Capitalist Diversity and Diversity within Capitalism

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4 Internationalization and sectoral diversity

The roles of organizational capabilities and dominant institutions in structuring firms’ responses to semiglobalization

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Introduction

The ways in which national institutional frameworks shape the development and competitiveness of industries and firms in different countries have long been a focus of research (Hall and Soskice 2001; Hollingsworth and Boyer 1997; Gerschenkron 1962; Shonfeld 1965; Whitley 1992, 1999). Recently, however, the increasing internationalization of product, capital and some labour markets since the collapse of the Bretton Woods System (BWS) has been seen as heralding a significant reduction in the importance of national institutional regimes governing economic activities for firm governance and behaviour, and hence of nationally specific business systems and forms of capitalism (Höpner and Jackson 2002; Jackson 2003; Lane 2005). In particular, the growth of foreign direct investment (FDI) has contributed to a decline in the national homogeneity and specificity of prevalent patterns of economic coordination and control relative to those established in the period dominated by the BWS in two ways. First, the more that leading firms invest – or, at the very least, gain access to – significant resources and strategic assets abroad, the more they are able in principle to develop new kinds of capabilities and strategies. Second, the more that foreign companies establish or takeover major subsidiaries within a political economy, the weaker the authority of domestic institutions and interest groups over strategic managers of the companies operating within a country may become (Morgan 2009).

In such cases, firms in different sectors and localities within national boundaries can be expected to develop more varied patterns of organization, collaboration and competition than was common in many countries during the heyday of the BWS. In the longer term, this may well mean that the sectoral specialization of different forms of capitalism may decline as the capabilities developed by major firms become less nationally specific and more attuned to competitors and markets in varied institutionalized settings. As the size of product markets grow through internationalization and capital markets support transnational mergers and acquisitions, some companies based in more collaborative kinds of institutional regimes are narrowing the scope of their activities while enlarging their...
customer base within particular sectors (see, for example, the account of some Danish firms in Meyer 2006). With institutional regimes in some national economies becoming less homogeneous and complementary, leading firms in those countries could become more sectorally heterogeneous, while international companies in general become more technologically specialized and focused on a limited range of product markets.

It is important to note, though, that the conduct of economically rational strategies and operation of competitive markets across national borders remain dependent on largely national institutional frameworks governing property rights, contracting practices, limited liability and other features of the business environment, which are maintained through states’ legal infrastructures (Gessner 2009). Furthermore, although pressures from international capital markets and foreign portfolio investors may have become more significant influences on large firm behaviour in recent decades, the extent of cross-border capital market integration remains limited and subject to the decisions of nation states (Ghemawat 2003; Pauly 2002; Weiss 2003). As the recent financial crisis has suggested, states remain important agents in dealing with the consequences of market failure and predominantly national legal systems, corporate governance practices and political pressures continue to play a critical role in supporting transnational economic coordination. Additionally, growing sovereign and counterparty risk fears in the wake of the 2008–2010 financial crisis, together with increasing national control over banks’ behaviour, may well reduce private cross-border capital flows and ‘mark the start of the deglobalisation of capital markets’ (Bowers 2010).

As Ghemawat (2003, 2007) has emphasized, increasing internationalization has also created opportunities for firms to realize economies of arbitrage, taking advantage of the continuing importance of different kinds of nationally provided collective competition goods and institutional frameworks in the semiglobalized world economy. This highlights the diverse ways in which leading firms in particular political economies can respond to the threats and opportunities created by product and capital market internationalization. At least three distinct response patterns can be identified theoretically, although, of course, they may be combined in various ways empirically. First, the reduction in, inter alia, trade barriers, transport and communication costs can enable firms in some sectors to continue to draw on domestic institutional resources to generate and maintain their competitiveness while reaching a larger market through exports. Second, firms in other sectors may use these opportunities to access different kinds of human and financial resources that cannot readily be obtained domestically. Third, other companies may seek to reform existing domestic business practices and dominant organizational patterns, as they either gain no benefit from those domestic regimes or see them as an important hindrance to the development of capabilities that would enable them to be competitive.

As the capabilities that firms need to be competitive vary from sector to sector (Dosi 1988; Malerba 2004; Malerba and Orsenigo 1993; Nelson 2008), these contrasting responses are likely to be greatly influenced by sectoral variations in
the nature of technical and market risks. Since different institutional regimes facilitate the development of different kinds of capacities and ways of dealing with such risks (Crouch 2005; Casper and Whitley 2004), firms in countries dominated by particular kinds of institutions that consider their industry to be relatively disadvantaged by them are more likely to seize the opportunities offered by internationalization by investing – or by drawing on assets based – abroad and/or trying to use external pressures to alter domestic arrangements than are those companies whose competitive competencies are more extensively supported by dominant home economy institutions.

In this chapter, we explore these connections between institutional regimes, sectoral differences and responses to internationalization by, first, summarizing the results of a number of well-known studies to highlight the varied ways in which the competitive advantages gained from dominant domestic institutions and collective competition goods have led firms in different sectors and countries to respond to increasing internationalization. In the following section, we consider how these relationships can be further specified in different kinds of industries developing new technologies, building on the earlier work of Casper and Whitley (2004) and others. It will shown that major areas, such as appropriability risks, competence destruction, and the associated need to create complementary assets that increase organizational complexity, can be expected to differ in their severity as well as the ways in which they are tackled in two important new-technology areas. The ways in which institutional frameworks and business systems shape the development of competitive competencies in these fields are then discussed.

Institutional regimes, sectoral differences and responses to internationalization

Table 4.1 draws on some well-known studies to illustrate the ways in which different aspects of internationalization can be expected to affect firms in different sectors in contrasting dominant institutional regimes. Given that sectoral characteristics play a key role in shaping the types of challenges that managers face, the ease, or otherwise, with which they are able to resolve those problems will, in turn, be influenced by the institutional regime within which the firm is located. If that regime does enable firms to resolve successfully all or the majority of those problems, companies will not, theoretically, have to access capabilities or institutional resources that are based abroad. However, internationalization could still prove to be either an opportunity (enlarged product markets) or a threat (increased competition). For instance, Thelen (2000) has drawn attention to the way in which internationalization – in the form of enhanced product-market competition – led German employers in the engineering sector of the economy to call into question – though not to reform fundamentally – key aspects of their environment (sectoral wage bargaining), even though they enable firms to build co-operative employee relations with highly skilled and autonomous workers who are the basis of their competitive capabilities (learning and incremental innovation).
Table 4.1 Sectoral responses to increasing internationalization

<table>
<thead>
<tr>
<th>Extent to which the company derives its competitive advantage from domestic, locationally specific institutions</th>
<th>Weakened</th>
<th>Left unchanged</th>
<th>Strengthened</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not at all or very little</td>
<td>Strong attempts by companies to change existing domestic business-system patterns. See, for instance, Barry and Nienhuys (2010)</td>
<td>No or relatively muted attempts to change patterns of economic coordination and control</td>
<td>FDI or off-shoring as a means to ‘escape’ domestic constraints (Lane 2000; Sinn 2007)</td>
</tr>
<tr>
<td>Modest</td>
<td>Continued support for those domestic business-system characteristics that support organizational capabilities, but criticisms where there are no benefits. See, for example, Swenson and Pontusson’s (2000) discussion of the preferences of the Swedish engineering employers</td>
<td>Continued support for those domestic business-system characteristics that aid organizational capabilities. See, for instance, Swenson and Pontusson’s (2000) discussion of the preferences of Swedish employers’ associations in the public and retail sectors; however, criticisms where there are no benefits</td>
<td>Complementarities between domestic business systems and those based elsewhere. See, for instance, Cantwell and Zhang, (2009), Casper (2009), Casper and Murray (2003), Chandler (1977), Lange (2009)</td>
</tr>
<tr>
<td>Great extent</td>
<td>Complex situation, in which ambivalence amongst key strategic actors, such as employers and their representatives, may exist towards certain elements of the domestic business system. See, for example, Thelen (2000)</td>
<td>Continued support, but, potentially, some ambivalence. See, for the case of Germany, Wood (2001)</td>
<td>Continued support. See Casper (2007), and Tylecote and Ramirez (2006)</td>
</tr>
</tbody>
</table>
Product-market internationalization also benefits firms whose competitive competencies are largely derived from domestic, locationally specific institutions. For instance, Tylecote and Ramirez (2006) show that the UK’s corporate governance and financial system has promoted the pharmaceutical and aerospace industries, as well as facilitating foreign investment in these sectors. Both of these sectors have benefited, in some respects, from the opening up of foreign markets. Similarly, Casper’s (2007) arguments on the US biotechnology industry are built on two key premises: first, that US firms have become successful largely as a result of domestic institutional resources, and, second and implicitly, that these firms have often been able to assume leading global positions within their industries as a result of lower trade barriers. Employers have not tried to alter radically existing forms of economic co-ordination.

Where the domestic institutional regime is seen as being deficient in some way, firms may be able to draw on institutional resources that are based abroad to complement – in the sense of ‘making up for’ (Crouch 2005: 50) – those shortcomings. For instance, if the domestic institutional regime is characterized by relatively weak venture capital funding, firms that require such funding are likely to seek to gain backing from foreign investors. Similarly, firms may attempt to counter a shortage of skilled employees, which is itself conditioned by the domestic institutional framework, by recruiting foreign-trained ones. A further way in which companies may attempt to overcome potential domestic weaknesses is by establishing links to researchers based abroad.

Some of the studies in Table 4.1 illustrate the varying ways in which internationalization may enable firms to enhance their competitiveness by drawing, to differing degrees, on capabilities that are derived from both domestic and foreign institutional resources. For instance, Chandler (1977) noted that the development of railroad companies in the US was promoted both by domestically generated capabilities (a cadre of managers some of whom had gained relevant skills in US military academies, and cheap manual labour that resulted from US immigration policy) and foreign-based ones (notably, financial capital and expertise from British banks). Cantwell and Zhang (2009) have noted that Japanese firms have attempted to enhance their competitiveness by extending their technology-licensing and R&D activities to foreign countries. Yet, this has not been to the detriment of existing organizational ties in Japan. Similarly, firms may invest in foreign countries with institutional regimes that are more cognate to their domestic one in order to access specific advantages.

For those firms that derive no or very few benefits from domestic, locationally specific institutions, internationalization – in the form of reduced policy barriers to overseas investment and/or cheaper forms of communication that enable off-shored activities to be co-ordinated more easily – may benefit them. This perspective underpins work by Sinn (2007) and, to a lesser extent, Lane (2000) that, simplifying greatly, suggests that some German firms have taken advantage of these enhanced possibilities to invest abroad or to out-source work to foreign companies in order to overcome some of the (many, according to Sinn, or far fewer, according to Lane) deficiencies within the German institutional regime.
Whilst this may have detrimental effects for some employees, it can benefit the company’s competitiveness.

Where companies do not seem to gain many benefits from the dominant domestic institutional regime and pattern of economic organization, internationalization of product markets may weaken their competitiveness. As a result, firms are likely to try to change the ways in which they coordinate and control their business activities. Barry and Nienhueser’s (2010) study provides an example of this from the airline industry. The reform of the airline industry in Europe has increased competitive pressures and led Lufthansa to establish its own ‘no-frills’ airline, Germanwings. Even though collective wage bargains in the airline industry have not conformed to the stylized German model for a long time, Lufthansa has gone further in using the company-wide agreements as a way to increase wage disparities between cabin attendants, who are largely semi-skilled and who make up a significant proportion of Germanwings employees, at its low-cost subsidiary and their Lufthansa counterparts. The wage settlements at Germanwings can be seen as an attempt to discipline staff at Lufthansa by creating an environment in which concession bargaining is a constant threat. Thus, Lufthansa has responded to increased internationalization and competition by changing existing business-system patterns.

The study by Swenson and Pontusson (2000) illustrates how the responses of firms in different sectors that face contrasting pressures from internationalization vary. For companies in sectors that face increased competition as a result of product-market internationalization and that derive only modest benefits from existing patterns of business co-ordination, there are likely to be persistent attempts to change those practices. In the case of Sweden in the 1970s, national collective bargaining was increasingly influenced by public-sector employers and unions that were sheltered from international competition. The wage increases that this system delivered were viewed by many exporters as a threat to their competitiveness; they, therefore, sought to change the pattern of wage bargaining, so that industry-level negotiations would predominate. This was finally achieved in 1993. However, it should be noted that many of these employers were reluctant to dismantle national collective bargaining completely, as it was seen as providing competitive benefits, such as lower levels of poaching and fewer disruptions to production. In contrast, those employers in the public and retail sectors, who benefitted from being able to operate in a strike-free environment as a result of peak-level bargaining, sought to retain that system.

**Sectoral characteristics, institutional frameworks and responses to internationalization in two high technology industries: marine energy and therapeutic biotechnology**

We now explore these connections in greater detail by focusing on two high technology industries in which key management problems differ significantly. These problems affect the types of organizational capabilities that must be
developed by firms in any particular sector (Dosi 1988; Malerba and Orsenigo 1993). Two of the most important ones in innovative industries concern appropriability and competence destruction risks (Casper and Whitley 2004). *Appropriability risks* arise from the ease with which competitors can imitate an innovation. There are various means by which such risks can be managed. For instance, patents are an effective way of protecting innovations in the pharmaceutical industry. Secrecy and ‘complementary assets’ (Teece 1986) are further means by which innovators can seek to protect their intellectual property.

*Competence destruction risks* result from the ease with which individual and collective skills and competences can be destroyed by technical and market change. It covers both the technological trajectory of that development (which processes or products will solve a particular market need) and market acceptance (which product design will come to dominate the market). If the uncertainty surrounding the development of a technology is high, it will be difficult to predict which investments, skills and capabilities will emerge as the most crucial to success. As a result, firms have to be able to reconfigure their capabilities at short notice. This is likely to be associated with employment risks and, potentially, organizational failure if the firm loses the ‘innovation race’. Thus, firms attempting to introduce innovations that are characterized by high technological uncertainty and, hence, high competence destruction risks must be able to attract and retain skilled and experienced employees who can resolve complex problems that have unpredictable outcomes not just in terms of the development of the technology, but also for their employment and the organization’s existence (Casper and Whitley 2004).

If competence destruction risks are high, the prospect that successful innovators will be able to benefit financially must also be high or the successful efforts of researchers and other employees would have been for very little. This, in turn, requires that innovators can protect their intellectual property, so that they can, consequently, capture a relatively large market share. In other words, attempts must be made to render appropriability risks as low as possible. The development of therapeutic technologies in the biotechnology industry has been characterized as having high competence destruction risks and appropriability risks that can be lowered successfully by patents (Casper and Whitley 2004). These characteristics enable small biotech companies to focus on the development of new therapies that can be protected and sold, either as part of an acquisition or by a licensing agreement, to a large pharmaceutical company that has the necessary capabilities in clinical development, regulatory compliance, and marketing (Gambardella et al. 2000). This means that therapeutic biotech firms can limit their investment in building complex organizations with high coordination costs.

For firms in sectors that are characterized by limited competence destruction risks and – in the absence of any legal mechanisms to protect innovations – greater appropriability risks, new technologies are likely to be integrated with other assets in a complementary way to generate firm-specific advantages (Teece 1986). For instance, in marine energy, patents could be used in an effort to protect new developments; however, these are likely to prove inadequate, as
competitors may use ‘work arounds’ to incorporate new ideas, components or designs into their own products without infringing the patent. Therefore, complementary assets will need to be developed. These can be in sales, distribution or a range of technical and consulting capabilities that enable the firm to provide products and services that match customers’ demands in a superior way to their competitors. As a result of needing to provide both technologically advanced and customer-specific solutions to problems, organizations in such sectors are likely to be relatively complex compared to therapeutic biotechnology firms.

In order to facilitate such collaboration, firms in these sectors are likely to rely on firm-specific knowledge and routines. This organizational complexity and the means by which collaboration is generated have implications for employment policies within companies, as knowledge, which has been developed in cross-functional teams, is likely to be both tacit and firm-specific (Casper and Whitley 2004). Employees will need to understand the performance of the firm’s device under different conditions, such as average power densities, maximum marine loadings, and the tidal range at the site in order to ensure that that efficiencies are optimized under the constraint of minimizing likely maintenance costs within a harsh environment (DECC 2010: 8; Wolfram 2006). This knowledge is of value to the firm. However, it is hard for individual employees to sell on open technology or labour markets. Therefore, employees’ concerns over exploitation by employers, and employers’ potential risk of being ‘held up’ by employees with crucial, yet difficult-to-monitor, skills raise the issues of credible commitments and the basis upon which these can be reached (Hall and Soskice 2001; Harcourt and Wood 2007; Whitley 2007; Williamson 1985). Overall, then, it seems reasonable to conclude that the key management problems for entrepreneurial firms in the marine energy industry concern appropriability rather than competence destructive risks, while the reverse is the case in therapeutic biotechnology.

The ways in which managers attempt to resolve organizational problems are influenced by the institutions that can help or hinder cooperation between both different employee groups within the firm and different organizations. In addition, the skill formation, labour market, corporate finance, corporate governance as well as public science systems of different countries will strongly shape the practices adopted in entrepreneurial firms, These different institutional frameworks and the influence that they have can be illustrated by comparing ‘coordinated industrial district’, ‘compartmentalized’ and ‘collaborative’ business systems (Whitley 2007). In broad terms, Denmark can be seen as an example of the first of these (Campbell and Hall 2006; Martin 2006); the UK, the second; and Germany, the final category. Table 4.2 sets out the key characteristics of the two sectors examined here as well as the broad research expectations.

In Denmark, the development of the marine-energy industry is likely to benefit from greater collaboration between firms in terms of technology development than their UK counterparts. However, the ability of Danish firms to establish long-term participative learning amongst their workforce may be hampered by employees’ desire to learn ‘by moving around’ (Lundvall and Lorenz 2006: 426)
within the context of fluid labour markets (Nielsen and Lundvall 2006) that, potentially, means employees have high industry – rather than firm-specific skills. In sectors in which the development of these latter skills is important, firms will have to ensure that they are able to retain and train their employees. In the UK, the lack of cooperation between organizations, which is a typical feature of the British business system, is also likely to be felt by firms in this sector in terms of recruiting sufficiently well-qualified staff. Although the presence of large firms in the off-shore oil, gas and wind industries may be beneficial to marine-energy firms (DECC 2010; IME 2008), the more uncertain career prospects in the marine sector compared to wind and especially oil and gas may deter potential employees from joining firms in that industry.

In both the biotechnology and marine-energy sectors, the need to obtain considerable capital to finance technology development is likely to lead many organizations to seek investment funding from either venture capitalists or institutional investors. However, such investors may not be sufficiently knowledgeable about the sector to take stakes in companies that are not only engaged in technologically and commercially risky ventures (Tylecote and Visintin 2008), but are also involved in developing new technologies that do not have clear ‘milestones’ as to the likely successful outcome of those efforts (BWEA 2009), as firms in the therapeutic biotech sector do (Tylecote and Visintin 2008). The funding that is available may also be focused on short-term outcomes (BWEA 2009; RAB 2008; Winskel 2007). Finally, the search for funding may lead companies in the sector to operate in relative isolation from one another in an attempt to protect their intellectual property, which, as noted above, may be difficult to defend with patents.

In the case of the therapeutic biotechnology industry in Germany, firms are likely to be hampered by both the relative lack of venture capital funding and difficulties recruiting highly skilled employees with relevant industry experience. Although some of these deficiencies may be met by accessing international labour and financial markets (Lange 2009), firms may still find insufficient levels of support. This is likely to be especially true for leading scientists and experienced managers, as alternative employment possibilities in the event of firm failure within the therapeutic biotechnology industry in Germany may be quite limited (Casper 2009).

a Marine energy: the UK and Denmark

Turning now to consider the marine energy industry in greater detail, despite the UK’s much longer coastline its installed power capacity in wave energy was only moderately more than Denmark’s (315 kW compared to 215 kW) in 2009 (OES-IA 2010: 108). The UK was able, however, to generate more electricity from tidal stream devices than Denmark (1,200 kW in comparison to none for Denmark (OES-IA 2010: 108). It should, though, be noted that these figures relate to where the technologies are deployed rather than where they have been developed. For instance, the figures for the UK would be increased if the
Table 4.2 Characteristic of selected renewable energy sub-sectors, and research expectations

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Therapeutic biotechnology</th>
<th>Wave energy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Competence destruction risks</td>
<td>High</td>
<td>Low</td>
</tr>
<tr>
<td>Appropriability risks lowered by:</td>
<td>Patents</td>
<td>Complementary assets</td>
</tr>
<tr>
<td>Sources of knowledge</td>
<td>Internal resources, but also, potentially, research institutes</td>
<td>Applied research institutes, component suppliers, users</td>
</tr>
<tr>
<td>Organizational complexity</td>
<td>Low</td>
<td>Moderate</td>
</tr>
<tr>
<td>Firm-specific knowledge and skills</td>
<td>Low</td>
<td>Moderate to high</td>
</tr>
<tr>
<td>Importance of credible commitments to employees</td>
<td>Low</td>
<td>Moderate to high</td>
</tr>
<tr>
<td>Need for stakeholder inclusion</td>
<td>Low</td>
<td>Moderate to high (suppliers, and employees)</td>
</tr>
<tr>
<td>Countries analysed</td>
<td>Germany, and UK</td>
<td>Denmark and UK</td>
</tr>
</tbody>
</table>
### Expectations:

#### Potential implications of domestic institutions

<table>
<thead>
<tr>
<th>Country</th>
<th>Implications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Germany</td>
<td>Weak domestic venture capital will hinder the ability of therapeutic firms to develop. Skilled employees will be difficult to attract.</td>
</tr>
<tr>
<td>UK</td>
<td>Domestic sources of venture capital are likely to be more extensive compared to Germany. Ability to attract appropriate skilled employees will be greater compared to Germany. Inter-firm networks may be weak, but this is unlikely to pose too many problems.</td>
</tr>
<tr>
<td>Denmark</td>
<td>Domestic long-term funding more likely to be available compared to the UK. Stronger inter-organizational networks that will facilitate learning.</td>
</tr>
<tr>
<td>UK</td>
<td>Shortage of long-term knowledgeable funding. Links between firms and research institutes may be greater in the UK than they are in Denmark. This will aid the competitiveness of firms. Links between firms will be weaker, which will limit inter-firm learning. Strong associated industries may ameliorate the recruitment of skilled employees.</td>
</tr>
</tbody>
</table>

#### Potential benefits of internationalization

<table>
<thead>
<tr>
<th>Country</th>
<th>Benefits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Germany</td>
<td>Potentially access foreign-trained employees, and overseas sources of funds.</td>
</tr>
<tr>
<td>UK</td>
<td>Access to foreign markets.</td>
</tr>
<tr>
<td>Denmark</td>
<td>Access to foreign markets.</td>
</tr>
<tr>
<td>UK</td>
<td>Access to foreign funds and product markets/subsidies.</td>
</tr>
</tbody>
</table>
UK-developed Pelamis devices that have been installed off the coast of Portugal were included. Overall, however, the UK does not clearly outperform Denmark despite its more favourable natural resources.

Private investors’ unwillingness to become involved in the UK’s ‘alternative energy’ sector as a whole, which along with wave and solar energy covers producers of ethanol, hydrogen and ‘biofuels’, is illustrated by the fact that it attracted investments of £1 million by venture capitalists in 2009 compared to £28 million for the ‘biotechnology’ sector (BVCA 2010). Indeed, for the period 2007 to 2009 (inclusive), the alternative-energy sector attracted £82 million from UK-based venture capitalists, while firms in the biotech industry received £134 million in funding (BVCA 2010). Government spending on research, development and demonstration in the energy sector (which includes nuclear) is, as a percentage of GDP, much lower in the UK than it is in Denmark, which does not have any nuclear power stations. In 2007, public spending on energy RD&D was 0.01 per cent of GDP in the UK; in Denmark, the figure was nearly 0.05 per cent (CCC 2010: 22).

The lack of knowledgeable long-term funding for the development of marine-energy technology in the UK is, perhaps, best illustrated by Wavegen. This firm was on the brink of bankruptcy when it was saved by Voith Siemens Hydro AG (BBC 2005). The acquiring company is a joint venture between Voith AG and Siemens. It is notable that Voith is one of Europe’s largest family-owned businesses; this is likely to render long-term capital more accessible to Wavegen. The facilities that Wavegen has in Scotland, which include its Limpet device, have helped it to become a ‘centre for marine energy competence’ in the parent company (Voith Hydro 2010). This suggests that Wavegen has been able to generate valuable competences, which were not, however, adequately recognized by domestic investors. Another British wave-energy company was not, however, as fortunate as Wavegen: in 2010, Orecon was forced into bankruptcy after its venture-capital backers withdrew funding.

Those firms that have raised significant amounts of venture capital often rely, although not exclusively so, on foreign backers. For example, Pelamis Wave Power Limited, which has raised £40 million, has, in addition to investments from British and American venture-capital firms, gained funds from Italian, Norwegian, and Swiss ones. The principal shareholders of Marine Current Turbines Limited, which has raised £40 million, include Dutch, Danish, French, Irish, German and UK investors. Pulse Tidal has gained investments from the Marubeni Corporation, which is one of Japan’s largest sogo shosha, or general trading houses. Finally, AWS Ocean Energy Limited has received investments from Shell Technology Ventures Fund 1, which is itself backed by Royal Dutch Shell (Anglo-Dutch), Coller Capital (UK) and the Abu Dhabi Investment Authority.

In general, the British state can be described as having an arm’s length relationship to technology developers. This certainly holds true for the Westminster parliament, and the levels of funding available from central government in the UK for developers of marine-energy devices have been compared unfavourably to the support given by governments in Japan and Denmark to, respectively, their solar and
wind-energy developers during the initial stages of the sector’s growth (BWEA 2009: 16). To be sure, the Carbon Trust, which is a government agency that was set up to reduce the UK’s CO₂ emissions, has invested in £4.6 million (which includes a £1.2 million grant to the European Marine Energy Centre) in research projects in the marine-energy sector, broadly defined, since 2002 (see also CCC 2010.) This represents just under 17 per cent of the Trust’s total grants for research projects (£27.3 million). In addition to these grants for research, the Carbon Trust, through Carbon Trust Investments Limited, its venture capital investment subsidiary, has invested in Marine Current Turbines Limited and Pelamis Wave Power Limited, both of which are private companies.

Arguably, the Scottish government has taken a more proactive approach to the development of the marine-energy industry than its UK counterpart: it has created a £10 million Saltire Prize, which will be awarded in 2017, to accelerate the commercial development of marine energy; it has established a £12 million fund, the Wave and Tidal Energy: Research, Development and Demonstration Support (WATERS) scheme; and the amount provided by renewable energy certificates (ROCs) is greater in Scotland than it is in the rest of the UK (BWEA 2009: 15–16). It should, however, be noted that the payment levels in Scotland will be less than they are in Portugal. As a result of these higher subsidies, a British company, Pelamis Marine Power, has been able to establish the first commercial-scale marine energy farm in Europe. This illustrates a yet further way in which companies can benefit from internationalization; in this case, access to a foreign government’s subsidies. The now bankrupt company Orecon had also used the possibility to sell its products abroad by entering into a joint venture with a Portuguese company.

Additionally, UK marine-energy firms have found it difficult to recruit sufficiently well-qualified staff (IME 2008; RAB 2008). The primary cause of this would appear to be the industry’s inability to offer careers that are as secure and well rewarded as those in the oil and gas industry, which requires employees with broadly similar skills and experience as those in the marine-energy sector. It has also been suggested that the marine-energy industry is at an even greater disadvantage since the skills and knowledge learnt in the oil and gas industries may not be relevant to the marine energy sector (IME 2008: 17). A further underlying cause may be the inability of the companies in the sector to offer sufficient financial incentives to those joining them. This will be hampered by the absence of a pioneering firm that has made its founders wealthy.

The report by the Renewables Advisory Board (RAB) (2008: 8) noted that the mix of skills that developers require their graduate employees to have – engineering design combined with an understanding of hydrodynamics – are not yet taught in universities. Although the Department of Energy and Climate Change (DECC) is in the process of setting up a National Skills Academy for Power, which has been cited as an attempt to improve the skills in the marine-energy sector (BIS 2009: 75), the extent to which the courses offered by the Academy will be tailored to marine-energy developers is debatable, as employer involvement in the scheme is confined to large energy companies.
The RAB (2008: iv; see also DECC 2010 and Winskel 2007) also noted that cooperation between developers was weak. This reflected companies’ desire to protect intellectual property, and led to ‘the same problems being addressed many times in parallel and the consequent inefficient use of available resources’. It should be noted that there are no major alliances that combine several of the prominent private-sector marine-energy developers. There is, however, one instance of a developer owning a stake in another: in 2008, Aquamarine bought shares in Ocean Flow Energy Limited, a private company. The reason behind the purchase was Aquamarine’s desire to draw on Ocean Flow’s intellectual property in the development of one of its own devices (Aquamarine 2008). This example underlines the lack of trust that exists between developers in the UK, as inter-firm collaboration needs to be underpinned by ownership integration.

The marine energy sector in Denmark is, like the UK’s, characterized by the presence of specialized, owner-controlled firms. However, there would appear to be far greater cooperation both between them and between developers and research institutes. It is, therefore, justifiable to describe the industry as a cooperative industrial district. The collaboration between different organizations covers close, long-term links between firms and investors; relatively strong ties amongst companies and research institutes; and connections to policy makers and employee representatives.

One firm that exemplifies the ability of Danish firms to draw on long-term domestic financing is Wave Star A/S. The company, which has received approximately DDK60 million in private investment and DDK35 million in public funds (OES-IA 2010: 65), is owned by members of the Clausen family, who also make up the supervisory board. The Clausen family control 97 per cent of the votes in Danfoss. Another Danish firm that draws on domestic sources of long-term finance is DegaWave Energy ApS, which has three shareholders: Dega Holding ApS (49 per cent); Lars Elbæk ApS (26 per cent), which is owned by the founder and inventor behind DegaWave Energy’s device; and Innovation MidtVest A/S (25 per cent). The latter is owned by a number of Danish organizations, including Bang & Olufsen A/S, Hans Foxby’s Fund, Heming Folkeblad A/S, Handelsbanken A/S, and Unimerco Group A/S, and the Craft and Industry Association, or Håndværker- og Industriforening. Notably, Unimerco A/S has, since 1995, been wholly owned by management and employees. When Unimerco first became a limited company in 1977, its shares were owned by its employees and two foundations, the Unimerco Fund and the Hans Foxby’s Fund; the latter was named after Unimerco’s founder.

Another Danish wave-energy firm, WavePlane A/S appeared to be on course to receive an investment from a long-term investor, Lønmodtagers Dyriftsfond (LD), or the Danish Employee’s Guarantee Fund, until its prototype broke free of its moorings and was damaged in 2009. This event illustrates two significant elements in developing marine-energy devices. First, it highlights the difficulties that developers, in general, face. Second, it shows, once again, that the range of investors available to developers in Denmark is greater than it is in the UK. The
LD fund, which was set up in the late 1970s by the Danish government to off-set some of the effects of inflation on the amounts received by pensioners, is able to take a long-term view of its investments, as it does not seek to maximize short-term gains, but, instead, must, at the very least, meet minimum targets. Any returns above that minimum target are kept within the fund. As its investments have yielded an average net return of 10.5 per cent per annum, it has, arguably, been able to pursue longer-term investments successfully.

A further illustration of the collaborative nature of the marine-energy industry in Denmark comes from the Alliance for Green Offshore Energy. Although the Alliance includes wind-energy companies, and marine-energy developers, it highlights the more extensive cooperation that occurs within Denmark in the latter field compared to the UK. For instance, the Alliance for Green Offshore Energy in Denmark is chaired by Poul Nyrup Rasmussen, a former prime minister, and was founded by, amongst others, the Southern Denmark regional advisory board, the Danish Marine Energy Society, three universities, the National Laboratory for Sustainable Energy, the Confederation of Danish Industry, and, importantly, the Danish Metal Workers’ Union. Although the involvement of the latter organization does not mean that firms will not face problems recruiting appropriately-skilled employees, the presence of the Metal Workers’ Union should, by allaying employees’ fears over potentially opportunistic behaviour by their employees, attenuate such difficulties.

b Biotechnology: Germany, and the UK

As measured by biotechnology patent applications filed under the Patent Co-Operation Treaty between 2004 and 2006 (inclusive), the UK has a revealed comparative technological advantage in biotech, while Germany had a technological disadvantage in this field (van Beuzekom and Arundel 2009: 70). These broad patent data do not, however, reveal the degree to which various countries specialize in different sub-sectors within the broader biotech industry. There is, for instance, cogent evidence to suggest that UK firms specialize in more radically innovative sub-sectors: between January 1989 and January 2009, the UK had approximately twice as many approved biotech therapeutic medicines or treatments per million inhabitants than Germany (0.085 compared to 0.043) (van Beuzekom and Arundel 2009: 85).

Within the biotechnology therapeutic drugs and treatments sub-sector, a further distinction can be made to isolate ‘experimental biotech therapeutics’, which covers tissue engineering, therapeutic vaccines and stem-cell research. As noted by van Beuzekom and Arundel (2009: 84), these are ‘defined as “experimental” because only a few of them have received marketing approval in one or more jurisdictions’. They also note that they are at the cutting edge of biotechnology research health. The firms that engage in such activities can, therefore, be expected to rely on capabilities that enable them to reconfigure their skills and other resources quite rapidly in the event of radical technical and market change. These tend to be supported by the UK’s institutional regime.
Data from 2007 show that, in both the broader biotechnology therapeutics category and the narrower experimental one, UK firms outperform their German counterparts in terms of the number of therapies in clinical trials. British companies had 70 of the former and 16 of the latter; the figures for Germany were 38 and seven, respectively. In terms of all bio-therapies in clinical trials per million inhabitants in 2007, the UK had 1.16, and the figure for Germany was 0.46. The data for experimental bio-therapies in clinical trials per million inhabitants in 2007 reveal a similar pattern: 0.26 for the UK and 0.08 for Germany (van Beuzekom and Arundel 2009: 87–8; see also Lange 2009). In 2008, the UK had far more treatments in the clinical pipeline than any other European country. The UK had approximately 70 in phase I trials, c.135 in phase II, and roughly 40 in phase III; by contrast, the corresponding approximate figures for German were 50, 75 and 10 (Ernst and Young 2009b: 96; see, also, Casper 2009).

The development of therapeutic medicines and treatments is not the only activity that firms in the biotechnology sector can engage in. A report by Ernst and Young (2010a) noted that such firms can also develop diagnostic tests, provide services and conduct activities in the green and industrial biotech sub-sector. According to 2009 data from that report, UK firms are far more likely to be engaged in developing therapeutic medicines than their German counterparts (162 compared to 129). For the UK, these companies account for 56 per cent of all biotech firms; by contrast, the German firms represent a third of all biotech firms. The biotechnology sub-sector with the highest number of German firms active in it is the service one (162 firms or approximately 42 per cent of the total); this compares to 93 firms in the same sector in the UK (just under one-third of the total). German firms are also more active in developing diagnostic tests (62 or 16 per cent of the total) and in green and industrial biotechnology (34 or 9 per cent). The corresponding figures for the UK were 24 (8 per cent) and 10 (3.5 per cent) (Ernst and Young 2010a: 19).

The Ernst and Young report notes one of the reasons for this pattern of specialization amongst German firms in sectors other than therapeutic medicine as being the lower requirements for venture-capital funding. A further reason is that those other sectors are marked by lower risks to the organization. Both of these reasons are consistent with the approach adopted here that emphasizes the ways in which domestic institutional frameworks and business systems shape the ability of firms to develop competitive competencies in certain sectors. For instance, UK biotechnology firms were able to draw on more venture capital funding than German companies in 2009: venture capitalists made €118 million of funding available in the UK; while just €69 million was invested in German firms (Ernst and Young 2010a: 69). UK firms were also able to raise far more capital in total compared to German biotechnology companies (nearly €400 million compared to c. €140 million (Ernst and Young 2010b: 70).

Whilst domestic institutions exert an influence over business-system characteristics that, in turn, shape the ability of companies to develop capabilities that can help them to compete on international markets, this does not, a priori, mean that firms cannot draw on resources based abroad. However, the ability of
German biotechnology companies to draw on such resources to develop competencies that enable them to compete in markets providing therapeutic medicines would appear to be limited. For instance, venture capital firms from Germany rather than foreign investors play a lead role in providing funds to biotechnology firms. In 2008, of the 39 venture capital firms that provided financing for those private German biotechnology firms that had a round of funding that was greater than €5 million, most (27) were from Germany, nine were from the rest of Europe, three were from the US, and none were from Asia (Ernst and Young 2009a: 75; cf. Lange 2009).

However, in other areas, such as recruiting appropriately skilled senior employees, some German therapeutic biotech firms have been able to recruit experienced managers based abroad (Casper 2009; Jong 2009: 131–2; see also Divito 2009 for the case of the Netherlands; cf. Lange 2009). In addition, a number of scientific advisors to German biotechnology firms have come from abroad (Casper and Murray 2003). However, Casper (2009) has noted that German biotechnology companies in general find it more difficult to recruit scientists with industry experience than do their British competitors. Indeed, his research indicates that even successful biotechnology firms in Germany employ far fewer scientists with industry experience than their foreign counterparts. Although the internationalization of certain segments of the labour market has enabled some German companies in entrepreneurial technology industries to make up for the deficiencies of their domestic institutional environment, then, the evidence suggests that considerable shortfalls remain.

Conclusion

In this chapter we have suggested how the impact of internationalization on firms’ strategies and competences can vary significantly according to the characteristics of both the sector and the institutional regime within which a company operates. This has been most clearly demonstrated for the case of the UK. The dominant pattern of economic organization in the UK for both of the innovative industries covered here can be characterized as a project network in which isolated firms engage in largely arm’s-length contractual relationships between each other, employees and investors (Whitley 2007: 14).

However, the dominant institutional regime in the UK affects these sectors differently. Whilst there is more venture capital available in the UK than in other European countries, there is a dearth of long-term knowledgeable funding available for firms developing new technologies. This is more of a hindrance to firms in the marine energy sector, as the characteristics of technology development differ in important aspects to those in the therapeutic biotechnology sector. In particular, the ‘visibility’ of developments in marine-energy devices to external investors is far less than it is in therapeutic biotechnology. Even if scaled-down models of devices have been shown to work in controlled environments, uncertainty still exists as to how the device will operate within a harsh, uncontrollable one. This relates not just to the survival of the device itself, but also to the likely
operation and maintenance costs, which will affect the cost of electricity generated by the device and, hence, the return on the investment. In contrast, in therapeutic biotechnology, data from previous clinical trials can be used to make judgements on the likely risk associated with any investment.

As lack of long-term, knowledgeable funding is more of a problem in the UK for marine-energy companies than it is for therapeutic biotechnology firms, solutions to this challenge are likely to be sought overseas by developers in the former sector. As our examples show, UK developers have been able, in some instances, to access long-term funding that is based abroad. Those sources range from being acquired by a firm that is, itself, partly owned and controlled by a family firm to developing close ties to a Japanese firm. This is one source of diversity within business systems in the UK: whilst firms in both sectors rely on overseas investors, the ability to access long-term knowledgeable backers is both more extensive and more important for those companies in the marine-energy sector. By contrast, the Danish companies examined in this chapter have been able to rely to a greater extent on domestic sources of long-term, knowledgeable funding.

In general, firms in the UK deal with one another at arm’s length. Once again, whilst firms in both sectors examined here may benefit from greater interactions with one another, the lack of intra-sectoral collaboration between firms creates more challenges for firms in the marine-energy sector than it does in the therapeutic biotechnology industry. Indeed, there are several challenges that this lack of cooperation poses for marine-energy companies that biotechnology ones do not have to deal with. For instance, the availability of appropriately skilled employees is a greater challenge for firms in the marine-energy sector, as they must compete with companies in the off-shore oil and gas industries, which are able to offer more secure careers. In addition, the ability of wave and tidal-stream device developers to collaborate with one another to promote courses at universities appears to be highly limited. UK government attempts to improve the skills in the broader energy sector look set to be shaped most strongly by the large utility firms. Public programmes may, therefore, overlook the needs of the smaller technology developers. These weaknesses cannot readily be rectified by access to resources, both human and physical, that are based abroad. This is in contrast to the situation of most firms in the therapeutic biotechnology industry that are more able to recruit foreign-trained employees. This is a further source of diversity within the UK’s business system, as the use of certain international labour markets plays a more prominent role in therapeutic biotechnology than it does in the marine-energy sector.

The lack of collaboration between marine-energy firms is also felt in the area of research. Even though device developers may have patented parts of their technology, there is a reluctance among them to cooperate on research projects. This hesitance stems from the risk that unwanted knowledge spillovers may occur. Indeed, even those marine-energy research projects in the UK that involve universities are marked by the absence of any significant involvement by the device developers. This undermines the usefulness of the findings of that
research: whilst the research may help to model fluid dynamics, it is unlikely to help manufacturers predict the ways in which their particular device will operate in adverse sea conditions over extended periods. This lack of cooperation between developers will be more keenly felt by firms in the marine-energy sector than it will by those conducting therapeutic biotechnology research and development, as the former are more likely to face similar challenges. For instance, the majority of the former are seeking to operate devices at sea, whereas biotechnology firms are attempting to develop therapies for a range of ailments that have different qualities. Whilst, in this regard, then, patterns of economic coordination and control are similar in both sectors, the consequences for developers of marine-energy devices are likely to be more severe.

There is another important difference between the two sectors examined here: the relevance of foreign product markets – or, more specifically, incentives created by overseas governments – is of greater significance to marine-energy developers than it is to therapeutic biotechnology firms. To be sure, access to foreign product markets is important to companies in both sectors; however, the nascent nature of devices and product markets the marine-energy sector means that sources of income are likely to be more limited and less ‘generous’. This is, indeed, the case for UK marine-energy device developers. This situation, in part at least, stems from the view that the British state should not be involved directly in picking industrial ‘winners’, but should allow new technologies to rely on markets for their development. This perspective has meant that subsidies and investments from the Westminster government to particular industries are lower than they are in other countries. Even though the Scottish government has adopted a more developmental role, the amount of funding that it has provided is less than that made available by other political authorities. Once again, the patterns of economic coordination vary between the two sectors, as the capability to gain access to foreign subsidies – which is likely to involve the ability, first, to engage with overseas political authorities over a relatively long period of time and, second, to learn how to meet their requirements – is of greater importance in the marine-energy sector compared to therapeutic biotechnology.

In summary, the internationalization of product and capital markets poses distinctive opportunities and challenges to firms in different sectors of the economy. As our examples suggest, internationalization has enabled developers of marine-energy devices to complement – in the sense of ‘making up for deficiencies’ – the dominant institutions and collective competition goods available in the UK in important aspects. This is most clearly illustrated in the case of funding and product market/subsidies from foreign governments. However, in other aspects, the deficiencies of the domestic business system cannot be countered by drawing on international resources. This is the case for skilled employees and for collaboration based upon obligatory forms of contracting. This may help to explain why the UK has not significantly out-performed Denmark in marine energy, despite having more favourable natural resources.

In biotechnology, on the other hand, the institutional regime in the UK offers greater advantages to therapeutic biotechnology firms. This is shown by the
superior performance of the UK’s therapeutic biotechnology industry compared to Germany’s over the past decade or so. In short, the environment for UK biotechnology companies suffers from fewer deficiencies than it does for firms in the marine-energy sector. Where deficiencies do exist (in certain labour markets), these can be partly overcome by attracting employees from abroad who have the required skills and experience.

Thus, responses to internationalization vary significantly between firms in sectors that rely of different kinds of capabilities to compete effectively. Since the development of these capabilities is helped or hindered by different institutional regimes and dominant business systems, companies based in particular countries will differ in how they deal with the threats and opportunities afforded by greater market internationalization, and so generate and reproduce increased strategic and organizational diversity. This is especially so in the more ‘liberal’ market economies such as the UK where dominant labour and financial market institutions are less mutually reinforcing and complementary across sectors (Whitley 2007: Chapter 2).

However, the ability of firms to overcome the weaknesses of their domestic institutions and patterns of economic organization by gaining access to foreign collective competition goods depends on their transferability and ease of appropriation. For instance, finance may be regarded as relatively fungible, so funding from foreign sources is likely to be easier to obtain than are appropriately skilled employees. Such employees may, in turn, be more transferable than are some forms of knowledge that are embedded within public science or technology systems. This suggests, then, that analyses of the links between institutions, business systems and firm competitiveness need to take into consideration not just firms’ domestic environment, but also the conditions under which firms are able to overcome local deficiencies by accessing institutionally embedded resources abroad. It also suggests that, as internationalization proceeds, the possibilities for increased business-system diversity within any single country are likely to be enhanced.

References

Internationalization and sectoral diversity


Ernst and Young (2010a) *Neue Spielregeln: Deutscher Biotechnologie-Report 2010*, Mannheim: Ernst and Young GmbH.

Ernst and Young (2010b) *Beyond Borders Global Biotechnology Report 2010*, New York: Ernst and Young.


Internationalization and sectoral diversity


