9. Atlantic strategic technology alliances

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Increased international competition and a further internationalization of corporate strategies of a wide range of companies are related to the growth of international strategic technology alliances (Duysters and Hagedoorn 1996). The broader context of these international alliances is found in the evolution of the world economy towards a system with increasing exports and imports of goods and services, internationalization of monetary and financial systems, growing flows of foreign direct investment and internationalization of technology flows. From the perspective of individual firms we can understand international strategic technology partnering as part of the spreading of their innovative capabilities over many countries. These internationalization strategies enable companies to capitalize on both market entry strategies and their internationalization of innovation and production. Internationalization enables these companies to use a large number of local sources through outsourcing part of their vertically integrated related activities to local suppliers and also to engage in market entry agreements. For technology and research-related activities internationalization allows these companies to tap into local scientific and technological sources either through internalization and equity investment or through contractual agreements.

In this chapter I shall analyse a number of trends and patterns in international strategic technology alliances, with a particular focus on Atlantic alliances, i.e. those between European and NAFTA companies. For Europe or the European Union (EU) I have taken the twelve member-states that until recently constituted the European Community plus the three new member-states (Austria, Finland and Sweden). It is important to note that my contribution focuses on international strategic technology alliances, which I define as those cross-border modes of inter-firm cooperation for which a combined innovative technological activity or an exchange of technology is at least part of an agreement. In other words, I shall only look at a particular set of alliances and disregard forms of cooperation that only deal with the sharing of manufacturing capacity or joint marketing agreements. The period studied in the empirical part of this chapter covers the most recent years in which these alliances have been formed, starting in 1980 and ending in 1994. The data is derived from the MERIT-CATI data bank (see the Appendix).
The struggle for world markets

In the next section I shall discuss the competitive and technological imperatives that, according to the literature, play an important role in explaining why companies enter into alliances. This is followed by a discussion of organizational aspects of alliances and the sectoral differences found in recent research. Based on this outline of the broader picture of partnering behaviour of international companies, the next section gives the reader some empirical insight as to the trends in international strategic technology partnering since 1980, the different roles that a number of incentives play, the changes in the organization of alliances, and the roles that different industrial sectors play in this context. For each of these topics I shall not only discuss the changes over time but also compare the findings regarding the EU-NAFTA alliances with the other international strategic technology alliances formed during the same period. The implications of the above for our understanding of international strategic technology alliances, and in particular our understanding of those alliances made between companies from the NAFTA countries and the European countries, will be discussed in the conclusions.

COMPETITIVE AND TECHNOLOGICAL IMPERATIVES IN INTERNATIONAL STRATEGIC TECHNOLOGY ALLIANCES

In Ohmae's (1985) well known and popular analysis of global competition it is stated that even the largest and most diversified and 'global' companies frequently still lack the economic power to successfully enter into their foreign markets for all their products and services. Companies can use international alliances to enter into these foreign markets in a joint effort with a local partner. This joint effort compensates for the lack of economic power, competence or foreign experience of at least one of the partners. In short, this kind of competitive pressure refers to strategic alliances as to their effort to create new markets, to provide non-domestic market entry and the search for international expansion of the product range of partnering companies (see Mowery 1988 for a large number of analyses for different markets and technologies). Apart from these concrete market-entry-related pressures to form alliances, strategic alliances can also be used as a scanning device to monitor the environment in which international companies operate and to search for possible new opportunities. In combination with new product development partnerships also allow companies to monitor new product markets without fully entering into these new markets and to rely on a quasi or partial diversification of their product folio. If these new opportunities materialize further, companies can still decide whether they
will pursue these new opportunities through their alliance or on their own (see Obleros and MacDonald 1988).

Although in practice it is difficult to separate the competitive pressures from the technological imperatives, as these are so interrelated and they constitute the very essence of competition in many high-tech industries, we can conceptually set them aside as different aspects of the more general explanation of partnering strategies (Hagedoorn 1993). The group of technology-related factors referred to are particularly relevant for science-based companies that cooperate for the further advancement of research and the diffusion of some applied scientific or technological knowledge among participating companies. These shared activities can be related to concrete research activities, and also to other factors that are associated with some general endeavour at the technological or scientific frontier of particular fields of technology. Other relevant pressures that play a role in the formation of strategic technology alliances are the increased complexity and inter-sectoral nature of new technologies and the cross-fertilization of scientific disciplines and fields of technology. Here it is the growing interrelationship between an increasing number of different scientific and technological disciplines that builds the necessity for close collaboration between companies. Despite successful diversification strategies that a large number of companies might have chosen, even many of these very large and diversified firms lack some competence in a number of scientific and technological fields. Partnerships with competent partners can create the necessary complementary technology and scientific inputs enabling these companies to capitalize on economies of scope through joint efforts. It is also important here to note the role of alliances as a scanning device, as it can enable companies to monitor the evolution of technologies in order to assess potential technological synergies and relevant complementarities of technologies (see Mowery 1988).

A number of more specific technological factors come closer to the concrete competitive pressures mentioned above as they are related to the need to reduce and share the uncertainty which is inherent to performing R&D as well as to sharing of costs of R&D (see Mowery 1988 and Link and Bauer 1989). With increasing competition companies are also forging alliances for concrete innovative projects to reduce the total period of products' life cycles and to jointly introduce new products and services. Increased competition, in particular at the international level, forces companies to preempt markets and to introduce innovations not only relatively simultaneously in different international markets but also to be the first to these markets (Ohmae 1985). Strategic partnerships can play a role in a joint effort to contract the period between invention and market introduction for a number of projects of each individual company.
DEGREES OF PARTNERING IN INTERNATIONAL STRATEGIC TECHNOLOGY ALLIANCES

It has to be stressed that international strategic partnering takes place in a variety of organizational modes that also have an impact on the degree of partnering between firms. In order to categorize these different forms of inter-firm cooperation a number of taxonomies have been introduced (see Auster 1992, Chesnais 1988, Harrigan 1985, Casson 1987, Contractor and Lorange 1988 and Hagedoorn 1990). Basically we can distinguish between a group of equity arrangements, such as international joint ventures and research corporations, and a group of so-called contractual arrangements, such as joint development agreements, R&D pacts and R&D contracts. A wide range of contributions (Auster 1992, Buckley and Casson 1988, Contractor and Lorange 1988, Hagedoorn 1990, Hagedoorn and Narula 1996, Harrigan 1985, Osborn and Baughn 1990, Root 1988) have demonstrated that these different modes of cooperation have a distinctive impact on the character of technology sharing, the organizational context and the possible economic consequences for participating companies.

International joint ventures are probably the oldest and most well-known mode of inter-firm partnering. In the context of strategic technology partnering joint ventures are those 'firms' that have shared R&D or joint technology development as a specific company objective next to production, marketing, sales, etc. Research corporations are a sub-category of joint ventures with distinctive research programmes of which the main purpose is to supply R&D to the parent. It is obvious that the creation of a new firm with usually two parents creates a relatively high degree of organizational interdependence. In terms of Williamson's (1985 and 1991) 'markets and hierarchies' this comes close to hierarchical structures with parent companies sharing control over their joint venture. Different company strategies such as entry into new markets, repositioning and expansion in existing markets and even exit strategies in declining markets are reflected in these joint ventures.

During the past decades a number of non-equity or contractual forms of strategic technology cooperation, in particular joint R&D agreements, have become an alternative to joint ventures. We understand these contractual arrangements to cover technology and R&D sharing by two or more companies through undertakings which establish research projects or joint development agreements with shared resources. So, these agreements suggest a relatively strong commitment of companies and inter-organizational interdependence during the joint project, although the interdependence is smaller than is the case with joint ventures. This category of cooperation covers a wide variety of legal and organizational arrangements. In particular large companies seem to use many
of these agreements to explore possible benefits of new technologies (Duysters and Hagedoorn 1995, Hagedoorn and Schakenraad 1994).

Research contracts are another example of non-equity alliances that regulate R&D cooperation in which one partner, usually a large company, contracts another company, frequently a small one, to perform particular research projects. For the contract-initiating party, advantages can be found in the possibility to focus on particular areas of research with substantial cost-saving compared to fully fledged in-house research facilities. Disadvantages for those companies are related to the lack of in-house expertise to assess the value of contract research and the dissociation of development expertise from manufacturing expertise (Opler and MacDonald 1988, Teece 1987). For the other contractor benefits are found in terms of substantial R&D funding and cooperation with experienced partners.

Organizational complexity is an important aspect of these different modes of international strategic technology partnering. The choice for a particular mode is affected by the trade-off between minimizing organizational complexity and maximizing control over the alliance by each partner. The more complex inter-organizational mode of technology cooperation, such as a joint venture, raises a number of problems of corporate governance. Its quasi-hierarchical nature not only reaches intermediate level of corporate control, but also introduces dilemmas related to trust, forbearance and opportunism (Parkhe 1993). Contractual agreements appear to involve lesser intra-organizational complexity because no separate new administrative element is created. However, although contractual agreements in themselves are less complex, companies often engage in several alliances simultaneously with a variety of partners. This introduces an additional level of complexity, namely difficulties associated with both the administration of these partnerships and the need to continuously monitor the net benefits accruing from various contractual alliances (Osborn and Baughn 1990).

The international context of these alliances increases the already existing high level of complexity. In terms of control, the agreement has to be monitored from corporate headquarters over long distances or from a local or regional subsidiary. However, even in the latter case, there is often no real reduction in the ‘distance of control’ but it frequently merely results in the introduction of an additional level of corporate governance. Furthermore, companies of different national backgrounds are influenced by their past business experiences as well as by the difficulties of maintaining control over the alliance across borders. Companies that have collaborated on other projects in the past, and are familiar with the business practices and/or regulatory framework in which their partners operate, will perceive less uncertainty in engaging in partnerships that are less complex than with firms with which they have had little experience (Gulati 1995).
As far as the question of control in these different modes of cooperation is concerned, 'traditional' internalization theory (Buckley and Casson 1976, 1988, Dunning 1993, Rugman 1980) appears to suggest that equity agreements offer a larger degree of control over technology sharing than non-equity partnerships. However, recent contributions (Hagedoorn 1993, Osborn et al. 1996, Powell et al. 1996) suggest that in particular for technology-related alliances formal control is probably less relevant than adequate access to new knowledge, flexibility in cooperation, and mutual flows of information for which both complete and incomplete contractual agreements seem adequate.

An interesting question in this context is whether sectors differ with respect to the distribution of equity versus contractual arrangements. Studies by Harrigan (1985 and 1988), Link and Bauer (1989), Osborn and Baughn (1990) and Hagedoorn and Narula (1996) suggest that technological stability of industrial sectors is a crucial factor explaining different patterns for equity and nonequity partnerships. In sectors with low or medium degrees of R&D intensity, that we can characterize as low or medium technology intensive sectors, one will witness a larger share of joint ventures than in R&D-intensive sectors, or high-tech sectors, in which we see a general preference for contractual agreements and a higher degree of organizational flexibility in partnerships.

Evolving Atlantic Patterns of Strategic Technology Alliances

If we look at the overall pattern of growth of strategic technology alliances between companies from the EU and the NAFTA countries (see Figure 9.1) we see that by and large the number of newly made alliances has grown over the years. In the early 1980s the number of alliances between the EU and NAFTA amounted up to only about 30 to 70 alliances made each year, but towards the first half of the 1990s this had risen to over 100 alliances registered each year. In 1994 the number of European-NAFTA alliances peaked at a record of over 150 new strategic technology alliances. Compared with other international strategic technology alliances we see that the growth pattern of EU-NAFTA alliances is somewhat less 'steep', but the growth pattern of the latter still essentially follows the overall growth pattern with a major exception towards the end of the period when the number of other international alliances made in 1994 has clearly dropped from nearly 250 to about 160.

In all this we should, however, not forget that strategic technology partnering as such has not necessarily become more internationalized. The number of international or global alliances has certainly increased quite strongly over the last couple of decades but so has the number of domestic alliances and the number
Figure 9.1  Growth of international strategic technology alliances, EU-NAFTA and other international alliances, 1980–94
of cross-border strategic technology partnerships made within international regions such as the EU or NAFTA. In relative terms these domestic and intra-regional alliances are still an important phenomenon. As with the internationalization of company R&D and other aspects of the internationalization of innovative efforts of companies there is certainly not an explosion of international activities but much more a gradual increase of international alliances in the context of an overall increase of inter-firm partnering (Duysters and Hagedoorn 1996).

In a previous section I discussed both the technological and the competitive imperatives that play a role in alliance formation. Table 9.1 presents the distribution of strategic technology alliances for which it was found that joint research and development was the only or by far the most important motive for cooperation set against alliances for which a wider range of incentives such as joint production or joint marketing was also part of the agreement. On average joint R&D appears to be the most important factor in the formation of strategic technology alliances between companies from the EU and NAFTA as over 70 per cent of these international alliances are focused on R&D. Throughout the 1980s this share was at a level of slightly over 60 per cent but during the first half of the 1990s the share of R&D-centred alliances between European and NAFTA alliances rose to over 80 per cent. Other international technology alliances seem to be somewhat less focused on joint R&D, given the about fifty-fifty distribution for both R&D alliances and alliances that have a broader manufacturing, marketing and technology-sharing orientation. However, in recent years these other international alliances also have become predominantly R&D-directed.

As we are analysing international strategic 'technology' alliances it does not come as a surprise that R&D, which plays an important role in technological development, is also a major imperative for companies to cooperate. However, the changes over time do suggest that the 1990s mark a period in which technological cooperation through joint R&D has become even more important and as such it stresses the relevance of advanced technology pressures that lay behind this phenomenon.

Table 9.2 demonstrates that this increasing role of joint R&D is also reflected in the role that different organizational forms of international technology partnering play. As mentioned above, joint ventures usually have a larger number of objectives than just the joint undertaking of R&D activities. For the other group of alliances, the contractual agreements, R&D as such appears to be more central to the agreement. Given the increasing role of technological and research-related imperatives for partnering, we might expect that the share of international joint ventures will decrease over time. Furthermore, we can also expect that, given the more dominant role of technological imperatives in Atlantic alliances, the share of contractual alliances between European and
NAFTA partners will be higher than for other international combinations. Table 9.2 demonstrates that during the 1980s European and NAFTA partners had chosen the joint venture mode for only about 30 per cent of their alliances, and this share decreased to about 22 per cent during the first half of the 1990s. Not only have contractual agreements become more important during the 1990s; Table 9.2 also shows that, as expected, joint ventures are significantly more important for the group of other international strategic technology alliances. Although for these other international alliances the share of joint ventures has also decreased, their share is still about 10 per cent higher than for the European-NAFTA alliances.

Table 9.1  Distribution of R&D and market-focused international strategic technology alliances. EU-NAFTA and other international alliances, 1980–94 (percentages)

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<tbody>
<tr>
<td>EU-NAFTA</td>
<td>R&amp;D</td>
<td>61.3</td>
<td>61.5</td>
<td>82.6</td>
</tr>
<tr>
<td></td>
<td>Market</td>
<td>38.7</td>
<td>38.0</td>
<td>15.5</td>
</tr>
<tr>
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<td>Unknown</td>
<td>0.0</td>
<td>0.5</td>
<td>1.9</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>International</td>
<td>R&amp;D</td>
<td>51.2</td>
<td>49.5</td>
<td>81.0</td>
</tr>
<tr>
<td></td>
<td>Market</td>
<td>48.6</td>
<td>49.8</td>
<td>16.9</td>
</tr>
<tr>
<td></td>
<td>Unknown</td>
<td>0.2</td>
<td>0.7</td>
<td>2.1</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>100</td>
<td>100</td>
<td>100</td>
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Source: MERIT-CATI.

Table 9.2  Distribution of joint ventures and contractual international strategic technology alliances. EU-NAFTA and other international alliances, 1980–94 (percentages)

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<tbody>
<tr>
<td>EU-NAFTA</td>
<td>Joint ventures</td>
<td>29.4</td>
<td>31.8</td>
<td>22.4</td>
</tr>
<tr>
<td></td>
<td>Contracts</td>
<td>70.6</td>
<td>68.2</td>
<td>77.6</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>International</td>
<td>Joint ventures</td>
<td>37.5</td>
<td>45.5</td>
<td>28.1</td>
</tr>
<tr>
<td></td>
<td>Contracts</td>
<td>62.5</td>
<td>54.5</td>
<td>71.9</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
</tbody>
</table>

Source: MERIT-CATI.
Previous research (Hagedoorn and Narula 1996) has entered into a more
detailed analysis of international partnering behaviour of companies from a larger
number of countries and in particular looked at patterns of partnering between
European, US and Japanese companies. In that particular analysis it is mentioned
that during the 1980s the share of joint ventures in international strategic
technology alliances between both European-Japanese and US-Japanese
combinations was substantially higher than the Atlantic alliances analysed
here. This suggests that formal control through equity partnerships plays a
more important role in alliances with Japanese companies following the logic
of a transaction-cost-based approach, whereas for Atlantic alliances other than
straightforward quasi-internalization motives have begun to play a more
dominant role.

Finally, we can take a closer look at the sectoral breakdown of international
strategic technology alliances (see Table 9.3). If we accept sectors or fields of
technology such as information technology, biotechnology, new materials and
aerospace, aviation and defence as high-tech sectors that will have a substantial
impact on international competition for an extended period of time, it appears
an interesting question to see to what extent alliances related to these activities
and sectors play a role in international partnering. Given the specific focus on
Atlantic alliances the next question would be to see whether strategic technology
partnerships between European and NAFTA companies are concentrated in a
different set of sectors and fields of technology than the group of other
international alliances.

Our data show that these high-tech sectors take the lion's share of the
international strategic technology alliances. For the EU-NAFTA alliances over
82 per cent of the alliances made in the past fifteen years are found in these sectors
and technologies. The share of alliances in information technology,
biotechnology, new materials and aerospace, aviation and defence has risen from
nearly 80 per cent during the first half of the 1980s to nearly 85 per cent during
the first half of the 1990s. Much of this increase can be attributed to the growing
importance of EU-NAFTA alliances in biotechnology which has reached a share
of nearly 25 per cent of the alliances made during the first half of the 1990s. The
other international strategic technology alliances show a somewhat similar
pattern. Although the share of high-tech sectors in these international alliances
is smaller than in the case of EU-NAFTA alliances they still constitute nearly
three-quarters of the alliances made during these fifteen years. Also, for these
international alliances we see a strong increase for high-tech sectors from
slightly over 70 per cent during the first half of the 1980s to nearly 80 per cent
of the alliances made during the first half of the 1990s. A somewhat striking
difference with the distribution for EU-NAFTA alliances we found is that for
this group of international alliances the increase of high-tech alliances seems
Table 9.3 Sectoral distribution of international strategic technology alliances, EU-NAFTA and other international alliances, 1980–94 (percentages)

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<tbody>
<tr>
<td><strong>EU-NAFTA</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Biotechnology</td>
<td>17.7</td>
<td>20.7</td>
<td>24.1</td>
<td>21.7</td>
</tr>
<tr>
<td>IT</td>
<td>43.3</td>
<td>45.2</td>
<td>44.0</td>
<td>44.3</td>
</tr>
<tr>
<td>New materials</td>
<td>7.4</td>
<td>9.1</td>
<td>8.3</td>
<td>8.4</td>
</tr>
<tr>
<td>Aerospace/aviation/defence</td>
<td>10.8</td>
<td>5.8</td>
<td>8.3</td>
<td>7.9</td>
</tr>
<tr>
<td>Automotive</td>
<td>3.5</td>
<td>5.4</td>
<td>1.7</td>
<td>3.3</td>
</tr>
<tr>
<td>Chemicals</td>
<td>7.8</td>
<td>6.5</td>
<td>9.6</td>
<td>8.1</td>
</tr>
<tr>
<td>Others</td>
<td>9.5</td>
<td>7.2</td>
<td>4.1</td>
<td>6.2</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td><strong>International</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Biotechnology</td>
<td>15.9</td>
<td>17.1</td>
<td>18.3</td>
<td>17.4</td>
</tr>
<tr>
<td>IT</td>
<td>41.3</td>
<td>38.1</td>
<td>40.4</td>
<td>39.7</td>
</tr>
<tr>
<td>New materials</td>
<td>9.7</td>
<td>10.5</td>
<td>7.7</td>
<td>9.1</td>
</tr>
<tr>
<td>Aerospace/aviation/defence</td>
<td>4.1</td>
<td>5.9</td>
<td>12.7</td>
<td>8.5</td>
</tr>
<tr>
<td>Automotive</td>
<td>5.2</td>
<td>8.7</td>
<td>2.4</td>
<td>5.3</td>
</tr>
<tr>
<td>Chemicals</td>
<td>12.0</td>
<td>11.5</td>
<td>12.1</td>
<td>11.9</td>
</tr>
<tr>
<td>Others</td>
<td>11.8</td>
<td>8.1</td>
<td>6.3</td>
<td>8.1</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
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Source: MERIT-CATI.

to a large extent to result from an increasing share of international alliances related to the aerospace, aviation and defence industry.

CONCLUSIONS

Complementarity between partners, in terms of either international markets or technological capabilities, turns out to be a major driving force behind the growth of international strategic technology alliances. And it is also this complementarity and the differences between companies that creates a large part of the complexity that is surrounding international partnerships. Furthermore, this complexity is increased by both the intrinsic complicated nature of modern technologies, for which we find so many alliances, and the multitude of both equity and contractual agreements that many companies have entered into.
The above discussion has shown that there is an increasing number of international strategic technology alliances in which the combination of companies from the EU and the NAFTA countries has taken a major share. Compared to other international alliances it turns out that these EU-NAFTA partnerships are particularly oriented towards high-tech activities and joint R&D. During the early 1990s high-tech sectors constituted over 80 per cent of the strategic technology alliances between the two economic regions discussed in this chapter. For instance, a highly research intensive field such as biotechnology turns out to generate nearly 25 per cent of the alliances between EU and NAFTA companies. Although other international strategic technology alliances are also quite high-tech oriented we still notice that the emphasis on advanced technologies and sophisticated inter-firm research cooperation within EU-NAFTA alliances is significantly stronger.

We also find that contractual agreements have become much more important than joint ventures and as such Atlantic partnerships demonstrate that increasingly international companies search for new forms of partnering that go beyond the traditional equity form. This could indicate that the long-term experience of partnering between European and NAFTA partners has generated a level of confidence and tolerance in cooperation that equals that of domestic alliances.

APPENDIX

The MERIT-CATI Data Bank on Strategic Technology Alliances

The empirical data in this chapter is derived from the MERIT-Cooperative Agreements and Technology Indicators (CATI) data bank. This relational database, with information on over 13,000 domestic and international technology cooperation agreements involving some 5000 different parent companies, was established in the late 1980s. After a pilot project in 1986–87, systematic collection of inter-firm technology alliances started in 1988. Many sources from earlier years were consulted, which enables us to take a retrospective view. For all sectors of industry or fields of technology in our data bank, we have information on cooperative agreements from at least as early as 1980 up to 1994. In order to collect information on inter-firm alliances and their parents, we consulted various sources, such as informal reports, newspaper and journal articles, books dealing with the subject, and, in particular, specialized technical journals which also report on business events. Company annual reports, the Financial Times Industrial Companies Yearbooks, and Dun & Bradstreet’s Who Owns Whom provide information about dissolved equity ventures and investments, as well as ventures that were not registered when surveying alliances.
This method of information gathering which we might call 'literature-based alliance counting' has its drawbacks and limitations such as inadequacy of certain sources, low profile of certain companies or industries, bias in favour of Anglo-Saxon sources, and underestimation of certain modes of cooperation such as licensing. It also introduces a certain bias in terms of the frequency versus the scale of alliances. Despite these shortcomings, which are largely unsolvable even in a situation of extensive and large-scale data collection, we think we have been able to produce a clear picture of the joint efforts of many companies. This enables us to perform empirical research which goes beyond case studies or general statements. We avoided some of the weaknesses of the database by focusing on the more reliable parts, such as strategic technology alliances, and by ignoring cost-economizing partnerships and licensing agreements.

The data bank contains information on each agreement and some information on companies participating in these agreements. The main entity is the inter-firm cooperative agreement. We define cooperative agreements as common interests between independent (industrial) partners which are not connected through (majority) ownership. The CATI database includes only those inter-firm agreements that contain arrangements for transferring technology or joint R&D. Mere production or marketing agreements are excluded. In other words, our analysis is primarily related to technology cooperation. Our focus is on those forms of cooperation and agreements for which a combined innovative activity or an exchange of technology is at least part of the agreement. Consequently, we exclude partnerships that regulate no more than the sharing of production facilities, the setting of standards, collusive behaviour in price-setting and raising entry barriers, although all of these may be side effects of inter-firm cooperation as we define it.

We count as an alliance any agreement made between two or more companies at a particular moment. Subsequent agreements between the same partners are considered as individual and separate agreements. However, if a particular agreement consists of several legal forms of cooperation that are parts of the agreement at large, such as a joint venture with a licensing agreement, we consider this as one agreement. If a partnership is extended with a new partner or a new contract is made between two cooperating firms we view this as a new alliance. Frequencies reported in this chapter therefore refer to the number of individual partnerships. Although we do have information on the value of a limited number of alliances (such as the amount of investment) we prefer not to utilize this information for two reasons. First, the coverage of this data excludes contractual agreements for which the value of the agreement is not disclosed, and second, a large percentage of technology partnerships involve interchange of knowledge rather than the exchange of funds or capital.

In this chapter, I record for each alliance: the country of origin of each partner, year of establishment of the agreement, field(s) of technology and/or industry, modes of cooperation and the degree of R&D- or market-orientation.
The country of origin of a given company refers to the country where a company or its head office is registered. Therefore, international alliances are partnerships between companies registered in different countries. This obviously has certain limitations in the case of international companies, because a number of their partnerships are between their local subsidiaries and local partners. However, many of these ‘artificial’ international alliances are monitored from the head office. Furthermore, there is no other choice in the context of large databases than to follow a strict procedure for categorization. Decisions regarding the possible degree of international subsidiary-level monitoring are impossible to make for a population of thousands of agreements and companies.

I make a distinction between cooperative agreements which are expected to be aimed at the strategic, long-term perspective of the companies involved and those agreements which appear to be more associated with the control of either transaction costs or operating costs of companies. In case both general motives appear possible, either because it is not feasible to differentiate between the cost or the strategic argument or because partners often have alternating motives as a consequence of the character of the agreement; I have marked such agreements as being of a mixed character. The procedure is described extensively in Hagedoorn 1993 and in Hagedoorn and Scharenhaar 1994. In practice, our decision rules imply that joint ventures with R&D, research corporations, joint R&D pacts, customer-supplier agreements combined with licensing, cross-licensing, research contracts with licensing, and (mutual) second-sourcing agreements are taken as strategic alliances. Excluded are standard co-makership contracts, co-production agreements, and single licensing agreements for which the cost-economizing argument is thought to be a major motive.

REFERENCES

Atlantic strategic technology alliances


