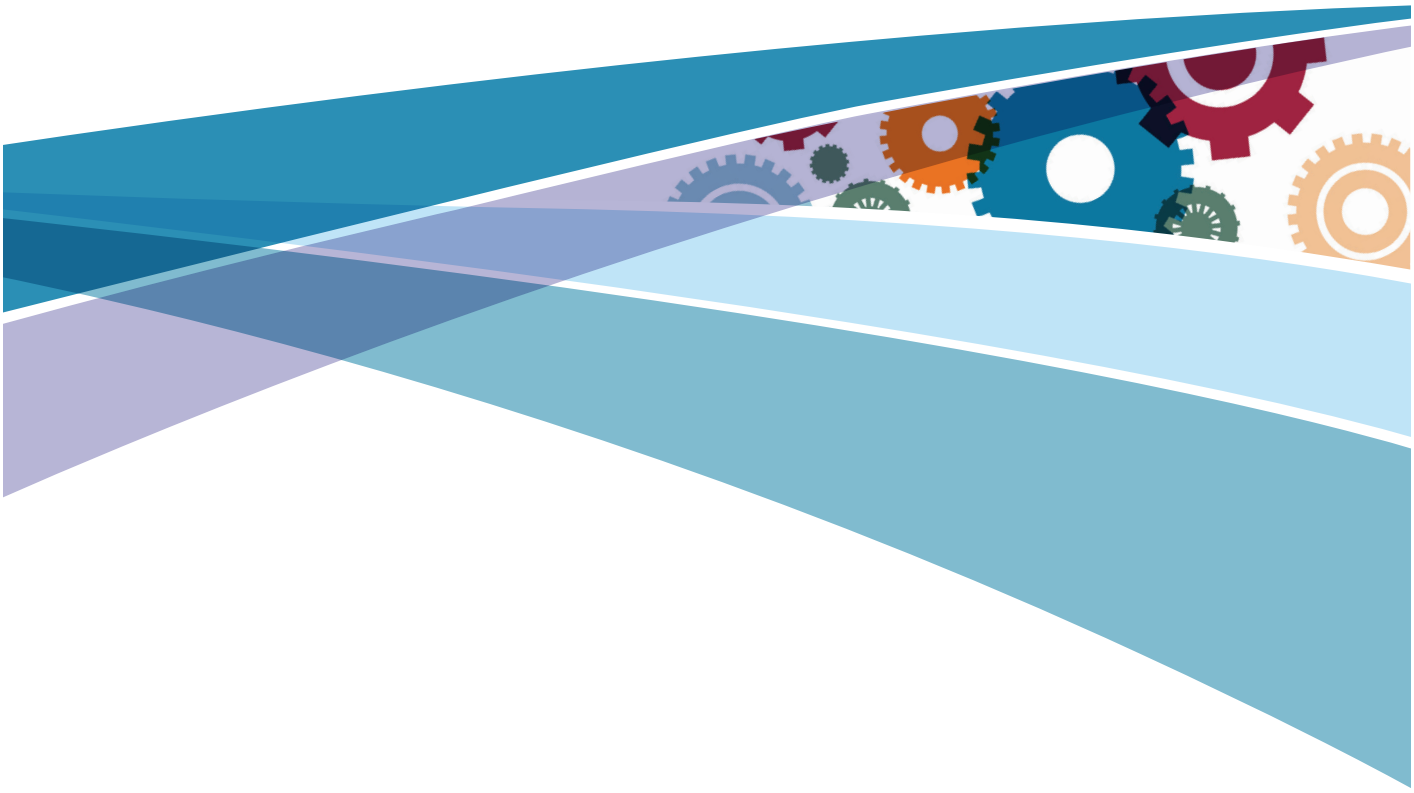
Intellectual Property Office

Intellectual property rights and high-growth firms in the UK



Report 1

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Executive Summary

This research is an initial investigation into the relationship between holders of registered intellectual property rights (IPRs) and growth performance of firms, which is measured in terms of growth in assets, employment, or sales. The results are not intended to be considered in isolation but to inform a second more extensive piece of research into the use of IPR bundles and their relationship with growth performance.

- In the sample, the largest share of employment (79%) was found in the non-manufacturing sector. The highest concentration (30%) of high growth companies was found in the R&D services sector.

- High-growth firms with at least one patent or trade mark created approximately 850 thousand new jobs during the period 2002-2009. By way of contrast, those companies showing negative growth, from a comparative study, laid off around 1.36 million employees.

- High growth firms with at least one patent or trade mark employed approximately 1.6 million workers, which accounts for 11% of total employment in the sample. Their contribution to the creation of new jobs, however, is disproportionate, with these companies accounting for approximately one out of two new jobs created through the period. However, those companies that owned IP rights and had a negative growth profile accounted for 4 million employees.

- Most high growth companies only hold trade marks, indicating that these companies either rely on reputation rather than technology, or on other means of protection of their know-how. 60% of these trade mark holding firms only hold national trade marks. In terms of IPR holdings, this group is followed by high growth firms holding both, trade marks and patents.

- Of the top 100 fastest growing UK companies identified by BIS, 55 were found to have applied for patents and/or trade marks between the years 2000 and 2009. Aside from one organisation, all patenting firms also owned trade marks.

Contents

1. Introduction

A Nesta report in 2009 (Anyadike-Danes et al., 2009) found that only 6% of registered UK businesses generated more than half of employment growth between 2005 and 2008. The report also assesses the relation between a number of basic firm characteristics including age, size, industry, location and the companies' growth performance. In a similar report for BERR, Helmers and Rogers (2008) look specifically at the correlation between firm growth rates in the UK and their holding of intellectual property in the form of patents and trade marks. They find some evidence that trade marking firms are growing faster than other firms. There is also some evidence that IPR-active SMEs are more likely to transition to the large firm-category (as defined by EU) within 5 years. The report also contains a list of 100 companies that BERR had identified as the fastest growing UK companies. This part of the analysis showed low use of patents by these companies: out of 100 companies, 3 had one or more UK patents, 3 companies had one or more EPO patents (5 companies patented). In contrast, 34 had one or more UK trade marks, and 10 companies had one or more Community trade marks. While this evidence was indicative of IP rights assisting firms in growing fast, the descriptive analysis was unable to determine whether IP rights cause firms to grow faster. Helmers and Rogers (2011) offer an attempt to address the potential endogeneity in a firm's decision to use registered IP and its growth performance. The paper relies on data for a cohort of high- and medium-tech start-ups to provide evidence that suggests that IPRs indeed help firms to outgrow IPR-inactive companies within the first five years after incorporation. There is also some related evidence available for the US. Balasubramanian and Sivadasan (2011) use census data for the US manufacturing sector to show a strong, positive correlation between first-time patenting and subsequent growth. They forward evidence that the growth spurt following first-time patenting can be mainly explained by the introduction of new products.

The objective of this current study is to investigate the growth performance of IPR-active firms. We analyse specifically the growth performance of firms that have obtained registered IP in the form of patents and/or trade marks. This means we analyse whether specific types of IPR are correlated with exceptional growth performance. We also offer some evidence on the importance of IPR bundles, i.e, the joint use of different forms of IPRs. Yet a detailed analysis of the importance of IPR bundles for firm performance is the focus of the second part of this project, "The use of intellectual property rights bundles by firms in the UK".

Our analysis supports the targeting of public policy in support of IPR-active companies with the largest potential to thrive and grow into large businesses. For this purpose, we identify the IP right portfolios as well as the main distinguishing characteristics of IPR-active companies across all industries in the UK that have succeeded in growing fast between 2002 and 2009. As a companion to this report, we also provide lists of IPR-active companies that have grown fastest between 2002 and 2009, where firms are selected based on their IPR portfolio as well as some basic firm-level characteristics.

The report relies on an updated version of the Oxford-Firm-Level-Database, which combines information on patents (UK and EPO), trade marks (UKTM and CTM) with firm-level information obtained from Bureau van Dijk's Financial Analysis Made Easy (FAME) database (for more details see the Appendix and Helmers et al., 2011). Unless stated otherwise, the data contains observations from the period between 2000-2009.

2. Analysis

This section presents the results of the first part of this project, i.e. the analysis of high-growth firms and their IPR activity. The second part, "The use of intellectual property rights bundles by firms in the UK" looks more closely at the role of IPR bundles in assisting firms to achieve exceptional growth performance is scheduled to start in March 2012.

The analysis proceeds in four steps:

We first take another look at the list of the 100 fastest growing UK businesses identified by BERR in 2008. Since the analysis was limited to IP rights applied for between 2001 and 2005, we use our updated data to verify whether these companies have acquired additional IP rights since 2006.

In the second part, we use the IPR-FAME match to investigate growth patterns among IPR-active firms in the UK over the period 2002-2009. In this analysis, we distinguish between three separate samples of firms: (a) firms that report employment data, (b) firms that report turnover data and (c) firms that report total assets. Due to reporting requirements in the UK, which differ across firm-size categories, the number of firms differs considerably across the three samples. We focus in most of the discussion on firms that report employment and asset data.

Third, we assess the sustainability of a firm's growth performance by splitting the sample period into two four-year spells. We analyze to what degree high-growth firms (where high-growth is defined as companies with an average growth rate of 20% or above) in the first four-year period are able to sustain their extraordinary performance also over the subsequent four-year period and how their IP rights are correlated with this performance.

Fourth, we look in more detail at firm-level characteristics of the set of high-growth firms.

2.1 BERR high-growth firms

In 2008, BERR supplied us with a list of the 100 fastest growing UK companies. We matched the list of firms to an earlier version of the IPR-FAME match, which allowed us to examine the companies' IPR activity over the period 2001-2005. We found that 38 out of the 100 companies held trade marks and/or patents. Only five out of the 38 IPR-active companies had at least one patent (UK/EPO) during the sample period 2001-2005. In contrast, 37 firms had at least one trade mark (UK/CTM), with the largest share of companies having UK trade marks.

We used the same list of companies and matched it to our up-dated IPR-FAME match. Table 2.1 shows that we found considerably more firms to be IPR-active among the 100 fastest growing UK firms for the extended period between 2000-2009. 55 out of the 100 companies are found to have applied for patents and/or trade marks during the period 2000-2009. There are now twice as many patenting companies (10 companies), with a total patent count of 52 patents (8 UK and 44 EPO patents). Except for one firm (Lescip T Ltd.), all IPR-active firms hold

trade marks (48 companies have at least one UK trade mark and 21 have at least one Community trade mark). Hence, nine out of the ten patenting companies also have at least one trade mark, so joint use of patents and trade marks by this subset of high-growth companies is very common.

Table 2.2 summarises the main insight from comparing the updated table with our earlier work, i.e. that the number of IPR-active firms has increased substantially over time from 38 to 55 (45% increase). At the same time it might be surprising to find only 55% of the BERR high-growth firms to rely on registered IP in the form of patents and trade marks. Still this share is much larger than for the population of firms in the UK: Hall et al. (2011) point out that only 1.3% of registered firms in the UK patent and less than 3% register a trade mark. Even in high-tech industries,[1] the share of patenting and trade marking firms is only around 8% and 5%, respectively. This points to the importance of patents and trade marks for sustained growth and is in line with findings by Helmers and Rogers (2011) for a larger sample of UK companies. It might be interesting to investigate in more detail the timing of the firms' decision to apply for registered IP in the form of patents and/or trade marks and the reasons underlying the decision of the 45 companies that do not hold any registered IP to refrain from doing so.

Source	Years	Companies	IP	Patent	Trade mark
BERR	2001-2005	100	38	5	37
Hall et al. (Table 9)	1998-2006	30,454	19.30%	16.24%	22.30%
This study	2000-2009	100	55	10	54

Table 2.2: "IPR usage by high growth and innovative firms".

2.2 Analysis of IPR-active firms

This section uses the full sample of IPR-active registered companies in the UK over the period 2002-2009 described in the Appendix ("Data"). We rely on three different variables to measure a firm's growth: employment, total assets, and turnover. However, to keep this report short, the main results discussed here are derived from using total assets and employment data ($N_{Employment}$=18,227; N_{Assets}=55,713).

In order to assign firms to growth categories as defined below, we compute the average annual growth rate of every firm in the sample for each of the three variables (employment, total assets, and turnover). This annual average growth rate is based on as many years as a firm reports data, which has the advantage that is maximizes the number of firms available for our analysis, but also suffers from the obvious drawback that the growth figures are based on a varying number of years.

1 Definition according to the OECD: pharmaceuticals SIC 2423; aircraft & spacecraft SIC 353; medical, precision & optimal instruments SIC 33; radio, television & communication equipment SIC 32; office, accounting & computing machinery SIC 30.

Those growth rates are then used to identify high-growth firms in two ways:[2]

The NESTA high-growth definition, where we create three growth categories based on firms' percentage growth rate. This means we group firms into three categories:

- "negative growth" (<0%),
- "moderate growth" (0-<20%), and
- "high-growth" (≥20%).

This analysis allows us to link our findings to the existing NESTA work, but relies on a somewhat arbitrary definition of absolute growth thresholds. We focus on these results in our discussion contained in the main text of this report.

Furthermore, following our analysis in the 2008 BERR report, we categorize firms into four groups:

- poor (1st quartile),
- weak (2nd quartile),
- solid (3rd quartile), and
- high-growth (4th quartile).

These categories are based on quartiles of the whole distribution of growth rates within a given sample (depending on the growth rate computed as described above). This has the advantage that we do not have to rely on arbitrary growth percentage thresholds but evaluate firms' relative performance. The drawback is that we only evaluate relative performance and are unable to make statements about absolute performance. This is particularly problematic for the evaluation of sustainability of firms' growth rates. The results for the quartile-based approach are shown in a number of figures but not discussed in the main text.

Our focus lies in evaluating associations in the data between the different ways in which we measure companies' growth performance and their IPR activity in the form of trade marking and patenting. Moreover, we also distinguish within patents and trade marks between UK and EPO patents and UK and Community trade marks, respectively. Corresponding markers identifying firms, which exclusively make use of either only national patents (trade marks), only EPO patents (Community trade marks), or both were created, too.

Given that the sample only contains firms that have at least one type of IP rights during the sample period, these fifteen possible patent/trade mark combinations exhaust the possibilities in our data.

2 Note that we trim the growth distributions by dropping the top and bottom 1 percentile to eliminate extreme outliers.

2.2.1 Growth performance

Figures 2.1-2.3 show the distribution of growth rates across all IPR-active firms. While the spread of the distributions varies depending on whether we look at employment, asset, or turnover growth, all distributions are centred around zero, that is, most firms do not grow or shrink moderately during the period under observation (2002-2009). However, the figures also show that there are a few firms that grow at a significantly faster pace.

The figures also illustrate our motivation for relying on different variables to compute growth. Employment data has a considerably lower spread than assets and turnover. This reflects in part the lag time in a firm's response to changing market conditions. While turnover adjusts relatively quickly to changes in market conditions, a firm's assets lag more, and employment is likely the most sluggish to respond.

Tables 2.3 and 2.4 show absolute growth of employment and assets across the NESTA growth categories (negative growth (<0%), weak growth (0-<20%), and high growth (≥20%)). The tables cross-tabulate the data with a number of basic firm characteristics including size (by assets), age (since incorporation), industry, as well as its IPR activity covering IPR type (patent/trade mark), patent type (EPO/UK), and trade mark type (OHIM/UK). Growth rates are defined using firms' assets as this method guarantees the largest sample of firms (most firms report assets, fewer report turnover, and even fewer firms report employment).

The employment numbers in Table 2.3 suggest that there has been a net loss of 123,000 employees during the sample period 2002-2009. This illustrates a major shortcoming of the data used for the analysis. In FAME, only a highly selected group of firms report employment data, which makes it unrepresentative of the population of registered businesses in the UK. Nevertheless, the data suggests that high-growth firms created about 850,000 new jobs, whereas firms that displayed negative growth laid off around 1.36 million employees. The overall decline in the number of employees is entirely due to the medium-tech and other manufacturing industries. R&D services, high-tech, and non-manufacturing industries in contrast expanded. High-growth firms in the R&D services industry created most jobs in relative terms as they account for 86% of all jobs created in that industry. In the medium-tech industry, in contrast, even high-growth firms shrank in terms of employment by more than 44,000 employees.

Table 2.5 and 2.6 show total employment and assets across the three growth categories to gauge the relative economic importance of high-growth firms. Table 2.5 shows that the share of total employment accounted for by high-growth firms is relatively modest. There are about 1.6 million employees employed by high-growth firms (12% of total employment in the sample) whereas there are over 4 million employed by companies registering negative growth (30% of total employment in the sample). As we will show below, the share of companies in the high-growth category is largest when we use total assets to compute growth relative to using employment or turnover to obtain growth rates. This implies that the share of employment due to high-growth firms would be considerably lower if we used employment or turnover data to determine whether firms belong to the high-growth category. In absolute terms, the largest share of employment is in non-manufacturing (79% of total employment), although the by far largest share of high-growth firms is found in the R&D services sector (30%).

In summary, high-growth firms account only for a minor share of total employment (11%), but they create disproportionally many jobs (852,000 new jobs given total employment of 1.6 million, or more than one new job for every two employees). This compares very favourably to job growth in the much larger group of weak growth firms (388,000 new jobs given total employment of 8 million, or less than one new job for every twenty employees). Even so, we find considerable differences in high-growth firms' ability to create employment across industries. Whereas high-growth firms in the medium-tech industry shrink in terms of employment, they expand considerably in R&D services.

2.2.2 Growth performance and IPRs

Figures 2.4, 2.6 and 2.8 show the distribution of companies across three growth categories as used in the NESTA report defined according to percentage growth rates: negative growth (<0%), weak growth (0-<20%), and high growth (≥20%). Figures 2.5, 2.7, and 2.9 show the distribution of companies across four growth categories as used in the BERR report defined according to quartiles of the growth rate distribution: poor growth (1st quartile), weak growth (2nd quartile), solid growth (3rd quartile), high growth (4th quartile). We limit the discussion to the figures based on the NESTA growth categories. All figures show growth rates computed using all three measures, employment, turnover, and total assets. We split the sample according to the IPR activity of firms.

Figure 2.4 shows that the share of companies in the high-growth category varies considerably depending on the measure used to compute growth rates. The share is lowest for employment, varying between 10% for the 'patent only' category and 16% for the 'trade mark only' category. When using assets, the share of high-growth firms varies between 34% for the 'patent only' category and 40% for the 'trade mark only' category. The results from using turnover to compute growth lie between those obtained from using employment and total assets. This motivates us to focus on total assets and employment in our discussion.

We see that independently of the underlying measure to compute growth rates, the largest share of companies in the high-growth category are firms that only hold trade marks, followed by firms that hold both trade marks and patents. The lowest share of high-growth firms (10% using employment and 34% using assets) with simultaneously the largest share of firms in the negative growth category (48% using employment and 31% using assets) is found in the 'patent only' category, i.e., firms that hold exclusively patents.

Table 2.7 tabulates the same data in a different way. Whereas in Figure 2.4 the columns (i.e., bars) sum to 100%, in Table 2.7 the rows sum to 100%. This allows us to compare firms' IPR activity across growth categories as well as to see the share of each IPR type in each growth category. We see, for example, that only 6.7% of high-growth firms possess a 'patent only', whereas 12.7% of firms in the negative growth category do so. In contrast, 83% of firms in the high-growth category only have a trade mark, which means that the overwhelming share of companies in the high-growth category only register trade marks.

The main insight from Figure 2.4 and Table 2.7 is that, across all IPR-active firms, those that have only trade marks are most likely to be found in the high-growth category, whereas firms that only have a patent are most likely to be found in the negative growth category.

Table 2.9 shows the total number of patents accounted for by each growth category. By far the largest number of patents is held by companies in the negative growth category (50%). Only 9% of all patents in the sample have been applied for by high-growth companies. This distribution looks different with regard to trade marks. Most trade marks are held by companies in the weak growth category (49%); firms in the high growth category account for 13% of trade marks and firms in the negative growth category account for 38% of trade marks.

Table 2.15 breaks the data down by the number of patents and trade marks held by companies across growth categories defined by assets. The most striking feature of Table 2.15 is that there are hardly any differences across these growth categories in terms of the percentages of firms with a given number of patents or trade marks. For example, there are 51% of firms in the negative growth category with only one trade mark and 51.4% in the high-growth category. Similarly, there are 7.9% of firms with more than five trade marks in the negative growth category and 7.4% in the high-growth category. With regard to trade marks, the only notable exception is firms without trade marks: there are 11.7% of firms with negative growth without a trade mark and only 8.5% of such firms in the high-growth category. With regard to patents, the situation is reversed: there are fewer firms in the negative growth category without patents and slightly more in the high-growth category (81.7% and 84.4%, respectively).

Figure 2.6 disaggregates the patent data according to whether firms hold UK and/or EPO patents. The general pattern across growth measures is similar to the one displayed in Figure 2.4: the lowest share of high-growth firms is found for employment and the largest when using assets. The largest share of high-growth firms is found in the 'no patent' category (16% for employment and 40% for assets). It is important to remember that due to fact that the sample consists of only IPR-active firms, 'no patent' implies that these firms belong to the 'trade mark only' category, which we had found in Figure 2.4 to contain the largest share of high-growth firms. Among firms that hold patents, we find the largest share of high-growth firms in the 'EPO patent only' category (14% for employment and 40% for assets). Firms that hold both UK and EPO patents account only for a share of 11% and 35% of high-growth firms using employment and assets, respectively. Further evidence is provided in the middle panel of Table 2.7. It shows that most firms within the high-growth category did not apply for any patents during the period, but registered only trade marks.

Figure 2.8 provides a breakdown based on the type of trade mark registered by companies, OHIM Community marks and UK trade marks. Here, the 'no trade mark' category has the lowest share of high-growth firms. This corresponds to the category 'patent only' firms, that were already shown in Figure 2.4 to contain the lowest share of high-growth firms. The largest share of high-growth firms is found among firms that only hold Community marks. A possible explanation may be that these firms operate also abroad and hence expand fastest. Yet, the difference to firms that only hold UK marks is modest. Again, Table 2.7 offers additional evidence. The third panel of Table 2.7 shows that the largest share of companies within the high-growth category only have UK trade marks (nearly 60%). The second largest share is accounted for by firms with only Community marks (18%) followed by firms that have both Community marks and UK trade marks.

Taken together, the evidence on IP rights and growth performance suggests that firms that only rely on patents are relatively more frequently found in the negative growth category. Most IPR-active firms that achieve high-growth only obtain trade marks. However, as we will show further below, this finding is largely explained by the overwhelming number of high-growth companies coming from the non-manufacturing sector, where patents are less applicable.

2.2.3 Sustainability of growth

In this section, we investigate how well firms sustain growth over time. To this end, we split the sample into two 4-year spells (2002-2005 and 2006-2009) and look at the growth performance in the second period of firms that we have identified as high-growth companies in the first 4-year spell. We conduct this analysis using a firm's total assets and employment to compute growth rates. We rely on the NESTA measure to identify high-growth companies, i.e., absolute percentage growth thresholds.

Table 2.11 shows the same breakdown of firms' IPR activity across growth categories as in Table 2.7, but limits the period of analysis to 2002-2005. The results displayed in Table 2.11 are very similar to those shown in Table 2.7: most high-growth firms only have trade marks (54%) and few firms that only have a patent make it into the high-growth category (17%). Furthermore, the results when disaggregating patents and trade marks are very similar to those displayed in Table 2.7.

More interestingly, Table 2.12 shows a breakdown for the period 2006-2009 specifically for those firms that were in the high-growth category during the period 2002-2005. Hence, in this table we examine whether firms that achieved growth rates of 20% and above during 2002-2005 managed to sustain growth during the subsequent 4-year period and we relate this performance to their IPR activity. The first panel of this table shows that 225 (17%) of 1,298 high-growth firms in 2002-2005 were able to sustain their growth rate over the subsequent 4-year period, whereas 39% of these high-growth firms slid into negative growth and the largest share (44%) achieved moderate growth rates between zero and <20%. The distribution across IPR types is as before (as shown in Tables 2.7 and 2.11), that is, most firms only hold trade marks. Even so, considering the category of those with no IP, such firms comprise only 25% of high and weak growth firms in 2006-9 but are 36% of firms suffering negative growth, indicating a more positive view of growth support from IPR ownership.

The lack of growth associated with patents is confirmed by the breakdown of firms holding some IPRs (919 firms) by patent type in Table 2.12 (second panel). We see a stronger concentration of firms that are able to sustain high or weak growth in the 'no patent' category (65% and 64%, respectively) compared with 51% of firms that regressed into negative growth. This means that most firms that are able to sustain high-growth over the entire eight-year period do not have any patents. Within the 'patent only' category, the largest share of firms ends up in the negative growth category. Most patenting firms in the negative growth category only have UK patents. Firms that have EPO and UK patents are least likely to display negative growth in 2006-2009. Also the results for the different types of trade marks in Table 2.12 (third panel) are similar to those shown in Tables 2.7 and 2.11 with the notable exception that there are even fewer firms without a trade mark (5.7% compared to 15.6% in Table 2.11). We also see that the

share of firms with both UK and Community marks is smaller compared to Table 2.11. The results when using assets instead of employment are very similar and not discussed in detail.

2.2.4 Characteristics of high-growth firms

In this section, we cross-tabulate a number of basic firm-level characteristics and firms' IPR activity for the sample of firms that we identified as high-growth companies in the analysis presented in Section 2.2.2 (i.e., the full sample). Figures 2.10 to 2.18 focus on high-growth firms and look at their characteristics and relate them to their IP right holdings. While we show figures for all three measures of growth (employment, turnover, assets), we focus in our discussion here on high-growth firms as measured by employment growth.

Figure 2.10 shows the distribution of IPR activity over firm size bands.[3] Most high-growth firms are small and medium sized enterprises (SMEs) although their combined share in total employment is just 10%. Independently of the firm size band, most high-growth companies only hold trade marks, i.e., smaller high-growth companies do not rely disproportionately more on trade marks than patents. The second largest group are firms that hold both trade marks and patents, that is, IPR bundles.

Figure 2.13 breaks the data down by age of the firm (counting from date of incorporation). Most high growth firms are relatively mature, being between 6 and 20 years old. While firms aged 20 years or above account for only about 18% of all high-growth firms, they account for nearly 40% of employment by all high-growth firms. The distribution of the IPR activity of high-growth firms is very similar across age groups as most firms in all age groups only hold trade marks, followed by firms holding both patents and trade marks.

Figure 2.16 cross-tabulates the data by sector. The figure shows that in absolute terms the great majority of high-growth companies are in the non-manufacturing sector. But while 85% of all high-growth firms are in non-manufacturing, these firms account only for 24% of total employment in high-growth companies. Instead the 3% of high-growth firms in the medium-tech sector account for 27% of employment. Figure 2.16 also reveals that the importance of trade marks for high-growth firms results from the prevalence of such companies in the non-manufacturing industry. If we look at high- and medium-tech industries and R&D services, firms that only trade mark are far less frequent. In fact in the R&D services industry, there are fewer firms that only trade mark than firms that only patent. This points to important differences in the underlying activities of high-growth firms across industries and hence the applicability and importance of certain types of IP rights.

3 In Figure 2.10 firm size bands are defined as follows: (a) micro <10 employees, (b) small 10-49 employees, (c) medium 50-249 employees and (d) large with 250 employees or more.

3. Conclusion

The objective of this report was to analyse the relation between growth and IPR activity – in the form of patents and trade marks – of registered companies in the UK over the period 2002-2009. We are particularly interested in the IPR activity of so-called high-growth companies, that is, companies that achieve growth above a certain threshold over a prolonged period of time.

In a first step, we revisited our analysis of a set of 100 companies that BERR had identified as the fastest growing UK companies in 2008. Our updated analysis finds that the number of IPR-active companies among these 100 companies has increased from 38 to 55 by extending the period of analysis from 2001-2005 to 2000-2009. The share of 55% of IPR-active firms among the set of 100 companies is dramatically larger than for the population of UK companies (around 1.3%). While our analysis does not attempt to uncover the reasons for the firms' decision to obtain IP rights or the timing of doing so, our evidence is still suggestive of IP rights assisting these firms in their growth performance.

In our analysis of high-growth firms, we find that high-growth firms account only for a minor share of total employment (11%). However, in-line with previous work (Anyadike-Danes et al., 2009), high-growth firms create disproportionally many jobs (852,000 new jobs given total employment of 1.6 million) relative to a much larger group of weak growth firms (388,000 new jobs given total employment of 8 million). We find considerable differences in high-growth firms' ability to create employment across industries. Whereas high-growth firms in the medium-tech industries even shrink in terms of employment, they expand considerably in R&D services.[4]

The analysis of firms' IPR activity reveals that firms that only have trade marks are most likely to be found in the high-growth category, whereas firms that only have a patent are most likely to be found in the negative growth category. These conclusions do not change when we consider the number of patents and trade marks held by companies instead of grouping firms simply by whether they hold a patent/trade mark or not.

We also disaggregate the patent and trade mark data by type, i.e., UK/EPO patents and OHIM/UK trade marks. With regard to patents we find the largest share of high-growth firms in the 'EPO patent only' category (14%). Firms that hold both UK and EPO patents account only for a share of 11% of high-growth firms. The largest share of high-growth firms is found among firms that only hold Community trade marks.

In terms of absolute numbers, we find that by far the largest number of patents is held by companies in the negative growth category (50%). Only 9% of all patents in the sample have been applied for by high-growth companies. This distribution looks different with regard to trade marks. Most trade marks are held by companies in the weak growth category (49%); still firms in the high growth category only account for 13% of trade marks.

We also assess how well firms are able to sustain their growth performance over time. To this end, we split the sample into two 4-year spells (2002-2005 and 2006-2009) and look at the

4 Firms are considered to be high-growth due to their growth in total assets.

growth performance in the second period of firms that we have identified as high-growth companies in the first 4-year spell. We find that most firms that are able to sustain high-growth over the entire 8-year period do not have any patents. Most patenting firms in the negative growth category only have UK patents. Among patentees, firms that have EPO and UK patents are least likely to display negative growth in the second 4-year spell.

Finally, we take a closer look at high-growth firms' characteristics. We find that most high-growth firms are small and medium sized enterprises (SMEs) although their combined share in total employment is just 10%. Moreover, the distribution of the IPR activity of high-growth firms is very similar across age groups: independently of their age, by far most firms only hold trade marks, followed by firms holding both patents and trade marks. When we break the data down by sector, we find that in absolute terms by far most high growth companies are in the non-manufacturing industry. While 85% of all high-growth firms are in non-manufacturing, these firms account only for 24% of total employment by high-growth companies. Instead the 3% of high-growth firms in the medium-tech sector account for 27% of employment. The large number of companies in non-manufacturing also explains the importance of trade marks for high-growth firms. If we look at high- and medium-tech industries and R&D services, firms that only trade mark are far less frequent. In fact in the R&D services industry, there are fewer firms that only trade mark than firms that only patent. This points to important differences in the underlying activities of high-growth firms across industries and hence the applicability and importance of certain types of IPRs.

References

Anyadike-Danes, M., Bonner, K., Hart, M. and Mason, C. (2009) 'Measuring Business Growth: High-growth firms and their contribution to employment in the UK', London: NESTA.

Helmers C. and M. Rogers (2008): 'Use of intellectual property by UK high-growth firms', in High Growth Firms in the UK: Lessons from an Analysis of comparative UK Performance, BERR Economics Paper No. 3.

Helmers, C. and M. Rogers (2011): 'Does patenting help high-tech start-ups?', Research Policy, Vol. 40, pp. 1016-1027.

Balasubramanian, Natarajan and Sivadasan, Jagadeesh (2011): 'What Happens when Firms Patent? New Evidence from US Economic Census Data', *Review of Economics and Statistics, forthcoming.*

Helmers, C., M. Rogers and P. Schautschick (2011): 'Intellectual Property at the Firm-Level in the UK: The Oxford Firm-Level Intellectual Property Database', University of Oxford, Department of Economics Discussion Paper No. 546.

Hall B., C. Helmers, M. Rogers, and V. Sena (2011): 'The importance of patents and other formal intellectual property in comparison to informal protection methods, unpublished report for UKIPO'.

Figures

Figures 2.1-2.3 Distribution of growth rates

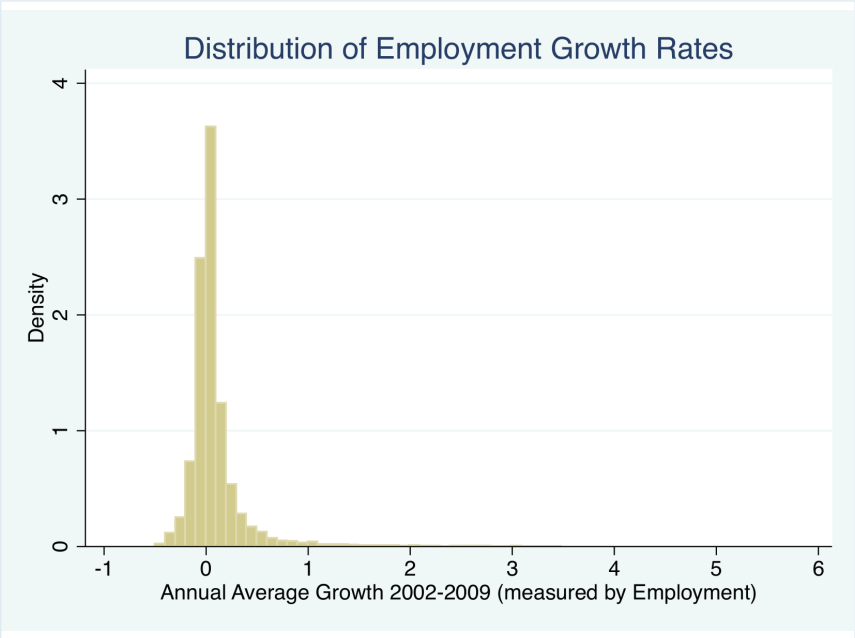

Figure 2.1

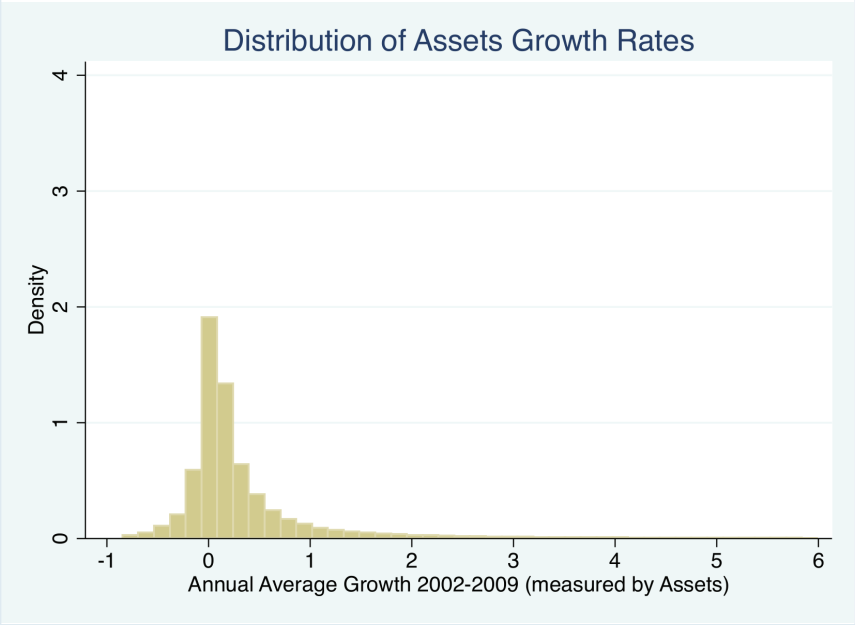

Figure 2.2

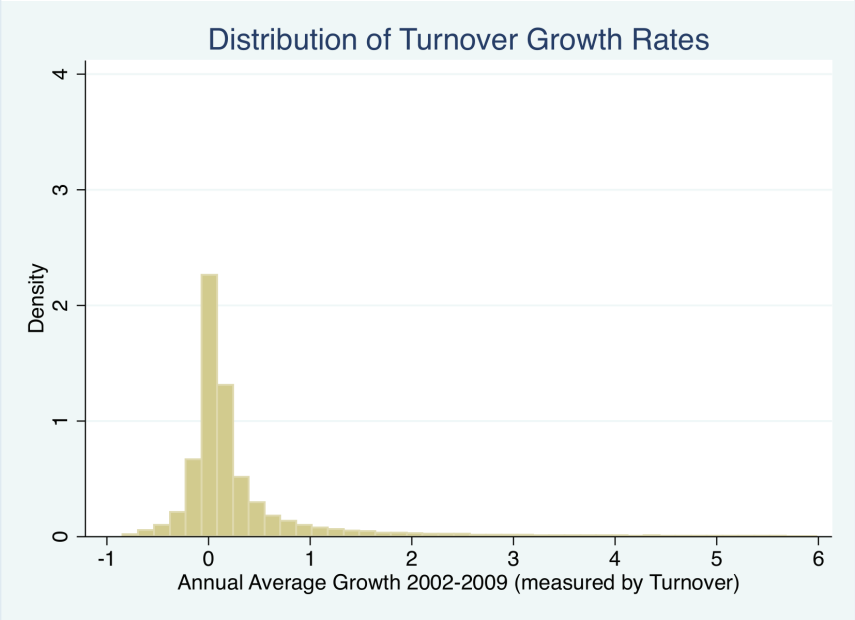

Figure 2.3

Absolute growth categories by IPR type

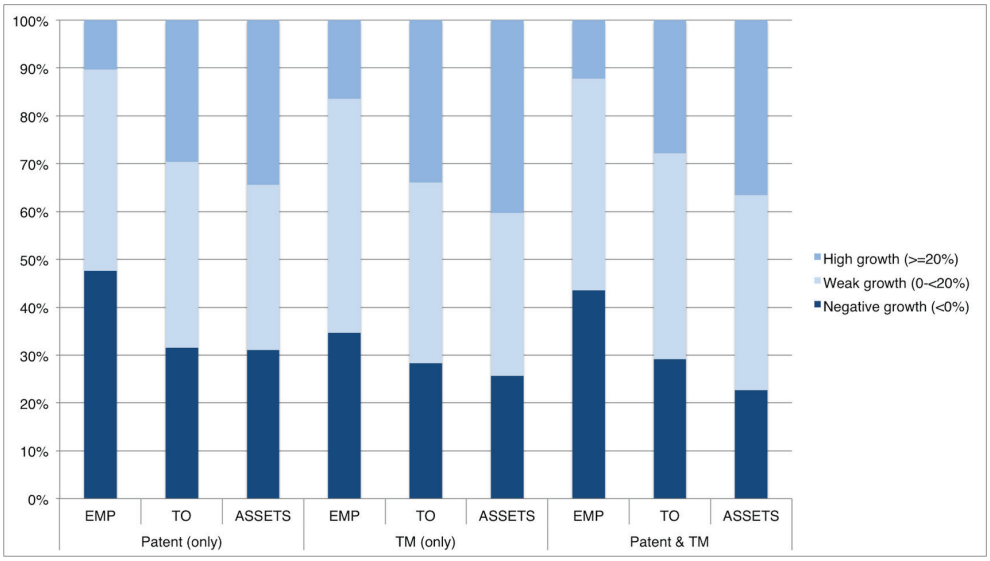

Figure 2.4. Note: Growth categories are defined according to absolute average annual percentage growth rates of one of the following: EMP = employment, TO = turnover, ASSETS = total assets.

Relative growth distribution by IPR type

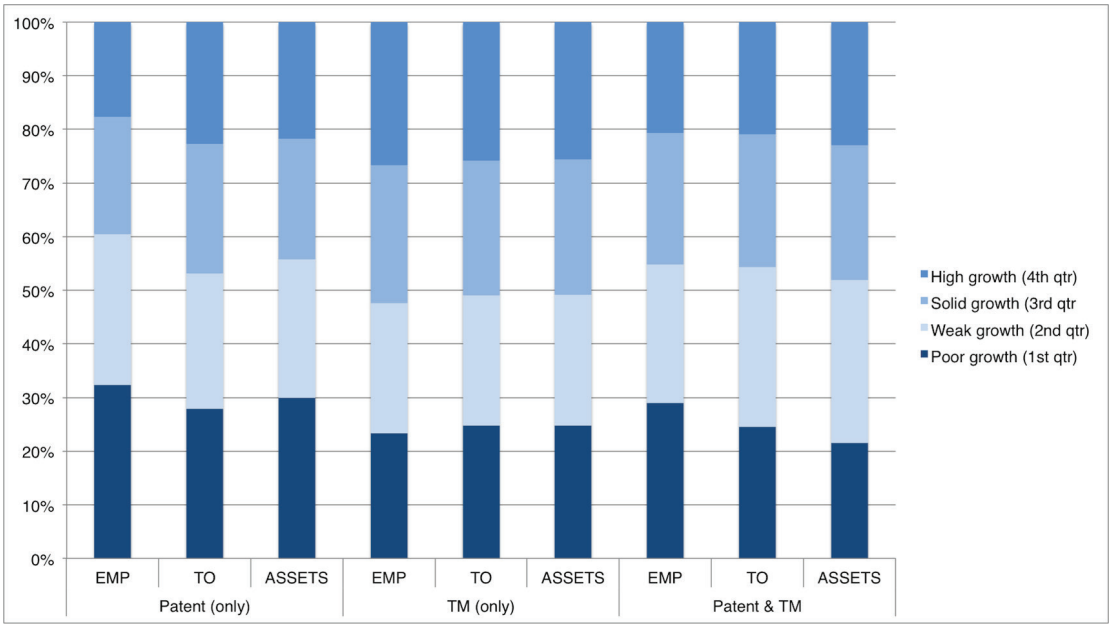

Figure 2.5. Note: Growth categories are defined according to quartiles of the entire growth distribution of one of the following: EMP = employment, TO = turnover, ASSETS = total assets.

Absolute growth categories by UK and EPO patent activity

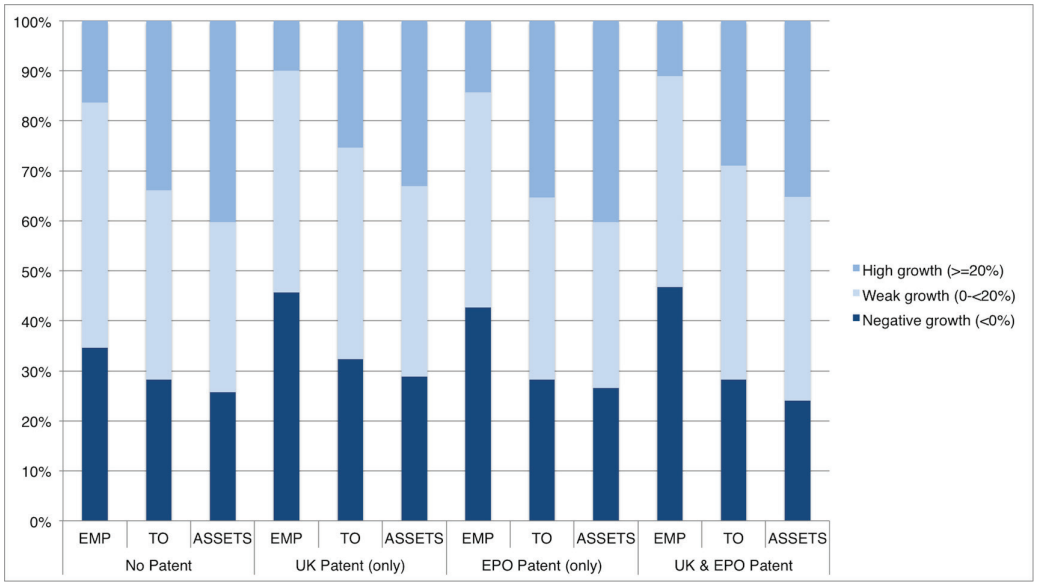

Figure 2.6. Note: Growth categories are defined according to absolute average annual percentage growth rates of one of the following: EMP = employment, TO = turnover, ASSETS = total assets. "No patent" means that firms hold trade marks as the sample only contains IPR-active firms.

Relative growth distribution by UK and EPO patent activity

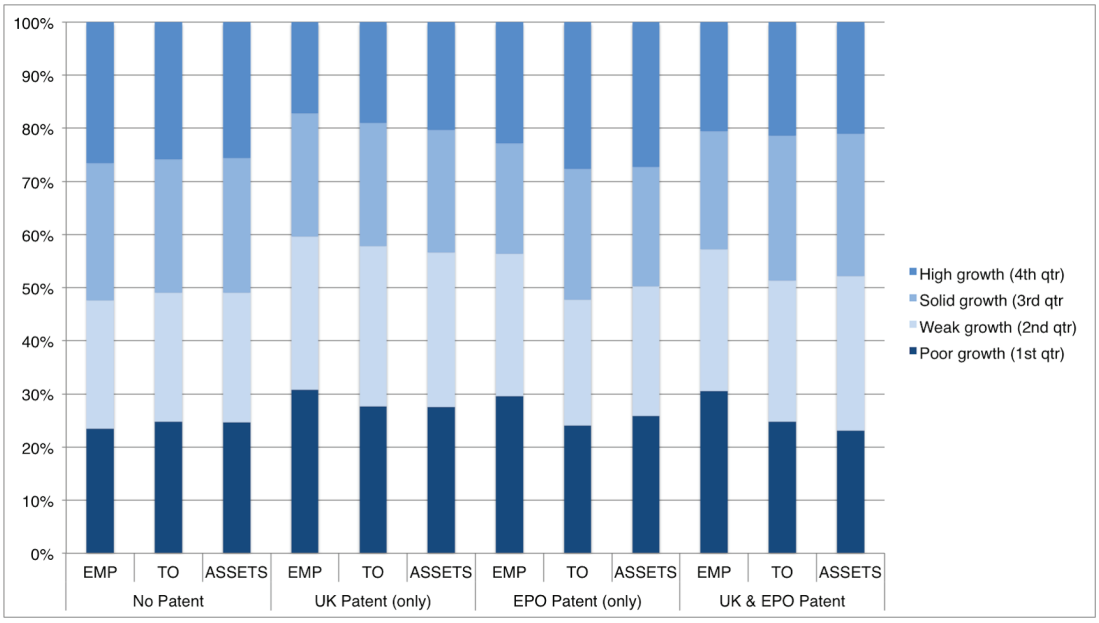

Figure 2.7. Note: Growth categories are defined according to quartiles of the entire growth distribution of one of the following: EMP = employment, TO = turnover, ASSETS = total assets. “No patent” means that firms hold trade marks as the sample only contains IPR-active firms.

Absolute growth categories by UK and Community trade mark activity

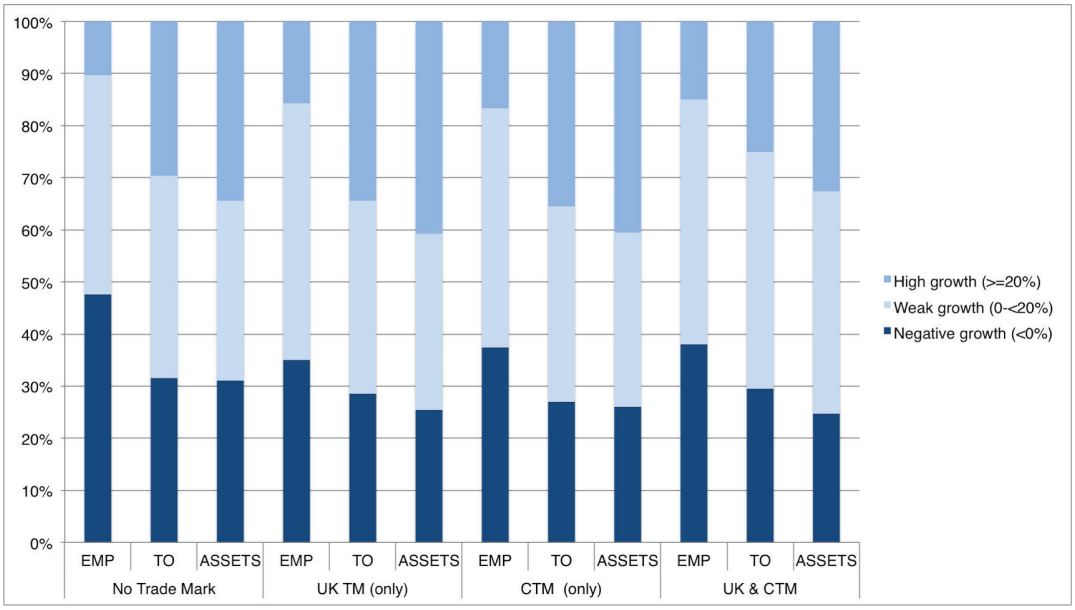

Figure 2.8. Note: Growth categories are defined according to absolute average annual percentage growth rates of one of the following: EMP = employment, TO = turnover, ASSETS = total assets.

UKTM = UK trade mark and CTM = Community trade mark.
“No trade mark” means that firms hold patents as the sample only contains IPR-active firms.

Relative growth distribution by UK and Community trade mark activity

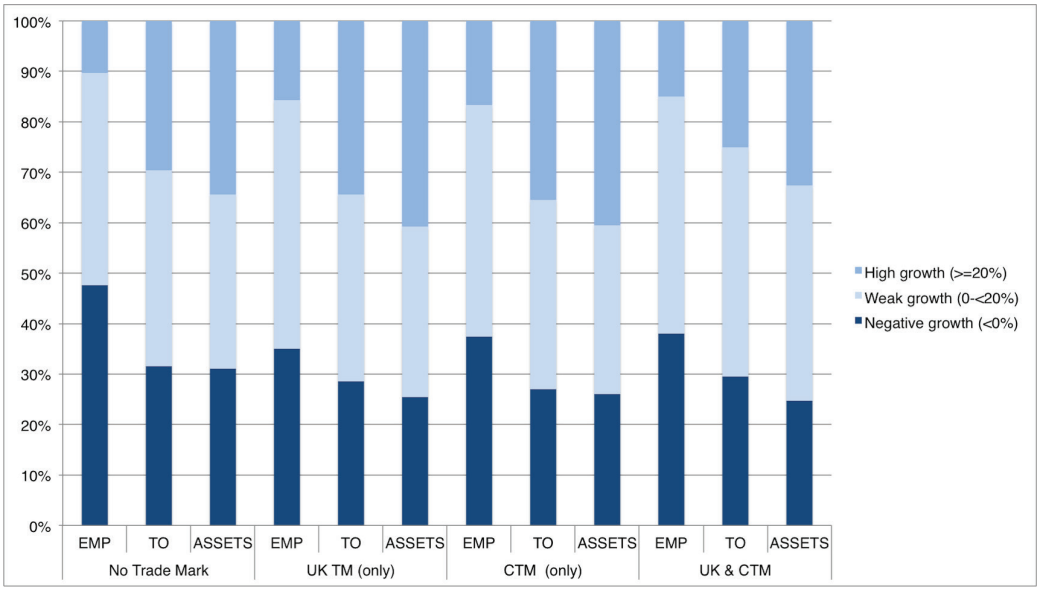

Figure 2.9. Note: Growth categories are defined according to quartiles of the entire growth distribution of one of the following: EMP = employment, TO = turnover, ASSETS = total assets.

UKTM = UK trade mark and CTM = Community trade mark. “No trade mark” means that firms hold patents as the sample only contains IPR-active firms.

Figures 2.10-2.12 Cross-tabulation of firms by size category and type of IPR

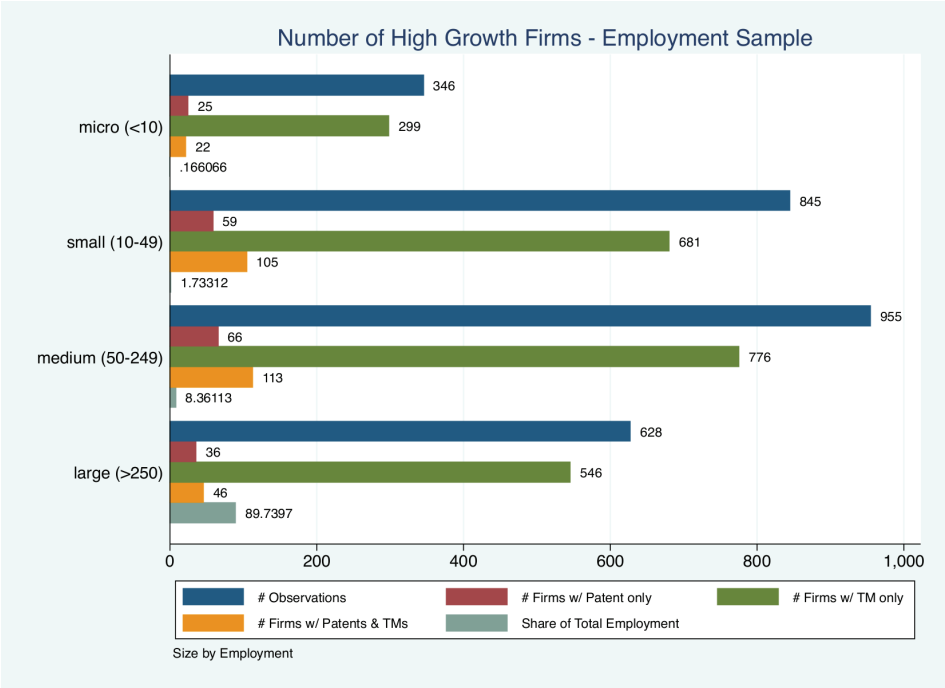

Figure 2.10

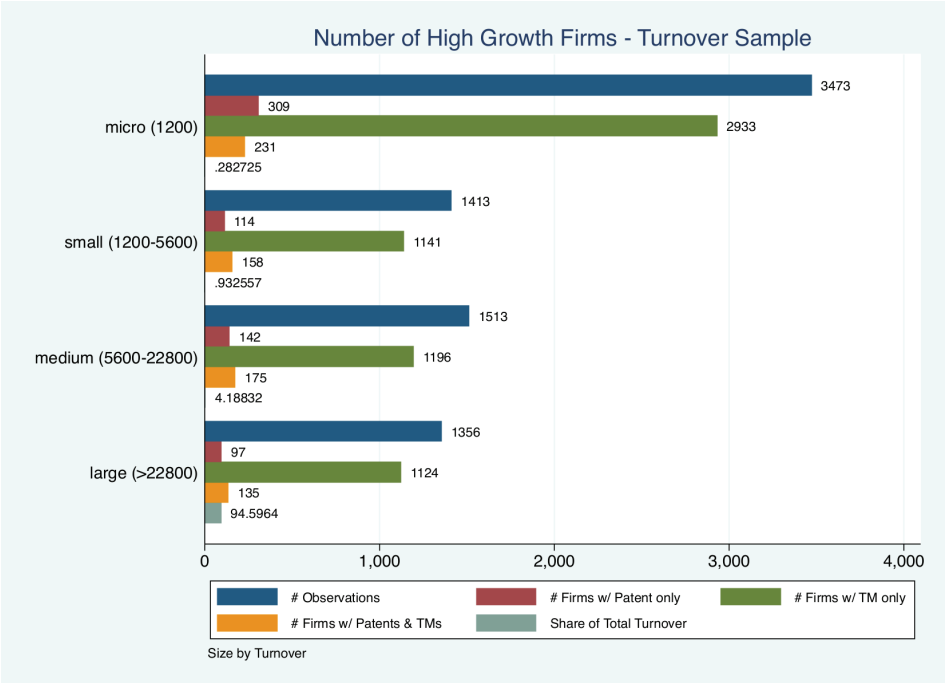

Figure 2.11

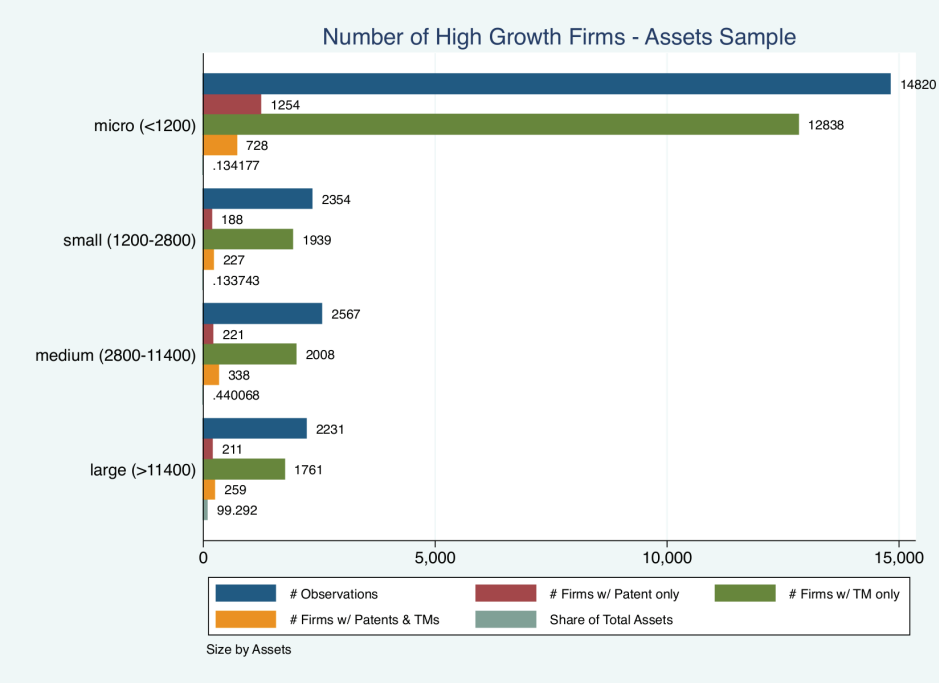
Number of High Growth Firms - Assets Sample
micro (<1200)
small (1200-2800)
medium (2800-11400)
large (>11400)
14820
1254
12838
728
.134177
2354
188
1939
227
.133743
2567
221
2008
338
.440068
2231
211
1761
259
99.292
0
5,000
10,000
15,000
Observations
Firms w/ Patent only
Firms w/ TM only
Firms w/ Patents & TMs
Share of Total Assets
Size by Assets

Figure 2.12

Figures 2.13-2.15 Cross-tabulation of firms by age category and type of IPR

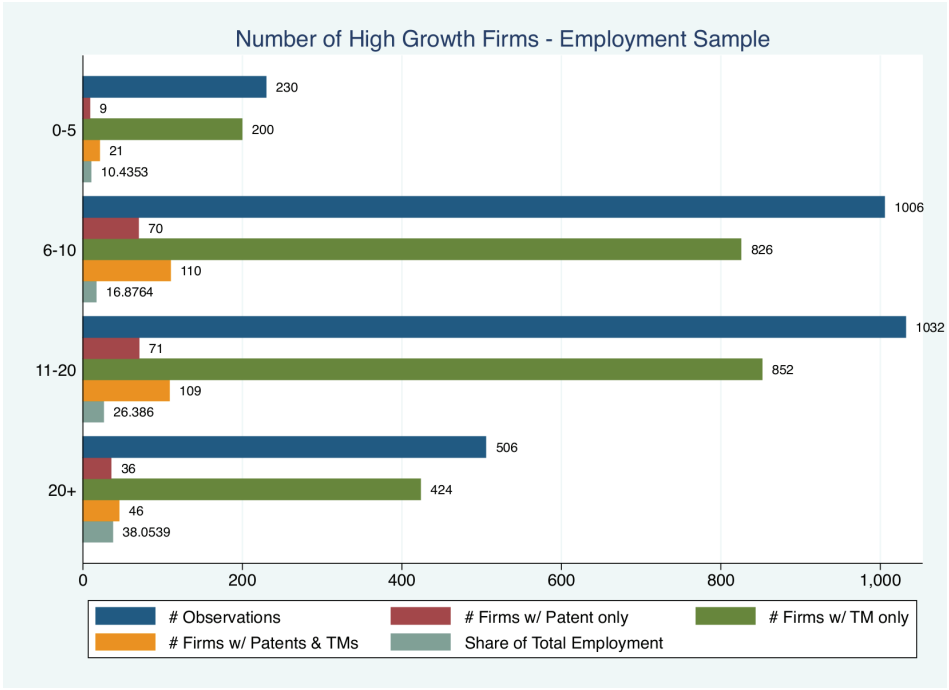

Figure 2.13

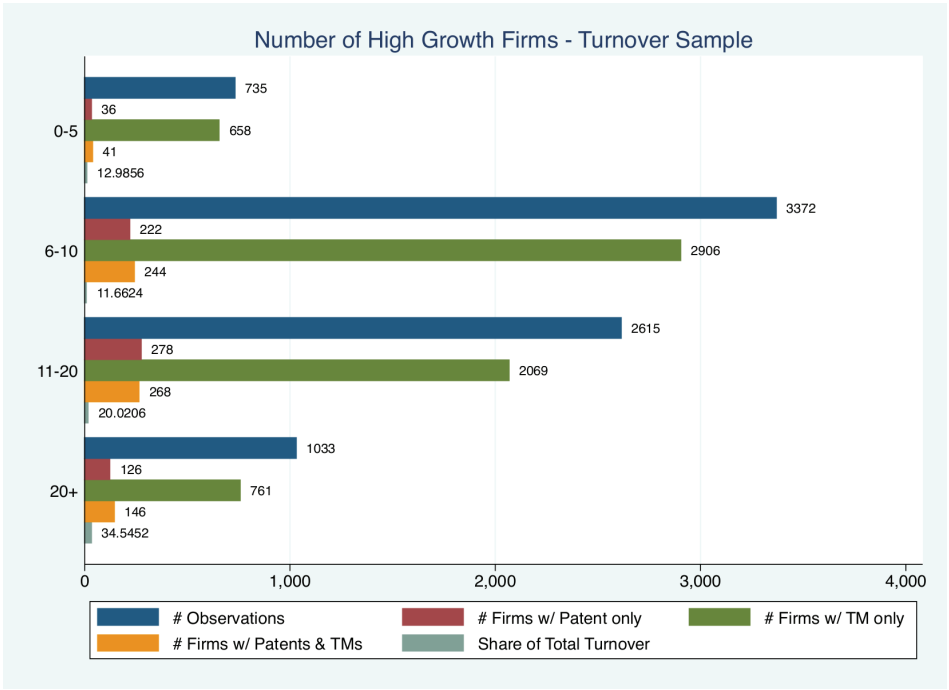

Figure 2.14

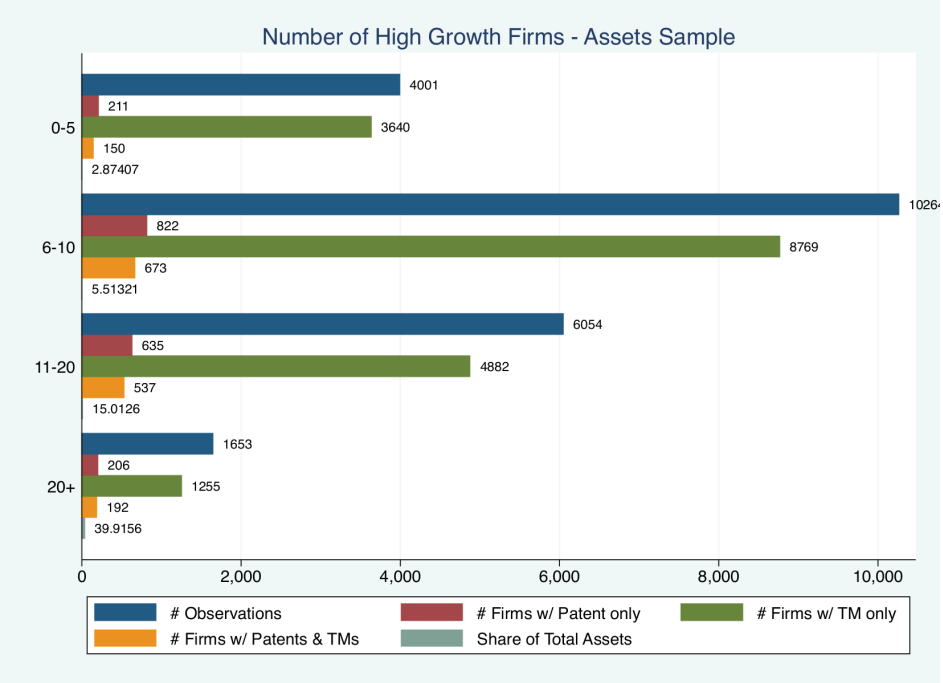
Number of High Growth Firms - Assets Sample
0-5
4001
211
3640
150
2.87407
6-10
822
8769
673
5.51321
11-20
6054
635
4882
537
15.0126
20+
1653
206
1255
192
39.9156
0
2,000
4,000
6,000
8,000
10,000
Observations
Firms w/ Patent only
Firms w/ TM only
Firms w/ Patents & TMs
Share of Total Assets

Figure 2.15

Figures 2.16-2.18 Cross-tabulation of firms by industry and type of IPR

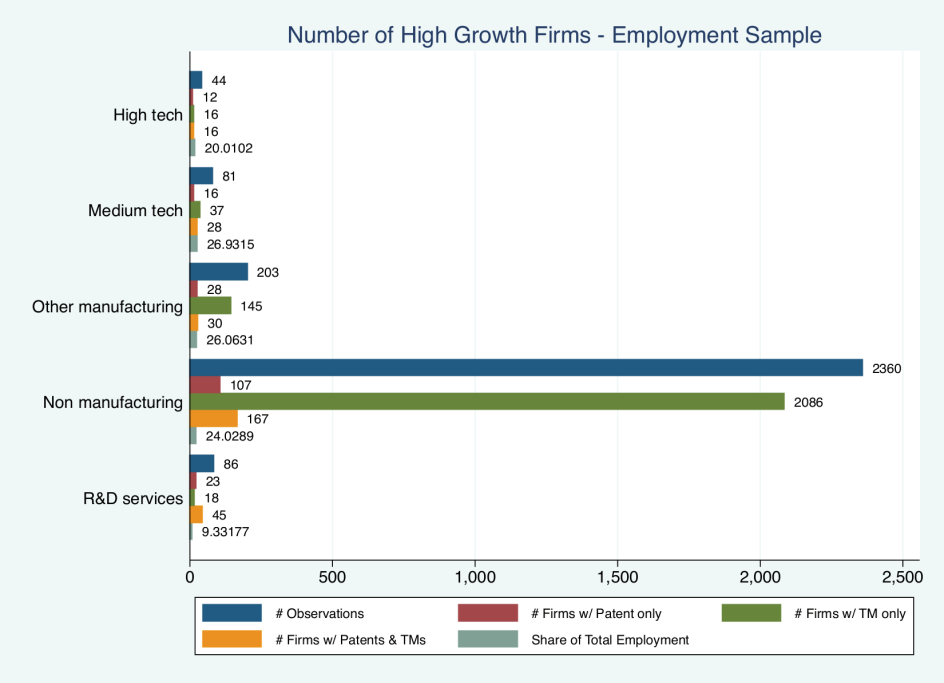

Figure 2.16

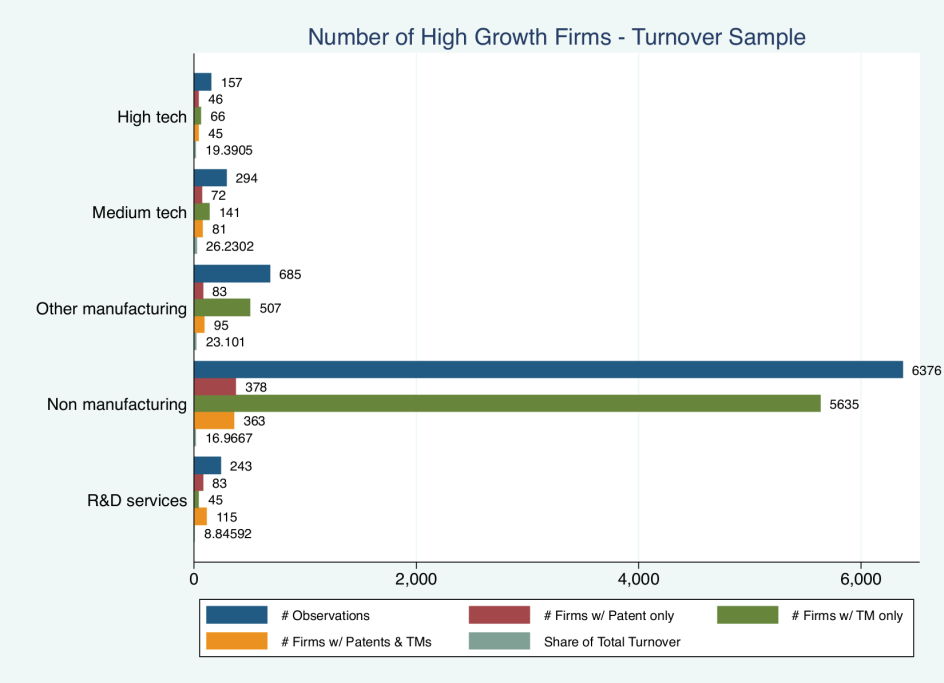

Figure 2.17

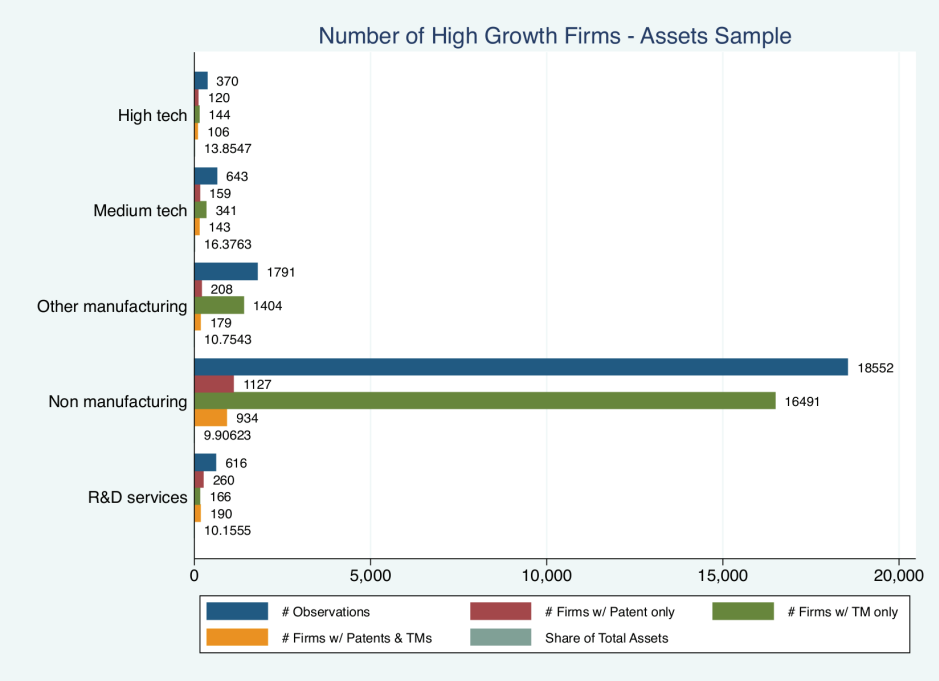
Number of High Growth Firms - Assets Sample
High tech
370
120
144
106
13.8547
Medium tech
643
159
341
143
16.3763
Other manufacturing
1791
208
1404
179
10.7543
Non manufacturing
18552
1127
16491
934
9.90623
R&D services
616
260
166
190
10.1555
0
5,000
10,000
15,000
20,000
Observations
Firms w/ Patent only
Firms w/ TM only
Firms w/ Patents & TMs
Share of Total Assets

Figure 2.18

Tables

Table 2.1 IPR activity of BERR 100 fastest growing UK firms (2000-2009)

BERR LIST (2008) OF 100 FASTEST GROWING UK FIRMS	2000-2009			
Firm name	Patents		Trade-mark	
	UK	EPO	UK	OHIM
A.J. Power Limited	0	0	1	0
Alpha International Accommodation Limited	0	0	3	1
Apatech Limited	3	6	0	14
Apertio Limited	0	5	1	0
Arrk Limited	0	0	4	0
Bluefish Communications Limited	0	0	2	3
Capital Solutions Group Ltd	0	0	2	2
Chess Limited	0	0	2	0
Coast Digital Limited	0	0	1	0
Contractor Umbrella Limited	0	0	1	0
Creativevents Limited	0	0	8	0
Digital Window Limited	0	0	3	3
Distribution Technology Limited	0	0	3	0
Elliott Thomas Limited	0	0	1	0
Enterprise Broker Services Limited	0	0	3	0
Exasoft PLC	0	0	1	0
First People Solutions	0	0	1	0
Forward Internet Group Limited	0	0	1	0
Gamesys Limited	0	0	4	1
Henry Howard Finance PLC	0	0	1	0
ICE Energy Heat Pumps Limited	1	0	2	1
Inforsense Limited	0	0	6	0
Innocent Limited	0	0	0	2
IP Infrastructures Limited	0	0	1	0
Just Lamps Limited	0	0	2	0
Lescip T Limited	0	11	0	0
Lovefilm International Limited	1	0	4	7
Maximus IT Limited	0	0	1	0
Melrob Limited	0	0	1	0
Midasplayer.Com Ltd.	0	0	0	4

Mint Financial Services Limited	0	0	1	0
N5 Limited	0	0	4	2
Neoss Limited	0	8	4	6
OB10	1	1	1	2
Oliver Marketing Limited	0	0	6	0
Oriel Securities Limited	0	0	1	0
Perfiliate Technologies Limited	0	0	2	0
Playphone Europe Limited	0	0	3	0
Powerlase Limited	1	8	0	2
Premium Appliance Brands Limited	0	0	24	2
Redtray Limited	0	0	4	0
Rocela Limited	0	0	1	0
Simply BIZ PLC	0	0	2	1
The ECU Group Public Limited Firm	0	0	0	4
The Feel Good Drinks Firm Limited	0	0	17	4
The Hut.Com Limited	0	0	0	3
Thunderhead Limited	0	5	2	3
Tideway Systems Limited	1	0	1	0
Timico Limited	0	0	1	0
Travel Republic Ltd	0	0	1	0
Vtesse Networks Limited	0	0	5	3
Widget (Uk) Limited	0	0	1	0
Worldstores Limited	0	0	19	0
Xantus	0	0	1	0
XLN Telecom Ltd.	0	0	1	0

Tables 2.3 and 2.4 Absolute growth

Tables 2.3 and 2.4 show total growth in terms of assets and employment by growth of assets cross-tabulated with firm size, age, sector, IP, patent and trade mark types.

Table 2.3 Absolute growth of employment

	Negative growth (<0%)	Weak growth (0-<20%)	High growth (>=20%)	Total	N
Firm size by assets					
micro (<1200)	-607	668	940	1,001	1,607
small (1200-2800)	-3,646	3,075	4,031	3,460	4,313
medium (2800-11400)	-39,341	34,514	45,504	40,677	7,305
large (>11400)	-1,320,730	350,110	801,798	-168,822	5,002
Firm age					
0-5	-22,234	16,160	9,259	3,185	719
6-10	-66,159	-318,270	185,309	-199,120	3,056
11-20	-213,433	170,578	306,980	264,125	5,954
20+	-1,062,498	519,899	350,725	-191,874	8,498
Sector					
High tech	-26,207	27,444	9,729	10,966	576
Medium tech	-189,167	-87,789	-44,215	-321,171	1,258
Other manufacturing	-322,979	-121,121	71,428	-372,672	3,219
Non manufacturing	-824,147	569,230	811,538	556,621	12,822
R&D services	-1,824	603	3,793	2,572	352
IPR type					
Patent only	-155,344	2,725	25,832	-126,787	1,806
Trade mark only	-836,776	222,016	782,762	168,002	14,071
Patent and trade mark	-372,204	163,626	43,679	-164,899	2,350
Patent type					
No patent	-836,776	222,016	782,762	168,002	14,071
EPO patent only	-58,634	110,224	22,455	74,045	1,028
UK patent only	-143,085	70,051	28,907	-44,127	2,021
EPO and UK patent	-325,829	-13,924	18,149	-321,604	1,107
Trade mark type					
No TM	-155,344	2,725	25,832	-126,787	1,806
CTM only	-224,444	44,563	58,126	-121,755	2,953
UK TM only	-397,897	85,616	455,464	143,183	10,523
CTM and UK TM	-586,639	255,463	312,851	-18,325	2,945
Total	**-1,364,324**	**388,367**	**852,273**	**-123,684**	
N	**6,762**	**8,691**	**2,774**	**18,227**	

Table 2.4 Absolute growth of assets in £m GBP

	Negative growth (<0%)	Weak growth (0-<20%)	High growth (>=20%)	Total	N
Firm size by assets					
micro (<1200)	-773	674	2,638	2,539	32,059
small (1200-2800)	-930	1,331	2,889	3,290	6,419
medium (2800-11400)	-4,457	6,004	9,513	11,060	8,290
large (>11400)	-987,141	4,430,607	1,590,551	5,034,017	8,945
Firm age					
0-5	-173,886	2,825	27,480	-143,580	7,730
6-10	-19,189	88,515	77,457	146,783	18,589
11-20	-142,524	408,152	153,769	419,397	16,444
20+	-657,702	3,939,124	1,346,885	4,628,307	12,950
Sector					
High tech	-30,297	24,237	10,065	4,004	1,242
Medium tech	-35,879	50,586	20,378	35,085	2,496
Other manufacturing	-39,298	63,806	64,054	88,562	7,039
Non manufacturing	-882,498	4,299,575	1,508,606	4,925,684	43,811
R&D services	-5,328	412	2,488	-2,428	1,125
IPR type					
Patent only	-152,803	625,882	30,527	503,606	5,449
Trade mark only	-731,154	2,098,110	598,169	1,965,125	46,017
Patent and trade mark	-109,344	1,714,625	976,895	2,582,175	4,247
Patent type					
No patent	-731,154	2,098,110	598,169	1,965,125	46,017
EPO patent only	-130,235	621,083	25,593	516,440	2,530
UK patent only	-38,845	1,629,484	323,601	1,914,239	5,370
EPO and UK patent	-93,067	89,941	658,228	655,102	1,796
Trade mark type					
No TM	-152,803	625,882	30,527	503,606	5,449
CTM only	-87,052	260,180	67,210	240,338	7,757
UK TM only	-276,555	391,470	214,526	329,441	37,846
CTM and UK TM	-476,891	3,161,084	1,293,327	3,977,520	4,661
Total	-993,301	4,438,616	1,605,591	5,050,906	
N	14,486	19,255	21,972		55,713

Note: Absolute growth of assets is calculated at 2005 prices.

Tables 2.5 and 2.6 Growth and economic importance

Tables 2.5 and 2.6 show total values of employment and assets for cross-tabulations of asset growth categories with the distribution of firms over size (by assets), age (since incorporation), sector, IPR type (patent/trade mark), patent type (EPO/UK), trade mark type (OHIM/UK).

Table 2.5 Total employment

	Negative growth (<0%)	Weak growth (0-<20%)	High growth (>=20%)	Total	N
Firm size by assets					
micro (<1200)	11,060	9,448	8,018	28,526	1,607
small (1200-2800)	27,511	38,816	19,457	85,784	4,313
medium (2800-11400)	143,541	270,227	111,241	525,010	7,305
large (>11400)	3,922,974	7,741,588	1,482,003	13,146,565	5,002
Firm age					
0-5	204,304	146,837	44,136	395,277	719
6-10	459,976	1,011,422	300,221	1,771,619	3,056
11-20	1,075,724	1,467,862	411,114	2,954,700	5,954
20+	2,365,082	5,433,959	865,248	8,664,288	8,498
Sector					
High tech	49,656	268,024	28,987	346,667	576
Medium tech	380,788	444,465	96,033	921,286	1,258
Other manufacturing	452,740	967,313	150,284	1,570,337	3,219
Non manufacturing	3,216,901	6,366,078	1,337,325	10,920,304	12,822
R&D services	5,001	14,200	8,091	27,291	352
IPR type					
Patent only	489,445	688,030	80,031	1,257,506	1,806
Trade mark only	2,266,682	5,311,731	1,231,768	8,810,181	14,071
Patent and trade mark	1,348,959	2,060,318	308,920	3,718,197	2,350
Patent type					
No patent	2,266,682	5,311,731	1,231,768	8,810,181	14,071
EPO patent only	134,935	806,735	47,651	989,322	1,028
UK patent only	1,021,541	988,590	146,963	2,157,094	2,021
EPO and UK patent	681,928	953,023	194,337	1,829,288	1,107
Trade mark type					
No TM	489,445	688,030	80,031	1,257,506	1,806
CTM only	381,977	653,354	187,091	1,222,422	2,953
UK TM only	1,517,444	2,368,661	658,641	4,544,746	10,523
CTM and UK TM	1,716,219	4,350,034	694,956	6,761,210	2,945
Total	4,105,086	8,060,080	1,620,719	13,785,885	
N	6,762	8,691	2,774	18,227	

Note: Total Employment is calculated as the sum of firms' average employment between the period 2002-2009.

Table 2.6 Total assets in £m GBP

	Negative growth (<0%)	Weak growth (0-<20%)	High growth (>=20%)	Total	N
Firm size by assets					
micro (<1200)	1,355	2,138	2,275	5,769	**32,059**
small (1200-2800)	1,801	3,739	2,268	7,808	**6,419**
medium (2800-11400)	7,858	16,357	7,462	31,677	**8,290**
large (>11400)	1,900,515	8,157,830	1,683,594	11,741,939	**8,945**
Firm age					
0-5	501,653	18,468	27,119	547,240	**7,730**
6-10	38,860	588,065	56,297	683,222	**18,589**
11-20	230,117	803,618	170,131	1,203,866	**16,444**
20+	1,140,899	6,769,914	1,442,052	9,352,865	**12,950**
Sector					
High tech	24,632	46,128	7,925	78,685	**1,242**
Medium tech	69,101	96,040	20,950	186,091	**2,496**
Other manufacturing	66,861	208,370	44,913	320,145	**7,039**
Non manufacturing	1,742,884	7,827,559	1,619,884	11,190,327	**43,811**
R&D services	8,052	1,967	1,926	11,945	**1,125**
IPR type					
Patent only	217,022	1,023,439	22,425	1,262,886	**5,449**
Trade mark only	1,449,344	4,473,661	611,901	6,534,906	**46,017**
Patent and trade mark	245,164	2,682,964	1,061,273	3,989,401	**4,247**
Patent type					
No patent	1,449,344	4,473,661	611,901	6,534,906	**46,017**
EPO patent only	233,128	1,245,890	20,333	1,499,351	**2530**
UK patent only	82,529	2,210,832	259,278	2,552,638	**5,370**
EPO and UK patent	146,528	249,682	804,087	1,200,297	**1,796**
Trade mark type					
No TM	217,022	1,023,439	22,425	1,262,886	**5,449**
CTM only	108,900	484,548	63,167	656,615	**7,757**
UK TM only	384,055	1,244,623	184,207	1,812,886	**37,846**
CTM and UK TM	1,201,552	5,427,454	1,425,800	8,054,806	**4,661**
Total	**1,911,529**	**8,180,065**	**1,695,598**	**11,787,193**	
N	**14,486**	**19,255**	**21,972**		**55,713**

Note: Total assets are calculated as the sum of firms' average asset holdings between 2002-2009 at 2005 prices.

Tables 2.7 and 2.8 Growth and IP rights

Tables 2.7 and 2.8 show the total number of patents and trade marks applied for during 2002-09 by growth categories for the two different samples, i.e. the asset and employment sample. The tables distinguish between patents and trade marks as well as patent type (EPO/UK) and trade mark type (OHIM/UK). It is noteworthy that the number of firms in the different growth categories vary substantially across the two samples ($N_{Employment}$=18,227; N_{Assets}=55,713), thus the patent and TM counts need to be interpreted with caution.

Table 2.7 IPR activity

Employment growth category	IPR type				
	Patent only	Trade mark only	Patent and trade mark		Total
Negative growth (<0%)	12.70% (859)	72.20% (4,881)	15.10% (1,022)		**100.00% (6,762)**
Weak growth (0-<20%)	8.80% (761)	79.30% (6,888)	12.00% (1,042)		**100.00% (8,691)**
High growth (>=20%)	6.70% (186)	83.00% (2,302)	10.30% (286)		**100.00% (2,774)**
Total	**9.90% (1,806)**	**77.20% (14,071)**	**12.90% (2,350)**		**100.00% (18,227)**

Employment growth category	Patent type				
	No patent	EPO patent only	UK patent only	EPO and UK patent	Total
Negative growth (<0%)	72.20% (4,881)	6.50% (439)	13.70% (924)	7.70% (518)	**100.00% (6,762)**
Weak growth (0-<20%)	79.30% (6,888)	5.10% (442)	10.30% (895)	5.40% (466)	**100.00% (8,691)**
High growth (>=20%)	83.00% (2,302)	5.30% (147)	7.30% (202)	4.40% (123)	**100.00% (2,774)**
Total	**77.20% (14,071)**	**5.60% (1,028)**	**11.10% (2,021)**	**6.10% (1,107)**	**100.00% (18,227)**

Employment growth category	TM type				
	No TM	CTM only	UK TM only	CTM and UK TM	Total
Negative growth (<0%)	12.70% (859)	16.30% (1,103)	54.40% (3,681)	16.50% (1,119)	**100.00% (6,762)**
Weak growth (0-<20%)	8.80% (761)	15.60% (1,356)	59.70% (5,188)	15.90% (1,386)	**100.00% (8,691)**
High growth (>=20%)	6.70% (186)	17.80% (494)	59.60% (1,654)	15.90% (440)	**100.00% (2,774)**
Total	**9.90% (1,806)**	**16.20% (2,953)**	**57.70% (10,523)**	**16.20% (2,945)**	**100.00% (18,227)**

Table 2.8 IPR activity

Asset growth category	IPR type				
	Patent only	Trade mark only	Patent and Trade mark		Total
Negative growth (<0%)	11.70% (1,692)	81.70% (11,833)	6.60% (961)		**100.00% (14,486)**
Weak growth (0-<20%)	9.80% (1,883)	81.20% (15,638)	9.00% (1,734)		**100.00% (19,255)**
High growth (>=20%)	8.50% (1,874)	84.40% (18,546)	7.10% (1,552)		100.00% (21,972)
Total	**9.80% (5,449)**	**82.60% (46,017)**	**7.60% (4,247)**		**100.00% (55,713)**

Asset growth category	Patent type				
	No patent	EPO patent only	UK patent only	EPO and UK patent	Total
Negative growth (<0%)	81.70% (11,833)	4.70% (674)	10.70% (1,547)	3.00% (432)	**100.00% (14,486)**
Weak growth (0-<20%)	81.20% (15,638)	4.40% (838)	10.60% (2,047)	3.80% (732)	**100.00% (19,255)**
High growth (>=20%)	84.40% (18,546)	4.60% (1,018)	8.10% (1,776)	2.90% (632)	**100.00% (21,972)**
Total	**82.60% (46,017)**	**4.50% (2,530)**	**9.60% (5,370)**	**3.20% (1,796)**	**100.00% (55,713)**

Asset growth category	TM type				
	No TM	CTM only	UK TM only	CTM and UK TM	Total
Negative growth (<0%)	11.70% (1,692)	13.90% (2,017)	66.40% (9,623)	8.00% (1,154)	**100.00% (14,486)**
Weak growth (0-<20%)	9.80% (1,883)	13.50% (2,601)	66.40% (12,783)	10.30% (1,988)	**100.00% (19,255)**
High growth (>=20%)	8.50% (1,874)	14.30% (3,139)	70.30% (15,440)	6.90% (1,519)	**100.00% (21,972)**
Total	**9.80% (5,449)**	**13.90% (7,757)**	**67.90% (37,846)**	**8.40% (4,661)**	**100.00% (55,713)**

Tables 2.9 and 2.10 Growth and total number of IP rights

Table 2.9 IPR counts

Employment growth category	# EPO patents	# UK patents	Total # Patents	# CTMs	# UK TMs	Total # TMs	N
Negative growth (<0%)	10,902 (24)	6,516 (5)	17,418 (26)	10,669 (5)	23,843 (15)	34,512 (18)	**6,762**
Weak growth (0-<20%)	8,033 (11)	6,591 (9)	14,624 (18)	13,696 (5)	29,633 (10)	43,329 (13)	**8,691**
High growth (>=20%)	1,531 (4)	1,635 (6)	3,166 (10)	4,119 (4)	7,399 (7)	11,518 (9)	**2,774**
Total	**20,466 (16)**	**14,742 (7)**	**35,208 (20)**	**28,484 (5)**	**60,875 (12)**	**89,359 (15)**	**18,227**

Note: Cells show the total number of patents or trade marks held by firms within the respective growth category. Standard deviation in parenthesis.

Table 2.10 IPR counts

Asset growth category	# EPO patents	# UK patents	Total # Patents	# CTMs	# UK TMs	Total # TMs	N
Negative growth (<0%)	7,950 (16)	5,639 (3)	13,589 (17)	10,257 (4)	27,791 (11)	38,048 (14)	**14,486**
Weak growth (0-<20%)	12,475 (11)	10,054 (6)	22,529 (15)	19,896 (5)	49,549 (9)	69,445 (12)	**19,255**
High growth (>=20%)	7,733 (4)	7,073 (3)	14,806 (6)	14,304 (2)	38,275 (6)	52,579 (7)	**21,972**
Total	**28,158 (10)**	**22,766 (4)**	**50,924 (13)**	**44,457 (4)**	**115,615 (8)**	**160,072 (11)**	**55,713**

See notes of Table 1a

Tables 2.11-2.14 Sustainability of growth

To analyse sustainability of growth, we split the eight-year period 2002-2009 into two four-year periods, i.e. 2002-05 and 2006-09. Table 2.11 and 2.13 look at the IPR activity of firms across growth categories between 2002 and 2005 using growth of assets and employment, respectively. The tables 2.12 and 2.14 retain only firms that were identified as high-growth between 2002 and 2005 and analyse their performance during the subsequent four-year period 2006-2009.

Table 2.11 IPR activity: all firms between 2002-05

Employment growth category	IPR type				
	No IPRs this period	Patent only	Trade mark only	Patent and trade mark	Total
Negative growth 25 (<0%)	28.20% (933)	13.60% (451)	46.50% (1,538)	11.70% (388)	**100.00% (3,310)**
Weak growth 25 (0-<20%)	33.80% (1,487)	9.50% (418)	47.90% (2,104)	8.70% (384)	**100.00% (4,393)**
High growth 25 (>=20%)	32.40% (402)	7.20% (89)	53.70% (666)	6.80% (84)	**100.00% (1,241)**
Total	**31.60% (2,822)**	**10.70% (958)**	**48.20% (4,308)**	**9.60% (856)**	**100.00% (8,944)**

Employment growth category	Patent type				
	No patent in Period	EPO patent only	UK patent only	EPO and UK patent	Total
Negative growth 25 (<0%)	64.70% (1,538)	9.20% (218)	15.50% (369)	10.60% (252)	**100.00% (2,377)**
Weak growth 25 (0-<20%)	72.40% (2,104)	7.50% (218)	12.90% (376)	7.20% (208)	**100.00% (2,906)**
High growth 25 (>=20%)	79.40% (666)	5.20% (44)	8.10% (68)	7.30% (61)	**100.00% (839)**
Total	**70.40% (4,308)**	**7.80% (480)**	**13.30% (813)**	**8.50% (521)**	**100.00% (6,122)**

Employment growth category	TM type				
	No TM in period	CTM only	UK TM only	CTM and UK TM	Total
Negative growth 25 (<0%)	19.00% (451)	16.30% (387)	46.70% (1,111)	18.00% (428)	**100.00% (2,377)**
Weak growth 25 (0-<20%)	14.40% (418)	14.50% (422)	53.60% (1,559)	17.40% (507)	**100.00% (2,906)**
High growth 25 (>=20%)	10.60% (89)	15.50% (130)	56.90% (477)	17.00% (143)	**100.00% (839)**
Total	**15.60% (958)**	**15.30% (939)**	**51.40% (3,147)**	**17.60% (1,078)**	**100.00% (6,122)**

Table 2.12 IPR activity: firms between 2006-09 that were high growth firms between 2002-05

Employment growth category	IPR type				
	No IPRs this period	Patent only	Trade mark only	Patent and trade mark	Total
Negative growth 69 (<0%)	35.90% (180)	6.40% (32)	51.40% (258)	6.40% (32)	**100.00% (502)**
Weak growth 69 (0-<20%)	25.00% (143)	4.90% (28)	63.90% (365)	6.10% (35)	**100.00% (571)**
High growth 69 (>=20%)	24.90% (56)	6.20% (14)	64.90% (146)	4.00% (9)	**100.00% (225)**
Total	**29.20% (379)**	**5.70% (74)**	**59.20% (769)**	**5.90% (76)**	**100.00% (1298)**

Employment growth category	Patent type				
	No patent in period	EPO patent only	UK patent only	EPO and UK patent	Total
Negative growth 69 (<0%)	51.40% (258)	4.00% (20)	5.00% (25)	3.80% (19)	**100.00% (322)**
Weak growth 69 (0-<20%)	63.90% (365)	3.50% (20)	3.20% (18)	4.40% (25)	**100.00% (428)**
High growth 69 (>=20%)	64.90% (146)	4.00% (9)	4.00% (9)	2.20% (5)	**100.00% (169)**
Total	**59.20% (769)**	**3.80% (49)**	**4.00% (52)**	**3.80% (49)**	**100.00% (919)**

Employment growth category	TM type				
	No TM in period	CTM only	UK TM only	CTM and UK TM	Total
Negative growth 69 (<0%)	6.40% (32)	12.70% (64)	35.90% (180)	9.20% (46)	**100.00% (322)**
Weak growth 69 (0-<20%)	4.90% (28)	14.20% (81)	41.30% (236)	14.50% (83)	**100.00% (428)**
High growth 69 (>=20%)	6.20% (14)	14.20% (32)	39.60% (89)	15.10% (34)	**100.00% (169)**
Total	**5.70% (74)**	**13.60% (177)**	**38.90% (505)**	**12.60% (163)**	**100.00% (919)**

Table 2.13 IPR activity: all firms between 2002-2005

Asset growth category	IPR type				
	No IPRs this period	Patent only	Trade mark only	Patent and trade mark	Total
Negative growth 25 (<0%)	33.90% (2,819)	13.60% (1,134)	45.90% (3,819)	6.50% (542)	**100.00% (8,314)**
Weak growth 25 (0-<20%)	38.20% (3,722)	9.30% (909)	46.60% (4,538)	5.90% (572)	**100.00% (9,741)**
High growth 25 (>=20%)	40.30% (3,780)	7.50% (706)	47.00% (4,404)	5.20% (486)	**100.00% (9,376)**
Total	**37.60% (10,321)**	**10.00% (2,749)**	**46.50% (12,761)**	**5.80% (1,600)**	**100.00% (27,431)**

Asset growth category	Patent type				
	No patent in period	EPO patent only	UK patent only	EPO and UK patent	Total
Negative growth 25 (<0%)	69.50% (3,819)	8.30% (456)	16.30% (898)	5.90% (322)	**100.00% (5,495)**
Weak growth 25 (0-<20%)	75.40% (4,538)	6.20% (374)	13.20% (794)	5.20% (313)	**100.00% (6,019)**
High growth 25 (>=20%)	78.70% (4,404)	6.20% (349)	10.80% (603)	4.30% (240)	**100.00% (5,596)**
Total	**74.60% (12,761)**	**6.90% (1,179)**	**13.40% (2,295)**	**5.10% (875)**	**100.00% (17,110)**

Asset growth category	TM type				
	No TM in period	CTM only	UK TM only	CTM and UK TM	Total
Negative growth 25 (<0%)	20.60% (1,134)	14.40% (792)	54.30% (2,982)	10.70% (587)	**100.00% (5,495)**
Weak growth 25 (0-<20%)	15.10% (909)	13.00% (784)	60.00% (3,610)	11.90% (716)	**100.00% (6,019)**
High growth 25 (>=20%)	12.60% (706)	13.50% (757)	64.10% (3,585)	9.80% (548)	**100.00% (5,596)**
Total	**16.10% (2,749)**	**13.60% (2,333)**	**59.50% (10,177)**	**10.80% (1,851)**	**100.00% (17,110)**

Table 2.14. IPR activity: firms between 2006-09 that were high growth firms between 2002-05

Asset growth category	IPR type				
	No IPRs this period	Patent only	Trade mark only	Patent and trade mark	Total
Negative growth 69 (<0%)	40.20% (1,823)	5.90% (268)	50.10% (2,270)	3.80% (174)	**100.00% (4535)**
Weak growth 69 (0-<20%)	31.90% (956)	5.80% (175)	56.70% (1,696)	5.50% (166)	**100.00% (2993)**
High growth 69 (>=20%)	26.50% (522)	6.10% (121)	60.80% (1,199)	6.60% (131)	**100.00% (1973)**
Total	**34.70% (3,301)**	**5.90% (564)**	**54.40% (5,165)**	**5.00% (471)**	100.00% (9501)

Asset growth category	Patent type				
	No patent in Period	EPO patent only	UK patent only	EPO and UK patent	
Negative growth 69 (<0%)	50.10% (2,270)	2.90% (131)	5.00% (225)	1.90% (86)	**40.20% (2,712)**
Weak growth 69 (0-<20%)	56.70% (1,696)	3.60% (107)	5.40% (163)	2.40% (71)	**31.90% (2,037)**
High growth 69 (>=20%)	60.80% (1,199)	4.40% (86)	5.90% (117)	2.50% (49)	**26.50% (1,451)**
Total	**54.40% (5,165)**	**3.40% (324)**	**5.30% (505)**	**2.20% (206)**	34.70% (6,200)

Asset growth category	TM type				
	No TM in Period	CTM only	UK TM only	CTM and UK TM	
Negative growth 69 (<0%)	5.90% (268)	9.90% (449)	38.70% (1,754)	5.30% (241)	**40.20% (2,712)**
Weak growth 69 (0-<20%)	5.80% (175)	12.20% (364)	42.30% (1,267)	7.70% (231)	**31.90% (2,037)**
High growth 69 (>=20%)	6.10% (121)	14.00% (277)	45.30% (893)	8.10% (160)	**26.50% (1,451)**
Total	**5.90% (564)**	**11.50% (1,090)**	**41.20% (3,914)**	**6.70% (632)**	34.70% (6,200)

Table 2.15 IPR quantity: all IPR active firms

Asset growth category	No Patent	1 Patent	2-5 Patents	>5 Patents	Total
Negative growth (<0%)	81.70% (11,833)	9.50% (1,376)	6.20% (899)	2.60% (378)	**100% 14,486**
Weak growth (0-<20%)	81.20% (15,638)	8.60% (1,650)	7.00% (1,347)	3.20% (620)	**100% 19,255**
High growth (>=20%)	84.40% (18,546)	7.50% (1,658)	5.80% (1,278)	2.20% (490)	**100% 21,972**
Total	**82.60% (46,017)**	**8.40% (4,684)**	**6.30% (3,524)**	**2.70% (1,488)**	**100% 55,713**

Asset growth category	No TM	1 TM	1-5 TMs	>5 TMs	Total
Negative growth (<0%)	11.70% (1,692)	51.00% (7,385)	29.40% (4,262)	7.90% (1,147)	**100% 14,486**
Weak growth (0-<20%)	9.80% (1,883)	44.50% (8,561)	33.40% (6,436)	12.30% (2,375)	**100% 19,255**
High growth (>=20%)	8.50% (1,874)	51.40% (11,295)	32.60% (7,171)	7.40% (1,632)	**100% 21,972**
Total	**9.80% (5,449)**	**48.90% (27,241)**	**32.10% (17,869)**	**9.30% (5,154)**	**100% 55,713**

Data

The integrated database consists of two components: a firm-level data set and IP right data. The firm-level data is the FAME database that covers the entire population of registered UK firms.[5] In FAME, 'firms' represent registered firms, i.e., the legal entity that organizes production (administrative unit), in contrast to census-type data that often uses the plant or production unit. This unit of analysis corresponds to the enterprise in the BSD. In contrast to ONS data, FAME is a commercial database provided by Bureau van Dijk. The advantage of using FAME over ONS data is that it is freely accessible under a licensing agreement and that firms can be identified by name, which is essential for this current project.

The original version of the database, which formed the basis for the update carried out by the UKIPO, relied on two versions of the FAME database: FAME October 2005 and March 2009. The main motivation for using two different versions of FAME is that FAME keeps details of 'inactive' firms (see below) for a period of four years. If only the 2009 version of FAME were used, intellectual property could not be allocated to any firm that has exited the market before 2005, which would bias the matching results. FAME is available since 2000, which defines the earliest year for which the integrated data set can consistently be constructed. The update undertaken by the UKIPO used a November 2011 version of FAME. However, since there are significant reporting delays by companies, even using the November FAME 2011 version means that the latest year for which firm-level data can be used reliably is 2010.

FAME contains basic information on all firms, such as name, registered address, firm type and industry code. Availability of financial information varies substantially across firms. In the UK, the smallest firms are legally required to report only very basic balance sheet information (shareholders' funds and total assets). The largest firms provide a much broader range of profit and loss information, as well as detailed balance sheet data including overseas turnover.

In terms of numbers of firms, FAME October 2005 contains information on around 3.1 million firms (of which 0.9 million are inactive). The FAME March 2009 data contain 3.8 million firms (of which 1 million are inactive) and FAME November 2011 contains 2.7 million active firms. Inactive firms are those that have exited the market and belong to one of the following categories: dissolved, liquidated, entered receivership or declared non-trading. FAME contains firms' Companies House registered numbers, which means that it can easily be linked to other data sets that also contain registered numbers, such as Bureau van Dijk's Zephyr database that contains Merger & Acquisition data.

The IPR data come from three different sources: the UKIPO, Marquesa Ltd and the EPO Worldwide Patent Statistical Database (PATSTAT). Marquesa Ltd supplied data on UK trade mark publications and Community marks registered for the earlier version of OFLIP. The UKIPO updated the database using its own trade mark data as well as data from OHIM.

The Community trade mark data include international marks designating the EU. Data on UK and EPO patent publications by British entities were downloaded from PATSTAT version April

5 FAME downloads data from Companies House records where all limited companies in the UK are registered.

2010 and April 2011. Due to the on average 18 months delay between the filing and publication date of a patent, using the April 2011 version means that the patent data are presumably only complete up to the third quarter in 2009. This effectively means that we can use the patent data only up to 2009 under the caveat that it might be somewhat incomplete for 2009. Patent and trade mark data are allocated to firms in the year in which a firm applied for the registration of the corresponding intellectual property.

PATSTAT combines patent information from several sources: DocDB (the EPO master bibliographic database containing abstracts and citations), PRS (the patent register for legal data), EPASYS (the database for EP patent grant procedure data), and the EPO patent register as well as the USPTO patent database for names and addresses of applicants and inventors. PATSTAT covers patent applications made to 80 patent offices worldwide and provides bibliographic details on over 60 million patent applications. Importantly, it also includes information on PCT patent applications as well as patents' legal status while alternative patent databases such as the EPO ESPACE Bulletin do not.

Since IPR records do not include the registered number of a firm even if the applicant is a registered business, it is not possible to merge data sets using a unique firm identifier; instead, applicant names in the IPR documents and firm names in FAME have to be matched. Both, a firm's current and previous name(s), were used for matching in order to account for changes in firm names. Matching on the basis of firm names requires names in both data sets to be `standardized' prior to the matching process in order to ensure that small (but often systematic) differences in the way names are recorded in the two data sets do not impede the correct matching. For more details on the matching see Helmers et al. (2011).

Note that we do not have any information on patent assignments. In contrast, FAME contains information on firms' ownership structure, which can be used to also allocate IP rights across business groups. However, the data used for this report do not account for business groups because the allocation of IP rights across holdings involves arbitrary decisions which we preferred to avoid in this present context.

We deflated turnover and assets using the sector-level producer price deflator provided by the EUKLEMS project for the years 2002-2007 and implied output prices from the ONS Blue Book 2011 for the years 2008 and 2009. The base year is 2005.

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