Deutsche Biotech-Unternehmen und Ihre Innovationsfähigkeit im internationalen Vergleich
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Summary

1. Introduction

In the mid-1990s, legal changes and policy initiatives in Germany led to the rapid emergence of a biotechnology industry. Initially, German biotech companies focused on the market segment of platform technologies, characterized by incremental innovations. In recent years however, many companies have shifted their strategic focus on the market segment of therapeutics, characterized by radical innovations. Since an active involvement in such a segment is untypical for German companies the central research question of this thesis was, if the German institutional framework allowed biotech companies to be internationally competitive in a radical-innovative market segment. The findings are particularly relevant for the literatures on “Varieties of Capitalism”, “National Innovation Systems” and for the sociology of technology. The British and the US biotech industry served as a comparison for the validation of the German case study.

2. Theory

The fact that German biotech companies have become active in the field of therapeutics, where both financial and technological risks are extremely high, contradicts an essential assumption of the “Varieties of Capitalism” (abbr. VoC) literature. The proponents of the VoC classify Germany as a coordinated market economy, dominated by non-market institutions and long-term relationships. In addition, they presume that such a type of market economy is not compatible with competitiveness in a market segment characterized by radical innovations. Biotech-companies that are active in the field of therapeutics are in need of a large and professional venture capital industry (abbr. VC industry) as well as a very flexible labour market for scientists and managers, given that most of the research projects fail. According to the VoC-approach, neither a flexible labour market for scientist and managers nor a professional VC industry is existent in Germany. Instead, German biotech companies are predominantly financed by public or publicly subsidized venture capital. In contrast, the US and Great Britain are expected to be very competitive in high-risk segments like biotech-based therapeutics due to their institutional frameworks. They are classified as liberal market economies, dominated by market institutions and short-term relationships. Both a large and professional VC industry and a very flexible labour market are in place. Thus, the hypothesis of the VoC-approach is that liberal market economies like the US and Great Britain would clearly
outperform the German coordinated market economy in the high-risk-segment of therapeutics.

Unlike the “Varieties of Capitalism”, proponents of the “National Innovation Systems” argue that German biotech-companies can compete with British biotech-companies in the high-risk segment of therapeutics because in recent years a professional VC industry has developed in Germany. At the same time, the flexibility of the labour market is not regarded as relevant for the competitiveness in high-risk segments.

What is more, the two approaches have conflicting views concerning the competitiveness of the American and the British biotech industry. The main proponents of the VoC see both biotech industries as highly successful due to the existence of large capital markets as well as flexible labour markets. The representatives of the “National Innovation Systems” presume, in contrast, that the US-biotech industry clearly outperforms the British biotech-industry given the massive governmental funding it receives.

Within the field of sociology of technology, Sorge suggested a relationship between the specific institutional configuration of the German society and its handling of technical innovation. He presumes that new technologies mature over time and hence the first phase of radical innovations is followed by a second phase of incremental innovations. According to Sorge, if there are first signs of the latter phase, German companies become involved in new fields of technology. Such an attitude towards new technologies originates from the professional socialisation of the German engineers where theory and practice is much more intertwined than in many other countries. As a consequence, we can deduce as a hypothesis that the development of biotech-based therapeutics has passed through a process of maturation and is now dominated by incremental innovations. Thus, German biotech-companies have shifted their focus to this market segment because it has proven to be of practical value.

3. Research Design

The competitiveness of the German biotech-industry in the market segment of therapeutics was assessed by a comparison with the British biotech industry, as the largest industry in Europe and the second largest in the world. The key indicator for competitiveness was the amount of therapeutics in clinical trials by biotech-companies in each country. Therefore, all biotech companies with therapeutics in clinical trials were surveyed. Moreover, to analyze the impact of national institutions on the competitiveness of
therapeutics companies, more than 40 interviews were conducted with company representatives and experts. This was complemented by the evaluation of publicly available statistics. For the comparison with the US-biotech-industry, relevant literature and publicly available sources were analysed. In addition, some interviews were conducted with venture capital managers investing internationally in biotech companies.

4. Competitiveness in the Market Segment of Therapeutics

In a first step, the competitiveness of German and British biotech-companies in the segment of therapeutics was compared. The difference with regard to therapeutics in clinical trials is substantial but far smaller than expected. According to Der Spiegel, in 2003 British biotech companies had many more therapeutics in clinical trials than the German ones: 200 (GB) compared to 15 (GER). In contrast, my investigation showed that in 2004 British biotech companies had only 122 therapeutics in clinical trials and the German ones 68. Taking into consideration that the German biotech-industry emerged 15 years after the British biotech-industry and that the development of therapeutics is very time-consuming (12 years, until clinical trials about 5 years), I conclude that the British compared to the German biotech-companies are similarly competitive in the field of therapeutics. This interpretation is corroborated by the fact that the amount of biotech-companies with therapeutics in clinical trials is identical between Germany and Great Britain (34).

5. Change of Strategy due to a Process of Maturation?

The result of the empirical analysis was that hardly any of the German biotech companies which had therapeutics in clinical trials have shifted their strategic focus in recent years. Most of them were already founded with the intention of developing therapeutics. Nonetheless, there was a strategic shift in the biotech industry from platform technologies to therapeutics, not only in Germany but worldwide. But presumably, the therapeutics of the companies that changed their strategy are still in preclinical trials.

A real process of maturation in the development of therapeutics has not taken place so far, there are only first steps which could lead to maturation in the future. Only a minority of the German biotech companies develop therapeutics that are incremental innovations. However, this was not due to technological breakthroughs in the bioscience but rather caused by the risk aversion of investors and could be observed internationally. But meanwhile, around 2000/2001, many actors of the industry had the expectation that
advances in the biosciences would significantly reduce the percentage of therapeutics failing in development – even though this turned out to be a misguided expectation eventually. So for a certain period of time there was a perceived or subjective process of maturation. But nevertheless, it is rather unlikely that this subjective process of maturation was the main reason for a change of strategy since many industry experts have described the attitude of German biotech managers towards the development of therapeutics as totally naïve and not as precautionful. It is more likely that changed preferences of global pharmaceutical corporations and investors were the driving force of the strategic change.

6. German and British Biotech Companies and their Access to Venture Capital and the Stock Exchange

In the access to VC, British biotech companies have a small advantage. Since 2003, the VC investments in the British biotech were approximately 250 Mio. Euro and the investments in the German biotech industry stabilized slightly above 200 Mio. Euro. For Great Britain the figures were startling given that it has a large venture capital industry. However, it turned out that only a small percentage is actually invested in the biotech industry. Besides, the German biotech industry has seen a change in kind and origin of investors take place. After the worldwide slump of the valuation of biotech companies in 2001 most German investors withdrew from this industry. But to a considerable extent, this was offset by the influx of international investors. Since 2003, international investors have been in the majority in financing German biotech companies. Apart from that, it turned out that German biotech companies with therapeutics in clinical trials are predominantly funded by private and professional venture capital companies and not by public and inexperienced ones.

In recent years, initial public offerings (IPOs) of biotech companies were easier to obtain at the London Stock Exchange (LSE) than at the Deutsche Börse. However, most of these IPOs in Britain were very small, so that the companies raised modest amounts of equity. Medium-sized IPOs of biotech companies succeeded in both countries, but were rare. Thus, no advantage of any country was observed. Finally and somewhat unexpectedly, the market capitalization of biotech companies at the Deutsche Börse slightly exceeded the LSE’s. Yet again, it was rather low in both cases. In sum, in the access to
venture capital and the possibility of IPOs Great Britain does have at the moment an advantage over Germany, but it is only a minor one.

7. Governmental Funding of British and German Biotech Firms

In both countries, governmental funding of biotech companies exists and to a certain extent its level and kind has converged recently. In Germany, public funding declined after the downturn of the biotech industry in 2001. In Great Britain, in the end of the 1990s the government provided some seed funds for young biotech companies to improve their financial situation. At the same time, public funding of biotech companies is still better developed in Germany than in Great Britain. This is also corroborated by a comparison of the therapeutic companies in both countries. However, it is important to note that the public funding German therapeutic companies have received, is only a small percentage of their entire funding. So there is only a small competitive advantage for German biotech companies and it is hardly possible to argue that these companies develop therapeutics because of governmental funding.

8. The Labour Market for German and British Biotech Companies

In the biotech-related disciplines there is abundance of highly qualified scientists in the biotech-related disciplines in both countries. An advantage for Great Britain is the larger pool of experienced biotech managers, which is not surprising since the British biotech industry emerged 15 years earlier. Apart from that, German biotech companies employ fewer managers with past experience in the pharmaceutical industry for different reasons. Firstly, the long-term employment security in the German pharmaceutical industry reduces the incentives for managers to change to a biotech start-up whose long-term future is not assured. Secondly – and for Anglo-Saxon VC managers this reason was more relevant – a process of consolidation in the pharmaceutical industry occurred in Great Britain ten years ago. As a consequence, many managers were released. In Germany, this process has just started. Thirdly, and this is related to the first point, due to the head-start of the British biotech industry, there are more mature biotech companies in Great Britain. This implies in turn that mature biotech companies are more attractive to pharmaceutical managers because these companies have on average a better viability. Irrespective of this mentioned, there is a notable amount of managers with a pharmaceutical background, especially in strongly funded and advanced German biotech companies. Another difference between both countries is that lay-offs in German companies
are slightly more expensive and bureaucratic than in Great Britain. But again, it is only a minor difference. If a project has failed, German biotech companies are able to dismiss employees relatively easily. Finally, co-determination in the form of works councils or employee-representatives in the supervisory board is of no importance because of the small size of this industry but also the low interest of employees.

9. US and Great Britain – Liberal Market Economies Compared

The overall conclusion of this comparison was that the US biotech industry is much more competitive than the British one. Only very few British biotech companies are of international importance, a finding that is transferable to different high-tech industries like semi-conductors or software. A central cause for the dominance of the US in the biotech-industry is the annual amount of invested venture capital which is more than ten times higher than in Great Britain. Even if we consider that the size of both market economies differ significantly this reveals an important advantage to the US. However, a lack of highly qualified scientists as a reason for the low venture capital investments in British biotech firms could be ruled out. Apart from that, a second central cause for the worldwide dominance of the US biotech-industry is the tremendous governmental funding not only of academic science but also of companies. There are strong indications that the massive funding of young biotech companies in the US attracts subsequent venture capital investments in these companies. The product development in the biotech industry – particularly in the segment of therapeutics – is very time-consuming and often exceeds the time-horizon of venture capital companies. Public funding of young companies makes it possible for them to move their products forward, up to the point at which they become interesting for investors. The public funding of British biotech companies which has started only recently and is still on a low level, is probably a main reason for scarcity of venture capital in the British biotech industry.

10. Conclusion

The central result of the British-German comparison was that the German biotech companies are internationally competitive in the market segment of therapeutics that is dominated by radical innovations. This assessment is supported by the analysis of the institutional frameworks in which German and British biotech companies are embedded. Differences exist between the relevant national institutions in both countries – British biotech companies have easier access to venture capital and experienced managers,
German biotech companies have better access to governmental funding - but these differences negligible. Moreover, some of these differences – like for example the lack of experienced biotech managers - are not a result of unfavourable institutions at present but mirror a time-lag, that is, the delayed establishment of institutions, and they should diminish over time.

This empirical result clearly contradicts the “Varieties of Capitalism” approach which maintains that companies in a coordinated market economy cannot be competitive in a market dominated by radical innovations. The institutional context in which German biotech companies operate differs in core respects: they have access to professional venture capital companies; only a small percentage of their total funding is from public sources; lay-offs due to failed projects are indeed possible; many therapeutic companies employ former pharma-managers; co-determination is virtually non-existent.

Also the comparison of the American and the British biotech-industry and their institutional embeddedness revealed weaknesses of the “Varieties of Capitalism” approach. The US biotech industry is much more competitive than the British one and one main cause for this is the massive public funding, especially of young biotech companies, which does not fit the view that the US is a clear-cut liberal market economy.

At the same time, despite these outcomes the proponents of the “Varieties of Capitalism” are not entirely wrong. Metaphorically speaking, the German biotech companies are not embedded in a coordinated market economy but rather located at their fringes. The German biotech companies can be successful in the high-risk segment of therapeutics because there is a relatively flexible labour market and access to professional venture capital companies. With a rigid labour market and bank loans it would not be possible and if the typical features of the coordinated market economy were interfering with the biotech industry, like for example the long-term dismissal protection in the German pharmaceutical industry, the effect would be negative. By the same token, the dominance of the US biotech industry stems not only from public funding but also from a large capital markets and flexible labour markets.

A process of maturation based on Sorge has not occurred yet in the biotech-based development of therapeutics even if there have been some advances that could lead to maturation in the future. The “National Innovations Systems” approach was confirmed for the most part: German biotech companies are internationally competitive in the
high-risk segment of therapeutics and the institutional frameworks in which German and British biotech companies are embedded do not differ significantly. Besides, massive public funding explains to a considerable extent the superiority of the US to Great Britain in biotech. Notwithstanding, I argue that the “Varieties of Capitalism” is still the best approach for analysing the relations between institutions and innovations provided that three insights are taken into account: (1) the dominant institutions in a market economy do not have an effect on all sectors in a similar and decisive way; thus, radical innovations can also be possible in a so-called coordinated market economy (2) one central precondition for the success of a market economy in a high-tech industry like biotech is massive public funding of young companies; (3) new technologies change over time in their innovative character due to processes of maturation and it is important to distinguish between subjective and objective processes of maturation.

The “Varieties of Capitalism” approach is preferable to the “National Innovation Systems” approach because the latter is not really a theoretical approach, as it does not strive for general conclusions and has an underdeveloped analytical framework. The strength of this approach emanates rather from the detailed empirical descriptions of specific innovation systems.