

Can new technology firms succeed in coordinated market economies? A response to Herrmann and Lange

Steven Casper

Keck Graduate Institute of Applied Life Sciences, Claremont, CA, USA

Correspondence: steven_casper@kgi.edu

Keywords: capitalism; varieties of; firm strategy; innovation; financial institutions; financial markets; human capital

JEL classification: P48 political economy; legal institutions; property rights; L65 industry studies: biotechnology; M13 new firms; start-ups

The performance of the therapeutics segment of the German biotechnology industry has become a focal case for debate over the usefulness of the varieties of capitalism (henceforth VOC) perspective in helping to explain cross-national variation in the organization and strategy of companies (Hall and Soskice, 2001). Articles in a recent and the current volume of SER by Herrmann (2008) and Lange (2009) draw on the existence of numerous German biotechnology firms focused on therapeutics discovery to contest the saliency of one of the VOC approach's core claims: that patterns of comparative institutional advantage structure patterns of national specialization across different types of innovation focused industries. Both authors present evidence that German firms in recent years have come close to matching the performance of those in the United Kingdom, once Europe's clear leader in biotechnology and an ideal-typical liberal market economy, in inventing new drug therapies. Lange also demonstrates that between 2001 and 2007, German biotechnology firms have narrowed a once large gap between the two countries in the drug development pipeline. The apparent success of German firms in a radically innovative industry such as biotechnology clearly runs counter to the key claim made by VOC proponents, including myself, that coordinated market economies should perform poorly in radically innovative industries.

Herrmann and Lange show (and my own research also suggests) that German biotechnology firms strive to develop patterns of work organization, remuneration, and financing that resemble the Silicon Valley model commonly used in the USA (Casper, 2007). Elements of this model include the use of venture capital and eventual stock market offerings to finance risky ventures, the use of stock-options and related financial incentives designed to foster fast-paced work environments, and the acceptance, on the part of skilled employees, of low employment security created by both the technological volatility of biotechnology start-ups and their high propensity to fail. Given that the German model has typically promoted credit-based financing, low-powered work incentives, and long-term employment, how is the 'Silicon Valley model' sustainable in Germany?

Herrmann and Lange both acknowledge the importance of institutions in structuring business practice in Germany but draw on a wealth of interview-based evidence to show that successful German biotechnology companies have, to use Herrmann's term, 'defected' from the German model. Small technology intensive firms can easily convince employees to ignore elements of the German industrial relations model, such as work councils, and they typically do not fall under industry wage agreements. Lange argues that such alternative patterns of company organization represent a case of institutional heterogeneity that recent scholarship (Allen, 2004; Schneiberg, 2007) has suggested exists in most economies, but is marginalized by the emphasis, within the VOC school, on developing coherent national models. Herrmann emphasizes the creativity of entrepreneurs, who, at best, appear to engage institutional frameworks selectively, choosing to craft sector-specific governance arrangements.

In addition to firm level experimentation, Herrmann and Lange stress the importance of globalization in creating new opportunities for firms located within inappropriate national institutional environments. Particularly within the tightly knit European economies, it makes sense that companies can shop around for needed resources. This is clearest in the case of venture capital. While most early or 'seed' financing within German biotechnology companies has come from local investors, both public and private, there are numerous cases of German companies successfully recruiting UK companies to join syndicates for follow-on financing rounds. Moreover, the largest UK venture capital firms, such as 3i, have set up offices in Munich, Germany's major biotechnology hub. German biotechnology firms can also shop globally for talent. Herrmann cites an interesting study by Jong (2006) showing that half the CEOs of Munich biotechnology firms are of international origin. My own research on the Munich cluster corroborates this finding; many of the senior executives of these firms are German 'returnees' with valuable experience in the US biotechnology sector. German firms have also routinely tapped into the international

networks to recruit members to scientific advisory boards; in 2003, foreigners comprised 59% of the scientific advisors of Munich biotechnology firms (Casper and Murray, 2003, p. 339).

An important criticism of the varieties of capitalism research is the eagerness of its advocates to 'read off' patterns of industrial organization from macro-level institutional architectures. Particularly when studying experimental new technology industries, this approach is dubious. Herrmann and Lange have both conducted insightful multiple-methodology and cross-national studies that carefully examine how biotechnology companies engage (and sometimes ignore) institutions. Most broadly, comparative institutional research should not assume that firms or other actors are reflexive to the institutions they are embedded within. Surveys of German biotechnology firms taken during the height of the country's technology boom, in 2001, showed that 65%, or 240 biotechnology firms, had adopted therapeutics discovery as their primary discovery strategy (Ernst and Young, 2002). At about this same time, I had published an article (Casper, 2000) suggesting that German companies had a comparative institutional advantage in more medium-tech biotechnology segments focused around research tools and other 'platform biotechnologies' that bore a resemblance to the machine tool industry and should specialize in these segments. Clearly, this message fell on deaf ears. German entrepreneurs have been far more responsive to international trends in the organization and strategy of biotechnology companies than to local institutional framework conditions.

Has Germany succeeded in biotechnology? An argument can be made that Germany has not. While both Herrmann and Lange present effective data on the firms that they study, there is an important selection bias in both studies. Herrmann focused primarily on companies that had successfully invented a new chemical entity. Lange studied German biotechnology firms that had attained sufficient resources to push compounds into expensive second or third stage clinical trials (35 firms in 2007). These are the crafty firms that have successfully embraced alternative organizational models and international networks to develop viable competencies. However, during the 1995–2000 period, over 400 biotechnology companies were founded in Germany, the majority of which were focused on radical innovation in therapeutic discovery.

How has this broader pool of companies performed? The answer, for the most part, is poorly. While Germany, as of 2004, had substantially more companies than the UK (346–275), the German firms employed less than half the number of people as the UK sector (10 079–22 000; Casper, 2007, p. 108). Moreover, these employment data are highly skewed. Over 40% of employment within German biotechnology is within the 30 largest firms (i.e. the successful firms). Over half of German biotechnology firms employ <10 people, and over 80% employ <30 (Casper, 2007, p. 97, based on Ernst and Young survey data). The

financing prospects of most German biotechnology firms are bleak. In 2004, about \$195 million was invested into German biotechnology (compared with \$390 million in the UK; Casper, 2007, p. 108). A good portion of these funds was targeted at the 30 expensive stage 2 or 3 clinical trials within several of the 35 larger companies examined by Lange. Most German biotechnology firms were initially funded during the period from 1995–2000 through a combination of federal and local venture capital funds, matched by local venture capital investments. As discussed by Lange, the *Neuer Markt* stock market designed for technology listings lost 90% of its value as part of the collapse of the Internet bubble and was forced to close. Since 2001, 80% of German venture capitalists have closed shop, while the federal public venture capital program wound down in 2001. German biotechnology companies with assets that compare favourably with UK and US companies do continue to have both venture financing and stock market listing options on the mainline German stock exchange or abroad. However, most German biotechnology companies, some 270–300 firms, are currently starved of capital and face extremely unfavourable prospects. In part to avoid a politically embarrassing collapse of the German biotechnology industry, many smaller companies have, during the mid-2000s, received grants from two government programmes discussed by Lange, *BioChance* and *BioChance Plus*.

While it is important to explore the creativity of entrepreneurs in reinterpreting or, at time, ‘defecting’ from home institutional constraints, these constraints have strongly impacted the majority of German biotechnology firms. The financial problems facing most German companies stem in large part from the primary orientation of the German financial system towards credit or bank financing. Given the collapse of both the *Neuer Markt* and the German venture capital industry, would it be far off base to suggest that the financing situation facing most German entrepreneurial firms in the late 2000s is similar to that in the early 1990s?

A similar argument can be made surrounding labour markets. Herrmann’s study of the skill composition of different types of pharmaceutical firms in Germany, the UK and Italy is important. Little comparative research exists that systematically explores the ability of high-technology companies to develop adequate human capital. Herrmann finds that radically innovative companies in Germany are able to match the skill composition of their competitors in the UK and Italy. My own research on the skill composition of German biotechnology firms comes to a similar conclusion on general skills, but not industry-specific skills. A study from 2002 of 44 German biotechnology companies located in four of the larger regional clusters showed that most firms were staffed by numerous PhD level scientists; about half of 299 scientists in the study had a previous academic affiliation with the academic founder of the company. However, the study also found that only 11% were directly recruited

from either a biotechnology firm (4%) or a pharmaceutical firm (7%); all others were recruited from universities (Casper, 2007, p. 99). Comparative data on biotechnology firms in the Cambridge region of the UK showed that 67% of scientists had previous industry experience, mostly within the UK pharmaceutical industry (Casper, 2007, p. 116).

The inability of most German biotechnology firms to secure scientists with industry experience is consistent with expectation from the VOC perspective. While long-term employment patterns continue to exist within the German pharmaceutical industry, they do not within the UK. Between 1995 and 2005, over 10% of the workforce within the UK pharmaceutical industry, about 25 000 people, were laid off through a series of mergers (Casper, 2007, pp. 114–115). While the German pharmaceutical industry has experienced downsizing through commonly used instruments such as reduced hiring and early retirement, it has never experienced a lay-off wave similar to that within the UK. The 44 German biotechnology companies I surveyed include most of the larger companies active during 2002, and thus overlap significantly with Lange's pool of companies. These data show that even the successful German biotechnology companies employ dramatically fewer scientists with industry experience than their foreign competitors. Most of the 300 smaller, underfinanced companies that comprise the bulk of the German biotechnology industry presumably face similar labour market constraints.

To summarize, two narratives must be taken into account when studying the case of German biotechnology. The narrative privileged by Lange and Herrmann stresses the ability of a successful pool of German companies to develop creative strategies needed to overcome an inhospitable home institutional environment. The emphasis on agency, on creating a firm-centred approach to comparative political economy, is important and helps counter the unfortunate trend in many studies to read off outcomes within the economy from institutional architectures alone. The second narrative focuses on the broader industry, assessing the winners *and* losers. The losers in German biotechnology currently vastly outweigh the winners. This might be seen as acceptable, given that a high percentage of biotechnology firms in the US and UK are known to fail. However, institutional factors privileged by the VOC perspective suggest that most German biotechnology firms are currently incapable of obtaining either the financing or the industry-specific human capital needed to compete successfully. While financial and labour market institutions serve as a reference point for the more successful firms—something either to defect from or work around—for most of the less successful German biotechnology companies, they present important constraints on the ability to compete successfully.

Given that a cohort of successful firms exists, why emphasize the negative story? German biotechnology is a reference case for current thinking about

whether technology policy can be used as a successful tool of economic development. While precise estimates are difficult to obtain, several interview respondents have asserted that between 1995 and 2001, Germany spent at least \$3 billion on its policies towards biotechnology (see Casper, 2007, chapter 4). These funds were used to develop technology transfer institutions, build technology parks and fund hundreds of new companies through a variety of public venture capital and research subsidies. Governments around the world are currently mimicking the German policies towards biotechnology. In East Asia, for example, Taiwan, Japan and South Korea each spent several billion dollars on biotechnology promotion policies during the 2002–2007 period. Liberal market economies, such as Canada and Australia, have also targeted biotechnology as an important industry for investment, though on a much less lavish scale.

The competitiveness of biotechnology and other science-based industries has clearly been impacted by government policies, such as lavish science funding and favourable intellectual property regulation surrounding the commercialization of university research. However, there is little evidence that governments can orchestrate the construction of science-based industries such as biotechnology, particularly within coordinated market economies. If academics and policy-makers come to view German biotechnology as a successful case of targeted technology policy, this may legitimate the argument that complex industries such as biotechnology can be created through government policies, regardless of the national institutional environment. This would be a mistake.

References

- Allen, M. (2004) 'The Varieties of Capitalism Paradigm: Not enough Variety?', *Socio-Economic Review*, 2, 87–108.
- Casper, S. (2000) 'Institutional Adaptiveness, Technology Policy, and the Diffusion of New Business Models: The Case of German Biotechnology', *Organization Studies*, 21, 887–914.
- Casper, S. (2007) *Creating Silicon Valley in Europe: Public Policy Towards New Technology Industries*, Oxford, Oxford University Press.
- Casper, S. and Murray, F. (2003) 'Examining the Marketplace for Ideas: How Local are European Biotechnology Clusters?'. In McKlevey, M. and Hageman, J. (eds) *Industrial Dynamics in European Biotechnology*, London, Edward Elgar.
- Ernst and Young (2002) 'Neue Chancen: Deutscher Biotechnologie Report 2002', Mannheim, Ernst and Young.
- Hall, P. A. and Soskice, D. (eds) (2001) *Varieties of Capitalism: The Institutional Foundations of Comparative Advantage*, Oxford, Oxford University Press.

- Herrmann, A. M. (2008) 'Rethinking the Link Between Labour Market Flexibility and Corporate Competitiveness: A Critique of the Institutional Literature', *Socio-Economic Review*, 6, 637–669.
- Jong, S. (2006) 'The Development of Munich and Cambridge Therapeutic Biotech Firms: A Case Study of Institutional Adaption', EUI Working Paper, SPS no. 2006/10.
- Lange, K. (2009) 'Institutional Embeddedness and the Strategic Leeway of Actors: The Case of the German Therapeutical Biotech Industry', *Socio Economic Review*, 7, 181–207.
- Schneiberg, M. (2007) 'What's on the Path? Path Dependence, Organizational Diversity and the Problem of Institutional Change in the US Economy, 1900–1950', *Socio-Economic Review*, 5, 47–80.