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Firms' intangible assets: who relies on trademarks? Analysis of French and German firms' trademarking behaviour

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Abstract

This study aims at analysing firms? trademarking behaviour in order to understand which types of firms rely on trademarks and what this asset may represent for them. It investigates whether trademarks are related to innovative activity by looking at the link between patents and product and marketing innovations, as reflected in innovation survey results. The analysis relies on a purposely built exhaustive firm-level database encompassing the trademarking and patenting activity of French and German firms. This was obtained through matching firm databases (ORBIS and Creditreform respectively) with IPR databases at the national and European levels.
The results suggest that trademarks are used in relation to innovation for marketing innovations, service and low-tech innovations, whereas patents do not seem to serve the purpose. Although high-tech manufacturing firms have a relatively high level of trademarking activity, they mostly rely on patents to protect their product innovations. They may however use trademarks to protect other kinds of assets, notably marketing innovations.

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FIRMS' INTANGIBLE ASSETS: WHO RELIES ON TRADEMARKS? ANALYSIS OF FRENCH AND GERMAN FIRMS' TRADEMARKING BEHAVIOUR[1]

Abstract

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According to the Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPs), a trademark can be "any sign [word, logo, phrase, etc.], or any combination of signs, capable of distinguishing the goods or services of one undertaking from those of other undertakings" (WTO, 1994, p. 326). Contrary to patents, there is no product novelty requirement. In order to register a new trademark, it suffices that the sign itself is novel with respect to the category of products to which it will be associated. The possibilities to register a new trademark are hence very broad.

The purpose of this study is to analyse firms' trademarking behaviour, to better understand which firms rely on trademarks and what this asset represents for them. A variety of factors and motivations may in fact lead firms to register a new trademark, and trademarks may represent a key asset for firms. Through trademarks firms can make themselves known, notably through advertising, and build their reputation. Trademarks help consumers choose between competing offers. If consumers choose to remain loyal to one specific brand, their loyalty enables firms to charge higher prices, and thus have higher margins.[2] This explain why Elliott and Percy (2006) argue trademarks play a key role in the financial success of firms.

Trademarks can also help firms appropriate the benefits of product innovations (Davis 2006). As brands constitute a way to advertise products, firms may associate new brands to new products, in order to help consumers perceive the innovation. In such cases, trademarks have a chance to become a reference – or *the* reference – on the market for the product. When starting to buy an innovative product of a certain brand, consumers are likely to remain loyal to this brand, thus making it difficult for competitors to enter the market. Trademarks are also likely to be related to marketing innovations, *i.e.* changes in the firms' marketing methods aiming to reach new customers and to increase sales. When firms want to reach new customers and change their positioning on the market, it may be useful for them to create a new brand. In turn, the creation of a new brand may encourage marketing innovations, in order to attract customers and to build a loyalty relationship (Aaker, 1991; Kapferer, 1991; Elliott and Percy, 2006).

Several empirical studies have shown the existence of a correlation between trademark use and innovative activity (Schmoch 2003, Mendonça & al 2004, Malmberg 2005). Survey results at the firm level show a significant positive relationship between trademark deposits and various innovation variables like patents, R&D, share of turnover associated to new products, number of new products launched, and so on. They find a very significant correlation in the service sector, especially knowledge-intensive services (Schmoch, 2003; Mendonça *et al.*, 2004), in high-tech sectors (Mendonça *et al.*, 2004), and in sectors like the pharmaceutical industry, where the target market is consumers (Malmberg, 2005). In addition, several studies find a significant positive impact of trademarking on the performance of firms, measured in terms of productivity or market value. The explanation these studies propose is based on trademark activity proxying a range of unobservable firm characteristics – like innovation – that raise productivity and product unit values (Greenhalgh and Rogers 2007, Griffiths *et al.* 2005).

This study addresses firms' trademarking behaviours, and looks at the characteristics of the firms depositing trademarks. It further investigates the relationship between trademark use, innovation, and the way other factors may affect firms' trademarking behaviours. It does so by analysing the link between trademarks and other innovation variables at the firm level – patents, and product and marketing innovation as reflected in innovation survey results–; and by looking at the role of firm characteristics such as age, size and sector.

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2. According to Scott Davis (2002), 72% of customers in various market sectors would pay a 20% premium for their preferred brand; 50% would pay 30% more; and 25% say price does not matter.

The analysis is based on a database combining French and German firm data (ORBIS for France and Creditreform for Germany), data on trademark applications (national and Office of Harmonisation for the Internal Market (OHIM) applications), and patent application data (national and European Patent Office (EPO) applications). This data was further matched with Community Innovation Surveys (CIS) data for German and French firms.

Due to data availability, the study initially focused on French firms. Since the French sample of the last two CIS (*i.e.* CIS 2004 and 2006) contained very few service firms – and trademarks are likely to be especially important in the service sector–, the study was later extended to the German firms included in the Mannheim Innovation Panel, since the latter contains a non-negligible number of service firms. This inclusion has also enabled a France-Germany comparative analysis. The work on German data was done in collaboration with the Centre for European Economic Research (ZEW), in Mannheim. ZEW provided the data regarding the German firms (Creditreform), the German IPR activity (DPMA, EPO and OHIM applications), as well as the German Innovation Survey.

The remainder of this paper is structured as follows. The first section of the paper describes the data used and the matching methodology that is followed. The second section presents analysis about the characteristics of firms that use patents and/or trademarks. Finally, the third section relies on Innovation Survey data and focuses on the link between trademarks and product and marketing innovation.

1. Data and matching methodology

A major problem facing researchers aiming to study the IPR behaviour of firms is the lack of databases integrating firm data and IPR data. To address this shortcoming, we built a database that linked ORBIS and Creditreform firm data to data on trademark and patent applications, thus obtaining an exhaustive database encompassing the main characteristics and IP activity of French and German firms.

Firm databases

For French firms: ORBIS (2006)

The ORBIS database, edited by the Bureau Van Dijk, contains in its 2006 version details of around 1.04 million active French firms for the years 1999 to 2006. ORBIS also contains around 0.13 million inactive French firms, that are firms that have been dissolved, liquidated, entered receivership or declared non-trading. For all those firms we have basic information (such as name, address, Nace sector) as well as a set of accounting and financial data.

For German firms: Mannheim Enterprise Panel – Creditreform (2005)

The Mannheim Enterprise Panel (MUP) is a panel data set of firms located in Germany, maintained by ZEW in cooperation with Creditreform. Every six months Creditreform provides ZEW with firm data, and ZEW is then responsible for data cleaning and organising. Two versions of Creditreform data are currently available at ZEW: 2010 and 2005. The latter has been used in the present study, given that the latest available year for the national German patents is 2005.

The 2005 version of Creditreform contains 7.2 millions observations in total. After excluding companies with zero or a negative number of employees, dead companies, and companies without up-to-date information[3], the final sample contains 2.52 million observations.[4]

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3. The original sample contains observations for which information on size and turnover predates the year 2005. This typically happens in three cases: the firm has ceased operations (case 1); the firm is alive but Creditreform has no updated information (case 2); the firm's data has not changed significantly since the last update, and there is no need to alter the data (case 3). In order to deal

IP databases

Firm databases were matched with data about trademark and patent applied for at the national and the European level over the period 1999-2006 (Community trademarks (CTM) and patent applications at INPI and DPMA, Community trademarks applications at OHIM and European patent applications at EPO) . The reason why both national and European patent and trademark data are used is that firms can choose between applying for Intellectual Property (IP) protection at either levels, and it is not ex-ante clear which level is more important or more informative. The national level may better mirror IP activity in volume, but European level IPRs are likely to be of a higher value.

It should be noted that the country coverage of the IPR granted by OHIM and EPO is not equivalent, as the procedures and linked effects differ. European patents granted by the EPO may be valid in one or several countries of the European Union, depending on the will of the applicant (it is just a centralised procedure for the application). Conversely, CTM granted by the OHIM are automatically valid throughout the European Union as a whole. Therefore, trademarks are comparatively more difficult to obtain at the European level than patents.

Description of matching methodology

The general matching methodology used consists in linking the company name in the firm database to the applicant name listed in the different IPR databases. Both for France and Germany, this was achieved in two steps. First, an automatic computer-based procedure was used to compare and match similar names. The methodology used was different for France and Germany, as we explain below. Then a manual checking of the unmatched applicants with many applications was performed (applicants with more than twenty applications in the considered office).

For France, The matching algorithm consisted of first harmonising names in both the firm and IPR datasets, to take into account possible spelling mistakes and equivalent denomination firms may use. The harmonisation procedure we implemented is based on the algorithm developed by KUL (detailed in Magerman ,Van Looy, and Xiaoyan 2006). The harmonised names were then matched on the basis of exact identities[5]. At the national level, additional information on the siren number was used for some firms[6], for which the matching was then straightforward[7].

For Germany, the automatic match consists in comparing the different words contained in the name and the address in the IP database and in the firm database (words being weighted according to the frequency of occurrences in the whole database). A score is attributed to each possible match based on the evaluation of the number of common words. The application is then automatically matched to the firm in Creditreform which reaches the best score, subject to this score being higher than a certain threshold. If equal high scores are found for several matches, the application is matched with the firm with the most recent timestamp and the highest number of employees[8].

The methodology used for Germany is thus more flexible than the one used for France, as the match is not based on the exact identity of the names. Yet, on the whole, those methodologies are similar: they are both

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with those observations one may: 1) keep only firms with up-to-date information, *i.e.* with last update in 2005. In this way one misses the firms of case 3 and the sample shrinks quite significantly.

2) Keep all the firms of the sample, including all firms of cases 1 and 2. Our strategy was to choose an intermediate solution whereby we kept all firms with last update in 2000 or earlier. In this way, we obtain an overview of firms that have been active between 2000 and 2005.

4. The German business register data contain around 3.5 million observations, a number that has been relatively stable over the past five years.

5. A control over the address was performed for the name duplicates contained in ORBIS.

6. Indeed the trademark database provided by the INPI contains a field for siren number, which is filled for around 50% of applications. For patents, we used the results of the „sirenage" process made by the INSEE, enabling a siren number to be associated to the patent applications.

7. The siren number serves as an identifier for most French firms in ORBIS.

8. The matching for Germany was performed by Thorsten Doherr from ZEW, based on an algorithm and a software he created

quite careful, based on the near identity of names, and favouring the occurrence of false-negatives over false-positives in the results. Furthemore, they both favour the matching at the subsidiary level rather than at the parent level (as the match is chosen for the highest number of common words, favouring for instance a match of the applicant "Siemens Pharma" to *SIEMENS Pharma AG* rather than to *SIEMENS AG*).

Matching results

In order to evaluate the results of the matching process, we look at the proportion of applications contained in the initial IPR databases that are in the matched database.

Table 1 : Comparison of the number of IPR applications in the matched database and in the initial databases for France[9] and Germany

	Number of matched national TM applications	Number of TM applications in the national database[3]	%	Number of matched national patent applications[3]	Number of national patent applications in PATSTAT[3]	%	Number of matched CTM applications[3]	Number of CTM applications in *CTM download*[3]	%	Number of matched EPO applications[3]	Number of EPO applications in *PATSTAT*[3]	%
France	**236884**	**535965**	**44%**	**69473**	**103559**	**67%**	**17943**	**30319**	**59%**	**54476**	**77349**	**70%**
Germany	**414604**	**510675**	**81%**	**122911**	**141068**	**87%**	**63991**	**70036**	**91%**	**162619**	**173953**	**93%**

The matching results are generally better for Germany than for France. This may be due both to the higher level of flexibility of the methodology used for the German data, as well as to the higher coverage of Creditreform as compared to ORBIS. Consequently, when noticing that German firms use relatively more IPR than French firms, one should bear in mind that there may be overestimation due to the different matching methodologies.

For both France and Germany we observe that the gap between the number of matched applications and the total number of applications is higher for patents than for trademarks, both at the European and at the national level. This can be explained by the fact that the proportion of applications from non-business applicants (notably from individuals) is higher for trademarks than for patents (although there is also a non-negligible part of patents filed by non-profit institutions such as universities or research institutes). The proportion of applications matched is also higher at the European level than at the national level. This suggests that the proportion of applications filed by individuals or small firms may be higher at the national level.

2. General characteristics of firms using trademarks and patents

In this section we rely on the year 2006 for France and 2005 for Germany to analyse characteristics such as firm age, size, and sector of the firms filing trademark and/or patent applications.

Age distribution of IP active firms

We define age as the number of years since firm creation up until the year of reference of the matched database. Figure 1 shows the age distribution of the whole sample and of firms filing only trademark or only patent or both types of applications[10].

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9. The figures for France actually mirror the number of different application-applicant couples contained in the database. When an application is jointly filed by several applicants, it is counted as one application for each applicant.

10. Applications are considered either at the national level or at the European level, the two levels being mixed here.

Figure 1. Age distribution of French and German IP active firms:
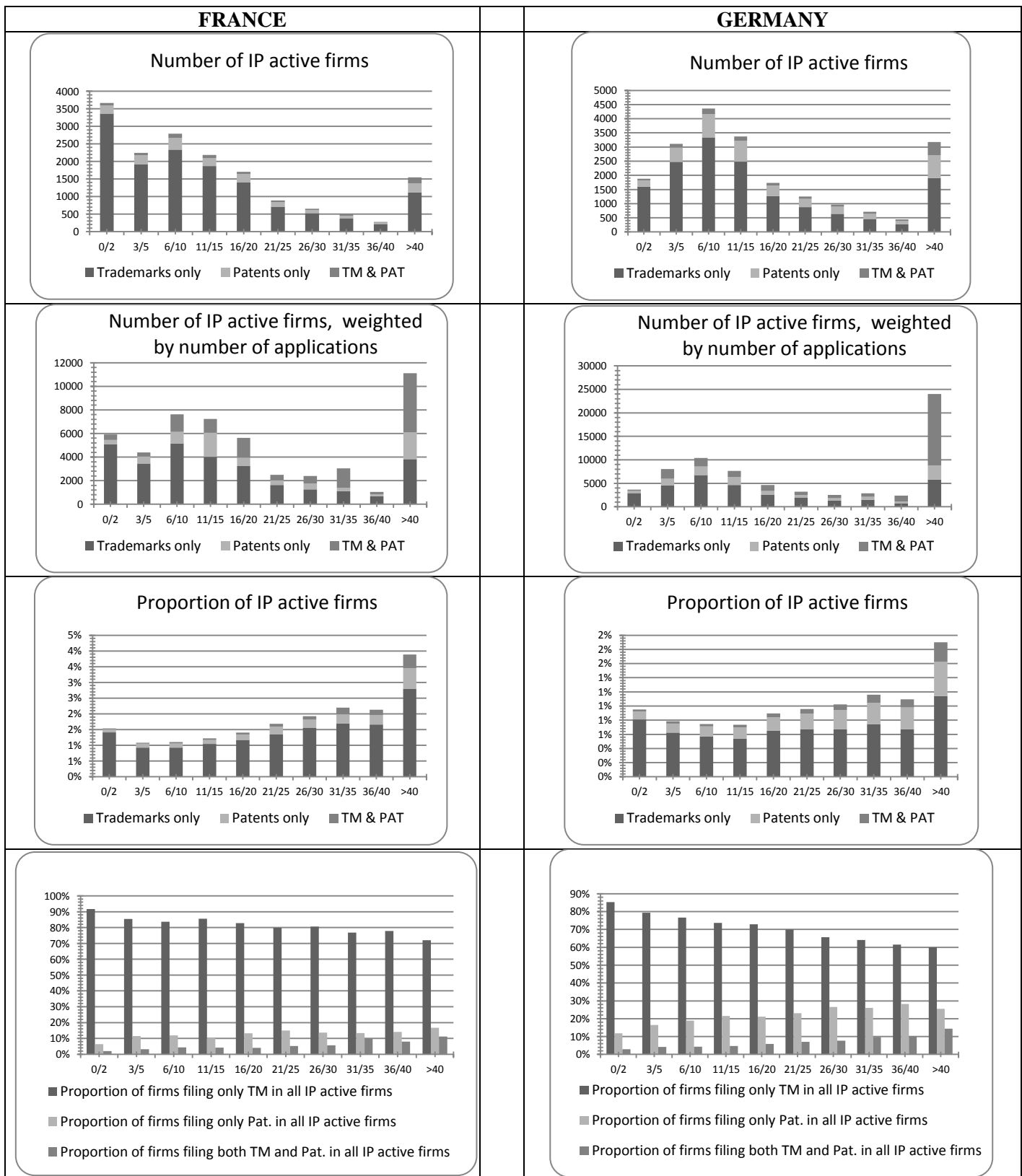
FRANCE		GERMANY

Number of IP active firms

Number of IP active firms

Number of IP active firms, weighted by number of applications

Number of IP active firms, weighted by number of applications

Proportion of IP active firms

Proportion of IP active firms

Trademarks only — Patents only — TM & PAT

Proportion of firms filing only TM in all IP active firms
Proportion of firms filing only Pat. in all IP active firms
Proportion of firms filing both TM and Pat. in all IP active firms

Source: ORBIS/Creditreform data matched with trademark and patent applications data at the French/German and European levels.

The age distribution of German and French IP active firms is generally similar, with the exception of an under-representation of 0-2 year old firms in the German sample, as compared to the French sample.

Youngest firms play an important role in trademark activity, as nearly one-half of the applications are filed by under-10 year old firms (against only less than one third for patents). This is actually due to the preponderance of younger firms in the entire population of firms. In proportion, the share of trademarking firms in the total sample strictly increases with age, with the exception of the 3-5 and 36-40 age cohort.

The relative proportion of IP active firms filing both patents and trademarks is increasing with age, both in France and Germany. A similar pattern is observed in the relative propotion of firms filing only patents, whereas the relative proportion of firms filing only trademarks is decreasing with age. The older firms are, the more they seem to file IP applications of any kind, whether patents or trademarks. In addition, the older firms tend to rely more on patents rather than trademarks, and tend to use both types of IP.

Note that the age distributions of IP active firms differ when comparing the European and national levels: younger firms – and notably very young firms, *i.e.* those in the age cohort 0-2 – tend to file relatively more at the national level. This can be explained by the market firms may want to target, as well as by differences in price between the two procedures, which may make national applications more affordable and hence more accessible to young firms.

Size distribution of IP active firms

1.   Using the number of employees in the reference year as a firm size indicator, Figure 2 shows the firm size distribution of the whole sample, and of the subset of firms filing trademark and/or patent applications.

Figure 2. Size distribution of French and German IP active firms :
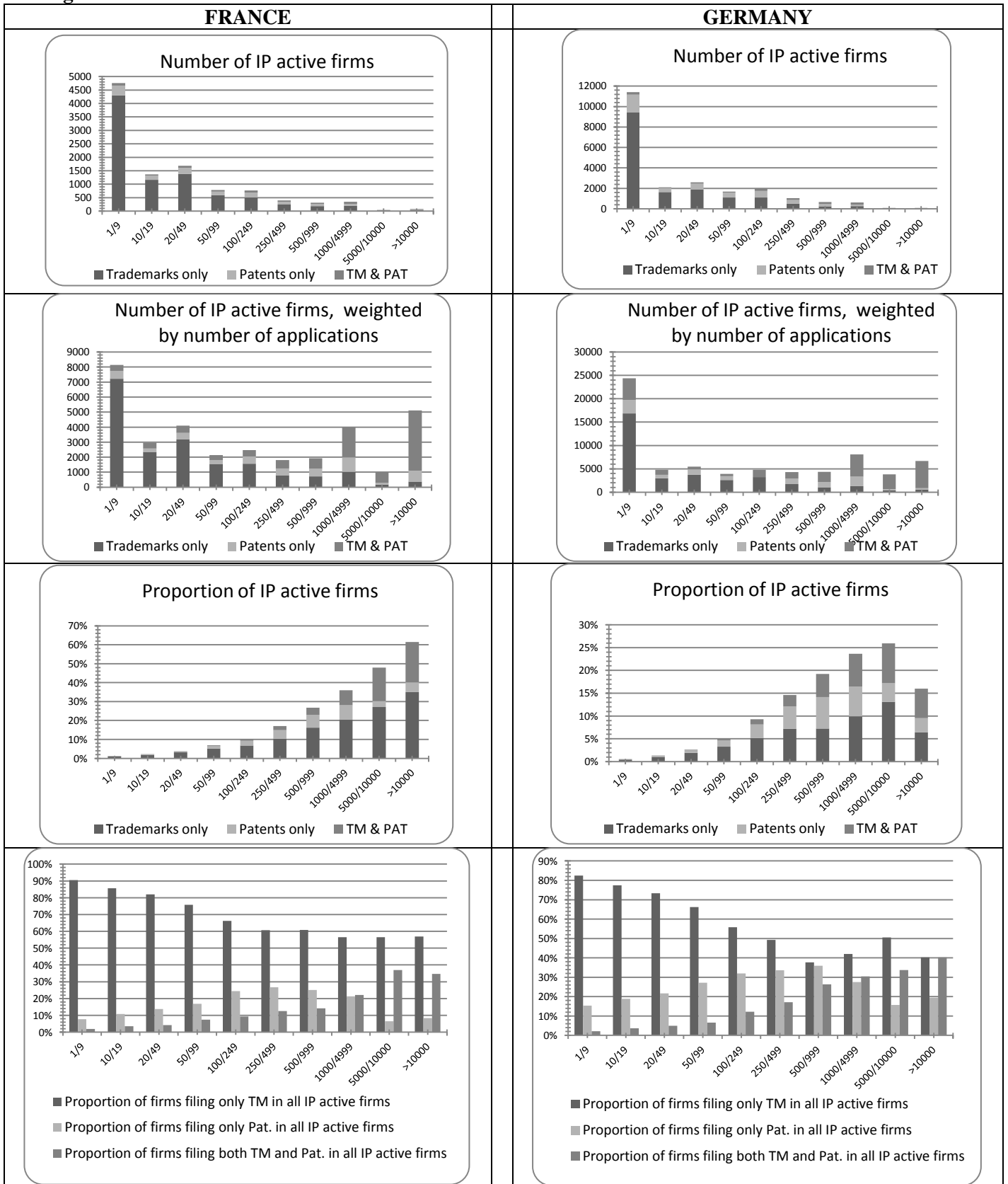
FRANCE	GERMANY

Source: ORBIS/Creditreform data matched with trademark and patent applications data at the French/German and European levels.

For France and Germany, the large majority (90%) of firms filing trademark applications are SMEs[11] and micro firms[12]. This holds true when weighting observations by the number of applications. However, in proportion to the whole sample, trademarking increases strictly with size. This pattern is even more marked when considering trademark-weighted distributions, with the exception of the biggest category (more than 10 000 employees) of German firms.

In general terms, the role played by micro firms seems relatively more important in Germany than in France, with micro firms being responsible for a larger share of applications, and notably for Community trademarks.

Similarly to what we observed in the age distributions, the relative proportion of IP active firms filing both patents and trademarks increases with size, whereas the opposite pattern can be observed for firms filing only trademarks (*i.e.* the relative proportion of firms decreases with size). Our data suggest that the bigger the firm, the more it tends to file IP applications of all kinds, and to rely on both IP types. This might be explained by the fact that big firms are typically more aware of IP procedures, often have dedicated IP services, and tend to exploit all protection means available. As it also happens in the case of age, the size distribution differs if one considers the European or the national level: the relative proportion of firms filing at the European level increases with size.

Sector distribution of IP active firms

The figures below show the proportion of firms filing trademark and/or patent across sectors. Sectors are defined on the basis of the Nace Rev 1.1 (2003) industry classification codes. Industries were aggregated in 37 sectors, to facilitate the readability of the tables.

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11. Between 1 and 250 employees.
12. Less than 10 employees.

Figure 3. Proportion of French firms filing trademarks and/or patent applications across sectors

FRANCE   GERMANY

Other Services
- Real estate activities
- Transport
- Hotels and restaurants
- Wholesale & retail trade, repair of goods
- Construction
- Electricity, gas, steam, water supply

Knowledge-intensive Services
- Other business activities
- Research and development
- Computer and related activities
- Renting of mach. & oth. goods
- Insurance
- Financial intermed.
- Post and telecommunications

High Tech Manufacturing
- Motor vehicles, trailers
- Medical, precision & optical inst.
- Radio, tv, communication equip.
- Electrical machinery and apparatus
- Office machinery and computers
- Machinery and equipment n.e.c.
- Chemical pdcts, except perfumes
- Cosmetics

Low Tech Manufacturing
- Furniture; manufacturing n.e.c, recycling
- Oth. transport equipment
- Fab. metal prdts
- Basic metals
- Plastic & non metallic mineral pdcts
- Coke, refined petrol. pdcts, nuclear
- Publishing, printing
- Pulp, paper
- Wood products and cork
- Wearing apparel, fur, leather
- Textile
- Food, beverages, tobacco

■ Trademarks only   ■ Trademarks and Patents   ■ Patents only

Source: ORBIS/Creditreform data matched with trademark and patent applications data at the French/German and European levels.

The most IP active sectors in France and Germany in the reference years are the high-tech manufacturing sectors, where firms show to use patents, trademarks, or both type of IP more frequently than in other sectors. Low-tech manufacturing sector firms tend to use less IP in general (less trademarks and less patents). The proportion of firms using both trademarks and patents is also lower. Knowledge intensive services firms score the third position in terms of IP activity. Those firms preferably rely on trademarks rather than patents: in most service sectors, except notably R&D, the proportion of firms filing patent applications in all IP active firms is inferior to 15%. Finally, other service firms not belonging to knowledge intensive services account for an overall important share of the trademark applications, but they nevertheless exhibit a relatively low trademarking activity and an almost negligible patenting activity in proportion to the whole sample.

The use of trademarks seems to be relatively more important in sectors that are technology- or knowledge-intensive, where innovation plays a bigger role: firms in high-tech sectors are twice as active in trademarking as firms in the low-tech sectors. Moreover, firms in knowledge intensive services are 50% more active in trademarking than firms in the other service sectors. The proportion of firms filing trademarks is important in the R&D sector, and the proportion of firms filing only trademarks is not negligible. This is possibly due to the impossibility of using patents, given the nature of the innovation to be protected.

Multivariate analysis of firm trademarking activity

We performed a multivariate analysis in order to better assess firms trademark and patent behaviours while controlling for the main firm characteristics in our dataset. We used trademarks – *i.e.* the number of national and community trademarks obtained by the firm in the reference year – as the dependent variable, and investigated the relationship existing between trademarks and patents (national patent and EPO patent applications in the reference year) while controlling for firm age, size, exporting activity and sector. We ran the regression separately for European and national level IP. As trademarks are used by a very small subset of firms (less than 2% of French firms, and less than 1% of German firms), we relied on a Tobit model. The regression was run on the whole sample of firms as well as separately on each sector group, namely high-tech and low-tech manufacturing, knowledge-intensive services (KIS) and not knowledge intensive services (NKIS). As the Research and Development sector (Nace Code 73) is more closely related to the manufacturing sector we excluded it from the KIS sample.

Tables 2 and 3 present the results of the regressions for France and Germany respectively, and are followed by the list of variables used in the regressions, and their source databases.

Table 2. Analysis of the link between trademark and patent use in various sectors for French firms

	(1) All firms	(2)	(3) High Tech	(4)	(5) Low Tech	(6)	(7) KIS	(8)	(9) NKIS	(10)
model										
INPI_pat~s	0.11*** (10.81)		0.12*** (3.62)		-0.04 (-1.84)		0.22*** (4.64)		0.03 (1.32)	
EPO_pate~s		0.06*** (6.50)		0.16*** (5.89)		0.09* (2.42)		0.00 (0.07)		0.45* (2.41)
age	0.02*** (7.45)	0.07*** (9.47)	0.09*** (5.64)	0.08*** (3.47)	0.07*** (10.89)	0.07*** (5.68)	0.01 (1.63)	0.06*** (3.44)	-0.00 (-1.09)	0.04** (3.29)
agesquare	0.00*** (4.76)	-0.00** (-3.28)	-0.00 (-1.88)	-0.00 (-1.69)	-0.00*** (-4.15)	-0.00** (-3.12)	0.00*** (3.61)	-0.00 (-0.19)	0.00*** (6.33)	-0.00 (-0.64)
sales	0.00*** (36.19)	0.00*** (12.88)	0.00*** (11.89)	0.00*** (7.24)	0.00*** (20.90)	0.00*** (6.37)	0.00*** (17.07)	0.00*** (8.52)	0.00*** (22.71)	0.00*** (8.52)
sales_sq~e	-0.00*** (-24.66)	-0.00*** (-9.44)	-0.00*** (-7.78)	-0.00*** (-7.26)	-0.00*** (-14.41)	-0.00*** (-5.36)	-0.00*** (-10.30)	-0.00*** (-5.21)	-0.00*** (-15.90)	-0.00*** (-5.72)
N	803461	803461	21320	21320	74289	74289	154566	154566	479530	479530

t statistics in parentheses
* p<0.05, ** p<0.01, *** p<0.001

Table 3. Analysis of the link between trademark and patent use in various sectors for German firms

	(1) All firms	(2)	(3) High Tech	(4)	(5) Low Tech	(6)	(7) KIS	(8)	(9) NKIS	(10)
model										
DPMA_pat~s	0.13*** (25.69)		0.27*** (13.18)		0.55*** (8.68)		0.10*** (17.15)		0.29*** (6.71)	
EPO_pate~s		0.09*** (17.29)		0.12*** (12.33)		0.19*** (6.64)		0.05*** (6.96)		0.24*** (6.74)
age	0.03*** (13.88)	0.06*** (17.34)	0.11*** (10.21)	0.10*** (9.41)	0.04*** (12.16)	0.04*** (9.60)	0.00 (0.96)	0.07*** (7.01)	0.01*** (3.79)	0.05*** (6.28)
agesquare	-0.00 (-0.56)	-0.00*** (-7.03)	-0.00*** (-4.02)	-0.00*** (-4.69)	-0.00*** (-3.76)	-0.00*** (-4.24)	0.00*** (3.37)	-0.00** (-2.76)	0.00 (0.53)	-0.00** (-2.87)
sales	0.00*** (12.24)	0.00*** (13.86)	0.00*** (12.99)	0.00*** (4.96)	0.00*** (18.55)	0.00*** (18.25)	0.00*** (9.44)	0.00*** (7.26)	0.00*** (16.01)	0.00*** (10.70)
sales_sq~e	-0.00*** (-9.09)	-0.00*** (-9.06)	-0.00*** (-12.77)	-0.00* (-2.09)	-0.00*** (-13.43)	-0.00*** (-14.16)	-0.00*** (-7.20)	-0.00*** (-4.68)	-0.00~* (-12.25)	-0.00*** (-8.39)
N	2325172	2325172	55743	55743	160271	160271	471757	471757	1577022	1577022

t statistics in parentheses
* p<0.05, ** p<0.01, *** p<0.001

All the regressions also included dummies of sector (Nace 2 level).

The depending variable is INPI_trademarks (first table) / DPMA_trademarks (second table) for regressions (1), (3), (5), (7) and (9) and Community_trademarks for regressions (2), (4), (6), (8) (10). Regressions (1) and (2) were run on the whole sample of firms, (3) and (4) only on High tech manufacturing firms, (5) and (6) only on low-tech manufacturing firms, (7) and (8) only on Knowledge intensive services firms (except R&D), and (9) and (10) only on firms in the other service sectors.

Dependent variable	*Community_trademarks*	*Number of Community trademark applications filed by the firm in 2006*	*OHIM*
	INPI_trademarks	*Number of trademark applications filed at INPI by French firms in 2006*	*INPI*
	DPMA_trademarks	*Number of trademark applications filed at DPMA by German firms in 2005*	*DPMA*
Explanatory variables	*EPO_patents*	*Number of EPO patent applications filed by the firm (in 2006/2005 for French/German firms)*	*EPO (PATSTAT)*
	INPI_patents	*Number of INPI patent applications filed by French firms in 2006*	*INPI (PATSTAT)*
	DPMA_patents	*Number of DPMA patent applications filed by German firms in 2005*	*DPMA (PATSTAT)*
	age	*Age of the firm in the reference year*	*ORBIS*
	age_square	*Age of the firm, squared*	*ORBIS*
	sales_square	*Net sales in thousand euros in the reference year*	*ORBIS*
	sales_square	*Net sales in thousand euros, squared*	*ORBIS*
	export_share	*Ratio of export turnover and net sales in the reference year*	*ORBIS*
	sector dummies	*Dummy variables for sector at the Nace 2 level*	*ORBIS*

As could have been expected, a positive relationship seems to exist between trademark use and the size and age of firms. The squared variables of age and size generally have a negative coefficient, indicating decreasing impact. Overall the correlation between trademarks and patents is positive and highly significant, and this is robust to controlling for age, size, sector and exporting activity.

At the European level, the correlation is significant across all the sectors except the knowledge intensive services in the French sample. In any case, the outcome of those sectors remains typically outside the area of patentable inventions[13]. The correlation between patents and trademarks is instead significant in the not knowledge intensive services – grouping industries like transport, repair of goods, electricity, gas and water supply–, where firms may tend to obtain more patentable innovations. At the national level the

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13. They may use alternative ways of protection, including trademarks.

correlation is positive and significant in all sectors except low-tech manufacturing and the other service sectors in the French sample. This may suggest that the use firms make of trademarks differs from that of patents, and that the two IP types are used for different purposes.

3. Trademarks and innovations as reflected by the Community Innovation Survey

In order to get more detail on the link between trademark use and the innovative activity of firms, the results from the CIS for France and Germany were matched with the database on firm and IPR data.

For France the CIS 2004 was used, covering the period 2002 to 2004 and containing 6191 observations. After the match with ORBIS, the number of observations went down to 5873 firms. The large majority of observations are in the manufacturing sector, and only the 5% of firms shows to be in the service sectors. For Germany we used the results of the 2006 survey – corresponding to the years 2004-2006 –, containing information on marketing and organisational innovations. Due to national patent data availability, the link between innovation survey results and IP applications data suffers from a year delay. This implies considering patents and trademarks filed in 2004 and 2005. To account for such a shortcoming, we dropped the less than one year old firms from the sample. After matching this data with Creditreform, the final sample contained 6509 observations, evenly distributed across manufacturing and service sectors (52% in services).
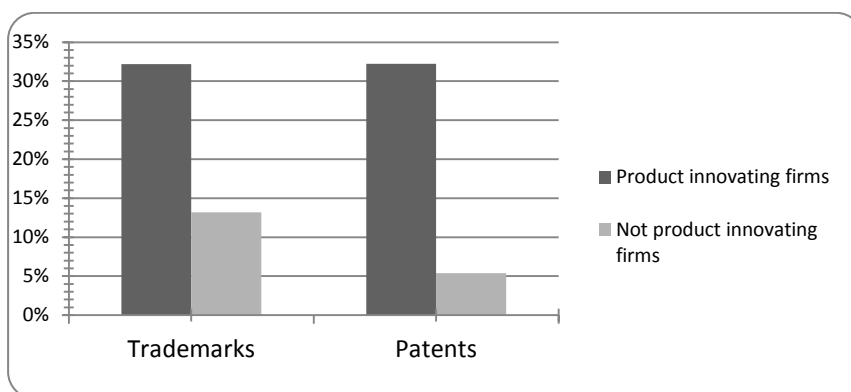
Trademarks and product innovations

Descriptive statistics

Figures 5 and 6 show the proportion of firms that file trademark or patent applications in the subsample of product-innovative firms and in the subsample firms not having product innovations. If trademarks were to be a good indicator of innovation we would observe the highest proportion of trademarks used by product innovating firms (perfect discrimination).

We below present the results separately for the various sectors (High tech, Low tech, KIS and Other Services) for the German sample. We do not present those results separately for France as the sample is very limited for services.

Figure 5. Proportion of French firms filing trademarks and patent applications in 2004-2006

Source: CIS 4 results for France, matched with IPR data.

Figure 6. Proportion of German firms filing trademark and patent applications in 2004-2005 across sectors
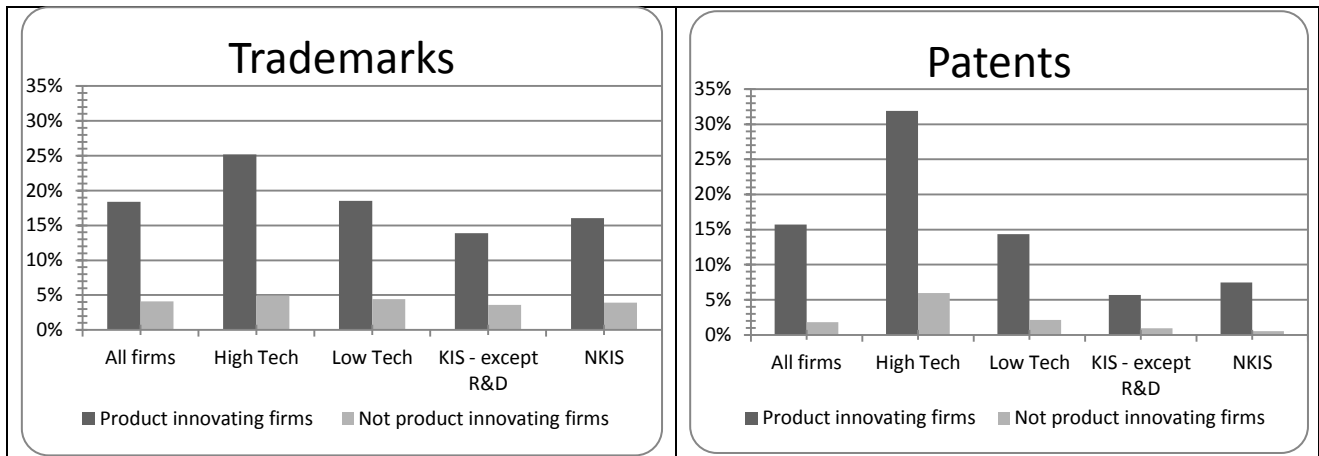
Source: CIS 2006 results for Germany, matched with IPR data

Overall product innovating firms are more active in trademarking and patenting than non-innovating firms, in all sectors. Product innovating firms in high-tech manufacturing sectors use patents more than trademarks, whereas the reverse is true for firms in the service sectors, and to a lower extent for firms in the low-tech sectors. Patents therefore appear as a better source of information for high-tech manufacturing sectors, whereas trademarks would be more appropriate for the other sectors.

However, although patents are less frequently used by product innovating firms in low-tech manufacturing and service sectors, the ratio between the proportion of firms using them among innovative firms and among non innovative firms is higher for patents than for trademarks.

We performed a multivariate analysis to investigate the correlation between trademark use and the occurrence of product innovation. The probit regression carried out saw the dummy variable "product innovation yes/no" as dependent variable. Among the control variables we included firm age, size, R&D expenses and sector. Results are shown in tables 4 and 5 and pertain to the whole samples of both countries, as well as to distinct sectors in Germany. Similarly to what we did before, we list below the tables the variables used in the regression.

Multivariate analysis

Table 4. Analysis of the relation between product innovation and IP use for French firms

	(1) All firms	(2)	(3) High Tech	(4)	(5) Low Tech	(6)
inpdgd						
INPI_tra~s	0.02*** (5.52)		0.01 (1.50)		0.03*** (4.18)	
CTM		-0.00 (-0.05)		-0.01 (-0.82)		0.13*** (3.76)
INPI_pat~s	0.02*** (4.89)		0.11*** (6.53)		0.00 (0.19)	
EPO_pate~s		-0.00 (-0.23)		0.04*** (4.52)		0.00 (0.30)
age	0.00 (1.29)	0.00 (1.65)	0.01 (1.42)	0.01 (1.62)	0.00 (0.73)	0.00 (0.66)
agesquare	0.00 (1.78)	0.00 (1.72)	-0.00 (-0.18)	-0.00 (-0.20)	0.00 (1.74)	0.00 (1.83)
sales	0.00*** (6.38)	0.00*** (6.85)	0.00** (2.89)	0.00*** (3.83)	0.00*** (7.76)	0.00*** (8.16)
sales_sq~e	-0.00*** (-6.47)	-0.00*** (-6.29)	-0.00* (-2.31)	-0.00*** (-6.62)	-0.00*** (-7.12)	-0.00*** (-7.56)
rd	-0.00* (-2.32)	0.00 (0.99)	0.00*** (5.63)	0.00*** (7.79)	-0.00*** (-4.38)	-0.00*** (-4.73)
N	5483	5483	1922	1922	3161	3161

t statistics in parentheses
* p<0.05, ** p<0.01, *** p<0.001

Table 5. Analysis of the relation between product innovation and IP use for German firms

	(1) All firms	(2)	(3) High Tech	(4)	(5) Low Tech	(6)	(7) KIS	(8)	(9) NKIS	(10)
pd										
DPMA_tra~s	0.14*** (6.10)		0.03 (0.73)		0.17*** (4.20)		0.04 (0.64)		0.46*** (5.92)	
CTM		0.29*** (5.56)		0.14 (1.46)		0.40** (3.16)		0.80* (2.49)		0.36*** (4.38)
DPMA_pat~s	0.21*** (5.59)		0.62*** (3.64)		0.06 (1.32)		0.53** (2.76)		1.21** (2.93)	
EPO_pate~s		0.07** (2.82)		0.49*** (4.21)		0.06 (1.05)		-0.03 (-0.57)		-0.06 (-0.58)
age	-0.00 (-0.49)	-0.00 (-0.32)	0.00 (0.23)	0.00 (0.01)	-0.00 (-0.86)	-0.00 (-0.91)	0.01 (1.22)	0.01 (1.42)	-0.00 (-0.77)	-0.00 (-0.64)
agesquare	0.00 (1.30)	0.00 (1.02)	0.00 (0.52)	0.00 (0.35)	0.00 (1.23)	0.00 (1.21)	-0.00 (-0.42)	-0.00 (-0.58)	-0.00 (-0.08)	-0.00 (-0.12)
sales	0.00*** (5.77)	0.00*** (6.43)	0.00 (0.70)	-0.00 (-0.15)	0.00* (2.51)	0.00** (2.74)	0.00** (4.93)	0.00*** (3.76)	0.00*** (3.64)	0.00*** (5.54)
sales_sq~e	-0.00*** (-4.91)	-0.00*** (-5.84)	-0.00 (-1.16)	-0.00 (-0.32)	-0.00* (-2.39)	-0.00** (-2.58)	-0.00*** (-3.36)	-0.00 (-1.63)	-0.00*** (-7.43)	-0.00*** (-7.51)
rd	0.14*** (9.24)	0.14*** (9.33)	0.28*** (5.73)	0.25*** (5.12)	0.47*** (7.23)	0.46*** (7.01)	0.10*** (3.87)	0.09*** (3.73)	2.38*** (8.32)	2.80*** (8.15)
N	4754	4754	842	842	1352	1352	1107	1107	1218	1218

t statistics in parentheses
* p<0.05, ** p<0.01, *** p<0.001

All the regressions also included dummies of sector (Nace 2 level)

Regressions (1) and (2) were run on the whole sample of firms, (3) and (4) only on High tech manufacturing firms, (5) and (6) only on low-tech manufacturing firms, (7) and (8) only on Knowledge intensive services firms (except R&D), and (9) and (10) only on firms in the other service sectors.

| Dependent variable	Product_innovation	Dummy variable : has the firm introduced a product information in the survey period yes/no	CIS
Explanatory variables	INPI_trademarks	Number of trademarks applications filed by French firms at INPI between 2002 and 2004	INPI
	DPMA_trademarks	Number of trademarks applications filed by German firms at DPMA between 2004 and 2005	DPMA
	CTM	Number of Communtiy trademarks applications filed the firm during the reference period	OHIM
	INPI_patents	Number of patent applications filed by French firms at INPI between 2002 and 2004	INPI (PATSTAT)
	DPMA_patents	Number of patent applications filed by German firms at DPMA between 2004 and 2005	DPMA (PATSTAT)
	EPO_patents	Number of EPO patent applications filed the firm during the reference period	EPO (PATSTAT)
	age	Age of the firm in the reference year	ORBIS
	age_square	Age of the firm, squared	ORBIS
	sales_square	Net sales in thousand euros in the reference year	ORBIS for France – CIS for Germany
	sales_square	Net sales in thousand euros, squared	ORBIS for France – CIS for Germany
	Rd	R&D expenses	CIS
	sector dummies	Dummy variables for sector at the Nace 2 level	ORBIS

In the high-tech sectors we find a positive and significant correlation between product innovation and patent applications, whereas we find no significant correlation with trademarks when both IPR are included. This result, which is found both at the national and European level, for France and Germany, confirms that patents are a better indicator than trademarks for product innovation in those sectors. In the low-tech sectors however, we observe the opposite pattern, with trademarks being significantly correlated to innovation at the national and European level, whereas patents show no significant relationship. Hence, in low-tech sectors trademarks seem to better mirror product innovation than patents. In the knowledge-intensive services sector (only German sample), we observe a significant and positive correlation with trademarks, whereas no significant correlation emerges with patents at the European level. Conversely, the reverse is true at the national level. For other services trademarks seem more correlated to product innovation than patents at the European level, yet both types of IP are found significantly correlated at the national level.

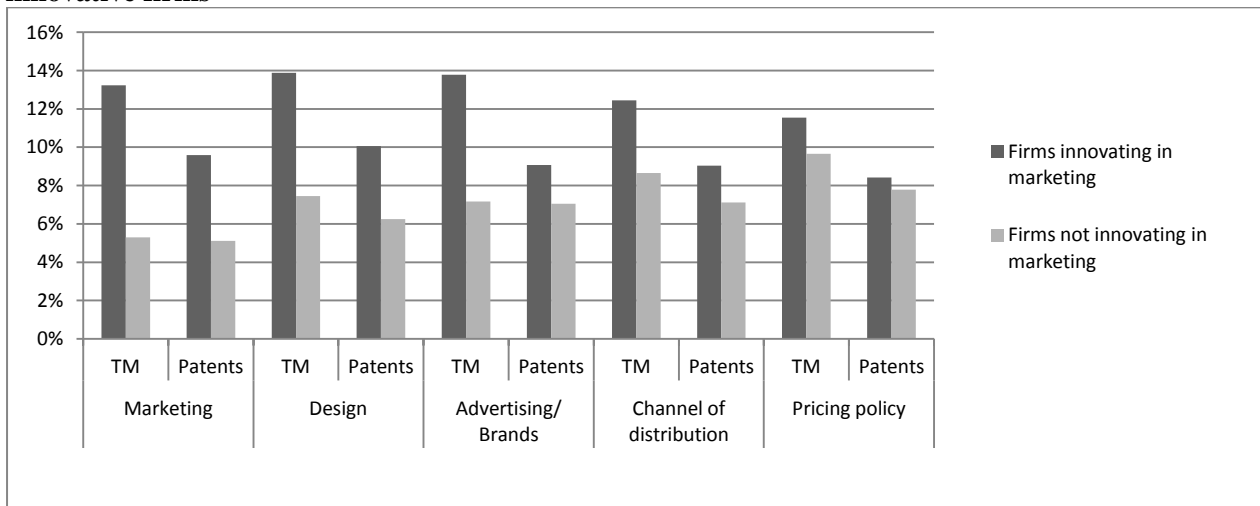### Trademarks and marketing innovation

Descriptive statistics

Figures 7 and 8 present the proportion of firms that file trademark or patent applications in the subsample of marketing innovative firms and in the subsample of non-marketing innovative firms. CIS survey results also provide information about different types of marketing innovations, these being product design, sales methods (for France), advertising, the channel of distribution, and the pricing policy (for Germany).

Figure 7. Proportion of firms filing trademarks/patents in the French subsample of marketing innovative firms
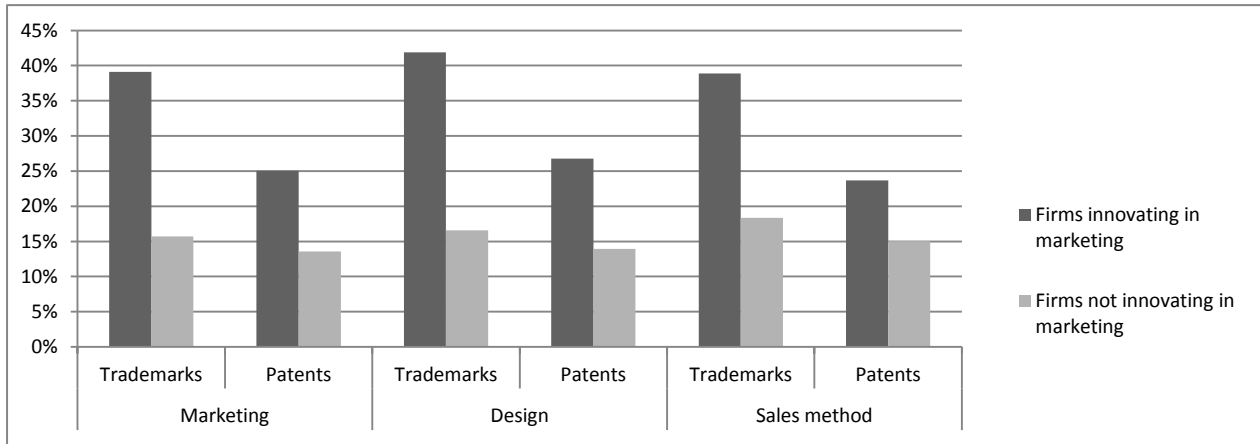
Source: CIS 4 results for France, matched with IPR data.

Figure 8. Proportion of firms filing trademarks/patents in the German subsample of marketing innovative firms

Source: CIS 2006 results for Germany, matched with IPR data

Marketing innovative firms are more active than others in patenting and trademarking. The gap between innovative firms and non-innovative firms is deeper for trademarks than for patents, especially regarding product design and advertising innovations. This suggests that those types of innovations are better reflected by trademarks than by patents. Such stylised facts seem to be confirmed by the results of a multivariate analysis using as dependent variable a dummy accounting for marketing innovations. The explanatory variables used were the number of trademark and patents applications filed by the firm during the reference period, R&D expenses, and firm age, size, and sector.

Multivariate analysis

Table 6. Relationship between IPR and marketing innovation (French firms)

	(1) marketi~o	(2) marketi~o
marketin~o		
INPI_tra~s	0.02***	
	(7.31)	
CTM		0.00
		(0.65)
INPI_pat~s	0.00	
	(0.29)	
EPO_pate~s		0.00
		(0.88)
age	0.00**	0.01**
	(2.68)	(3.14)
agesquare	-0.00	-0.00
	(-0.47)	(-0.59)
sales	0.00***	0.00***
	(3.76)	(3.88)
sales_sq~e	-0.00**	-0.00*
	(-3.03)	(-2.56)
rd	0.00	0.00
	(0.60)	(0.70)
N	5483	5483

t statistics in parentheses
* p<0.05, ** p<0.01, *** p<0.001

Table 7. Relationship between IPR and marketing innovation (German firms)

	(1) marketi~o	(2) marketi~o
marketin~o		
DPMA_tra~s	0.11***	
	(5.13)	
CTM		0.07**
		(2.90)
DPMA_pat~s	0.01	
	(1.61)	
EPO_pate~s		0.00
		(0.38)
age	0.00	0.00
	(0.25)	(0.56)
agesquare	-0.00	-0.00
	(-0.12)	(-0.14)
sales	0.00***	0.00***
	(4.88)	(5.42)
sales_sq~e	-0.00***	-0.00***
	(-4.74)	(-4.92)
rd	-0.00	0.00
	(-0.28)	(1.52)
N	3467	3467

t statistics in parentheses
* p<0.05, ** p<0.01, *** p<0.001

All the regressions also included dummies of sector (Nace Rev 1.1 2 level)

Dependent variable	Marketing_innovation	Dummy variable : has the firm introduced a marketing information in the survey period yes/no	CIS
Explanatory variables	INPI_trademarks	Number of trademarks applications filed by French firms at INPI between 2002 and 2004	INPI
	DPMA_trademarks	Number of trademarks applications filed by German firms at DPMA between 2004 and 2005	DPMA
	CTM	Number of Communtiy trademarks applications filed the firm during the reference period	OHIM
	INPI_patents	Number of patent applications filed by French firms at INPI between 2002 and 2004	INPI (PATSTAT)
	DPMA_patents	Number of patent applications filed by German firms at DPMA between 2004 and 2005	DPMA (PATSTAT)
	EPO_patents	Number of EPO patent applications filed the firm during the reference period	EPO (PATSTAT)
	age	Age of the firm in the reference year	ORBIS
	age_square	Age of the firm, squared	ORBIS
	sales_square	Net sales in thousand euros in the reference year	ORBIS for France – CIS for Germany
	sales_square	Net sales in thousand euros, squared	ORBIS for France – CIS for Germany
	Rd	R&D expenses	CIS
	sector dummies	Dummy variables for sector at the Nace 2 level	ORBIS

A significant and positive correlation is found between trademark applications and marketing innovation at the national level for France, and at both level of trademarking for Germany. European and national patent applications seem not to be significantly correlated to marketing innovations, thus suggesting that trademarks are preferable to patents when protecting marketing innovations.

CONCLUSION

This study aimed at analysing firms' trademarking behaviour in order to understand which types of firms rely on trademarks and what this asset may represent for them. It investigated whether trademarks are related to innovative activity by looking at the link between patents and product and marketing innovations, as reflected in innovation survey results. The analysis relied on a purposely built exhaustive firm-level database encompassing the trademarking and patenting activity of French and German firms. This was obtained through matching firm databases (ORBIS and Creditreform respectively) with IPR databases at the national and European levels (patents and trademarks applications at the INPI and the DPMA and EPO patent and Community trademarks applications).

The study shows that the use of trademarks increases with firm age and size, with younger firms (less than 15 years old) and small and medium enterprises accounting for the majority of trademark applications in the reference period. The relationship we uncover does not say anything about causalities, as the analysis has so far been able to only address correlations. In terms of sectors, the use of trademarks is relatively higher in technology- or knowledge-intensive sectors: firms in high-tech manufacturing sectors are twice as active in trademarking as low-tech manufacturing firms, and firms in the knowledge-intensive services are 50% more active than in the other services.

As far as the link with innovation is concerned, multivariate analyses show a significant and positive correlation between trademarks and patents in high-tech manufacturing sectors for Germany and France, both at the European and national levels. Conversely, in other sectors the link is less obvious. Using the results of the Community Innovation Surveys, we find trademarks to be significantly correlated to marketing innovation, whereas patents are not. Product innovation is found to be significantly correlated to trademarks but not to patents in the low-tech manufacturing sectors (both at the European and at the

national level) and in the knowledge-intensive services (at the European level), whereas the reverse is true for high-tech manufacturing sectors.

Overall we can conclude that trademarks are used in relation to innovation for marketing innovations, service and low-tech innovations, whereas patents do not seem to serve the purpose. Although high-tech manufacturing firms have a relatively high level of trademarking activity, they mostly rely on patents to protect their product innovations. They may however use trademarks to protect other kinds of assets, notably marketing innovations. Despite already providing quite interesting insights, the work presented in this paper is still preliminary. A shortcoming of our work is that German and French matched databases are not directly comparable, given that the initial firm databases and the matching methodologies are not harmonised. In future work the French database will improve by relying on a more flexible matching methodology, which in the German case proved to achieve significantly better results. In addition, panel analysis could be carried out by means of extending the German database. This is feasible, given that Creditreform and the Community Innovation Survey are maintained as panels by the ZEW. Finally, it would be interesting to investigate causal links, and to address the impact of the various types of IP on the productivity of firms, thus assessing the relative importance of technological and non-technological assets over the performance of firms.

REFERENCES

Aaker, D.A. (1991), *Managing Brand Equity*, The Free Press.

Davis, L. (Draft 2006), "How do trademarks affect firms' incentives to innovate?", electronic version available at http://www.dime-eu.org/files/active/0/Davis.pdf

Davis, S. (2002), "Brand asset management: how businesses can profit from the power of the brand", *Journal of Consumer Marketing*, Vol. 19 No.4, pp.351-8.

Elliott, R. and L. Percy (2006), *Strategic Brand Management*, Oxford University Press

Greenhalgh, C. and M. Rogers (2007), "The value of intellectual property to firms and society", Oxford Review of Economic Policy, Winter 2007.

Griffiths, W.E., P.H. Jensen and E. Webster (2005), "The Effects on Firm Profits of the Stock of Intellectual Property Rights", Intellectual Property Research Institute of Australia Working Paper. no. 05/05

Kapferer, J.N. (1991), *Les marques, capital de l'entreprise,* Les Éditions d'Organisation.

Magerman, T.,Van Looy, B. and S. Xiaoyan (2006), "Data Production Methods for Harmonized Patent Statistics:Patentee Name Harmonization", KUL Working Paper No. MSI 0605.

Malmberg, C. (2005), "Trademark Statistics as Innovation Indicators? - A Micro Study", CIRCLE Electronic Working Paper Series, 2005-17, CIRCLE (Centre for Innovation, Research and Competence in the Learning Economy), Lund University.

Mendonça, S., T. S. Pereira and M. M. Godinho (2004), "Trademarks as an Indicator of Innovation and Industrial Change", *Research Policy* vol. 33(9), pages 1385-1404.

OECD (2005), "Proposed Guidelines for Collecting and Interpreting Innovation Data*"*, 3rd edition, *Oslo Manual*, OECD, Paris

Schmoch, U. (2003), "Service Marks as Novel Innovation Indicator", in *Research Evaluation*, vol. 12 (2).

Thoma G., S. Torrisi, A. Gambardella, D. Guellec, B. H. Hall, and D. Harhoff "Methods and software for the harmonization and integration of datasets: A test based on IP-related data and accounting databases with a large panel of companies at the worldwide level," OECD STI Working Paper *forthcoming*

WTO (1994), "Agreement on Trade-Related Aspects of Intellectual Property Rights", Annex 1C of the Marrakesh Agreement Establishing the World Trade Organisation, full text available at http://www.wto.org/english/docs_e/legal_e/27-trips.pdf