The European Patent Office and Emerging Technologies

How does the administrative capacity at the European Patent Office relate to the quality of the search- and examination process in the sector of biotechnology?

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Enschede, 23 August, 2011
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List of Abbreviations and Acronyms

COM European Commission
ECLA European Classification system
EESC European Economic and Social Committee
EESR Extended European Search Report
EPC European Patent Convention
EPO European Patent Office
ESR European Search Report
EU European Union
IPC International Patent Classification
NPO National Patent Office
R&D Research and Development
S&E Search and Examination
WIPO World Intellectual Property Organisation
ABSTRACT

In this thesis, I focus on the administrative capacities at the European Patent Office (EPO) and study their relation to the efficiency of the search- and examination (S&E) process of patents. It is often argued that the availability and training of the personnel, in particular examiners, is an important precondition for patent quality and therefore also the quality of the process in which patents are issued.

The focus lies on the sector of biotechnology, as this is a relatively new, emerging technology field and therefore already poses a lot of challenges to the EPO. It will be interesting to see how the EPO has dealt with this technology field in terms of administrative changes, especially as the influx of patents in general is steadily growing. Has the EPO adapted to these changing circumstances?

With this recent development in mind, the aim of my research will be to answer the question:

How does the administrative capacity at the EPO relate to the quality of the search- and examination process in the sector of biotechnology?

In order to approach the main research aim, a longitudinal design will be used, analysing statistical data for the biotechnology sector from a time period of 13 years, ranging from 1997 to 2009.

The main finding of this research is that there is a positive relationship between the administrative capacity at the EPO and the quality of the S&E process in the sector of biotechnology. In the years from 1997 to 2009, as the administrative capacities at the EPO have improved, so has the quality of the S&E process.

CHAPTER 1. Introduction

1.1. Background

“As the Patent Office for Europe, we support innovation, competitiveness and economic growth across Europe through a commitment to high quality and efficient services delivered under the European Patent Convention.”

This mission statement of the EPO, which was published on their official website, shows that patent quality and in particular the quality of the S&E process form central elements of the process of supporting economic growth and innovation.
This paper intends to shed more light on how the EPO pursues those aims with a special focus on the role that administrative mechanisms play in the aforementioned process.

1.1.1 Intellectual Property Rights in Europe

Ever since the Lisbon Strategy for Growth and Jobs was called into existence in 2000, also the need for a better and more effective protection of intellectual property came back onto the agenda.

With the Lisbon Strategy aiming at making Europe "the most competitive and dynamic knowledge-based economy in the world capable of sustainable economic growth with more and better jobs and greater social cohesion" by 2010, intellectual property rights protection is of course a key element of this innovation strategy. Furthermore, Intellectual Property Protection can undoubtedly be seen as a key condition for stimulating innovation, Research and Development (R&D) investment and the transfer of knowledge among the member states and going beyond the borders of the European Union (EU).

In a Communication to the European Parliament, the Council and the European Economic and Social Committee (EESC), the Commission (COM) makes clear that "A clear regime for intellectual property rights is an essential condition for the single market and in making the fifth freedom, the free movement of knowledge, a reality." (COM, 2008)

There exist initiatives to create a unitary title for Intellectual Property Rights in the EU, meaning that that their granting and validity is being governed by a supranational organ, namely the European Patent Office (EPO) having its seat in Munich.

A more specific form of an intellectual property right is patenting, which will be the focus of this thesis.

Patents are "a limited-term exclusive right granted to an inventor in return for the disclosure of technical information from the invention." (COM, 2008)

In the field of intellectual property rights, patents take an especially important place, as they are often referred to as being the main driving force for innovation, competitiveness and economic growth at the European level.

However, the European Patent Protection System is facing multiple challenges. Foremost, these are related to quality issues and dealing with and adapting to newly emerging technologies, which will also play a major role in this thesis.

Another striking challenge in the field of patent protection is, that there is still no common regulatory framework apparent, indicating that the single market for patents is not yet completed.
It is often argued among scholars that the European Patent System suffers from a lack of affordability, consistency and balance between rewards to investors and the circulation of ideas. This can be mainly attributed to the fact that there has been no creation of a single and affordable EU-wide patent yet, even though there have been many calls for that in the past by several heads of states and other actors (COM, 2007). Furthermore, efforts to create an EU-wide patent jurisdiction have also been delayed. The shortcomings of the European Patent System become especially obvious when put in a direct comparison with the leading innovation economies, such as Japan and the USA. In this comparison, Europe clearly lags behind with respect to the costs and the overall effectiveness of the system. (COM, 2007)

However, concerning the quality element of patenting in Europe, it can be said that this is usually perceived to be very high in Europe. Nevertheless, constant reform and improvement is inevitable if Europe wants to maintain its leading position in the global innovation environment. Especially the continually rising number of patent applications at the EPO and the increasing complexity of patent applications pose a number of challenges.

1.1.2 The Procedures

With this background in mind, a closer look can now be taken at the procedural elements of the European Patent System.

"Patent protection for European Member States can be obtained by filing several national applications or alternatively one EPO patent application designating the states for which patent protection is requested." (COM, 2007)

This means that, when filing an EPO patent application, the EPO offers a single procedure for granting patents. However, once the patent has been granted, it becomes a bundle of national patents. Consequently, it becomes subject to the national rules of the contracting EPO states designated in the application.

If patent protection is sought for more than three designated states, filing a European application usually pays off, as it then becomes cheaper than filing independent national applications in those states.

But when is an invention patentable?

Art. 52 of the European Patent Convention (EPC) lays down that "European patents shall be granted for any inventions which are susceptible of industrial application, which are new and which involve an inventive step."

They imply that an invention has to be new, meaning that the claimed subject-matter was not already disclosed before the date of filing (Novelty), non-obvious, meaning that the invention must be sufficiently inventive even for a person skilled in the art (Inventive Step) and industrially applicable (Industrial Applicability).

These features are the so-called patentability criteria.
Art. 53 EPC regulates the exceptions to patentability. "European patents shall not be granted in respect of (...) inventions the publication or exploitation of which would be contrary to "ordre public" or morality, provided that the exploitation shall not be deemed to be so contrary merely because it is prohibited by law or regulation in some or all of the Contracting States." This is particularly interesting in the biotechnology sector, as will be seen in a later chapter of this thesis.

**Search and Examination**

After a patent application has been filed, it is formally examined by the EPO, meaning that it is being examined whether the application fulfils the formal requirements. If this is the case, then the patent application will be published by the EPO as soon as possible. The next phase in the granting process of a European patent is the search phase. In this phase, a “European Search Report” (ESR) is drawn up. According to the Official Journal of the EPO (2007), the “search is an essential element of the grant procedure, being designed to identify prior art, meaning all information that has been made available to the public and relates to the subject-matter, relevant to the application. The intention is to make it possible to determine, on the basis of the documents mentioned in the search report, whether and to what extent the invention is patentable (...).

Knowledge of the prior art forms the basis for examination of the application by the examining divisions. It is also important for applicants, giving them a basis for deciding whether to continue prosecuting their applications and have them examined. Lastly, it is also important for the public and especially for competitors, enabling them to gain an idea of the scope of any protection that might be granted." In short, the search phase is relevant to gather relevant information in order to be able to assess the patentability of an invention. If an invention can already be found in the prior art, the patent application either has to be altered or it will be dropped.

After the search, the phase of "substantive examination" follows. In this phase, the EPO examines “whether the application and invention meet the requirements of the EPC and whether the invention is patentable in light of the search report issued in the search phase.” (Official Website of the EPO)

The examination phase is highly coined by active communication among the examining division of the EPO and the applicant. At the end of the examination procedure, if the examining division decides to grant the patent, the decision is communicated to the applicant and when the various formalities are completed by the applicant, the patent can be granted.

**Opposition**

As a next step, the opposition procedure which the EPO offers in order to give third parties the chance to act against patent granting decisions, which they perceive as being wrongful, will be dealt with.
Harhoff & Reitzig (2004) describe the procedure for filing an opposition to the point. "Up to nine months after the granting date, (…), third parties can attack the European patent centrally at the EPO by filing their opposition against the granting decision. As with the granting decision, the outcome of the opposition procedure is binding for all designated states. (…) The opponent has to substantiate his opposition by presenting evidence that the prerequisites for patentability were not fulfilled, e.g. he has to show that the invention lacked novelty, and/or an inventive step, or that the disclosure was poor or insufficient. (…) At the end of the opposition procedure the chamber may uphold the patent without amendments, or it may amend or even revoke the patent." On average, the opposition procedure takes around 2.2 years if the patent is revoked and about 4 years if the patent is amended. (Harhoff & Reitzig, 2004) The costs for the trial are born by the EPO. The two parties involved have to bear the fee for filing opposition and their attorney costs. Due to the fact that, once filed, a European patent becomes a “bundle” of national patents, a patent holder or opponent faces the risk of multiple litigation in several national jurisdictions, depending on the designated states of the patent, meaning that a patent-holder might have to defend, and that an opponent might have to oppose a patent in front off several national courts, which often handle patent cases differently. This leads to a lack of legal certainty and can become very cost-intensive for both parties. Even though the national proceedings in the sovereign member states differ substantially in their set-up etc., “the opposition-procedure at the EPO, however, can to some extent be regarded as a centralised “first instance challenge suit” for EPO-granted patents.” In short, national litigation on validity or infringement of patent rights before national courts remains sovereign, but loses importance. (Harhoff & Reitzig, 2004) We will go deeper into the dynamics of this process in a later chapter.

1.1.3 Case Selection
For the analysis of the relationship between administrative capacities and the quality of the S&E process, the field of biotechnology has been selected. Biotechnology is defined as “the use of living organisms, (e.g. bacteria), or the enzymes produced by them, in the industrial manufacture of useful products, or the development of useful processes, e.g. in energy production, processing of waste, manufacture of drugs and hormones.” (Chambers 21st century dictionary) The field of biotechnology stands out among classical technical fields, such as machinery, for two main reasons. Firstly, patents in this technology field often do not meet the typical, classical patentability requirements. Mostly this is related to the third criterion, “industrial applicability". This is mainly due to the fact that biotechnology patents, involving matters such as gene sequences, are often not that concrete and tangible as for example machinery patents. This leads to a situation in which uncertainty about the interpretation of patentability criteria arises. (Kica et al, 2010) This makes the technology field
especially interesting, as it can be expected to attract a high number of opposition proceedings.
Secondly, biotechnology patents often include a high level of controversy, mostly related to the involvement of “living material” such as stem cells. Due to this, they often attract a lot of attention from third parties, mostly civil society organisations (activist groups etc.), which can in turn be expected to file opposition proceedings due to moral reasons.
Due to the controversies that biotechnology patenting brings along, it can be expected that the S&E process takes longer on average than this is the case for classical technology fields and therefore also an appropriate number of examiners is more important in the biotechnology sector.
Furthermore, the choice of this technology field is based on the argument of Harhoff & Reitzig (2004) that “alternative means of generating returns to R&D (such as secrecy) are typically not available” for the biotechnology sector. This makes patenting for companies and investors in this technology sector more interesting and therefore a high patenting activity can be expected.

1.1.4 Scientific and Social Relevance
As already mentioned, the steadily growing influx of patents, not only in the biotechnology sector, but in general, poses a major challenge on patent offices worldwide.
The EPO is no exception in this case. The need for reform is acknowledged by many scholars and experts, as well as by the EPO itself. The need for recruitment of further specialized staff has become a highly important feature of the discussion of how to improve the existing system.
I am confident that my research could really contribute to this discussion, as it shows that administrative capacities are clearly linked to the performance of patent offices in adapting to new developments, such as emerging technologies and the growing influx of patent applications.
Even though other quality mechanisms might be as relevant as improving the administrative performance of the EPO, I am confident that the focus on administrative mechanisms is the right choice, as the personnel is the most vital element of the S&E process at the EPO. The examiners provide the direct link between the EPO as the provider of patent grants and the applicants as its customers.

When looking at the social relevance of patents in the biotechnology sector, the important role of patents in general for society as a whole has to be acknowledged. Guellec and van Pottelsberge de la Potterie (2007) argue that the “primary mission assigned to patents by society is to encourage investment in invention (R&D) so as to foster new products and production processes.”
This view shows that patenting plays a crucial role in generating advantages for society as a whole, such as the availability of products and services that might not have been
provided by companies if it weren’t for the possibility to patent their inventions in order to generate profit.
It becomes obvious that a well-functioning patent system is very desirable in order to continue the provision of certain goods to the public.
In the sector of biotechnology, the necessity of useful inventions to be made available to the public is even more distinct, as a majority of biotechnology inventions relate directly or indirectly to producing medication and treating diseases.
The aim of this study, being to shade light on how the European Patent System can be improved, in particular for the sector of biotechnology, determines its relevance, both in the scientific and the social sense.

1.2. Outline of chapters

The reminder of the thesis is organised as follows.
In chapter 2, the conceptual framework will be presented.
Firstly, a literature review will be conducted in order to get an overview over previous studies that have been conducted on the topic of the quality of the S&E process at the EPO and how administrative mechanisms can be related to this.
Secondly, a closer look at important concepts relating to the topic will be taken. A concept relating to a special mechanism for third-party involvement existing in the patent system in Europe, namely the aforementioned opposition proceedings will be presented. More specifically, it relates to why and when they are likely to occur.
Using this conceptual framework as a basis, the main research question will be formulated in Chapter 3, alongside with three subquestions.
Chapter 4 of this thesis deals with the methodology that is being used in order to approach the final research aim.
Firstly, the research design will be presented, before a closer look will be taken at the method of data collection and analysis.
In chapter 5, the empirical findings will be presented and interpreted.
In section 5.1, general figures on patenting in the biotechnology sector, including the number of patent applications, granted patents and opposed patents will be given and analysed.
Section 5.2 deals with the Quality Development of the S&E process, while section 5.3 deals with the administrative capacities at the EPO in the sector of biotechnology.
In Section 5.4 some preliminary conclusions will be drawn.
Section 5.5 relates the findings from the previous sections, thereby creating a link between the two elements.
In Chapter 6 of this thesis, the main findings and answers to the research questions of this study will be presented. Section 6.2 deals with the limitations of this study and the implications that this has for future research on the topic. The thesis will be concluded in section 6.3 by giving policy recommendations.
CHAPTER 2. Conceptual Framework

In this part of my thesis, firstly a literature review will be conducted before taking a closer look at the concepts that are important in order to arrive at an answer to the main research question.

2.1 Literature Review

In the previous literature on patent quality, administrative mechanisms are generally attributed an important role. Wagner (2009) even places administrative reforms at the centre of patent quality mechanisms. In particular, these should include the introduction of supportive means to increase the number of patent examiners, especially in highly controversial and/or newly emerging technology. Therefore, it is interesting to find out how these propositions for administrative reforms look like and to what extent they might have already been realised at the EPO for the biotechnology sector.

Previous studies on patent quality have first of all shown that there is an inherent difficulty in measuring patent quality.

“The evaluation of the efficacy of the examination process at patent offices is a complex task for an external observer, due to the non-eligible level of subjectivity involved in the assessment of the required conditions for patentability of an invention.” (Scellato, Calderini, Caviggioli, Franzoni, Ughetto, Kica & Rodriguez, 2009)

However, there are some studies existent that have aimed at assessing patent quality based on statistical analyses.

The first one to be mentioned here is the study by Harhoff (2006) on patent quantity and quality in Europe. He finds that on average, more questionable patents are being granted by the EPO. Based on the study by Harhoff (2006), it is expected, for the research being conducted in this thesis that the quality of the S&E process in the sector of biotechnology would be decreasing if the EPO did not increase its administrative capacities in this sector.

Another study by Harhoff & Wagner (2009) analyses the duration and outcomes of patent examination at the EPO, using a random sample of more than 200.000 patent applications filed between 1982 and 1998. They argue that the timeliness of the examination process can be seen as an important indicator of the overall level of patent quality. Their main finding is that more controversial claims lead to slower grants but faster withdrawals.

In their analysis, they also refer to biotechnology patents as a classical example for controversial claims and base their main findings on the analysis of those.
This study leads to the acknowledgement of two implications for the research being conducted in this thesis. Firstly, it fortifies the choice of looking at timeliness of the S&E process when assessing patent quality and secondly, it suggests, like the previously mentioned study, that biotechnology patents will be granted on average more slowly than patents from classical technology fields, thereby highlighting the importance of administrative capacities in this sector.

Burke & Reitzig (2007) study the patent assessment quality that patent offices can provide, with a focus on the EPO, by analysing the concordance of the EPO's granting and opposition decisions for individual patents. They regard decreasing patent quality as a consequence of decreasing patent office “service quality”, and therefore they imply an econometric methodology to investigate the degree and typology of inconsistency in patent offices’ decision-making.

They argue that it is desirable, in addition to other mechanisms, to ensure an “appropriate number of examiners to meet demand.” (Burke & Reitzig, 2007) Therefore, it can be said that they, among other scholars, acknowledge the influence of administrative capacities on the quality of patent assessment. Also Burke & Reitzig (2007) have taken notice of the special obstacles that newly emerging technologies pose when it comes to patent quality and patent assessment quality and therefore they chose to focus on the biotechnology industry in the 1980’s, which can be seen as the starting point for biotechnology patenting activity.

They find “no empirical evidence that the EPO provided maximal or optimal assessment quality as far as can be told from bibliographic indicators.” (Burke & Reitzig, 2007) Their study therefore implies that it is important to study the relationship between the number of patent examiners and the quality of the S&E process, especially for newly emerging technologies.

2.2 Concepts

For the conceptual framework, one concept referring to the opposition proceedings has been selected, as these form an integral part in determining the quality of the S&E process at the EPO.

In general, the question “When is opposition likely to occur?” has to be asked in order to understand the dynamics behind this unique institutional feature of the EPO-system.

According to Harhoff & Reitzig (2004), “Opposition at the EPO is the most important mechanism by which the validity of a European patent can be challenged.” They argue that the likelihood of opposition increases, among others, with high technical uncertainty. The field of biotechnology is clearly an example for such a field.

In their article “Determinants of opposition against EPO patent grants – the case of biotechnology and pharmaceuticals”, Harhoff & Reitzig (2004) introduce an important
theoretical concept, which will also be used as a basis for the expectations of this research.
In particular, they develop a “formal model of opposition” based on a classical study by Priest and Klein (1984) in their article “The selection of disputes for litigation” and apply it to the patent opposition procedure at the EPO.
They assume that the parties involved in the opposition proceedings make imprecise assessments of quality and decision standards, but that information is distributed symmetrically.
Furthermore, it is important to take note of one specific, in this case very important, feature of the opposition proceedings. Once an opposition has been filed, the EPO can pursue an opposition case even when the opponent backs out or if both parties agree on a settlement. Therefore, the assumption is made that oppositions that have already been filed will also be tried.
Testing several possible scenarios for likelihood of their possible outcomes, Harhoff and Reitzig (2004) find that if the opponent is optimistic, which means that his subjective probability of winning is higher than the patent holder's assessment, opposition will become more likely. If these costs, however, exceed the gains from reaching a settlement, which would have to be done in advance of filing an opposition, then opposition is not likely to occur.
Thus, Harhoff & Reitzig (2004) conclude that “As the stakes increase and the cost advantage of settlement decreases, opposition is more likely to occur. And the higher the opponent's anticipated probability of winning the case and the lower the patent holder's anticipated probability of losing the case, the more likely opposition will be.”

This concept therefore introduces an important finding that will be used as a basis for the research conducted in this thesis, namely that oppositions will only be filed by third parties when opponent sees a realistic chance of winning, with the consequence of the opposed patent being ultimately revoked.
CHAPTER 3. Research Question

In light of the expectations that have been laid out so far, the overarching research question is being formulated as follows:

**How does the administrative capacity at the European Patent Office relate to the quality of the search- and examination process in the sector of biotechnology?**

To answer the main research question and in order to approach the final research aim gradually, three subquestions have been formulated, which will be answered separately in sections 5.2 to 5.4 of this thesis.

1. Is there any trend in the quality development of the search and examination process in the sector of biotechnology?

2. In what way does the EPO adapt their personnel capacities in the sector of biotechnology to the growing inflow of patent applications in this sector?

3. How can the administrative capacity in this sector be related to the quality of the search and examination process?
CHAPTER 4. Methodology

In this chapter, the approach taken in order to answer the research question will be laid out. In section 4.1, the research design will be presented and justified. This includes setting up a hypothesis and identifying the relevant variables and the indicators that are being used to measure those.

In section 4.2 a closer look will be taken at the method of data collection before shading light on how the collected data will be analysed.

4.1. Research Design

In order to answer the aforementioned research question, explanatory research will be conducted. The main research aim is to detect a possible relationship between the administrative capacities at the EPO and the quality of the S&E process.

It is expected that there is a positive relationship between increasing the administrative capacity and an increasing quality of the S&E process. Therefore, the hypothesis can be written as follows:

*The more administrative capacities, the higher the quality of the search- and examination process at the EPO in the biotechnology sector.*

The independent variable in this study is “administrative capacity” at the EPO in the sector of biotechnology. Here, it has to be kept in mind that this variable is being operationalised as being the personnel capacities (i.e. the number of examiners in the biotechnology sector) in relation to the number of patent applications in this sector for each year from 1997 to 2009.

The choice to plot the number of examiners against the number of applications in order to measure administrative capacity is based on the principle of operation at the EPO, meaning that the examiners work on every patent application from the beginning on and that it is solely their decision whether a patent application is being dropped or examined further. Therefore, there is a direct link between the availability of examiners and the number of patent applications they have to work on.

When using the administrative capacity as the explanatory variable, it is being expected that the level of administrative capacity determines the level of the outcome variable to a certain extent. More specifically, it can be expected, that in years with a high level of administrative capacity, also the quality of the S&E process will be higher.

The dependent variable in this study is the “quality of the S&E process” at the EPO in the sector of biotechnology. Here, it has to be kept in mind that there is not any “actual data” on timeliness, understood as the compliance of the patent office to the time-scales
as desired by the applicants, as there are no deadlines or similar guidelines being set in which time-frame the patent examiners have to finish their work. On the contrary, much discretion is left to the patent examiners in how to and when to conduct S&E of a patent application. In order to measure the dependent variable, two indicators will be used.

The first indicator being used is the average time that has passed between the applications for biotechnology patents until they are ultimately granted. It is assumed that the longer the S&E process took, the lower the quality of this process will have been, as a long duration of this process is often marked by delays and other forms of setbacks that may have been avoidable.

The second indicator being used is the ratio of opposition proceedings being filed with the EPO. As explained in more detail earlier, opposition proceedings can often be seen as a sign for flaws in the S&E process, as they are filed mainly when concerns about the patentability of the subject-matter arise. This implies that the parties filing for opposition will have serious doubts about the accuracy with which the granted patent has been searched and examined. No third party would make the efforts and pay the costs for the proceeding when there were no serious doubts about the legality and appropriateness of the patent grant.

For this research, a longitudinal design will be used, collecting data over a time period of 13 years, ranging from 1997 to 2009. The reason for this is that appropriate, consistent and coherent data on the number of patents and personnel information for the biotechnology sector are available from 1997 onwards until 2009, with the data for 2010 not being published yet. Furthermore, by looking at each year from 1997 to 2009 individually, it is possible to identify certain trends in the development and risk an outlook as to what the future of patenting in the biotechnology sector might look like. For the explanatory research approach, a quantitative analysis will be employed. It will consist of the number of EPO examiners in the biotechnology sector plotted against the number of patent applications in this sector for each year from 1997 – 2009. Furthermore, also the data collected for the the time the S&E procedure takes and the opposition ratio, will be of a quantitative nature. The quantitative analysis of statistical data provides a thorough overview over the development the EPO has undergone in the biotechnology sector for the time frame from 1997 to 2009. Qualitative elements are not part of the analysis as they would not directly contribute to the research aim of identifying a causal relationship over a longer period of time. Pursuing this aim, the analysis of quantitative data is more appropriate and to the point.
In order to approach the final research aim gradually, three subquestions have been formulated. The first two subquestions are of a purely descriptive nature, as they aim at simply describing the development the EPO has undergone concerning the quality of the S&E process and the administrative capacities, both for the sector of biotechnology. The third subquestion aims at relating the first two elements in order to establish a causal relationship between the explanatory and the outcome variable.

4.2. Data Collection and Analysis

The statistical data are mostly retrieved from the official annual reports published by the EPO every year, which have been requested directly at the EPO headquarters in Munich. These contain specific information about the personnel capacities for each technology sector individually. Furthermore, the data about the average time of the S&E process and the number of opposition filings are either retrieved from the annual reports, via the official website of the EPO or direct communication with EPO staff. Since the data is being retrieved from one single source, this source being the EPO, I am confident that they are consistent and reliable.

Based on the numbers and the statistical data retrieved, several calculations have been performed in order to analyse these data properly. To be mentioned here, is the opposition ratio (Fig. 7), which has been calculated by dividing the number of granted patents in the biotechnology sector by the number of opposed patents in that sector for each year from 1997 to 2009, thereby gaining an overview of the development of the relative share of oppositions. Furthermore, an Examiners Ratio (Fig. 8) has been calculated, showing the number of biotechnology patent examiners per 1000 biotechnology patent applications for each year from 1997 to 2009, in order to get an overview over the development of the administrative capacities.

Concerning the analysis of the data, it is important to note that first of all the data for the different elements under study are being analysed separately before they are put in relationship to one another in section 5.5 of this thesis.
CHAPTER 5. Empirical Part

In this chapter, the empirical findings of my analysis will be described and evaluated. In the first section, “Patenting in the biotechnology sector”, some descriptive statistics will be given in order to develop an overview over general developments, including the number of applications, granted patents and opposed patents in the sector of biotechnology between 1997 and 2009.

The second section, “Quality Development”, deals with the first subquestion “Is there any trend in the quality development of the search- and examination process in the sector of biotechnology?” and it gives statistics that describe the quality of this process, based on the two indicators that are being used for its analysis, namely the average time the S&E process took until a biotechnology patents was granted and the opposition ratio.

In the third section of this chapter, “Administrative capacities”, the second subquestion “In what way does the EPO adapt their personnel capacities in the sector of biotechnology to the growing inflow of patent applications in this sector?” is dealt with. For this purpose, an examiners ratio for the years 1997 to 2009 is being computed, showing the number of examiners in the biotechnology sector per 1000 patent applications.

In the fourth section, some preliminary conclusions will be given. In the fifth section, “Relating quality development and administrative capacities”, the above-mentioned elements will be put in relation to one another with the aim of answering the main research question “How does the administrative capacity at the EPO relate to the quality of the search- and examination process in the sector of biotechnology?”
5.1 Patenting in the biotechnology sector

As a first step, general figures and statistics on the development of patenting in the biotechnology sector at the EPO will be presented and analysed critically. The detailed numbers used for this section can be found in Table 1. These figures support the supposition that patenting activity in the biotechnology sector has generally increased and lay the foundation for a deeper analysis of the administrative capacities in this sector and their relationship to the quality of the S&E process.

Figure 1: Biotechnology patent applications filed (1997-2009)

As already mentioned in an earlier chapter, patent applications at the EPO have steadily been rising. The figure shows that this also holds for the applications being filed for biotechnology patents in the time period from 1997 to 2009. While in 1997, 3881 applications for biotechnology patents were filed with the EPO, this number rose steadily until reaching a peak in 2003, with 7217 biotechnology patent applications being filed. Therefore, in a time period of 6 years, the number of applications almost doubled. In 2009, 7164 biotechnology patent applications were filed with the EPO.

This increasing number of patent applications of course poses a huge burden on the EPO. An increasing inflow of applications leads to an increasing workload and it has to be seen whether the EPO has reacted by hiring additional examiners in the sector of biotechnology.

The huge inflow of patent applications can be attributed to the increasingly prominent role that biotechnology patents play in the global innovation environment. More and more companies like Hoffmann-La Roche or BASF rely heavily on patenting their biotechnology inventions in order to generate profit returns from those.
When taking a look at the number of patents granted, it can be observed that as the number of patent applications rises, so does the number of patents granted. This, at first, seems not surprising, but of course it also relates to the capacities that are available to the EPO for performing a thorough and consistent S&E process. In 1997, 1036 biotechnology patents were granted. After that, a steady increase can be observed until 2006, with 2936 patents being granted. Therefore, in a time period of 9 years, the number of granted biotechnology patents has almost tripled. In 2009, 2765 biotechnology patents were granted.

When plotting the number of patents granted against the number of patent applications, it becomes apparent that the relative share of granted biotechnology patents has steadily increased between 2000 and 2009. While in 2000, only 16% of the biotechnology patents that were applied for were also granted after S&E, this share has increased to 38.5% in 2009. Therefore, the relative share of granted patents has more than doubled.
Another important factor to look at is the development of opposition of biotechnology patents from 1997 to 2009 (Fig. 4). The opposition procedure gives third parties the chance to oppose patents that have already been granted when they feel that the granting decision is being wrongful. This can be due to several reasons, such as morality or ethical reasons, but mostly opposition is based on doubts concerning the patentability of biotechnology inventions.

When looking at patent opposition, it can be observed that between 1997 and 2001, the number of opposition filings dropped from 112 to 75. Ever since 2001, the number of opposition filings has increased, from 96 filings in 2002 to 179 filings in 2009, meaning that the number of oppositions being filed has almost doubled.

However, the increasing number of opposition filings goes hand in hand with the increasing number of patents that have been granted and can therefore not be interpreted as a sign for decreasing quality of the S&E process as such. Foremost, it just means additional workload for the patent examiners that deal with these patent oppositions. In the next section, a closer look will be taken at the relationship between the number of opposition filings and the number of granted patents, thereby making statements about the quality development of the S&E process, alongside with an analysis of the timeliness of this process.
5.2 Quality development

In this section, the quality development of the S&E process at the EPO in the sector of biotechnology will be analysed, thereby answering the first subquestion:

*Is there any trend in the quality development of the search and examination process in the sector of biotechnology?*

For this purpose, two indicators will be used. Section 5.2.1 deals with the timeliness of the S&E process by looking at the average time that has passed from patent application to the granting of biotechnology patents from 1997 to 2009. In the subsequent section 5.2.2 the second indicator, the opposition ratio, will be analysed by looking at the share of opposed biotechnology patents in relation to the number of granted biotechnology patents from 1997 to 2009. The detailed numbers used for the analysis in this section can be found in Table 2.

5.2.1 Timeliness of the search and examination process

The average time from a biotechnology patent application to the granting of those is used as an indicator for the quality of the S&E process, as this time period is marked by the work that the examiners perform in between the patent application and the actual grant of the patent. The S&E phase has already been outlined, however it makes sense to look at the examiners' role in this process in a more detailed fashion. After the patent application, the search phase begins, in which the application is being studied by the examiner in order to identify previously published technical disclosures that might be relevant for the assessment of the patentability of the biotechnology invention. The examiners study the description and the claims of the patent application in order to understand its technical contribution and scope. After that, the patent application is assigned to a specific class of the European Classification Scheme (ECLA) within its technology field by the examiners. The examiner's work in the search phase continues with deciding on a strategy to search by selecting the appropriate databases, the keywords to be searched and sometimes by contacting experts on the subject-matter. The search phase proceeds with the implementation of the search strategy that has been selected by the examiners, who then do their best to identify the prior art. After a detailed evaluation of the results and a further evaluation of the patent application, the examiner writes and issues an “Extended European Search report” (EESR), in which the documents found are listed and their relevance for the claims is assessed. Furthermore, the IPC-classes that are relevant to the application are indicated in the EESR. At the end of the search procedure, the EESR is published and forwarded to the
applicant, who has then six months in order to decide whether to proceed with the application. If the applicant decides to do so and pays the examination fee, the examination phase begins. This phase also is marked by an intensive workload for the examiners. It begins with the set-up of the examining division, consisting of three examiners. Even more than the search phase, the examination phase is marked by intensive communication between the examiners and the applicant. This communication mostly relates to the objections that might have been raised during the search phase already and, if objectives are present, is performed via oral proceedings. The examination procedure ends, if the examining division jointly agrees on patenting the invention, with a final communication to the applicant, who then has to complete certain formalities and subsequently the publication of the granted patent by the examiners. This outline shows that the conduct and outcome of the S&E process is highly marked by the performance of the examiners, which in turn depends on the resources these are able to provide.

Figure 5 shows the development of the average time that has passed between the application for a biotechnology patent until its granting in months for the time period of 1997 to 2009. It can be seen that this number has steadily decreased over the years.

**Figure 5:** Average time from application to grant of biotechnology patents (in months) (1997-2009)  
*EPO (1997-2009)*  
While in 1997, a biotechnology patent was, on average, granted 67 months (5.6 years) after its application, this number has dropped to 57 months (4.8 years) in 2009. This significant decrease is rather surprising, as over the years when more and more biotechnology patents have been granted, this goes hand in hand with an increase in the amount of prior art that has to be taken into account when searching and examining new patent applications. However, for newly emerging technologies like biotechnology, this effect can be expected to be counterweighted by the increasing experience in the technology sector, especially concerning the recruitment and constant training of highly skilled personnel. Expecting that the improving timeliness of the S&E process in the sector of
biotechnology, which can clearly be observed in the time-frame from 1997 to 2009, constitutes an improvement of the quality of this process and that increasing administrative capacities have a positive impact on this, it can be expected that the administrative capacities at the EPO will also have increased during that time period, especially when put into relation with the number of biotechnology patent applications.

**Figure 6:** Average time from application to grant in total versus average time from application to grant for biotechnology patents (in months)

*EPO (1997-2009)*

When comparing the average time from application to grant of biotechnology patents to the average time the same process takes for all patents in general, it becomes obvious that there is a remarkable difference.

While the average time for granting a patent at the EPO ranges from 50 months in 1997 to 43 months in 2009, this process took 67 months in 1997 and 57 months in 2009.

This finding supports the expectation that biotechnology patents are generally more complex and more difficult to assess due to the high level of controversy and technical uncertainty that this technology sector brings along.

Based on this finding, it becomes especially interesting to take a closer look at the share of biotechnology patents being opposed, which will be done in the next section of this thesis.

Furthermore, due to the higher complexity of the subject-matter and the difficulty of assessing biotechnology patents, the need for an appropriate number of patent examiners in this technology becomes more and more obvious. In the subsequent sections, it will be examined whether the EPO has been able to adapt its personnel capacities to the special circumstances of this technology field.
5.2.2 Opposition Ratio

The second indicator used for the development of the quality of the S&E process in the sector of biotechnology is the opposition ratio, which has been computed by dividing the number of opposed biotechnology patents by the number of granted patents in this sector for each year from 1997 to 2009.

Figure 7: Opposition Ratio biotechnology (in %) (1997-2009)

Author’s calculations based on EPO (1997-2009)

This figure displays the relative percentages of patents being opposed by third parties. Here, it becomes obvious that post-grant opposition of biotechnology patents has become less frequent when looking at the relative percentages. While in 1997, opposition proceedings were initiated for 10.81% of the granted patents, this number dropped to 6.88% in 2004. After 2004, a small increase can be observed until the opposition ratio reaches its lowest point in 2008, with 5.18% of the granted biotechnology patents being opposed. In 2009, 6.47% of the granted patents were opposed.

The decreasing share of post-grant opposed biotechnology patents marks a clear improvement of the quality of the S&E process, as patents can and will only be opposed if the third party that initiates the proceedings has substantive reason to believe that the patent has been issued wrongfully. No third party would bear the costs and take on the effort of filing an opposition if it sees no chance of the patent being actually revoked in the aftermath.

The reasons for filing an opposition proceeding are basically of two different natures. The first possibility is that the third party has grounds to believe that a breach of Art. 53 EPC is present. This article regulates the exceptions to patentability and lays down that “European patents shall not be granted in respect of (...) inventions the publication or exploitation of which would be contrary to "ordre public" or morality, (...)”.

It can be expected that this is frequently the case especially for biotechnology, as inventions in this sector often involve living material such as gene sequences or enzymes. This concern is often raised by civil society organisations and NGOs, which will not hesitate to file an opposition on this basis when they see a chance of winning.
The other possible reason to file an opposition is if the third party believes that one or more of the patentability criteria (Novelty, Inventive Step and Industrial Applicability), laid down in 52 EPC, is not met by the granted patent. This is more frequently used by competitors and other market actors in the same technology sectors. Irrespective of the reason for an opposition filing, every opposition being initiated can clearly be seen as a sign for flaws in the quality of the S&E process, as it is the examiners' task to search and examine the patent application properly and at best to a degree in which no doubt can be raised over the patentability of the invention. However, this is often not possible and the administrative capacities influence this significantly. Patent examiners work on many different applications at once, and often they don't have the time to investigate each patent perfectly. This leads to the expectation that, as the opposition ratio decreases in the biotechnology sector, as it clearly does from 1997 to 2009, an increase in the administrative capacities at the EPO in this sector should be observable for the same time-frame.

This section has shown, based on the quantitative analysis of the two indicators used, that there has been a clear improvement of the quality of the S&E process in the sector of biotechnology. The average time between application and grant of biotechnology as well as the opposition ratio for biotechnology has steadily decreased from 1997 to 2009, thereby marking an increase in the quality of the S&E process. The answer to the first subquestion therefore is, that there is a positive trend in the quality development.

5.3 Administrative capacities

In this section, the development of the administrative capacities at the EPO in the sector of biotechnology from 1997 to 2009 will be described and analysed, with the administrative capacities being operationalised as being the personnel capacities (number of examiners) in the biotechnology sector in relation to the total number of patent applications in this sector, thereby answering the second subquestion:

*In what way does the EPO adapt their personnel capacities in the sector of biotechnology to the growing inflow of patent applications in this sector?*

The administrative capacities play an important role for quality assurance at the EPO and this is also acknowledged by the EPO, as it becomes visible through the constant recruitment of new staff and intensive training mechanisms.
A particular important element of the administrative capacities are the patent examiners, as they are responsible for assessing the patent applications extensively in the S&E phase, as well as dealing with opposition filings.

It can therefore be said that the patent examiners are part of every single element of the patenting process, thereby always being in close contact with the applicant and other parties having an interest in the process.

During this whole process, much discretion is left to the examiners. They don't have any deadlines or other requirements for timeliness as to when a decision about an invention has to be made. They are simply instructed to perform their task to the best they can, given the resources they have.

In order to study the relationship between the administrative capacities and the quality of the S&E process at the EPO, it is not enough to just look at the development of the number of examiners employed in the biotechnology sector as such. The number of examiners has to be regarded in relation to the number of applications in this sector, as they determine the workload for each examiner individually. For this purpose, a ratio has been computed. The numerical data used for this purpose can be found in Table 3.

Figure 7 shows the Examiners Ratio at the EPO for the sector of biotechnology from 1997 to 2009. It gives the number of examiners per 1000 applications.

This figure shows that the EPO has gone beyond simply adapting to the growing inflow of patent applications in the sector of biotechnology from 1997 to 2009. While in 1997, the examiners ratio amounts to 28 examiners per 1000 applications, this number has steadily risen until 2006, when 37 biotechnology examiners per 1000 applications were employed at the EPO. In 2009, the examiners ratio amounts to 36 biotechnology patent examiners per 1000 applications.

This is a clear sign for the EPO's efforts to improve the quality of its S&E process, to reduce the time until a biotechnology patent is granted, and to ensure “better” patents, that will be expected to be opposed less frequently.
The significant increase in the examiners ratio can be expected to go alongside with a significant increase in the quality of the S&E process, as an individual examiner then has to work on less patent applications at a time and therefore can be expected to be able to put more effort and time into the applications he or she is currently working on.

Based on the findings of this section, the answer to the second subquestion is that the EPO has done more than simply adapting the number of examiners to the increasing inflow of applications. Indeed, it has increased its share of examiners in relation to the number of patent applications in the biotechnology sector, thereby making an effort to increase the quality of the S&E process.

5.4 Preliminary Findings

The previous sections have yielded several interesting results. The overall patenting activity in the biotechnology sector has increased from 1997 to 2009, this includes the number of applications and granted patents, as well as opposition filings.

Concerning the first subquestion “Is there any trend in the quality development of the search and examination process in the sector of biotechnology?”, it can be observed that an overall improvement of the quality of the S&E process has occurred. This is based on two observations. Firstly, the average time from application to grant of biotechnology patents has decreased. Secondly, the opposition ratio has decreased, which means that fewer patents have been opposed in relation to the number of patents that have been granted. When looked at individually, these developments suggest an improvement. When taken together however, the argument that the quality of the S&E process has improved becomes even stronger. Patents have been issued faster, while at the same time granted patents have been opposed less frequently.

The second subquestion “In what way does the EPO adapt their personnel capacities in the sector of biotechnology to the growing inflow of patent applications in this sector?” has been answered in section 5.3 of this thesis. The main finding of this section is, that the EPO has not only adapted its personnel capacity in the biotechnology sector to the growing inflow of patent applications, but it has gone beyond this by increasing the share of examiners in relation to the number of applications. Due to this, biotechnology examiners have to work on fewer applications at once.

Therefore, it can be said that both quality of the S&E process as well as administrative capacities at the EPO have increased.

In the subsequent section, these two elements will be linked, thereby describing the relationship between quality development and administrative capacities.
5.5 Relating quality development and administrative capacities

In the previous sections, we have seen that the quality of the S&E process has increased in the years from 1997 to 2009, as have the administrative capacities at the EPO and that it has gone beyond simply adapting to the growing inflow of applications. In this section, the link between the examiners workload and the quality of the S&E process will be created, thereby answering the third subquestion:

*How can the administrative capacity in this sector be related to the quality of the search and examination process?*

As already outlined earlier, it can be seen that the S&E phase, and thereby the time between the application and grant of a patent, is highly coined by the effort that the examiners put into it. The length of this process is highly influenced by the workload and therefore the number of different applications an examiner is currently working on. The high level of discretion that is left to the examiners in how long they will search for prior art and other relevant documents leads to a situation in which patent examiners might make their effort depending on how much workload they have to cope with individually.

Therefore, the timeliness of the S&E process is very much related to the administrative capacities at the EPO and the fact that an increasing examiners ratio goes along with an increasing quality can clearly be seen as a sign for the influence of the administrative capacities on the quality of the S&E process in the sector of biotechnology.

In the opposition proceedings, the examiners also play a major role in determining how these are being conducted and might influence their outcome. Within 9 months after the publication of a granted patent, third parties are given the chance to oppose it. If this is the case, an opposition division is set up, usually consisting of three examiners. It is important to note that usually one of these three examiners is one that has also already been involved in the S&E phase of that particular patent. The notice of this opposition is then thoroughly examined by the opposition division, which is in close contact with the involved parties, being the patent holder and the opponent. The patent holder is given the chance to propose amendments and most of the time oral proceedings are being held after which the decision whether to maintain the patent in full or amended form or to revoke the patent is made by the examiners.

(Official Website of the EPO)

The important role that patent examiners play throughout the whole process from the application to the outcome of opposition proceedings suggests a strong positive relationship between the administrative capacities at the EPO and the quality of the S&E process.
In order to visualise the relationship between the administrative capacities and the quality of the S&E process, two graphs have been created.

In Figure 9, the Examiners Ratio is plotted against the first indicator that is being used to measure quality of the S&E process, namely the average time from application to grant of biotechnology patents for each year from 1997 to 2009.

Figure 10 plots the Examiners Ratio against the Opposition Ratio, being the second indicator used to measure quality of the S&E process.

The numerical data used for this analysis can be found in Table 4.

**Figure 9: Average Time by Examiners Ratio**

*Author's calculations based on EPO (1997-2009)*

Figure 9 shows a negative linear association between the examiners ratio and the average time from application to grant of biotechnology patents. This in turn supports the expected positive relationship between the examiners ratio and the quality of the S&E process.

While in 1997, an examiners ratio of 28 was associated with an average duration of 67 months to grant a biotechnology patent, in 2009 the higher examiners ratio of 36 examiners per 1000 applications was associated with an average duration of only 57 months to grant a biotechnology patent. This implies that between 1997 and 2009, increasing the number of examiners per 1000 applications by 8 was accompanied by a reduction of the average duration to grant biotechnology patents by 10 months, which is almost one year.

Even though this development is not perfectly steady, a clear pattern can be observed in this graph. While in the early years under study, in this case mainly from 1997 to 2003, a higher average duration was associated with a relatively low examiners ratio, the subsequent years (2004-2009) show a relatively short average duration accompanied by an increasing examiners ratio.
Figure 10 shows a similar pattern as Figure 9. There is a negative, moderately linear, relationship between the opposition ratio and the examiners ratio. This implies, based on the expectations, that there is a positive association between the number of examiners per 1000 applications and the quality of the S&E process at the EPO in the sector of biotechnology.

In 1997, an examiners ratio of 28 was associated with an opposition ratio of 10.8%, in 2009 an examiners ratio of 36 is accompanied by an opposition ratio of 6.5%. This implies that between 1997 and 2009, increasing the number of examiners per 1000 applications by 8 was accompanied by a decrease in the opposition ratio by 4.3%

While in the early years under study, mainly from 1997 to 1999, a high opposition ratio is accompanied by a low examiners ratio, this picture has changed in the later years under study, mainly from 2001 to 2009, a low opposition ratio is accompanied by an increasing examiners ratio.

The analysis of these two graphs shows, that as the administrative capacities increased, so did the quality of S&E.

Therefore, the hypothesis

*The more administrative capacities, the higher the quality of the search and examination process in the biotechnology sector*

can be regarded as being confirmed.
CHAPTER 6. Conclusion

6.1 Main Findings

Next to the findings that there is a general increase in patenting activity in the biotechnology sector, a positive trend in quality development of the S&E process in the sector of biotechnology, and a remarkable increase in the administrative capacities at the EPO in the sector of biotechnology, which have already been put forward in section 5.4 of this thesis, the main finding of this research is that there is a positive relationship between the increasing administrative capacities at the EPO and the improvement of the quality of the S&E process in the sector of biotechnology for the time frame from 1997 to 2009.

Therefore, based on the observations of the quantitative analysis, the hypothesis:

*The more administrative capacities, the higher the quality of the search and examination process in the biotechnology sector*

is confirmed.

The EPO has gone beyond simply adapting its personnel capacities in the sector of biotechnology to the growing inflow of patent applications in this sector, and has thereby made an effort to increase the quality of the S&E process. This study has shown that the EPO’s efforts in this sense have been effective, as a significant improvement of the quality of S&E in the sector of biotechnology has been observed in the time frame from 1997 to 2009.

The formulation of the research question implies that the main aim of this study is to observe a development and to make statements as to what this development looks like. The longitudinal design and thereby the analysis of quantitative data for a period of 13 years has allowed for this, by giving a thorough overview over the development of the relationship between the administrative capacities on the one hand and the quality of the S&E process on the other hand.

In order to approach the main research aim, the formulation of three subquestions and answering each of them separately before putting the results together has paved the way to reach a clear final conclusion that there is a clear positive relationship between increasing the administrative capacities at the EPO and an improvement in the quality of the S&E process in the sector of biotechnology.

By selecting the sector of biotechnology, being an emerging technology field, a sector that is marked by high technical uncertainty has been chosen. Based on this, the findings of this research can be regarded as an important lesson for the EPO, which is still in the process of adapting to the challenges that newly emerging technologies bring along when it comes to patenting.
So far, based on the observations from 1997 to 2009, it can be concluded that administrative capacities have lived up to the expectations that were put on their ability to influence the quality of patent assessment significantly. Based on previous literature dealing with patent quality, often highlighting the centrality of administrative mechanisms as a major instrument for improving patent quality, it has been shown that the relative share of examiners is indeed an important determinant of the quality of patent examination at the EPO. Due to the high level of discretion that is left to patent examiners in the S&E process, their influence on its conduct and outcome is significant.

**6.2 Limitations and implications for future research**

When thinking about possible limitations that might play a role in this study, it becomes apparent that administrative mechanisms are certainly not the only factor to be considered when it comes to attempts to improve the quality of the search and examination procedures at the EPO. Other factors include Patent Law and organisational changes (including changes in patentability standards and the organisational structure), changes concerning the availability and provision of information to patent applicants and examiners (including access to e.g. scientific and patent literature) and technical advancement for examiners (such as training schemes and qualification schemes for examiners). (Rodriguez & Kica, 2010)

However, administrative mechanisms are the central focus in this thesis, as administrative mechanisms are expected to play the central role in the S&E process. The personnel, in particular the examiners, at the EPO constitute the direct link between the EPO as the provider of patent grants and the applicants as its customers. There is a direct communication between the EPO personnel and the applicants and therefore it can be expected that the quality of the S&E process is directly influenced by the number of examiners being available for the technology sector of interest. Therefore, I am confident that the study of administrative capacities in this context grasps a major element and thereby provides important insights.

Future research should include an analysis of other factors that are expected to be influential in determining the quality of the S&E process at the EPO. Due to limitations of time and resources for this study, these have been left out. Nevertheless, their existence and possible influence should not be neglected.

In this thesis, when making statements about the relationship between administrative capacities and the quality of the S&E process at the EPO in the sector of biotechnology, it has to be kept in mind that the for the quantitative analysis simply numbers are being studied and put in relation to one another. For the research aim of this thesis, this is
most appropriate and to the point as the observation of the development over time is of interest here. However, it might be interesting to perform future research that includes an in-depth study of the effect of the discretion that is left to patent examiners in the S&E process on the quality of this process. This research should be of a qualitative nature in order to be able to fully grasp the dynamics of the work ethics and conduct of patent examiners' work.

6.3 Policy Recommendations

The EPO should continue to increase its relative share of biotechnology examiners, especially in relation to the increasing number of patent applications. It has been proven that administrative capacities play an influential part in increasing patent quality and that the increasing administrative capacity is positively related to the increasing quality of the S&E process at the EPO. It is important that the EPO continues to make efforts in order to keep this trend up. This might be helped by an introduction of supportive means for hiring additional examiners, meaning that the EPO should not hesitate to provide further financial means for this purpose.

It can be expected that a larger examiners ratio can also increase the quality of the S&E process in other technology sectors than biotechnology. Even though the biotechnology sector is marked by special circumstances, making appropriate administrative capacities even more necessary, this doesn't mean that the importance of increasing administrative capacities can be neglected for other sectors. Therefore, the EPO should consider recruiting more examiners in every technology sector.

Furthermore, it is important that the EPO observes the development of patent applications carefully so that it can continue to fit its personnel capacities to this growing inflow. The EPO is already conducting several surveys and campaigns in order to assess and increase patent quality. However, it would be desirable for the EPO to put more emphasis on administrative mechanisms when trying to find ways to improve the output of the patent granting procedure.

All in all, it can be said that the EPO is on the right track regarding the improvement of patent quality through increasing its administrative capacities, especially for emerging technologies, but the reservoir of means and instruments being used for this purpose is far from being exhausted.
References


Kica, E., & Groenendijk, N. The European Patent System: Dealing with emerging technologies. Department of Legal and Economic Governance Studies, University of Twente, the Netherlands.


**Websites**


### Appendix

**Table 1: Patenting in the biotechnology sector (1997-2009)**

<table>
<thead>
<tr>
<th>Year</th>
<th>Applications filed</th>
<th>Granted Patents</th>
<th>Grant Ratio (in%)</th>
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**Table 2: Quality of the S&E process (1997-2009)**

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### Table 3: Administrative capacities (1997-2009)

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<th>Examiners Ratio, biotechnology (Number of examiners per 1000 applications)</th>
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### Table 4: Relating administrative mechanisms and quality development (1997-2009)

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<th>Examiners Ratio, biotechnology (Number of examiners per 1000 applications)</th>
<th>Average time from application to grant, biotechnology (in months)</th>
<th>Opposition Ratio (in%) (Opposed patents/Granted patents)</th>
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