# Bilateral International R&D Cooperation Policies of the EU Member States

## Volume 1: Overview

## Final Report

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# Bilateral International R&D Cooperation policies of the EU Member States

## Volume 1: Overview Report

# 1 Introduction

## 1.1 The study

This is the Overview Report for the study 'Bilateral International R&D Co-operation Policies of the EU Member States,' carried out by Technopolis for DG Research (Contract Number ERBHPV2-CT-1999-0009). The study objectives included:

- Compilation of a list of bilateral R&D agreements, by EU Member State
- Compilation of statistics for each bilateral R&D agreement, including expenditure data, number of projects by scientific field and geographic area
- A comparative analysis of Member State policy

We identified around 990 instances where EU member states were signatories to international bilateral R&D agreements with countries elsewhere in the EU, Europe and the Rest of the World. Taking account of the fact that there are two ends to each individual agreement, the total number of agreements falls to around 800 where EU member states are the two signatories. Even with this reduced number, the total population is rather too large to list in this paper. However, we have compiled a separate compendium of country reports that present a description of the situation in each EU member state and this includes a list of current agreements; Volume 2. Exhibit 1 lists 10 of agreements. There are too few agreements for the table to be representative, but even this truncated list reveals the diversity of topics and motives that one is faced with in the total population of bilateral R&D agreements.

Turning to the second study objective, we present the aggregate statistics in this paper, though our analysis is concerned primarily with the number of agreements and the type of activities supported. Few research administrations maintain detailed management information systems whereby it is possible to distinguish expenditure and output data for bilateral R&D agreements as compared with all other forms of international research cooperation.

We hope our policy discussion will be a useful contribution to understanding and debate in a subject area that has not been written about extensively to date.

**Exhibit 1 Selected intergovernmental bilateral R&D cooperation agreements, current in 2000**

| Partner 1 | Partner 2 | Date of agreement | Review period | Type of agreement | Thematic focus |
|---|---|---|---|---|---|
| Austria, Austrian Foundation of Scientific Research (FWF) | Australia, the Australian Research Council (ARC) 12.09.1994 | 1994 | 5 | Goodwill | Open |
| Austria, Austrian Foundation of Scientific Research (FWF) | USA - The National Science Foundation of the United States of America (NSF) | 1984 | 5 | Goodwill | Open |
| Denmark, Danish Research Foundation (DRF) | Russia, The State Committee of Ecology and Natural Resources in St Petersburg | 2000 | 5 | Strategic | Joint research programme to promote research into regionally-specific environmental and energy problems |
| France, National Research Institute in Computer Science and Control (INRIA) | Portugal, Institute for international cooperation in science and technology ICCTI) | 1996 | 5 | Goodwill | Exchange of researchers in the areas of applied informatics and mathematics |
| France, National Research Institute for the Exploitation of the Sea (IFREMER) | UK, Natural Environment Research Council | 1992 | 5 | Strategic | Promotion of more efficient use of both parties' major naval equipment |
| Germany, Ministry of Education and Science (BMBF) | Czech Republic, Ministry for Education, Youth and Culture | 1990 | 5 | Goodwill | Biotechnology, Materials Science |
| Italy, National Research Council (CNR) | Japan - The Japan Society for the Promotion of Science (JSPS) | 1997 | 3 | Goodwill | Open |
| Finland, Ministry of Trade and Industry | Korea - Ministry of Science and Technology (MOST) | 1989 | Ad hoc | Goodwill | Open |
| Sweden, Medical Sciences Research Council (MFR) | France, INSERM | 1998 | 1 | Goodwill | Open |
| UK, Particle Physics and Astronomy Research Council | Netherlands, Netherlands Research Council (NWO) | 1984 | 5 | Strategic | Joint operation of a series of ground-based astronomical telescopes, at la Palma |

Source: Technopolis survey of EU member state government departments and research administrations, June 2000

## 1.2 Intergovernmental bilateral R&D agreements

We defined 'intergovernmental' bilateral R&D agreements as those formal contracts, treaties or memoranda of understanding between national administrations in two countries, which are concerned to promote increased research cooperation between the scientific communities of the partners, either exclusively or as one of several key policy goals. Each agreement is based in a written, declaration signed by a senior official of a government department or national scientific administration. We excluded the many bilateral research agreements that exist between research institutions and universities as these are not governmental or national agreements and the signatories are not budget holders in most cases.

### 1.2.1 Legal form of bilateral agreement

Intergovernmental bilateral R&D agreements are formalised in the sense that they are based in either a

- *A written, legal contract,* which is binding on the parties involved
- *A written Memorandum of understanding*, which is not mandatory but does set out a declaration of why and how the parties would expect to cooperate

The majority of agreements are based on memoranda of understanding rather than legal contracts; the former is easier to create and more flexible than the latter. On the other hand, an intergovernmental treaty in law brings a number of benefits compared with a Memorandum of Understanding, notably it permits the signatories to create legal entities (to run the secretariat, laboratory or whatever) that are incorporated in international law. An international body can provide both parties – and their research constituencies – with privileges and immunities that do not hold at the national level with respect to rules on personal tax, employment, intellectual property and so on.

There are national preferences at work too, so for example, the German government and national research administrations have a preference for legal contracts while the Scandinavians prefer MoUs. In addition, there is some correlation between legal formality and the small number of strategic and facility-oriented agreements, many of which are based on legal contracts with more specific goals.[1]

There is another pattern that is just discernible, which suggests there may be a life cycle of sorts with respect to these agreements. In the Italian case, an MoU is the starting point for cooperation and where an agreement has proved to be both active and useful it is likely that subsequent agreements will be somewhat more prescriptive and may evolve to the point that a legal contract is instituted.[2]

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[1] This association between the purpose and legal form is not a strong one. While most strategic agreements are based in legal contracts some are based in MoUs and equally a proportion of the 'goodwill' agreements are based in legal agreements, where one might have speculated that the additional effort and cost of a legally binding treaty would not have been warranted.

[2] This and other matters relating to the role of international S&T cooperation in Foreign Affairs was discussed at the sixth biennial review meeting under the agreement between the

### 1.2.2 Primary purpose of bilateral R&D agreements

Based on our empirical research, we concluded that intergovernmental bilateral R&D agreements fall into one of two broad categories:

1 *Goodwill* agreements, where the motivation is to express a willingness to collaborate, and to facilitate collaboration, over a broadly specified range of scientific and or technological areas
2 *Strategic* agreements, which have a specific scientific objective of strategic importance to the parties. This type of bilateral agreement includes joint facilities and joint research centres

### 1.2.3 Mode of cooperation

Intergovernmental bilateral R&D agreements foresee a range of types of international research cooperation, including:

- Exchange visits and fellowships for researchers, for study and research, where travel costs (and perhaps living expenses) are provided
- Joint research projects, where researchers will typically do most of their own work in their own country
- Organisation of scientific and technological meetings or workshops, including the provision of training
- Arrangements for the exchange of scientific and technological information, not necessarily involving the movement of people
- Joint development and or sharing of infrastructure or facilities, to take advantage of 'economies of scale' and avoid wastage caused by unnecessary duplication of effort in the countries involved.

In practice, the majority of agreements are directed to researcher mobility in one form or another, from study visits to n+n seminars. Within these types of network-building activities, support might be in the form of a general stipend, or be restricted to a particular source of expense such as travel. The latter dominates. These financial rules make it less likely that joint research projects (or programmes) will emerge under the auspices of the agreements.

There is a weak correlation between the type of agreement (*goodwill* or *strategic*) and the type of cooperation, with the strategic agreements supporting a higher level of activity through project or programmatic activities.

Exhibit 2 shows an agreement between the Swedish Medical Research Council and the Netherlands Council for Medical and Health Research concerning incentive grants for collaboration between Swedish and Dutch researchers. While the agreement is unusual in that it indicates an annual budget and the number of awards anticipated, it is typical inasmuch as the emphasis is on support for researcher mobility (in any subject within health research). Plus, this particular MoU provides a good example of the frequency and scale of cooperation that is anticipated by such international agreements.

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government of the United States and the Government of Italy signed (Rome, April 2000). A minute of the meeting is available at www.esteri.it/polestra/dgrc/accordi/usproteng.htm

## Exhibit 2 Memorandum of Understanding between the Swedish Medical Research Council and the Netherlands Council for Medical and Health Research

### NWO, Nederlandse Organistatie Voor Wetenschappelijk

**Agreement between the Swedish Medical Research Council and the Netherlands Council for Medical and Health Research** concerning incentive grants for collaboration between Swedish and Dutch researchers.

***Purpose***
To stimulate collaboration between research groups in Sweden and the Netherlands in the fields of clinical research and epidemiological research, by awarding grants for travel and/or housing expenses for short research visits.

*Budget*
Yearly at least 40,000 Dutch guilders and 155,000 Swedish Kroner respectively will be made available by the councils. Each council finances its compatriots.

*Type of grants*
Grants are available for joint meetings with and short (minimum stay one week, maximum stay three months) research visits to the collaborating group

*Application*
Applications can be done once a year, deadline 1 March.
Swedish and Dutch groups that want to collaborate apply simultaneously, each to their national council. The application contains:
A Names of collaborating research groups and participants
B Intended research program, experimental approach and practical investigation scheme
C Purpose of collaboration and the motivation for collaboration with that particular research group
D Requested support.

*Selection*
Each council sends each application to at least two peers to review the research program and intended collaboration. A small group of representatives of both councils rates the applications in categories A (to be funded), B (to be funded if budget available) and C (rejected) – based on the total impression of the parallel applications and reviews – and makes the final selection and decides about the amount to be awarded.

*Financial support*
Each selected proposal receives funding for two years collaboration.
The amount is not fixed although an indicative maximum of 15.000 Dutch guilders or 60000 Swedish Krone per council might be considered. This indicates that yearly about six to eight applications can be awarded.

*Evaluation*
After three years the co-operation will be evaluated.

2.10.1997

# 2 Measures of the nature and extent of bilateral collaboration

## 2.1 Numbers of agreements

A count of the 'Numbers of agreements' is a long way from being a perfect measure of the quantity and quality of collaboration that occurs under these formal bilateral agreements.[3] However, it is the one group of data that scientific administrations maintain in a consistent and comprehensive manner and does provide a worthwhile indicator with which to gauge the differing motives and priorities.[4]

## 2.2 EU, Japan and US

The EU has 993 bilateral R&D agreements. Japan has 26 intergovernmental agreements with 22 countries, for the most part with current or potential trading partners. The USA has more than 820 current bilateral R&D agreements with other countries, both at the government-to-government level and at the agency-to-agency level. The total number of government-to-government agreements is 117.

## 2.3 Distribution of bilateral R&D agreements, by region

### 2.3.1 World regions

**Exhibit 3 EU bilateral R&D agreements, grouped by World Region**

| | Number of bilateral agreements | Number of EU Member States involved | Number of partner countries | Number of country – country connections |
|---|---|---|---|---|
| Other Europe | 150 | 12 | 16 | 81 |
| Ex-USSR | 52 | 12 | 13 | 34 |
| Africa | 82 | 9 | 22 | 47 |
| Asia | 149 | 12 | 15 | 59 |
| N. America | 89 | 11 | 3 | 17 |
| S. America | 102 | 8 | 11 | 40 |
| Australasia | 20 | 8 | 2 | 9 |

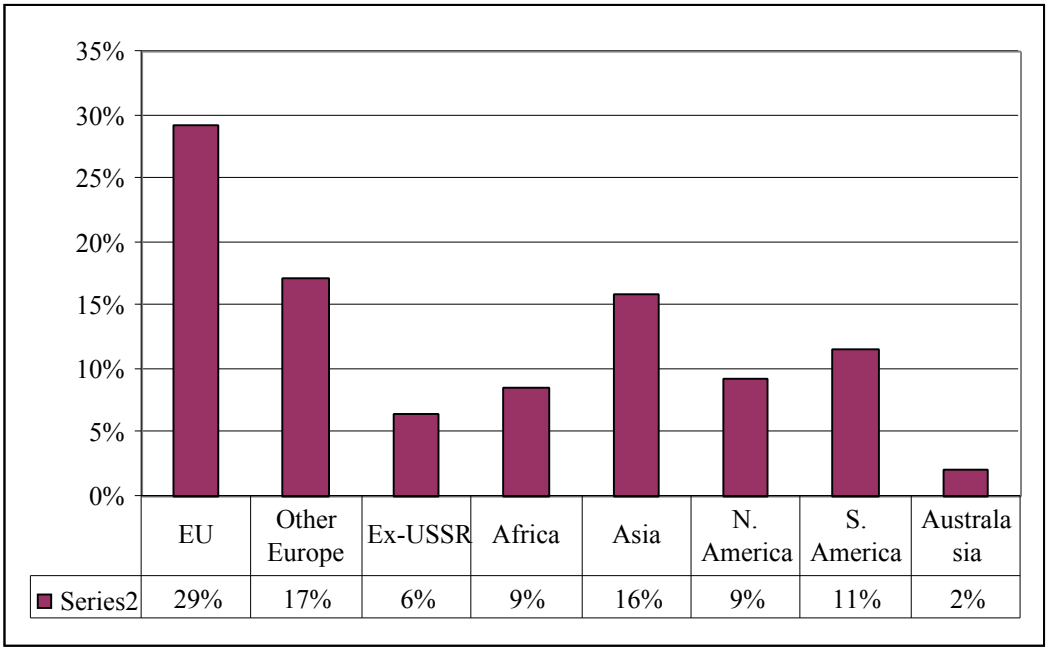
− Source: Technopolis survey of officials at EU national research administrations, summer 2000.

[3] For example, Japan's agreements with the USA underpin perhaps as much as 100 times more research activity than would be the case for the bilateral agreements it has concluded with China. Equally, Finland concluded identical framework agreements with China and South Korea at roughly the same time, but the former agreement has resulted in around ten times more cooperative ventures than has been the case for the latter.

[4] In several EU member states, we were advised that a high proportion of bilateral agreements have been in existence for several decades and have become "facts of life," which are not promoted actively and encourage a minimal amount of cross-border cooperation. On the basis of rather too few data points, we can speculate that as much as 25% of all bilateral R&D agreements may be dormant.

Exhibit 3 shows the number of bilateral agreements EU member states have with countries in each 'world region'. On the basis of a count, Other Europe, Asia and South America are the most important regions.

**Exhibit 4 Regional distribution of EU bilateral R&D agreements (%, June 2000)**




| | EU | Other Europe | Ex-USSR | Africa | Asia | N. America | S. America | Australasia |
|---|---|---|---|---|---|---|---|---|
| Series2 | 29% | 17% | 6% | 9% | 16% | 9% | 11% | 2% |

There is a degree of concentration within regions. China, Korea, Brazil and the other South American countries are attractive as large emerging markets, while Japan is a scientific and technological leader in many research areas. Regarding the Africa/Middle Eastern bloc, Israel (with 25% of EU bilateral agreements) stands out; no other partner country in the region approaches this number of agreements.

### 2.3.2 Distribution of EU member state agreements, by region

For the 15 EU Member States, we have identified a combined figure of 990 formal bilateral R&D agreements. However, this figure does involve some degree of double counting. Of the 990, 290 counts relate to intra-EU agreements, with a member state at each end, or 145 separate bilateral agreements. So, we have identified a total of just over 850 separate bilateral R&D agreements between EU member states and other Member States, countries elsewhere in Europe and the rest of the world.

Exhibit 5 shows the number of bilateral agreements for each EU member state, grouped by region in the world. The diversity of nations with which EU countries have bilateral agreements is wide. In addition, Exhibit 5 shows that Germany has more active bilateral R&D agreements – with all countries – than is the case for any other EU member state. In addition to Germany, France, Spain and the UK have 100 or more agreements. At the other extreme, we have identified no agreements involving Luxembourg, where bilateral co-operation focuses mainly on higher education. If one were to weight the number of agreements by national government expenditure on R&D, Germany and Spain are dominant and Scandinavia is shown to be an area where formal bilateral agreements are less common.

**Exhibit 5 Number of bilateral R&D agreements, EU Member State – World Regions (June 2000)**

| | Austria | Belgium | Denmark | Finland | France | Germany | Greece | Ireland | Italy | Luxembourg | Netherlands | Portugal | Spain | Sweden | UK | TOTAL EU |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Other Europe** | 18 | 22 | 3 | 0 | 23 | 28 | 8 | 2 | 19 | 0 | 5 | 2 | 22 | 1 | 17 | 170 |
| **Ex-USSR** | 7 | 6 | 3 | 1 | 5 | 9 | 3 | 0 | 8 | 0 | 2 | 0 | 5 | 1 | 14 | 64 |
| **Africa** | 4 | 2 | 0 | 0 | 24 | 20 | 0 | 0 | 14 | 0 | 1 | 4 | 10 | 0 | 6 | 85 |
| **Asia** | 10 | 14 | 0 | 3 | 22 | 54 | 1 | 0 | 14 | 0 | 6 | 2 | 3 | 3 | 26 | 158 |
| **N. America** | 3 | 5 | 0 | 1 | 9 | 54 | 0 | 1 | 4 | 0 | 0 | 4 | 3 | 1 | 7 | 92 |
| **S. America** | 1 | 18 | 0 | 0 | 26 | 23 | 0 | 0 | 10 | 0 | 0 | 4 | 28 | 0 | 4 | 114 |
| **Australasia** | 1 | 0 | 0 | 0 | 6 | 6 | 0 | 1 | 2 | 0 | 2 | 0 | 0 | 1 | 1 | 20 |
| **Total exc. EU** | 44 | 67 | 6 | 5 | 115 | 194 | 12 | 4 | 71 | 0 | 16 | 16 | 71 | 7 | 75 | **703** |
| **EU** | 18 | 14 | 3 | 4 | 52 | 46 | 11 | 10 | 16 | 0 | 16 | 16 | 41 | 12 | 31 | **290** |
| **TOTAL** | **62** | **81** | **9** | **9** | **167** | **240** | **23** | **14** | **87** | **0** | **32** | **32** | **112** | **19** | **106** | **993** |
| **% exc-EU** | 71 | 83 | 67 | 56 | 69 | 81 | 52 | 29 | 82 | 0 | 50 | 50 | 63 | 37 | 71 | 71 |
| **% EU** | 29 | 17 | 33 | 44 | 31 | 19 | 48 | 71 | 18 | 0 | 50 | 50 | 37 | 63 | 29 | 29 |

- Source: Technopolis survey of officials at EU national research administrations, summer 2000.

The ratio of EU-EU agreements to EU-rest of world agreements is typically 30:70 in favour of the links with the rest of the world. Ireland and Denmark have an inverse ratio, which may reflect the pattern of historical relationships.

**Exhibit 6 Number of bilateral R&D agreements, EU Member State – EU Member State (June 2000)**

| | Austria | Belgium | Denmark | Finland | France | Germany | Greece | Ireland | Italy | Luxembourg | Netherlands | Portugal | Spain | Sweden | UK | TOTAL EU |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Austria** | 0 | 1 | 0 | 1 | 2 | 3 | 0 | 1 | 2 | 0 | 1 | 0 | 3 | 1 | 3 | **18** |
| **Belgium** | 1 | 0 | 0 | 0 | 6 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 4 | **14** |
| **Denmark** | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | **3** |
| **Finland** | 1 | 0 | 0 | 0 | 2 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **4** |
| **France** | 2 | 6 | 1 | 2 | 0 | 11 | 2 | 2 | 4 | 0 | 4 | 5 | 6 | 3 | 4 | **52** |
| **Germany** | 3 | 0 | 0 | 1 | 11 | 0 | 4 | 1 | 1 | 0 | 5 | 2 | 9 | 5 | 4 | **46** |
| **Greece** | 0 | 0 | 0 | 0 | 2 | 4 | 0 | 0 | 1 | 0 | 0 | 0 | 3 | 0 | 1 | **11** |
| **Ireland** | 1 | 0 | 0 | 0 | 2 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 4 | **10** |
| **Italy** | 2 | 1 | 0 | 0 | 4 | 1 | 1 | 1 | 0 | 0 | 0 | 1 | 4 | 1 | 0 | **16** |
| **Luxembourg** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **0** |
| **Netherlands** | 1 | 1 | 0 | 0 | 4 | 5 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 1 | 2 | **16** |
| **Portugal** | 0 | 0 | 1 | 0 | 5 | 2 | 0 | 0 | 1 | 0 | 0 | 0 | 6 | 0 | 1 | **16** |
| **Spain** | 3 | 1 | 0 | 0 | 6 | 9 | 3 | 1 | 4 | 0 | 2 | 6 | 0 | 0 | 6 | **41** |
| **Sweden** | 1 | 0 | 0 | 0 | 3 | 5 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 1 | **12** |
| **UK** | 3 | 4 | 1 | 0 | 4 | 4 | 1 | 4 | 0 | 0 | 2 | 1 | 6 | 1 | 0 | **31** |
| **TOTAL** | **18** | **14** | **3** | **4** | **52** | **46** | **11** | **10** | **16** | **0** | **16** | **16** | **41** | **12** | **31** | **290** |

- Source: Technopolis survey of officials at EU national research administrations, summer 2000.

### 2.3.3 Distribution of bilateral R&D agreements, by policy rationale

Exhibit 7 lists the predominant type of agreement, by EU member state, and the extent to which agreements are associated with predefined budgets. It reveals that the emphasis on 'goodwill' agreements holds at the member state level as well as at the EU level. Germany is the main exception to this tendency, with Denmark, Greece and Portugal also having a larger number of focused, strategic agreements compared with the number of 'goodwill' agreements, albeit as a proportion of a small number of total agreements.

For more than two thirds of the 700 'goodwill' agreements, the primary objective is to build stronger ties between the two countries (or regions) for reasons of international trade and or culture rather than the advancement of science itself. There is a general view that scientific agreements are a convenient means through which to consolidate and extend international relationships, because science is predisposed to work across geographical and cultural boundaries to a greater extent at least than would be the case for other fields of human endeavour.

**Exhibit 7 Distribution of bilateral R&D agreements for EU member states, by type of programme (951 agreements current in 2000)[5]**

| | Predominant type | Budgets associated with agreements |
|---|---|---|
| Austria | Primarily goodwill | In some cases |
| Belgium | Primarily goodwill | In some cases |
| Denmark | 40:60 goodwill, strategic | Generally not |
| Finland | Primarily goodwill | Generally not |
| France | Primarily goodwill | In some cases |
| Germany | 40:60 goodwill, strategic | In some cases |
| Greece | 40:60 goodwill, strategic | In some cases |
| Ireland | Primarily goodwill | Generally not |
| Italy | Primarily goodwill | Generally not |
| Netherlands | Primarily goodwill | Generally not |
| Portugal | 30:70 goodwill, strategic | Generally not |
| Spain | Primarily goodwill | Generally not |
| Sweden | Primarily goodwill | Not generally |
| UK | Primarily goodwill | Not generally |

− Source: Technopolis survey of officials at EU national research administrations, summer 2000.

### 2.3.4 Distribution of US bilateral R&D agreements, by geographic region

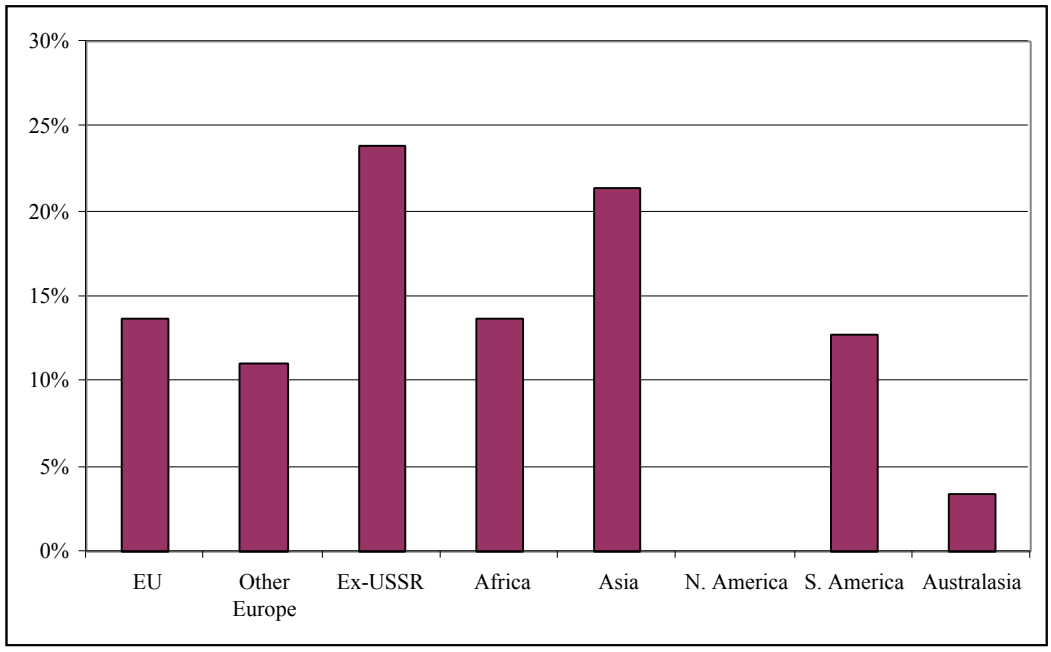
Exhibit 8 shows the geographical connections of US bilateral R&D agreements. Compared with the EU and Japan, the high proportion of agreements with the ex-USSR is noteworthy, reflecting the importance of geopolitics as a determinant of bilateral R&D cooperation.

The other point of variance is in the number of agreements with North America: despite geographical proximity, there are no bilateral intergovernmental R&D agreements with Canada at present. Among the Asian countries, China figures prominently, as it does in the EU, but the Asian partner with whom the USA has the

[5] Luxembourg has not been included in this table as international R&D cooperation is pursued through multilateral frameworks, such as the European Commission's RTD Framework Programmes, rather than intergovernmental bilateral R&D agreements.

most agreements is Japan, which is not the case for the EU. Among South and Central American countries, Mexico is the most frequent partner where for the EU member states, Brazil is proportionately more important.

**Exhibit 8 Distribution of US bilateral R&D agreements by geographic region (%, June 2000)**




– Source: Technopolis survey of US national research administrations, summer 2000.

Apart from the 'special cases' of the ex-USSR, the same principles, such as a political desire to show goodwill or to encourage emerging nations, hold in the USA at the aggregate level.

### 2.3.5 Distribution of Japanese bilateral R&D agreements, by region

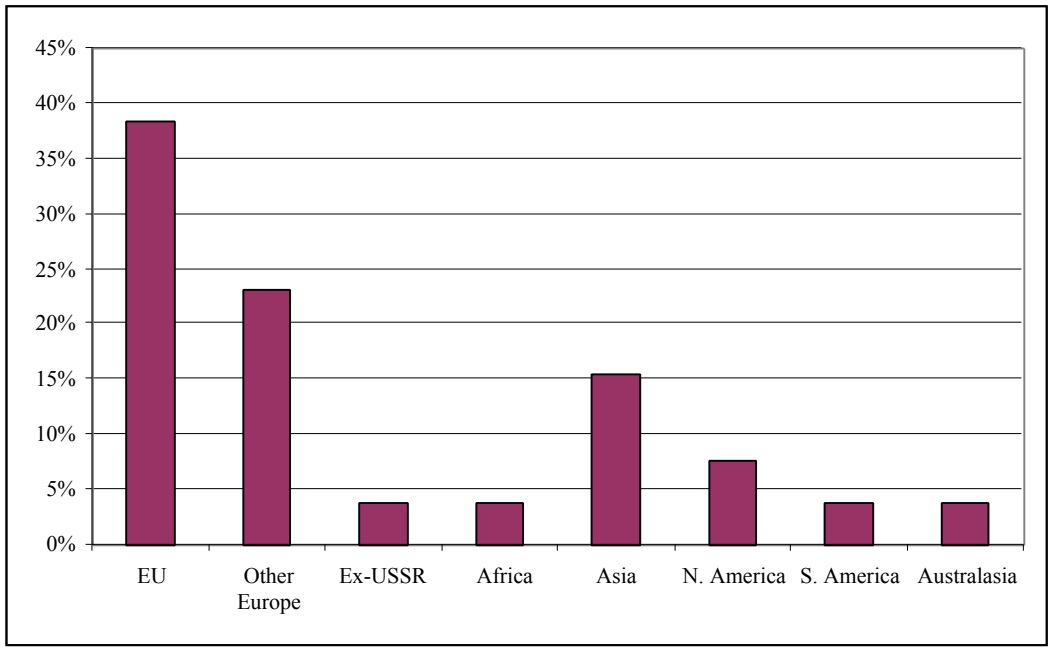
The regional distribution of agreements shows that Japan has extensive links with the research ministries and scientific institutions of the EU and greater Europe.

No explicit S&T agreements exist with the EU as a whole, or with Norway or Switzerland, but "discussions" are held within the framework of trade talks (Norway), the S&T round table (Switzerland), and the S&T Forum (EU). A cooperation agreement with France was renegotiated in 1991.

A bilateral agreement with the former Soviet Union was concluded in 1973, and an agreement on space cooperation with Russia in 1993. At the occasion of Putin's visit to Japan in early September this year, a bilateral agreement with Russia was concluded. Japan had also concluded bilateral agreements ("kyotei") with the former Yugoslavia and Poland, as well as less formal cooperation agreements ("tori-kime") with the Czech Republic, Slovakia, Bulgaria, Hungary, and Rumania. Of all these agreements with Eastern European countries, the agreements with Hungary, Poland, Rumania, and Bulgaria are most active.

Japan has agreements with a small number of Asian countries, such as Thailand and Malaysia. In the framework of trade agreements, Japan is presently in discussions with Saudi Arabia on S&T cooperation.

**Exhibit 9 Geographic distribution of Japanese bilateral R&D agreements (%, June 2000)**




– Source: Technopolis survey of officials at Japanese national research administrations, summer 2000.

What this analysis does not reveal is that the international agreement with the US is the single most important agreement and encompasses more international cooperation activities (researcher exchanges and investments) than do all the other agreements combined.

## 2.4 Expenditure on R&D cooperation within bilateral agreements

We estimate the annual volume of cooperative activity taking place within the terms of these agreements to be around 200 million Euro.[6] This figure is dwarfed by domestic R&D activity and amounts to less than 5% of all international cooperative R&D expenditure.

For the several countries where we do have aggregate data for R&D expenditure that occurs within the terms of a formal bilateral agreement, the figures are modest by comparison with total government expenditure on R&D. For example, Belgium commits around 5 million Euro in 2000 while in Finland, the equivalent figure is estimated at less than 3 million Euro, which contrasts with an annual spend of around 250 million Euro in 2000 for *all* international R&D cooperation. The larger

[6] Our estimates are based on a very partial data set and, while we believe them to be indicative, they must be treated with care. Estimates may be subject to sizeable errors due to difficulties associated with grossing up (using ratio estimation with government R&D expenditure as the auxiliary variable) and mis-reporting of expenditure, as a result of uncertainties with respect to our definition of an intergovernmental bilateral agreement).

figure includes bilateral programmes, multilateral programmes (e.g. for ESA) and an attribution for Finnish contributions to the EU RTD Framework Programme. At the other end of the spectrum, we estimate the equivalent annual expenditure figure for Germany to be around 50 million Euro.

# 3 Comparison of EU policy with that of the US and Japan

There is a similar set of policy rationales that underpin the use of bilateral R&D cooperation agreements in each of the three regional groups.

### 3.1.1 Bilateral R&D cooperation policy in the EU member states

From a science policy perspective, EU member states make only limited use of formal bilateral R&D agreements, *goodwill* or *strategic*. There is a general preference expressed by officials across the EU member states to pursue international R&D cooperation on a case by case basis, driven bottom up by the proposals of national research groups and research institutes.

There is a divergence between EU member states in the North and those in the South, with respect to the importance attached to *formal* intergovernmental R&D agreements. In the South, international cooperation is a focal point for policy makers who are concerned to build national capability and strengthen their presence in the European and international scientific panorama. In the North, most member states devote comparatively little effort to formal cooperation agreements at the national level, because there are more direct and cost-effective means through which to ensure their research communities maintain an international perspective. Germany and France are the main exceptions, each of which maintain a high proportion of bilateral R&D agreements with a specific scientific focus and set of policy objectives.[7]

Member states view international cooperation as an essential component of first-class research in the natural, physical and social sciences. The view of the Economic and Social Research Council (ESRC) in the UK is typical

> "… strongly believes that research in the social sciences flourishes in an open and internationalist perspective, when it is ready to derive lessons from comparisons across countries and cultures and from the best current contributions to social science, whatever their provenance. The best of British social science has always been carried on within such a perspective. Across Europe and worldwide there are social scientists with expertise and knowledge beyond that held by British experts. The Council has therefore affirmed its support for a broad and comprehensively internationalist approach in all the research it supports, while retaining a strong orientation towards promoting its own Thematic Priorities."

[7] The differences are driven by many factors, most of them seemingly external to bilateral R&D cooperation. For example, the funding rules of national administrations may differ so while Denmark, The Netherlands and France will promote and subsidise the entry of EU research students to their universities this is less the case in the UK or Italy. Indeed, in the UK the emphasis is on recruiting non-EU students as they pay fees that are wholly additional to national institutional funding. Equally, other policy issues can impact internationalisation so education policy in France and industrial policy in the UK both tend to encourage students (including research students) to seek out positions in nationally-located businesses.

This presumption of cooperation as being intrinsic to research means that the majority of scientific administrations in the EU provide their respective constituents with access to a range of international mobility schemes to facilitate cooperation among researchers. In addition, most administrations test all grant applications – national and international – on their international strengths. While few of those national funding organisations foresee the possibility of sponsoring non-national researchers within the terms of a national research project, a growing number do see the merit in permitting and endorsing the creation of active links between national and international research groups and facilities within national projects.

Where member states do see the need for a formal agreement to structure international cooperation, those agreements are predominantly multilateral rather than bilateral. Multilateral intergovernmental agreements relate to R&D organisations such as the European Space Agency (ESA) or the European Molecular Biology Laboratory (EMBL) or the soon-to-be launched Global Biodiversity Information Facility (GBIF). The multilateral imperative results from one or more of the following factors:

- The magnitude of the scientific challenge (e.g. particle physics)
- The universal importance of the topic for government, business and society (e.g. climate change)
- The scale of the financial investment required over time (e.g. space)

In such cases, member states argue that the additional cost and bureaucracy is justified.[8] We found few instances where there was a scientific imperative underlying a formal intergovernmental bilateral R&D agreement where a national programme had been considered to be insufficient and a multilateral initiative unwarranted. Of course there is a natural bias here that counts against bilateral agreements, which have a specific structure whereas the geometry of multilateral agreements is variable and may involve anything between three and 30 signatories.

Where multilateral R&D agreements may be said to satisfy Europe's need for strategic cooperation, in their respective fields, European researchers have the further option to participate in international research projects on an ad hoc basis through the CEC RTD Framework Programme. This excerpt from an interview with an Austrian official is typical of the situation in many EU member states.

> "… the Austrian government has concluded a number of formal bilateral R&D agreements however, this mode of cooperation is not at the top of the agenda with respect to international research activities. Rather, the government has placed much greater emphasis upon Austria's integration into the European Research System. As such, the CEC RTD Framework Programme and other multilateral schemes (from ESA to Airbus) dominate research policy."

[8] The management requirements are sufficiently demanding in most cases for the signatories to the intergovernmental agreement to create a dedicated secretariat financed out of the annual subscriptions. The additional management cost associated with bilateral agreements is rarely so high as to justify a separate management unit with its a budget line written in to the international agreement

Taken together – researcher to researcher cooperation, international R&D programme and multilateral R&D agreements – policy makers have little need for other cooperative instruments.

In science policy terms then, bilateral agreements tend to be a residual category of mechanisms to promote international research cooperation where a formal agreement is deemed to be necessary and no relevant agreement exists; either

- Where national researchers have demonstrated, in principle at least, the scientific value of strengthening relationships and networks with non-national researchers resident in a country with which there is no applicable agreement (e.g. multilateral scientific or bilateral trade). In some Asian and Central and Eastern European countries, there is a presumption on the part of national scientific administrations that government can only sponsor its national researchers' participation in international projects where there is a current intergovernmental R&D agreement in place.[9] In part, this reflects a presumption that government should be in a position to regulate all international cooperation. In addition, there is a tendency for these emerging economies to use agreements as a means to persuade partners to set aside a dedicated budget.[10]
- A joint venture that is of strategic importance – and will involve a high level of commitment and or investment to succeed – and yet falls outside the scope of existing multilateral and bilateral agreements with the envisaged partner country

We concluded that the typical bilateral R&D agreement has few if any features that would make it an attractive instrument through which European policy makers might encourage higher-levels of cross-border mobility and help to underpin progress towards the European Research Area.

### 3.1.2 Bilateral R&D cooperation policy in Japan

In Japan, bilateral cooperation agreements are general in nature with an open-ended rationale, objective and set of cooperative instruments. The content of the agreement is not strategic in most cases, but the ease with which these agreements can be brokered does mean that they are seen as an easy-to-use tool to underpin strategic interests with respect to international trade or international relations. There are exceptions to this observation, with the United States representing perhaps the most important one.

Japan's limited historical presence in international cooperation combined with the country's affluence has meant that bilateral agreements look a little different than is

[9] In most cases, governments agree to finance only those eligible costs incurred by their national research teams, though there are exceptions. Austria for example has several bilateral agreements with central European governments where it is foreseen that the Austrian scientific administration will bear 2/3 of the total eligible costs associated with the collaboration. Similarly, Japan has tended to finance a high proportion of the total costs of cooperation. The majority of bilateral agreements will cover the costs of travel, subsistence and some equipment. Proportionately few agreements pay salary or overhead costs.

[10] Where there is no predefined budget, bilateral proposals have to compete on equal terms with national and international bids. The allocation of a budget to a bilateral agreement means that competition will operate between programmes rather than projects and that the agreement ought to be able to sustain a higher level of activity as a result.

the case elsewhere. There is a tendency for Japan to cover the cost of the bulk of the cooperative activity where it is typical for member states elsewhere to bear only the costs incurred by their national researchers.

A formal agreement is not a pre-requisite for S&T cooperation. Indeed, as with Europe and the USA, the bulk of international R&D cooperation is organised at the level of Japan's research institutes and researchers. Second, even among the major S&T funding administrations (JSPS, JST and NEDO) there has been a preference to build capability in international cooperation through the operation of overseas offices in London, Washington and several Asian capitals.

### 3.1.3 EU member states' profiles of bilateral R&D agreements

Our research revealed markedly different profiles of bilateral agreements across the EU member states, which suggests that:

- Cultural ties and colonialism play a significant part in the profile of bilateral agreements, with the French case being typical in that there are several agreements with Morocco and Tunisia or the Netherlands and Belgium (Flanders region) having agreements with South Africa.
- Geographical proximity is an influence. This factor is more pronounced when we consider individual agreements rather than agreements grouped by region. So, for example Finland has a high degree of collaboration with the ex-USSR and the Netherlands has a high proportion of agreements with regional governments in countries with which it shares a border (e.g. Belgium, Germany). This factor can work in the opposite direction too. As an example, there are no formal bilateral agreements between Germany and Austria even though they are neighbours and Germany is Austria's most important foreign partner. Similarly, there is no current bilateral agreement between the USA and Canada
- Ireland, Portugal and Sweden have a relatively high proportion of intra-EU agreements (more than 40% of a small total). Other EU member states are more reliant on the CEC RTD Framework Programme and multilateral agreements such as EUREKA or COST or CERN
- France, Germany and Spain, have a below-average representation with Central and Eastern Europe and the countries of the former Soviet Union
- Germany has an unusually large number of agreements with the USA
- Co-operation with central- and Eastern-European countries is largely for foreign policy reasons, to assist with their future integration into the EU
- Far-Eastern 'emerging' economies are favoured partly because of their economic position as expanding markets, and partly because of their technological dynamism – close contact with them is regarded as competitively advantageous
- Both groups of countries are more inclined than most Western industrialised economies to enter into formal agreements, sometimes as a means of facilitating the funding of international cooperation within their own countries. It is easier for researchers to get permission to travel where such an agreement exists.

## 3.2 Evolution in policy on bilateral R&D cooperation

We found few data to help us to understand the evolution in the use of bilateral R&D agreements by EU member states. From the limited data that we did acquire, the

number of bilateral R&D agreements appears to be stable at the EU level overall. This is in contrast to trends international cooperation in research generally, in both the academic and the business sectors.[11]

There are indications of an increase in the use of bilateral agreements within science policy when one considers individual EU member states and regions: Italy, Spain and Portugal have increased their attention to international cooperation in the past three years. Formal bilateral agreements are singled out as an important policy instrument within a broader commitment to increase the level of national engagement with relevant international communities. Each of these three countries has stated that the number of bilateral R&D agreements concluded in the three-year period to June 2000 had increased over the previous period and that the stock of current agreements had increased.

The situation appears to be broadly stable in the US too. In contrast, international cooperation is in the ascent in Japanese policy circles, albeit from a low base compared with the situation in the US or EU and policy interest in bilateral S&T cooperation agreements is increasing (though still limited).

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[11] See Chen, S H (1997) "Decision making in research and development collaboration" *Research Policy,* 26, 121-135 and Hicks, D and Katz, S (1996) "Science Policy for a highly collaborative science system", *Science and Public Policy*, 23, 39-44.

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