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Abstract

This paper evaluates the extent to which private, non-subsidised cooperative agreements in R&D by EU firms has evolved, paying particular attention to the extent to which economic integration may have influenced intra-EU activity relative to extra-EU agreements (i.e., EU-US and EU-Japan alliances) over the period 1980-1994. Essentially, EU firms' partnering habits reflect the need to seek strong partners regardless of nationality within a given industry, although intra-EU partnering enjoyed a brief popularity during the latter half of the 1980s.

Keywords: Single European Market; R&D collaboration; strategic alliances

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Strategic technology alliances by European firms since 1980: questioning integration?

Introduction

The single European market (SEM) initiative, through its various stages of economic cooperation until the establishment of the European Union, can be said to be one of the most important socio-economic developments of this century. At the heart of much of this activity has been a belief that cooperation by institutions and firms across the various European countries represents a means by which the technological and economic gap between the US and Europe after the Second World War might be narrowed. As Peterson (1991) has pointed out, although technological collaboration has constantly remained high on the agenda of European policy makers, policy makers have systematically developed pan-European R&D activities only since the 1980s. Several initiatives by the European Commission have been implemented over the past two decades in an attempt to bolster the competitiveness of European firms, particularly in high technology sectors.

In this paper, we evaluate the extent to which private (i.e. non-subsidised) cooperative agreements in R&D by EU firms have evolved, paying particular attention to the extent to which economic integration may have influenced intra-EU activity relative to extra-EU agreements (i.e. EU-US and EU-Japan) over the period 1980-1994. Given the crucial nature of technology development to the competitiveness of firms, we wish to enquire whether in fact the SEM initiative has had a significant effect on the propensity of EU firms to collaborate in R&D type activities, with special attention to information technology, new materials and bio-technology. Our analysis is somewhat anecdotal and qualitative, and utilises data from the MERIT-CATI database, which contains records of over 10,000 instances of strategic technology partnering (see the appendix). Essentially, EU firms' partnering habits reflect the need to seek strong partners regardless of nationality within a given industry, although intra-EU partnering enjoyed a brief popularity during the latter half of the 1980s. While the SEM has been judged to have affected the structure of European industry through a general restructuring of European industry to exploit economies of scale through rationalisation, this has brought limited improvement in the competitive position of European industry.

Explaining cross-border activity and European integration

The SEM initiative has been judged to be reasonably successful, in terms of encouraging intra-European economic activity - at least in terms of trade and FDI - although there have been some reservations expressed about the qualified nature of these gains, given the inter-relation between the two. For instance, there has been an increase in trade in particular sectors that are sensitive to non-tariff barriers that were to be scrapped by 1993, as firms have sought to improve their efficiency through the rationalisation of production in order to achieve economies of scale. However, as Hughes (1992) has argued, US and Japanese firms have been equally well positioned as EC firms to exploit the SEM initiative. She points out that the only way firms can take advantage of scale economies is by the relocation and readjustment of produc-

tion activities, something which US and Japanese firms have also undertaken in response to the SEM initiative. Indeed, as numerous studies have shown[1], there has been a growing amount of FDI inflows during the run-up period to 1993 as non-EU firms have established (or consolidated) their presence within the EU. They have done so partly in the fear of a 'fortress Europe', but also to exploit potential benefits of a single market of 300-odd million consumers.

In terms of FDI, Dunning (1997a, 1997b) in a survey of inward FDI into the EU, concluded that:

1. FDI into the EC since the early 1980s has grown faster than in most other parts of the world;
2. the geographical and industrial distribution of inward FDI stocks have changed to reflect a certain level of rationalisation, with the more labour intensive aspects moving to the periphery (Portugal, Spain and Greece); and with the bulk of technology and information sensitive sectors remaining in the 'core' countries of the EU;
3. intra-EC FDI and Japanese FDI inflows have outpaced US inward FDI. He also observed that overall, the spatial distribution of production activities has not undergone a major shift.

The current paper aims to throw some light into the third area that has been expected to promote the growth of intra-EU economic activity, that of industrial collaborative activity, or strategic alliances. In particular, we focus on understanding the behaviour of a rather important subset of cooperative agreements, that of strategic technology partnering (STP).

By strategic alliances we refer to inter-firm cooperative agreements which are intended to affect the long-term product-market positioning of at least one partner (Hagedoorn 1993). In this paper we are specifically interested in strategic technology alliances where innovative activity is at least part of the agreement.

What make this line of enquiry important and topical? The contra argument to this line of analysis lies in the fact that in general, while production activities have gradually been increasingly internationalised, there has been relatively little internationalisation of R&D (see e.g., Patel and Pavitt 1991, Dunning and Narula 1995, Archibuigi and Michie 1995). On the pro side, it is worth noting that there has been some growth in the technological development activities of MNEs relative to its level 20 years ago, and these changes have resulted in two trends worth of noting. First, in addition to overseas R&D activities associated with demand side factors, there has been a growing extent of foreign R&D activities by firms in response to supply-side factors (Florida 1997, Kummerle 1997). Second, there has been a growing use of external or quasi-external technological sources. Tidd and Trewhella (1997) suggest that the most important external sources of technology are universities, consortia, licensing, customers and suppliers, acquisitions, joint ventures and alliances and commercial research organisations. Although there is little systematic and thorough analysis of this process, companies such as Phillips and Akzo-Nobel are currently attempting to externally source 20% of their technology needs (van Hoesel and Narula 1998). Indeed, there is a direct relationship between how much R&D a firm does internally, and its external acquisition of technology. Veugelers (1997) demonstrates that there is a positive relationship between external technology sourcing and internal R&D. Indeed, indications are that collaborative arrangements to

[1] See Dunning (1997a and 1997b) for a review.

undertake R&D are becoming ever more popular, having tripled in significance since the early 1980s (Gugler and Pasquier 1996).

Furthermore, the European Commission through its framework programme has encouraged R&D collaboration by public and private EU based institutions, significantly relaxing its prohibition on anti-competitive agreements where they are related to technology development (Urban and Vendemini 1992). In addition, under the auspices of programmes such as ESPRIT, RACE, BRITE and BRIDGE, it has provided considerable subsidies to collaborative R&D.

Although it is clear that there has been something of an explosion in the propensity of European firms to undertake strategic alliances, to what extent can this be attributed or explained by the SEM initiative? Can we apply our understanding of European integration as applied to trade and FDI to explain collaboration in general, and R&D cooperation in particular?

Explanations for the growth in collaboration

It is especially difficult to delineate the various reasons for the growth in intra-European FDI and trade, particularly those to do with the SEM initiative from other factors such as those associated with globalisation. In addition, the phenomena under discussion are dynamic and complex, and as such are fraught with complex interdependencies. Nonetheless, underlying reasons for much of the growth may be summarised as being due to the reduction in the tariff and non tariff barriers between European countries and the harmonisation of laws and the subsequent free(er) movement of good and people across borders. It is possible, at the risk of oversimplifying, to suggest there are two sets of highly inter-related and co-dependent explanations, firstly from a transaction-economics perspective, and secondly from a strategic perspective.

Integration as a reduction in transaction costs

To what extent can this inter-disciplinary framework be an explanation for the growth of inter-firm collaboration? It might be argued that the harmonisation of regulations across borders makes coordination and monitoring costs of cooperative agreements lower, thereby making quasi-internalisation through collaboration a more cost-effective option than had previously been the case. In general, it might be argued that these transaction costs reductions accrue to a greater extent to intra-EU alliances, than to extra-EU agreements. However, as implied by Hughes (1992) and Ramsay (1995), many of the major foreign-owned MNEs already present (and in many cases, firmly embedded) in the EU economy would accrue the same benefits as EU firms. As Narula and Hagedoorn (1997) have shown, there are no significant country-specific differences in the propensity to engage in alliances. Nonetheless, it might be argued that, *ceteris paribus*, greater absolute cost-reductions might occur for EU firms since the extent of their European value added activity is generally higher and the significance of their European operations much larger to their total world-wide activity. *This reasoning might suggest that ceteris paribus, EU firms should derive a larger benefit when engaging in collaboration with other EU firms as a result of European integration relative to non-European firms.*

However, while reduced transaction costs might lead firms which otherwise might have considered full internalisation to undertake collaborative agreements, this assumes that these firms were already interested in international expansion. Firms that might not have had the resources to engage in overseas activity on their own, would now also be able to consider it, since a collaboration could require fewer resources than it might otherwise have done before integration. In other words, this line of reasoning would suggest that *ceteris paribus, the number of firms undertaking alliances within the EU would have increased since the 1980s in response to integration.* However, it is important to note that there is a strong causality between size and the propensity to engage in STP, given the need to have sufficient resources to undertake R&D.

Evolving motives for collaboration

A second line of reasoning has to do with the change of strategy of firms in response to integration. The primary reasons why firms undertake collaborative activity in the first place have, on balance, not changed substantially. Successive surveys of the literature have resulted in a near-taxonomy of motives for alliances (see e.g., Hagedoorn (1993), Dunning (1993), Glaister and Buckley (1996)), and can be summarised as being to:

1. improve appropriability of innovation
2. improve access to markets
3. Co-opt and block competition
4. reduce rising costs/risk of innovation
5. seek complementary assets

It would seem logical to argue that European integration has (or should have) eliminated the need to undertake alliances for motive (2) and to a lesser extent, motive (1)[2]. On the other hand, motives (4) and (5) have become increasingly important as these are global phenomena, while open markets may have aggravated the use of motive (3), since firms are obliged to restructure to strengthen or even maintain their competitive position, either through aggressive or defensive means. Indeed, such a restructuring of EU industry has occurred since the early 1980s in response to the impending single market agreement (Dunning 1997a). Much of the EU-subsidised R&D programmes was aimed at achieving this renewed competitiveness, and indeed, was undertaken in earnest by most firms with a view to being able to compete on equal terms with other EU firms as well as US and Japanese firms by 1993. To what extent then, can it be argued that they may have effected intra-EU alliances relative to EU-US alliances or EU-Japan-alliances? Narula and Hagedoorn (1997) show that firms display similar STP behaviour within a given industry regardless of their nationality. *We should therefore expect to see a growth of intra-EU alliances as 1993 approaches, as well as a growth in EU-US and EU-Japanese alliances as these firms too will be interested in consolidating their global position, and a decline thereafter.*

However, an alternate and contrary approach is taken in research by Ramsay (1995) Kay (1991) and Kay, Ramsay and Hennart (1996) who argue that in fact the restructuring of EU industry favours other fully-internalised modes of activity such as mergers and acquisitions (M&A). Furthermore, intra-EU agreements would not be popular since market entry post

[2] If one assumes that laws pertaining to the protection and enforcement of property rights had become harmonised. However, given that property rights are generally difficult to define, particularly in technology intensive sectors, complete harmonisation may in fact be de jure but not necessarily de facto.

1992 is barrier free in all directions, potential partners would also be potential competitors. In their view, firms from outside the EU would be relatively more inclined to undertake collaborative agreements. This argument is based on the assumption that collaborative activity is a device of last resort, and that firms engage in joint ventures primarily to achieve market entry. However, there are two points that cause umbrage: First, the assumption that collaborative arrangements are devices of last resort. This in fact, is arguably no longer the case, as we are entering what Dunning (1995) has termed the age of alliance capitalism. In many cases, alliances represent a first-best option (Ciborra 1991), particularly where quick response to dynamic conditions is called for. This is especially true of alliances that involve technology development (Hagedoorn 1993). However, it should be pointed out that their analyses focused entirely on joint ventures, and not on strategic alliances. Second, there is the explicit assumption that firms undertake joint ventures in order to enter markets. As we have highlighted above, this is only one of the motives for alliances, and in the case of STP, a relatively unimportant one.

Examining the evidence.

What are the trends of European firms in undertaking strategic technology partnering? Figure 1 is a plot of the number of newly established STP agreements by regional pairings. For instance, in the case of European-Japanese STP, we count how many alliances contain at least one Japanese and one European partner. The data shows that in the case of intra-EU alliances, between 1980 and 1984, there was a total of 270 alliances, and over the proceeding 5 years this number almost doubled to 534. Between 1990 and 1994, the level of intra-EU partnering dropped to its pre-1985 extent. In the case of EU-US alliances, the trend is somewhat different. Although there was a sharp increase in transatlantic partnering activity in the mid-1980s, the level of this activity (on an aggregate basis) continued unabated until 1993, with a sharp increase in the latest year. In the case of EU-Japanese alliances, the level of activity has remained at more or less the same level over the entire 15-year period for which data is available. Table 1 examines the trends for the UK, France and Germany and shows the change over time in their alliance activity with the seven most significant industrial countries of partner firms between 1980 and 1994. These trends tell a similar story.

Figure 1: Number of new STP per year by EU firms, 1980-1994

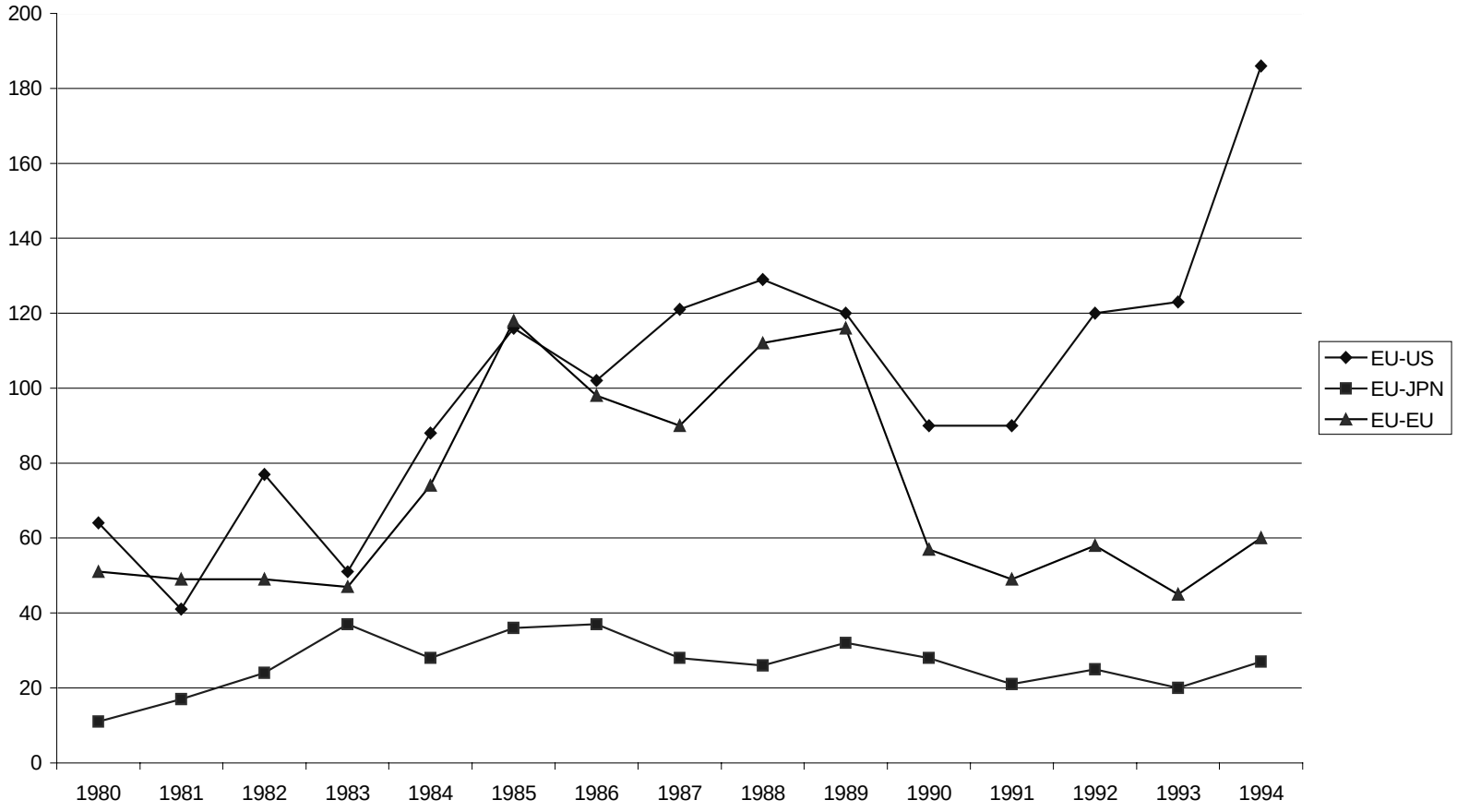

Figure 2: STP by EU firms, by core sectors and regional groupings

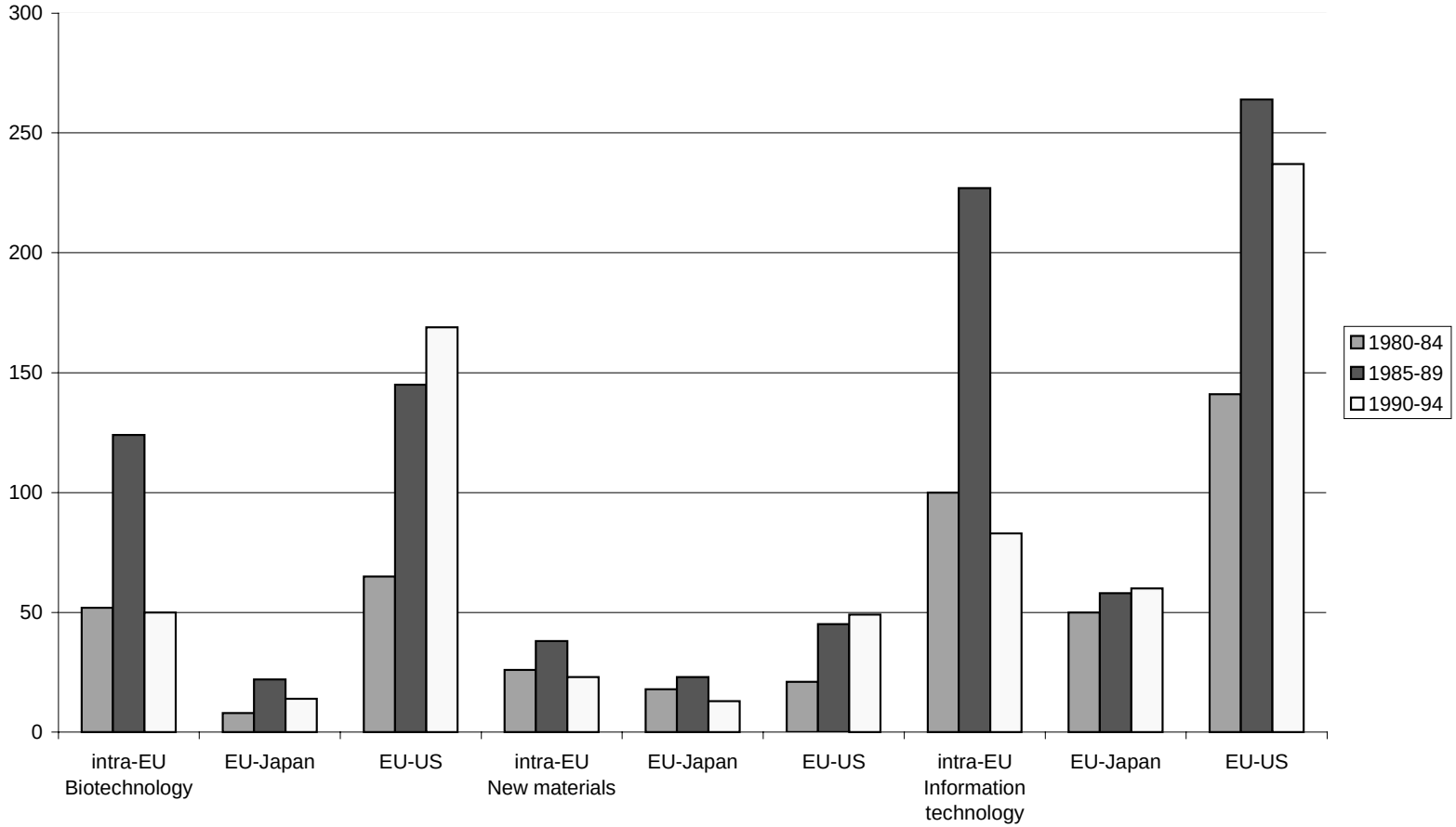

Table 1: STP by German, UK and French firms

STP by German firms with companies from:	1980-84	85-89	90-94
UK	9	29	21
France	11	26	21
Netherlands	10	25	16
Italy	5	13	7
USA	51	108	163
Japan	22	33	41
STP by UK firms with companies from:	**1980-84**	**85-89**	**90-94**
Germany	9	27	18
France	10	31	24
Netherlands	9	27	8
Italy	5	13	8
Japan	117	159	121
USA	69	139	140
STP by French firms with companies from:	**1980-84**	**85-89**	**90-94**
Germany	9	24	21
UK	10	31	24
Netherlands	5	24	15
Italy	14	17	14
Japan	23	27	27
USA	58	69	100

Source: MERIT/CATI database

What do these data imply? First, that European industry began to undertake a much more serious view of alliances in the mid-1980s, with a doubling of activity over a short period. This can be in part be attributed to three things. First, that the process of economic integration had by this time been seen to be a reality. Second, European firms had begun to realise by the mid-1980s that they were technologically lagging in new core high technology sectors such as information technology, and leading European firms had begun to cooperate by this period (Mytelka and Delapierre 1987, Mytelka 1995). This cooperation in R&D was further enhanced by encouragement from the European commission around this same period, with the commission establishing a 'Big 12 roundtable' to develop proposals for new collaborative R&D projects (Peterson 1991). Although our data excludes information from EU-subsidised projects, the availability of funds through the establishment of EU subsidised R&D programmes (which expanded to include other non-IT national champions which were major consumers of IT products such as Volvo, Aerospatiale and Volkswagen) further enhanced the intra-EU collaborative efforts of European companies. It is indeed no coincidence that the launch of the EC's framework programme and Eureka occurred around the same time as the surge in alliance activity. In other words, European firms, driven by the need to improve their competitive position in the face of increasing competition on a global basis, sought to improve their technological advantages through collaboration, a process which was further encouraged through financial and legal support from the European Commission. It is worth noting that it is exceedingly difficult for governments to determine, where R&D collaboration is

concerned, which projects within a large company's research portfolio actual benefits from the R&D subsidies (Narula and Dunning 1998).

Third, given the realities of the SEM initiative, the need to become competitive within the European context required a certain level of restructuring on the part of the various individual EU firms. Although while Kay, Ramsay and Hennart's (1996) argue that intra-EU collaboration was inhibited because potential partners are also potential competitors, the fact is that this is also one of the primary attractions of partnering: strategic partnering also affords firms a chance to (temporarily) pre-empt competition, in addition to allowing the to evaluate the capabilities of the partner firm. Indeed, Hagedoorn and Schakenraad (1993) found that over the period 1980 to 1989 the subsidised R&D networks and private R&D networks were started almost simultaneously, and that the intensity of private R&D cooperation could be predicted by the intensity of subsidised R&D cooperation.

The subsequent decline of the number of new alliances in the 1990s, in our view reflects the result of re-structuring of European industry, in part through the series of M&A that occurred in the run-up to the single market (e.g., Nixdorf by Siemens, ICL by Fujitsu, Plessey to Siemens-GEC) as well as the re-positioning of firms' technological profiles (e.g., the exit of Philips from computers, its entry of the telecommunications sector with AT&T) (Mytelka 1995).

The second reason for the decline in intra-EU alliances may have to do with the growth of extra-EU alliances. As table 1 and figure 1 both show, the propensity for EU firms to engage in alliances with Japanese and US firms also increased in the mid-1980s. This reflects in part the desire for Japanese and US firms to seek strategic positions within European industry prior to 1992 to avoid any question of being excluded from 'fortress Europe'. In addition, there had been some attempt to spur transatlantic R&D cooperation though the strategic defence initiative (SDI) programme of the US government in the mid 1980s (Carton 1987). Perhaps most significant of all, however, was that EU firms were primarily spurred to partner with US and Japanese firms given their technological lead that US firms possessed, in information technology and bio-technology, and to a lesser extent new materials, while Japanese firms had a technological lead in information technology and new materials. In other words, EU firms would be interested in partnering with firms regardless of nationality, depending primarily on their relative competitive positions in the industry, or the presence of significant clusters at given locations. Figure 2 (above) shows trends in STP by the three core technological areas- biotechnology, information technology and new materials for which data is available, further subdivided by geographic groupings. EU firms prefer to engage in transatlantic STP, particularly in sectors such as biotechnology where there is a considerable technological gap with the US. Two other reasons come to my mind as plausible explanations. First, the decline in the number of new intra-EU agreements may be because the rules regarding the participation of non-EU firms in EU-subsidised consortia was relaxed. Second, as suggested by Mytelka (1995) in relation to the European IT sector, the EU 'big 12' failed to act in a orchestrated way, due to a lack of consensus on strategy.

This relates to our earlier discussion on the motives for STP since firms are often engaged in partnerships to access resources that they are unable to acquire as easily by going it alone. These resources may be either firm specific or even location specific,

associated with the national systems of innovation of a region or a country. For instance, centres of agglomeration of economic activity exist, and firms may wish to collaborate with other firms located there, in order to accrue externalities that derive therefrom. More importantly, however, companies will prefer to partner with technology or market leaders, regardless of where they might be located, or what their nationality is. Furthermore given the increasing tendency for the cross-fertilisation of technologies, firms prefer to collaborate than develop a simultaneous expertise in several seemingly unrelated technologies. A second aspect of motive is that firms may simply engage in alliances to so-opt a competitor. It is well known, for instance, that firms do not always have recourse to patenting as a means to protect new and rapidly evolving technologies, and must rely on secrecy or by co-inventing with potential competitors (Levin et al 1987). In other cases, by co-invention, firms are able to determine that they will jointly have 'won' the race to innovate (Narula and Dunning 1998). Other less R&D-specific reasons also exist. For instance, Veugelers (1996) notes that European firms are more active in alliances in industries in which they lack a comparative advantage, but are more defensive in sectors where they have a comparative advantage. Furthermore, weak EU firms actively seek strong partners, and strong EU firms ally with weak partners. Given that most of the EU firms in the bio technology and information technology sector do not enjoy a significant competitive advantage, it is not surprising therefore, that a majority of STP by these companies are with Japanese and US firms.

Conclusions

Although the SEM initiative has been judged as a qualified success as far as FDI and trade are concerned, relatively little has been said about strategic technology alliances, an area in which the European Commission has explicitly sought to promote. Although our conclusions are somewhat similar to those proposed by Kay, Ramsay and Hennart (1996), both our analysis and explanation are different. Our analysis suggests that the single European market did not achieve the objective of the framework programme: Closer cooperation among European firms in undertaking cooperative R&D. While intra-EU cooperation did in fact increase during the second half of the 1980s, this level was not sustained through the early 1990s. Instead, EU firms have shown a continued propensity to undertake EU-US and EU-Japanese R&D collaboration, particularly in the information technology, biotechnology and new materials sectors. This is perhaps not surprising, for at least 3 reasons.

First, EU firms are idiosyncratic in nature, and have distinct technological trajectories. Cooperative arrangements, difficult at the best of times, are made even more complex by the nature of cross-border cooperation. Cooperation between firms with different and distinct technological competencies requires some common ground.

Second, the nature of technology development and R&D adds a unique twist. In most cases, tariff and non-tariff barriers do not effect these activities, since they involve the development and implementation of knowledge, which is highly tacit and embodied in highly skilled personnel. Such activities, especially where they are in more basic, non-market related aspects are not effected by the SEM initiative since few, if any, barriers have existed to the movement of skilled personnel and embodied information. (Unlike applied R&D, which is necessarily located close to production sites and therefore is effected by the SEM initiative).

Third, globalisation is a more powerful force than economic integration within any one region, even if it is, as a bloc, the largest single economic entity on the planet. The fact is that there is a growing convergence of income and consumption patterns, as well as types of technologies used, and this is occurring across all countries within the Triad. Several studies have shown that firms are competing and growing in order to compete with other firms in the same industry, regardless of their nationality (Cantwell and Sanna Randaccio 1990). The same is true for STP, where firms are interested in partnering with other firms in the same industry, regardless of their nationality, but on their relative qualities as a partner, and the nature of their technological competitiveness (Narula and Hagedoorn 1997). The failure of the framework programmes to create a European oligopoly is gratifying, for it shows that market forces are stronger than central planning. Strange's recent comments (1998) regarding 'Who are EU' are appropriate here. The attempt of the commission to try and exclude so-called non-EU firms from European consortia, and to create exclusive European oligopolies are based on an antiquated assumption that only firms of historic European nationality can contribute significantly to the competitiveness of European industry and the welfare of Europe. In a globalised world, attempting any sort of industrial policy based on national exclusion is sure to be sub-optimal.

Appendix

The cooperative agreements and technology indicators (CATI) information system

The CATI data bank is a relational database which contains separate data files that can be linked to each other and provide (des)aggregate and combined information from several files. The CATI database contains three major entities. The first entity includes information on over 10,000 cooperative agreements involving some 4000 different parent companies. The data bank contains information on each agreement and some information on companies participating in these agreements. We define cooperative agreements as common interests between independent (industrial) partners that are not connected through (majority) ownership. In the CATI database only those inter-firm agreements are being collected, that contain some arrangements for transferring technology or joint research. Joint research pacts, second-sourcing and licensing agreements are clear-cut examples. We also collect information on joint ventures in which new technology is received from at least one of the partners, or joint ventures having some R&D program. Mere production or marketing joint ventures are excluded. In other words, our analysis is primarily related to technology cooperation. We are discussing 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, partnerships are omitted 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 regard as a relevant input of information for each alliance: the number of companies involved; names of companies (or important subsidiaries); year of establishment, time-horizon, duration and year of dissolution; capital investments and involvement of banks and research institutes or universities; field(s) of technology[3]; modes of co-operation[4]; and some comment or available information about progress. Depending on the very form of cooperation we collect information on the operational context; the name of the agreement or project; equity sharing; the direction of capital or technology flows; the degree of participation in case of minority holdings; some information about motives underlying the alliance; the character of cooperation, such as

[3] The most important fields in terms of frequency are information technology (computers, industrial automation, telecommunications, software, microelectronics), biotechnology (with fields such as pharmaceuticals and agro-biotechnology), new materials technology, chemicals, automotive, defence, consumer electronics, heavy electrical equipment, food & beverages, etc. All fields have important sub-fields.

[4] As principal modes of cooperation we regard equity joint ventures, joint R&D projects, technology exchange agreements, minority and cross-holdings, particular customer-supplier relations, one-directional technology flows. Each mode of cooperation has a number of particular categories.

basic research, applied research, or product development possibly associated with production and/or marketing arrangements. In some cases we also indicate who has benefited most.

The second major entity is the individual subsidiary or parent company involved in one (registered) alliance at least. In the first place we assess the company's cooperative strategy by adding its alliances and computing its network centrality. Second, we ascertain its nationality, its possible (majority) owner in case this is an industrial firm, too. Changes in (majority) ownership in the eighties were also registered. Next, we determine the main branch in which it is operating and classify its number of employees. In addition, for three separate subsets of firms time-series for employment, turnover, net income, R&D expenditures and numbers of assigned US patents have been stored. The first subset is based on the Business Week R&D scoreboard, the second on Fortune's International 500, and the third group was retrieved from the US Department of Commerce's patent tapes. From the Business Week R&D Scoreboard we took R&D expenditure, net income, sales and number of employees. In 1980 some 750 companies were filed; during the next years this number gradually increased up to 900 companies in 1988, which were spread among 40 industry groups. The Fortune's International 500 of the largest corporations outside the US provides amongst others information about sales (upon which the rankings are based), net income and number of employees.

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STEP group

STEP-gruppen ble etablert i 1991 for å forsyne beslutningstakere med forskning knyttet til alle sider ved innovasjon og teknologisk endring, med særlig vekt på forholdet mellom innovasjon, økonomisk vekst og de samfunnsmessige omgivelser. Basis for gruppens arbeid er erkjennelsen av at utviklingen innen vitenskap og teknologi er fundamental for økonomisk vekst. Det gjenstår likevel mange uløste problemer omkring hvordan prosessen med vitenskapelig og teknologisk endring forløper, og hvordan denne prosessen får samfunnsmessige og økonomiske konsekvenser. Forståelse av denne prosessen er av stor betydning for utformingen og iverksettelsen av forsknings-, teknologi- og innovasjonspolitikken. Forskningen i STEP-gruppen er derfor sentrert omkring historiske, økonomiske, sosiologiske og organisatoriske spørsmål som er relevante for de brede feltene innovasjonspolitikk og økonomisk vekst.

The STEP-group was established in 1991 to support policy-makers with research on all aspects of innovation and technological change, with particular emphasis on the relationships between innovation, economic growth and the social context. The basis of the group's work is the recognition that science, technology and innovation are fundamental to economic growth; yet there remain many unresolved problems about how the processes of scientific and technological change actually occur, and about how they have social and economic impacts. Resolving such problems is central to the formation and implementation of science, technology and innovation policy. The research of the STEP group centres on historical, economic, social and organisational issues relevant for broad fields of innovation policy and economic growth.