitet Odense. Spørgsmål vedrørende spørgeskemaet bør stilles til projektlederen i dit land, og ikke til Europa Kommissionen eller det Europæiske Patent Kontor.

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Sektion A: Personlige Informationer

A.1. Fødeland _____

A.2 Fødselsår _____

A.3 Opholdsland _____

(*Da forskningen, der førte til dette patent foregik*)

A.4 Køn ❒ Mand ❒ Kvinde

Sektion B: Uddannelse

B.1 Da forskningen, der førte til dette patent fandt sted, var dit højeste uddannelsesniveau: *(Sæt ét kryds i boksen med den korrekte angivelse)*

❒ Folkeskole eller lavere
❒ Gymnasial uddannelse
❒ Bachelor eller tilsvarende
❒ Kandidat eller tilsvarende
❒ Ph.D. eller tilsvarende

B.2 Angiv også venligst:

Hvilket år graden blev opnået _____

I hvilket land den blev opnået _____

For bachelorer eller højere, i hvilken fagdisciplin graden blev opnået *(F.eks. maskiningeniør, biokemi)* _____

(I tilfælde af mere end én grad, angiv da venligst den vigtigste for patentet)

B.3 Angiv også venligst:

Har du tilbragt en længere periode i et ikke-dankstalende land som medarbejder eller studerende? (I tilfælde af at du haft flere længere udlandsophold, henvis til det længste)

❒ Intet længere udlandsophold

❒ 3-6 måneder ❒ 6-12 måneder / ❒ 1-2 år ❒ mere end 2 år

Sektion C: Beskæftigelse & Mobilitet

Beskæftigelse på tidspunktet for opfindelsen

C.1 Da forskningen, der førte til opfindelsen fandt sted, var din beskæftigelsessituation:

❒ Ansat af *(angiv venligst navnet på din arbejdsgiver)*

_____

❒ Selvstændig *(hvis anvendeligt, angiv da venligst navnet på dit firma)*

_____

_____

❒ Studerende *(angiv venligst navnet på uddannelsesinstitutionen og enten bachelor eller kandidat)*

_____

❒ Andet *(angiv venligst nærmere)*

_____

C.2 Hvor stor en del af din arbejdstid brugte du på innovativ aktivitet under opfindelsesforløbet? *(angiv venligst andel af din arbejdstid i %)*

	10 %	20 %	30 %	40 %	50 %	60 %	70 %	80 %	90 %	100
Op til	❒	❒	❒	❒	❒	❒	❒	❒	❒	❒

C.3 Hvor stor en del af din arbejdstid bruger du i dag på innovativ aktivitet? *(angiv venligst andel af din arbejdstid i %)*

	10 %	20 %	30 %	40 %	50 %	60 %	70 %	80 %	90 %	100
Op til	❒	❒	❒	❒	❒	❒	❒	❒	❒	❒

C.4 I hvilket år lavede du din første opfindelse, som blev patenteret? *(angiv venligst opfindelsesåret)*

_____

C.5 Hvilken position har du i firmaet i dag? *(angiv venligst din nuværende position)*

_____

C.6 Hvilken position havde du i firmaet under opfindelsesforløbet? *(angiv venligst din position)*

_____

C.7 Hvad beskriver bedst typen af ovennævnte organisation? (A*fkryds kun én boks)*

- ❒ Stort firma (> 250 medarbejdere)
- ❒ Medium firma (100-250 medarbejdere)
- ❒ Lille firma (< 100 medarbejdere)
- ❒ Hospital, fond/stiftelse, eller privat forskningsorganisation
- ❒ Offentlig forskningsorganisation
- ❒ Universitet og uddannelse
- ❒ Andet offentligt
- ❒ Andet *(angiv venligst nærmere)* _____

C.8 Er denne organisation også (en af) ansøger(ne) til patentet?

❒ Ja ❒ Nej

C.9 I hvilket år blev du ansat i denne organisation eller startede din egen virksomhed, hvis selvstændig?

_____

Beskæftigelse før opfindelsen

C.10 Hvad var din tidligere beskæftigelsessituation?

❒ Ansat af *(angiv venligst navnet på din arbejdsgiver)*

_____

❒ Selvstændig *(hvis anvendeligt, angiv da venligst navnet på dit firma)*

_____

_____

❒ Studerende *(angiv venligst navnet på uddannelsesinstitutionen og enten bachelor eller kandidat)*

_____

❒ Andet *(angiv venligst nærmere)*

_____

C.11 Hvad beskriver bedst typen af ovennævnte organisation?

❒ Stort firma (> 250 medarbejdere)
❒ Medium firma (100-250 medarbejdere)
❒ Lille firma (< 100 medarbejdere)
❒ Hospital, fond/stiftelse, eller privat forskningsorganisation
❒ Offentlig forskningsorganisation
❒ Universitet og uddannelse
❒ Andet offentligt
❒ Andet *(angiv venligst nærmere)*

_____

_____

C.12 I hvilket år blev du ansat i denne organisation eller startede din egen virksomhed, hvis selvstændig?

_____

C.13 Hvis du arbejdede for en anden arbejdsgiver inden ansættelsen hos den arbejdsgiver, hvor opfindelsen blev gjort, var den tidligere arbejdsgiver i så fald indenfor den samme branche?

❒ Ja ❒ Nej

Beskæftigelse efter opfindelsen

C.14 Hvor mange gange har du skiftet din arbejdsgiver i alt?

❒ Jeg skiftede ikke arbejdsgiver

❒ 1 ❒ 2 ❒ 3 ❒ Mere end 3

C.15 Hvor mange gange skiftede du arbejsgiver/organisation efter et af patenterne i spørgsmål C1?

❒ Jeg skiftede ikke arbejdsgiver **(*Fortsæt venligst direkte til Sektion D*)**

❒ 1 ❒ 2 ❒ 3 ❒ Mere end 3

C.16 Hvad var din beskæftigelsessituation efter et af patenterne i spørgsmål C1? *(Hvis du skiftede mere end én gang, angiv da venligst situationen lige efter patentet)*

❒ Ansat af *(angiv venligst navnet på din arbejdsgiver)*

_____

❒ Selvstændig *(hvis anvendeligt, angiv da venligst navnet på dit firma)*

_____

❒ Studerende *(angiv venligst navnet på uddannelsesinstitutionen og enten bachelor eller kandidat)*

_____

❒ Andet *(angiv venligst nærmere)*

_____

C.17 Hvad beskriver bedst typen af ovennævnte organisation?

❒ Stort firma (> 250 medarbejdere)

❒ Medium firma (100-250 medarbejdere)

❒ Lille firma (< 100 medarbejdere)

❒ Hospital, fond/stiftelse, eller privat forskningsorganisation

❒ Offentlig forskningsorganisation

❒ Universitet og uddannelse

❒ Andet offentligt

❒ Andet *(angiv venligst nærmere)*

_____

____

C.18 I hvilket år blev du ansat i denne organisation eller startede din egen virksomhed, hvis selvstændig?

_____

Nuværende beskæftigelse

C.19 Er din nuværende arbejdsgiver indenfor den samme branche, som den du var tilknyttet, da opfindelsen blev gjort?

❒ Ja ❒ Nej

Sektion D: Opfindelses-processen

Hvis du er den eneste opfinder angivet i patentet, fortsæt da direkte til spørgsmål D.4

D.1 Var én eller flere af dine med-opfindere, der er angivet i dette patent, ansat af andre organisationer end din primære arbejdsgiver på opfindelsestidspunktet (i spørgsmål C.1)?

❒ Ja ❒ Nej

(Hvis Nej, fortsæt da venligst direkte til spørgsmål D.4)

D.2 Hvilken organisation tilhørte dine med-opfindere? *(Afkryds én eller flere af nedenstående bokse)*

❒ Stort firma (> 250 medarbejdere)
❒ Medium firma (100-250 medarbejdere)
❒ Lille firma (< 100 medarbejdere)
❒ Hospital, fond/stiftelse, eller privat forskningsorganisation
❒ Offentlig forskningsorganisation
❒ Universitet og uddannelse
❒ Andet Offentligt
❒ Andet *(angiv venligst nærmere)*

_____

_____

D.3 Var én af dine med-opfindere ansat af (en af) ansøger(ne) til patentet?

❒ Ja ❒ Nej

D.4 Var der et formelt eller uformelt samarbejde mellem din arbejdsgiver/organisation og andre parter i forbindelse med forskningen ledende til dette patent? Angiv venligst også samarbejder med ansøgere til dette patent.

(*Ved formelt mener vi samarbejde, der involverer en detaljeret kontrakt mellem parterne*)

❒ Ja ❒ Nej

Hvis Ja, angiv venligst følgende information:

Partnernes navn	Formålet med samarbejdet	Formelt	Uformelt
_____	_____	❒	❒
_____	_____	❒	❒

_____ _____ ❒ ❒

_____ _____ ❒ ❒

_____ _____ ❒ ❒

D.5 Var interaktioner (diskussioner, møder, idégrundlag, m.v.) med følgende typer af personer (*bortset fra med-opfindere*) vigtige *under* forskningen, der førte til den patenterede opfindelse? (*1=ikke vigtig, 5=meget vigtig*)

Personer tilknyttet…	1	2	3	4	5	Ingen Interaktioner
- *din organisation (inklusiv tilknyttede organisationer)*, hvor det typisk tog mindre end en time at komme frem til hans/hendes kontor eller arbejdssted	❒	❒	❒	❒	❒	❒
- *din organisation (inklusiv tilknyttede organisationer)*, hvor det typisk tog mere end en time at komme frem til hans/hendes kontor eller arbejdssted	❒	❒	❒	❒	❒	❒
- a*ndre (ikke tilknyttede) organisationer*, hvor det typisk tog mindre end en time at komme frem til hans/hendes kontor eller arbejdssted	❒	❒	❒	❒	❒	❒
- andre *(ikke tilknyttede) organisationer*, hvor det typisk tog mere end en time at komme frem til hans/hendes kontor eller arbejdssted	❒	❒	❒	❒	❒	❒

D.6 Hvad var den vigtigste af de følgende kilder til viden for forskningen, der førte til den patenterede opfindelse? (*1=ikke vigtig, 5= meget vigtig*)

	1	2	3	4	5	Jeg brugte ikke denne videnskilde
- Universitetslaboratorier og fakulteter	❒	❒	❒	❒	❒	❒
- Offentlige laboratorier (ikke-universitets)	❒	❒	❒	❒	❒	❒
- Tekniske konferencer og workshops	❒	❒	❒	❒	❒	❒
- Videnskabelig litteratur	❒	❒	❒	❒	❒	❒
- Patent litteratur	❒	❒	❒	❒	❒	❒
- Kunder eller brugere af produktet	❒	❒	❒	❒	❒	❒
- Leverandører	❒	❒	❒	❒	❒	❒
- Konkurrenter	❒	❒	❒	❒	❒	❒
- Andre relevante kilder *(angiv venligst)* _____	❒	❒	❒	❒	❒	❒

D.7 Vi er interesserede i at finde ud af i hvilken region eller by, at opfindelsen rent faktisk blev gjort. Anfør venligst postnummeret på det sted, hvor opfindelsen blev gjort, og navnet på byen.

Postnummer: _____ By:_____

D.8 Vi er interesserede i at finde ud af i hvilken form for bymæssigt eller landligt miljø, at opfindelsen blev gjort. Afkryds venligst den mest passende boks:
Opfindelsen blev gjort...

- ❒ i en by med mere end 1 million indbyggere
- ❒ i en by med 500.000 til 1 million indbyggere
- ❒ i en by med 100.000 til 500.000 indbyggere
- ❒ i en by med 50.000 til 100.000 indbyggere
- ❒ i en by med 10.000 til 50.000 indbyggere
- ❒ i en by med mindre end 10.000 indbyggere
- ❒ i et landligt område

D.9 Hvilket af de følgende *scenarier* beskriver bedst den kreative proces, der førte til opfindelsen? *(Afkryds kun én boks ved det mest passende svar)*

❒	Opfindelsen var det målrettede resultat af et forsknings- eller udviklingsprojekt
❒	Opfindelsen var et forventet biprodukt af et forsknings- eller udviklingsprojekt, ikke direkte relateret til projektets hovedformål
❒	Opfindelsen var et ikke-forventet biprodukt af et forsknings- eller udviklingsprojekt, ikke direkte relateret til projektets hovedformål
❒	Idéen til opfindelsen var direkte relateret til dit normale job (som ikke drejer sig om at opfinde), og var derefter videreudviklet i et (forsknings- eller udviklings) projekt
❒	Idéen til opfindelsen var ren inspiration/kreativitet eller kom fra dit normale arbejde (som ikke drejer sig om at opfinde), og var ikke videreudviklet i et (forsknings- eller udviklings) projekt (blev patenteret uden videre forsknings- eller udviklingsomkostninger) ***(Hvis du krydser dette svar af, fortsæt da venligst direkte til spørgsmålene D.10 og D.11)***
❒	Andet *(angiv venligst)* _____

D.10 Hvor mange mande-måneder krævede forskningen, der førte til patentet?

❒ Mindre end 1 mande-måned
❒ 1-3 mande-måneder
❒ 4-6 mande-måneder
❒ 7-12 mande-måneder
❒ 13-24 mande-måneder
❒ 25-48 mande-måneder
❒ 49-72 mande-måneder
❒ Mere end 72 mande-måneder

D.11 Hvad er dit bedste estimat af de totale omkostninger (*i euro*) af forskningen, der førte til dette patent, op til ansøgningsdatoen? *(Inkludér ikke juridiske honorarer eller andre honorarer relateret til patentansøgningen)*

_____

D.12 Hvilke af de følgende beskriver bedst finansieringen af forskningen, der førte til dette patent? (*Afkryds én eller flere af nedenstående bokse*)

- ❒ Patentansøgerens interne kapital (*inklusiv hans datterselskaber*)
- ❒ Kapital fra en ikke-tilknyttet organisation, deltagende i projektet
- ❒ Kapital fra finansielle institutioner af en hvilken som helst form (*banker, andre finansielle institutioner, m.v.)*
- ❒ Offentlige forsknings-programmer eller anden offentlig kapital
- ❒ Andet (angiv venligst) _____

D.13 Hvorfor blev det besluttet at patentere opfindelsen, som den var, i modsætning til at videreudvikle den ved at ofre flere ressourcer? *(Afkryds én eller flere af nedenstående bokse)*

- ❑ Opfindelsen var god nok, som den var
- ❑ De oprindelige formål med opfindelsen blev opfyldt
- ❑ Yderligere forbedringer kunne være opnået, men de estimerede omkostninger oversteg de tilgængelige ressourcer (*budget*)
- ❑ Yderligere forbedringer syntes at være udenfor de eksisterende teknologiske muligheder
- ❑ Yderligere forbedringer (*kunne have*) resulteret i en anden opfindelse, der kunne patenteres separat
- ❑ Det var nødvendigt at patentere opfindelsen hurtigt, fordi din organisation var opmærksom på andre opfindere, forskningersgrupper eller firmaer, der arbejdede på opfindelser indenfor samme område

D.14 Blev opfindelsen i væsentlig grad baseret på andre opfindelser, som du kendte? ❒ Ja ❒ Nej ❒ Det ved jeg ikke

(*Hvis Nej eller Det ved jeg ikke, fortsæt da direkte til spørgsmål D.16*)

D.15 Var denne tidligere opfindelse blevet gjort i den samme organisation?

❒ Ja ❒ Nej ❒ Det ved jeg ikke

D.16 Vi definerer en "familie af patenter" som en gruppe af patenter, der i afgørende grad afhænger af hinanden i forbindelse med deres værdi, eller i et teknisk omfang. Var det adspurgte patent en del af en familie af patenter?

❒ Ja ❒ Nej ❒ Det ved jeg ikke

(*Hvis Nej eller Det ved jeg ikke, fortsæt da direkte til Sektion E*)

D.17 Angiv venligst hvor mange patenter, der var del af patent-familien

❒ 1-2 ❒ 3-5 ❒ 6-10 ❒ 11-20 ❒ >20

❒ Det ved jeg ikke

D.18 Hvor mange mande-måneder krævede forskningen, der førte til hele familien af patenter?

❒ Mindre end 1 mande-måned
❒ 1-3 mande-måneder
❒ 4-6 mande-måneder
❒ 7-12 mande-måneder
❒ 13-24 mande-måneder
❒ 25-48 mande-måneder
❒ 49-72 mande-måneder
❒ 73-96 mande-måneder
❒ 97-120 mande-måneder
❒ Mere end 120 mande-måneder

D.19 Hvad er dit bedste estimat af omkostningerne (*i euro*) af forskningen, der førte til hele familien af patenter, op til ansøgningsdatoen? *(Medregn ikke juridiske gebyrer eller andre gebyrer relateret til patentsansøgningen)*

Euro: _____

Sektion E: Opfindernes Belønninger

Vi forstår, at spørgsmålene i denne sektion kan lyde "påtrængende", da de omhandler personlige aflønninger. Alligevel er de afgørende for at kunne forstå opfindernes belønninger, og til at udtænke nyskabende ordninger til fremme af produktionen af opfindelser. Vi opfordrer dig til at svare åbent. Husk på, at de informationer, som du stiller til rådighed i dette spørgeskema, aldrig vil blive

afsløret på en måde, der ville kunne identificere dig eller forbinde dit navn med dine svar.

E.1 Modtog du nogen personlig kompensation i form af penge, der udtrykkeligt blev givet på grund af produktionen af dette patent?

❒ Ja ❒ Nej

(*Hvis Nej, fortsæt da direkte til spørgsmål* E.4)

E.2 Var dette en *permanent* eller *midlertidig* stigning i indkomsten?

(*Permanent = f.eks. lønforhøjelse, forfremmelse med indirekte lønforhøjelse, en strøm af indtægter fra licensering af patentet eller udnyttelse af det i et nyt firma; Midlertidig = f.eks. honorarer, bonuser, belønninger, licensindtægter eller lignende opnået én gang*)

❒ Permanent ❒ Midlertidig ❒ Begge

E.3 ***Hvor stor en andel af din årlige indkomst udgjorde denne kompensation?*** **(Angiv i procent)**

	10 %	20 %	30 %	40 %	50 %	60 %	70 %	80 %	90 %	100
Op til	❒	❒	❒	❒	❒	❒	❒	❒	❒	❒

E.4 ***Hvor stor en del af din årlige bruttoindkomst udgør dine godtgørelser fra*** *alle* ***dine opfindelser?*** **(Angiv i procent)**

	10 %	20 %	30 %	40 %	50 %	60 %	70 %	80 %	90 %	100
Op til	❒	❒	❒	❒	❒	❒	❒	❒	❒	❒

E.5 ***Hvor vigtige er de følgende belønninger for dig i forbindelse med patentering? (1=ikke vigtig; 5=meget vigtig)***

	1	2	3	4	5
- Pengemæssige belønninger	❒	❒	❒	❒	❒
- Forfremmelser og muligheder for nye/bedre jobs	❒	❒	❒	❒	❒
- Prestige/omdømme	❒	❒	❒	❒	❒
- Opfindelser øger ydeevnen i den organisation, som jeg arbejder for	❒	❒	❒	❒	❒
- Tilfredsstillelse ved at vise, at noget er teknisk muligt	❒	❒	❒	❒	❒
- Fordele i form af arbejdsforhold som en	❒	❒	❒	❒	❒

belønning fra arbejdsgiveren

- Andet *(angiv venligst)*

_____ ❒ ❒ ❒ ❒ ❒

E.6 Hvor mange europæiske patent-ansøgninger (inklusiv dette patent) angiver dig foreløbigt som opfinderen?

_____

E.7 Hvor mange andre opfindelser, som ikke blev patenteret, men som blev beskyttet gennem hemmelighedsholdelse, har du lavet i løbet af din karriere?

_____ opfindelser uden patent

Sektion F: Værdien af Patentet

Nogle gange har opfinderne ikke en nøjagtig information omkring værdien af deres patent, men de har sædvanligvis en forestilling. Dine "informerede gæt" vil være meget passende i denne sektion. Vi opfordrer dig samtidig til at drøfte det med andre i dit firma eller institution, der kunne tænkes at have en bedre viden omkring værdien. Spørgsmålene i denne sektion er afgørende for at forstå, hvordan man kan øge værdien af de europæiske patenter. For en god ordens skyld skal det nævnes igen, at denne information aldrig vil blive afsløret på en måde, der ville kunne gøre det muligt at identificere dig eller dit patent.

F.1 Hvordan vil du vurdere den økonomiske og strategiske værdi af dette patent i forhold til andre patenter indenfor din branche eller teknologiske område?
(Angiv venligst kun ét kryds)

- ❑ Øverste 10 %
- ❑ Øverste 25 %, men ikke øverste 10 %
- ❑ Øverste 50 %, men ikke øverste 25 %
- ❑ Nederste 50 %

F.2 Har ansøgeren/ejeren nogensinde brugt dette patent til kommercielle eller industrielle formål?

❒ Ja ❒ Nej ❒ Ikke endnu, men undersøger stadig mulighederne

F.3 Er dette patent blevet licenseret af *(en af) patentholder(ne) til en uafhængig part*?

❒ Ja ❒ Nej ❒ Nej, men villig til at licensere

F.4 Er dette patent blevet udnyttet kommercielt af dig selv eller nogen af dine med-opfindere ved at starte en nyt firma?

❒ Ja ❒ Nej

F.5 Hvor vigtige var de følgende grunde til patenteringen af denne opfindelse?

	1	2	3	4	5
Kommerciel udnyttelse *(opnå eksklusive rettigheder til økonomisk udnyttelse af opfindelsen)*	❒	❒	❒	❒	❒
Licensering *(opnå eksklusive rettigheder til licensering af opfindelsen for at generere licensindtægter)*	❒	❒	❒	❒	❒
Kryds-licensering *(forbedre din forhandlingsposition ved bytte af dine patentrettigheder til fordel for andre firmaers patentrettigheder)*	❒	❒	❒	❒	❒
Forebyggelse mod efterligning *(beskytte nuværende eller fremtidige opfindelser ved at patentere "omkring" disse)*	❒	❒	❒	❒	❒
Blokering af patenter *(undgå at andre opfindere patenterer lignende opfindelser)*	❒	❒	❒	❒	❒
Omdømme *(patenter som et element af evalueringen af opfinder/forskningsenheden)*	❒	❒	❒	❒	❒
Andet *(angiv venligst)* _____	❒	❒	❒	❒	❒

F.6 Er der nogensinde ført proces i en retssal om dette patent? (*Ved procesførelse mener vi andre retsprocesser end en opposition eller appel ved det Europæiske Patent Kontor)*

❒ Ja ❒ Nej

F.7 Dette er et hypotetisk spørgsmål. *"Antag at ansøgeren, den dag patentet blev bevilliget, havde al den information om værdien af patentet, der er til rådighed i dag. I tilfælde af at en potentiel konkurrent var interesseret i at købe patentet, hvilken minimumspris (i euro) skulle ansøgeren så forlange?"*

- ❒ Mindre end € 30.000
- ❒ € 30.000 til € 100.000
- ❒ € 100.000 til € 300.000
- ❒ € 300.000 til € 1 million
- ❒ € 1 million til € 3 millioner
- ❒ € 3 millioner til € 10 millioner
- ❒ € 10 millioner til € 30 millioner
- ❒ € 30 millioner til € 100 millioner
- ❒ € 100 millioner til € 300 millioner
- ❒ Mere end € 300 millioner

(Hvis patentet ikke er en del af en familie, f.eks. at du svarede Nej eller Det ved jeg ikke til spørgsmål D.16 ovenfor, undlad da venligst at svare på spørgsmål F8 nedenfor og fortsæt direkte til "Dine Anmærkninger" ved slutningen af spørgeskemaet)

F.8 Du har allerede angivet en hypotetisk værdi af patentet i F.7 ovenfor. Angiv venligst nedenfor dit bedste bud på den hypotetiske værdi af hele familien af patenter.

- ❒ Mindre end € 30.000
- ❒ € 30.000 til € 100.000
- ❒ € 100.000 til € 300.000
- ❒ € 300.000 til € 1 million
- ❒ € 1 million til € 3 millioner
- ❒ € 3 millioner til € 10 millioner
- ❒ € 10 millioner til € 30 millioner
- ❒ € 30 millioner til € 100 millioner
- ❒ € 100 millioner til € 300 millioner
- ❒ € 300 millioner til € 1 milliard
- ❒ € 1 milliard til € 3 milliarder
- ❒ Mere end € 3 milliarder

DINE ANMÆRKNINGER

Angiv venligst din e-mail adresse hvis du er interesseret i at modtage den endelige rapport om dette projekt:

_____@_____