Output Legitimacy of European R&D-policy*

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Abstract
According to an influential argument, the legitimation of European public policies needs to be 'output-oriented'. From the perspective of output-oriented legitimacy "political choices are legitimate if and because they effectively promote the common welfare of the constituency in question". Basically, output-oriented legitimation can be sustained when policies are Pareto-efficient and preclude the abuse of public power (Scharpf 1999; cf. Majone 1996; Moravcsik 2002).
This paper takes up the case of R&D-policy to review the viability of output-oriented legitimacy. European R&D-policy has developed along several different lines (Framework programs, Eureka, Cost). As R&D-policies involve considerable amounts of public money, the question of legitimacy cannot be avoided. Hence the various R&D-initiatives have led to a notable stream of evaluation studies.
In this paper I first introduce the two main European R&D-policy frameworks: EUREKA and the Framework Programme. Then the main part of the text reconstructs how various rationales have been adduced to justify these policies and to appreciate them. Notably, none of these rationales provides a conclusive justification. However, each of them does justify aspects of the policy structure and, taken together, they also provide critical clues to the main problems that the current policies encounter.

1. Introduction

The last two decades have seen a steady development of European policies in the field of Research and Development (R&D). The two major policy frameworks, the intergovernmental EUREKA-programme and the supranational Framework Programmes have showed themselves remarkably versatile. As such European R&D-policy challenges a number of presuppositions about the kinds of policies that can be legitimated at the European level. Most notably it has emerged not as a 'negative', deregulatory policy but rather as a 'positive' policy, establishing new policy frameworks involving considerable budgets. With an average yearly budget of 3.5 billion Euro, the 6th Framework Programme is the third biggest heading on the Community's budget (after CAP and structural funds).

All in all this picture is somewhat at odds with the theory of 'output legitimacy' that may be taken as the dominant account of how European policy-making can be justified (Scharpf 1999; cf. Majone 1996; Moravcsik 2002). The concept of output legitimacy remains once we accept that, for the moment at least, EU politics has to do without strong 'input legitimacy' rooted in a comprehensive political identity and meaningful democratic practices that are generally found at the level of the nation-state. In the words of its main theorist, Fritz Scharpf (1999), output legitimacy implies that "political choices are legitimate if and because they effectively promote the common welfare of the constituency in question". This condition can be spelled out a little further. To require that policies genuinely promote the common European welfare, their objectives need to be of a Pareto-efficient character, making no one worse off or at least allowing

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them to be compensated. Using similar reasoning, Majone (1996) submits that Europe is better suited to administer regulatory policies that allow for common gains in efficiency and effectiveness than to administer policies with redistributive implications. A final requirement underlined by Scharpf (cf. Moravcsik 2002; Majone 1996), is that the administrative apparatus required to deliver these benefits should be appropriately constrained.

Notably, the question of legitimacy is little featured in the major accounts of the development of the two European R&D-frameworks. The dominant approach is an institutionalist one in which the development of the policy frameworks depends on the way the existing institutional context conditions the political strategies of the stakeholders involved (Peterson & Sharp 1998: esp. Ch. 8; Banchoff 2002). The main stakeholders in the EUREKA-framework are business and national governments. Their commitment to this programme has been markedly sensitive to the business cycle, booming and tightening again with the economy (cf. Peterson & Sharp 1998: 91). The Framework Programme, on the other hand, has steadily expanded in size, pushed by a broad coalition including the Commission, the European Parliament, and research groups (cf. Banchoff 2002).

The institutionalist account is appropriate as far as it goes. However, in this paper I want to suggest that additional insights can be gained by introducing the perspective of legitimacy. First of all, the legitimacy perspective can account for some of the qualitative (rather than quantitative) transformations the policy frameworks have undergone. Beyond that, the normative standpoint of legitimacy provides us with a critical vantagepoint that can help to shed light on the challenges currently encountered in European R&D-policy.

In this paper I first introduce the two main policy frameworks: EUREKA and the Framework Programme. Then the main part of the text reconstructs how various rationales have been adduced to justify these policies and to appreciate them. Notably, none of these rationales provides a conclusive justification. However, each of them does justify aspects of the policy structure and, taken together, they also provide critical clues to the main problems that the current policies encounter.

2. Parallel Lives: EUREKA and the Framework Programme

There are many striking parallels between the EUREKA-programme and the Framework Programme.[1] For a start they were established at about the same time, the first Framework Programme in 1984 and EUREKA in 1985. Until then European cooperation had failed to reach beyond specific sectors (atomic energy, space, aviation). The early 1980s provided a unique momentum for a more comprehensive approach as three factors coincided: worries about Europe's competitiveness, the emergence of information technology as a driver of economic growth, and a general reinvigoration of European cooperation embodied in the 1992 project leading to the single market (Peterson & Sharp 1998: 26).

[1] A third R&D-policy framework is COST. However, as the budgets involved in this programme are considerably smaller than those in EUREKA and the Framework Programmes it is not further analysed in this paper (see however Georghiou 2001).

Also the objectives of both frameworks are markedly similar.[2] Both programmes seek to invest in the research capacities in Europe to improve the competitiveness of European industry and economies. To that aim both EUREKA and the Framework Programmes are build around the shared-cost approach by which public authorities commit themselves to co-financing significant parts of research projects initiated and administered by private or semi-public research groups. What is more, both frameworks require research groups to cooperate in international consortia.

The main difference between the two frameworks is that EUREKA is an intergovernmental programme, while the Framework Programmes are administered at a supranational level. Within the Framework Programmes, the European Commission selects projects to co-finance them directly from the Community budget. The selection of projects is programmed by the definition of priority themes and actions that are desired under these themes.[3] The selection is further predicated by a number of political criteria that, among other things, favour the engagement of disadvantaged parts of the Union, the involvement of SMEs and ethical principles.

EUREKA provides (better) access to national funding by granting selected international research projects the EUREKA-label. The programme relies on a bottom-up logic, leaving also its 34 member governments (thus many more than the EU member states and its candidates) a considerable freedom in deciding to go along with the common approach suggested. Basically, the EUREKA-label serves as an instrument to stimulate research groups as well as policy makers to prioritise similar initiatives across the various member countries.

Formally there is no clear line delineating research initiatives that are appropriate to the Framework Programmes from those that fit better within the EUREKA-framework. Indeed, as the European Union is a member of EUREKA, EUREKA-projects may also enjoy support from the Framework Programme. Most notably this has been the case with the JESSI-programme (1989-1997) on microelectronics. However, research priorities emerging from EUREKA and the priorities set in the Framework Programme are not strictly coordinated and, thus, do not necessarily coincide. What is more, combining financial support from both national and European authorities meets with obstacles in practice, not least the fact that (European) competition rules maximise the share of public investment in research projects. For that reason many research projects are only entered in one of the two frameworks (cf. Georghiou 2001: 897).

In fact a certain division of tasks has arisen between the two programmes (cf. Kuhlmann 2001). As indicated, the Framework Programme goes much further in programming the kind of research that it will support. By implication this has led to a stronger orientation towards research of a more fundamental

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[2] Article 163 TEC formulates the objective of the Framework Programmes as "strengthening the scientific and technological bases of Community industry and encouraging it to become more competitive at international level". The objective of EUREKA formulated in the Hanover Declaration of 1985 reads "to raise, through closer cooperation among enterprises and research institutes in the field of advanced technologies, the productivity and competitiveness of Europe's industries and national economies on the world market, and hence strengthen the basis for lasting prosperity and employment."

[3] FP6 identifies seven thematic priorities: Life sciences, genomics and biotechnology for health; Information society technologies; Nanotechnologies and nanosciences, knowledge-based multifunctional materials, and new production processes and devices; Aeronautics and space; Food quality and safety; Sustainable development; Global change and ecosystems; and Citizens and governance in a knowledge-based society.

nature. By implication other, more applied research interests are more likely to turn to EUREKA (Georghiou et al. 1999: 12). Moreover, within EUREKA big firms have a strong presence, certainly in terms of total research volume. In turn the budget of the Framework Programme is more or less equally divided between enterprises, institutes for Higher education and research centres (Commission 2001: 43). One further difference is that the Framework Programme reaches out to social sciences where these are not involved in EUREKA.

Size of projects varies strongly within both frameworks and depends, moreover, very much at the level at which projects are defined (and distinguished from 'umbrella' or 'cluster' projects etc. on the one hand and from 'subprojects' and 'working packages' etc. on the other). In general, however, it appears that EUREKA projects are bigger on average and, more importantly, involve less partners, so that the share per partner is bigger (Commission 2001: Annex 1; EUREKA 2002b). The Commission has however been keen to sponsor ever bigger RTD projects under the Framework Programme (cf. Commission 2000b: 7).

Over the years the budget of the Framework Programme has steadily expanded from less than 1 billion Euro per year during the 1st Framework Programme (1984-87) to up to an average yearly budget of 3.5 billion Euro under the 6th Framework Programme (2002-06). How much money is involved in EUREKA is much harder to determine as the labelling method disconnects recognition as a EUREKA-project, project budgets and public subsidies from each other. In contrast to the linear growth of the Framework Programme, total volume of EUREKA-projects displays a more cyclical pattern reflecting patterns in the presence of mega cluster projects, the funding commitment of member governments (Germany in particular) and the business cycle (cf. Peterson & Sharp 1998: 90). With new projects worth about half a billion Euro each year plus ongoing investments in cluster projects, total EUREKA turnover can be estimated in the range around 2 billion. What part of this budget is covered by public money is even harder to say, but it is likely to be between 0.5 and 1 billion Euro.

To sum up we may say that the decisions taken within the Framework Programme and EUREKA involve public budgets worth 4-5 billion Euro. Given the co-funding nature of these budgets, they involve up to 10 billion Euro worth of European research investments. These are considerable budgets, even if one considers that total EU R&D investment is estimated at 164 billion Euro in 2000; 60 billion of which is government financed (Commission, 2002a: 16).

3. The Search for Legitimacy

If only for the sheer size of the budgets involved, European R&D-policies require to be justified. In fact, European R&D-programmes "are probably the most over-monitored, over-evaluated programmes in the world" (Peterson & Sharp 1998: 237). These monitoring and evaluation exercises should throw light on the objectives that underlie the R&D-programmes and the extent to which they actually succeed in realising these objectives in practice.

On first sight the objectives of the European R&D-programmes may appear rather unproblematic. The official formulations of their objectives suggest that they aim to improve the research capacities in Europe as to increase the competitiveness of European industries and economies. However, the validity of this line of causal reasoning has been contested on various accounts. Most importantly the added value of

public co-funding has been put in doubt. Thus the linear model in which public R&D-programmes serves to boost competitiveness has been complemented by two additional justifications for European policies: securing specific socio-economic goods and facilitating a knowledge-driven economy. Going through these models brings out how the search for legitimacy has informed the ways the two European research frameworks have been portrayed and structured over time.

The classical justification: Increasing competitiveness

The basic rationale behind R&D-policy initiatives – like EUREKA and the Framework Programmes – is that they should increase the competitiveness of the firms engaged. It is assumed that public R&D-support will increase the volume of overall R&D-investments, as a consequence industry will be able to develop new and better products, which are in turn to create extra revenues. While the limits of this linear model are widely acknowledged (Peterson & Sharp 1998: 47; Airaghi et al. 1999), it still serves as a useful starting point for this debate. Also because in practice alternative models have remained contested as well and for many political arguments the linear model still serves as the backbone.

In principle the causal sequence invoked is open to empirical testing, though there are clear practical complications when it comes to establishing actual causality (Georghiou et al. 2002: 85). The innovative ability of industry may change for many other reasons than public R&D-support. At the same time public R&D-investments may bring about effects that are hard to register, because they are unintended or only capitalise in the long run. The direct causal chain is most likely to be registered at the micro-level of individual projects. However, the more indirect and long-term benefits require a wider macro-perspective in the long run (Bach & Georghiou 1998: 2).

Projects in both the Framework Programme and EUREKA are systematically monitored on their progress and results by way of surveys. Effects generally appear more than satisfying within both kinds of R&D-programmes. Given the inherently uncertain nature of research, strikingly few projects are stopped short. Of the 2092 EUREKA-projects started by January 2002, 371 (18%, worth 2.6 million Euro in all) had been withdrawn before reaching their conclusion (EUREKA 2002b). Moreover, for the overwhelming majority of the participants the projects yield satisfying research results. Almost 85% of the EUREKA-participants rank the technological achievement as 'good' or even 'excellent'. 79% of the participants in the Framework Programme are very satisfied with the quality of the project outputs (Majó 2000: appendix III).

The record on commercial effects is somewhat more mixed. Among the EUREKA-participants, almost 45% rank the commercial achievement as 'good' or 'excellent'. However, more than 20% cannot give an answer to this question. EUREKA-participants report almost 2 billion Euro of additional annual turnover, and expect yet another 6 billion within 3 years (EUREKA 2002b: 8). This suggests that the EUREKA-projects do compensate the investments made for them, but only in due course. Commercial returns in the Framework Programme are considerably less identifiable, also because two-thirds of its participants are not commercially oriented. For 30% of the participant in the Framework Programme benefits fail to offset the costs made. Among the industry participants 11% had directly received commercial returns from their project participation, while commercial returns were eventually expected by 69% of the industry participants (Majó 2000: appendix III). Finally, EUREKA-participants indicate that

EUREKA-projects have allowed them to create or safeguard 10,750 jobs (fte) and expect this number to rise with another 14,450 within 3 years (EUREKA 2002b: 8).

The estimates of jobs achieved most strongly bear out the practical limits of this kind of monitoring figures. While the numbers may look impressive in absolute terms, they need to be appreciated in the light of the fact that they involve a volume of 1,109 finished projects of a total worth of about 10 billion Euro. At the same time many respondents fail to respond to this kind of questions, and the ones that do, can generally provide no more than an educated guess (cf. EUREKA 2002b). As an indication, response rates for so-called Final Reports at the conclusion of EUREKA-projects oscillate between 30 and 55%, to settle just below the 50% (64% of the leading participants). What is more, the EUREKA-secretariat (2002b) observes that "response rates vary considerably between members and, in many instances, companies clearly have difficulties to give precise (even any) responses to some of the questions in the forms."

However one appreciates these outcomes, it is almost impossible to relate them to the overall development of Europe's competitiveness in the world. Analyses of the macro-economic performance of the Union are continuously being made (and indeed on an ever wider scale since the adoption of the Lisbon-agenda in 2000). The most comprehensive attempt to date is the Commission report *Key figures Science, Technology and Innovation* first published last year (Commission 2002a). This report provides a systematic analysis of Europe and its two main economic competitors (the US and Japan) in terms of investment and performance in the knowledge-based economy. The report demonstrates that European R&D-investments structurally lag behind those in the US and the Japan, though current European investment growth rates come close to those of the US and are indeed higher than Japan (cf. Commission 2002b).

On the performance side, the picture is not that much different: Europe's performance in terms of patents, world high-tech market share and productivity lags behind the US, but its current growth rate prevents the gap from widening further and actually allows it to surpass Japan. One striking finding is that Europe generally scores rather well in pure science indicators, but its position is considerably weaker on more commercial accounts. This confirms the general picture of Europe's weakness in the commercial exploitation of knowledge and innovations.

Eventually also this study has to acknowledge that the relationship between R&D-investments and performance remains a highly complex one, even though it is asserted that in general higher investments tend to correlate with a better performance (Commission 2002a: 12). What is more, the question remains what distinctive contribution public interventions can make, both in terms of investments as well as, more importantly, in terms of performance.

Additionality

Whether policy effects are measured at a micro- or at a macro-level, the results all beg the key question of additionality: what research activities and commercial benefits have been attained due to European R&D-support that would not have been attained in its absence? (cf. Bach & Georghiou 1998: 8). Consistently thought through, the requirement of additionality reveals that R&D-policy cannot be justified on commercial grounds alone. If indeed R&D is deemed justified because it yields considerable commercial

benefits, then one would consider that it should be possible to finance it by private sources alone. If, on the other hand, later revenues fail to compensate the earlier R&D-investments, then one may well wonder whether public authorities should spend taxpayers' money on it.

Empirical evidence on the issue of additionality is scarce. What might have happened in the absence of public intervention can only be modelled, and the reliability of the evidence that beneficiaries give in surveys may well be disputed. Still 71% of the participants in the Framework Programmes indicate that they would not have undertaken the work in its absence (Majó 2000: appendix III). This high figure reflects to a large extent the fact that 62% of these participants were non-industry. Indeed companies generally indicate that public support is unlikely to commit them to research they would not have undertaken otherwise (cf. Peterson & Sharp 1998: 233). However, public support may influence the direction of the research, as well as the speed in which projects are taken up ('behavioural additionality', Georghiou et al. 2002: 108).

The question of additionality does not only raise itself at the level of the individual firm. One also needs to take account of possible displacement and crowding-out effects in the economy (cf. Bach & Georghiou 1998: 2; Airaghi 1999: 15). The incentive for one firm may well come at the cost of its competitors. In the end there is little public interest in favouring one particular firm at the expense of another. In that sense, it often turns out that "solving a given market failure [always] makes another market failure emerge" (Georghiou et al. 2002: 98).

Indeed, following this line of reasoning, it emerges that the question of additionality depends very much on the level of analysis chosen. While European countries may take an interest in sponsoring their national champions, such policies loose their justification if they only serve to replace revenues and employment from one place to another. Raising R&D-policymaking to the European level may be seen as a way to prevent such strategies from being adopted, by seeking for an optimal division of initiatives. In turn however, this raises a further issue of additionality, which is of particular concern to the supranational Framework Programme, namely whether the aims pursued cannot be attained by governments at a lower level. In recent evaluation literature, the latter part is captured by the term European value added (EVA). Basically this requirement corresponds to the legal principle of subsidiarity.

At an even higher level of analysis, European R&D-policy can be seen in the world-wide context in which European industries compete. Indeed the very emergence of an European R&D-policy can be regarded as an attempt to put European knowledge-intensive industries on an equal footing with their competitors from the US and Japan (Peterson & Sharp 1998: 5). Obviously, however, such an approach catches public authorities in a competitive dilemma in which they are under pressure to match, or even outmatch, the support made available by each other. As a consequence, investment markets are distorted and over-investments are likely to ensue, while even the most successful continent will find its net benefits reduced by the public interventions of the others. Indeed the intercontinental competition for competitiveness has been criticised as based on a misconception of the nature of the international economy. As Paul Krugman (1994) puts it in a well-known, provocative essay: "If the European economy does well, it need not be at U.S. expense; indeed, if anything a successful European economy is likely to help U.S. economy by providing it with larger markets and selling it goods of superior quality at lower prices. International trade, then, is not a zero-sum game."

As it turns out, the primary rationale for public R&D-investments is far from self-evident. Even if subsidised projects have a high rate of technological success and can be demonstrated to create new sources of revenue, one may well wonder why the market acting by itself would not have made the necessary investments available. Taking a wider perspective, one is moreover led to wonder whether the main effects of public R&D-investments involve substitution rather than growth effects. The economic argument can only be saved, if we can identify market imperfections. One of these may be that the great uncertainties and the long-term returns involved prevent the market from validating the returns on R&D-investment sufficiently in practice (Nelson's (1959) 'lack of incentives' argument). Then the question remains whether governments can actually succeed where the market fails. Instead many analysts have turned away from the neo-classical framework to look for alternative rationales for a public R&D-policy.

Securing socio-economic goods

A first alternative strand of arguments focuses on other, socio-economic values that R&D may serve besides its presumed commercial benefits. Indeed it can be argued that investments in R&D bring about a whole range of positive externalities (public goods) that are not sufficiently grasped by the individual investment functions of firms. Above all the boosting of society's knowledge base may be recognised as a public good in itself. Also public investments in R&D may be justified for creating specific high quality jobs. Further, public authorities may seek the development of specific products that can make important contributions to the level of social welfare, think, for instance, of new kinds of medicine or environment friendly technologies.

Over time the contribution R&D can make to specific social-economic goods has become part of the backbone of the Community's Framework Programme. Initially the Framework Programmes embraced a number of initiatives aimed at improving the competitiveness of specific European industries, microelectronics (ESPRIT), communications (RACE), materials (BRITE-EURAM) and biotechnology (BRIDGE). As these various Community R&D-initiatives were integrated in the Framework Programme, a more comprehensive rationale was needed. In considering this, the limits of the neo-classical competitiveness model well emerged, also because anything like an industrial policy aimed at national champions became increasingly discredited in the liberalising world economy. Thus the emphasis on competitiveness in the objectives of the successive Framework Programmes has gradually been replaced by an emphasis on socio-economic goods, up to the point at which the Commission affirms that "The main objective of the 5th Framework Programme is to help resolve economic and social problems" (Commission 2000b: 4). In an even more pretentious formulation the Framework Programme is presented as a "'social contract' which, much more than its predecessors will aim explicitly to create jobs, promote health and quality of life and preserve the environment" (Commission 1999, cited in Kuhlmann 2001: 964).

Typical socio-economic objectives that feature in the European Framework Programmes are employment, environmental enhancement, health and safety, and quality of life (cf. Georghiou et al. 2002: 198 ff.). These objectives weigh heavily upon the organisation of the Framework Programme (especially from FP5 onwards) as they are used to determine research priorities, to select projects and to define research activities of particular interest (Commission 2000b: 5). Most notably, the Framework

Programmes have come to be organised around 'key actions' (FP5) or 'thematic priorities' (FP6) to orient the projects selected towards the specific socio-economic challenges European society faces.

The introduction of these objectives brings in a whole range of new variables and with them a whole range of evaluation problem. These objectives cannot simply be identified as outputs of the research process but can only be measured far beyond the research organisations involved and reach out to society as a whole (Bach & Georghiou 1998: 5). Eventually, these considerations lead to the conclusion that "Different approaches are needed at different levels of aggregation" and that "a portfolios of approaches should be applied, with a clear understanding of the limitations of each one" (Georghiou et al. 2002: 19; cf. Airaghi et al. 1999). Indeed in practice we find that the Community's R&D-policy is monitored and evaluated at various levels starting at the level of individual projects and building up to the level of programme and eventually to the overall Union RTD-activities. Across these levels a whole range of methodologies is employed: core indicators, surveys, interviews, document studies and expert panels.

Strikingly, however, while the volume of evaluation studies has become unprecedented, they appear to cloud rather than to clarify the perspective on the outputs or value added by the Community's initiatives. Above we already noted the difficulties enterprises encounter when they are asked the employment effects of individual research projects. Complexities become even greater if these effects are to be established at an aggregate level. Beyond the problems encountered earlier concerning additionality and replacement effects, indirect, supplier and multiplier effects need to be taken into account as well (cf. OECD 1998, cited in Airaghi et al. 1999: 15). All in all these objectives eventually seem to elude actual measurement and can at best be estimated through empirically informed modelling.

Problems are even greater when it comes to socio-economic goods like environmental enhancement, health and safety, and quality of life. For these variables there do not even exist well-established scales and indicators. Any evidence of effectiveness on them is likely to remain at the micro-level of qualitative case studies.

Indeed most of the evaluation efforts reveal the difficulties to use valid indicators of the impacts achieved and to develop a proper framework to assess them (cf. Georghiou et al. 2002: 151 ff.). Instead most attention is given to the data that are most easily available, project performance and output indicators. Unable to present a balanced assessment of the effectiveness of the policies, evaluation conclusions tend to focus on procedural matters and the strategic choices made. Notably, the expert panel assessing the Community's RTD programmes 1995-1999 – while noting that the system of evaluation is well established and that there is a clear risk of over-evaluation – cannot but conclude that "more emphasis should be placed on demonstrating the relevance of RTD efforts"(Majó et al. 2000: 11).

Facilitating the Knowledge-driven Economy

Among theorists of technology policy a third paradigm has been taking root. They have turned away from analysing technology policy in any causal way leading to economic advantages or public goods. Instead technology is analysed in a more 'ecological' way that emphasises the way the development of new ideas and new products is inherent to the whole of the economy, if not the whole of society (Archibugi & Lundvall 2001). One fundamental assumption behind this approach is that, contrary to traditional approaches, knowledge needs to be understood as much more than a concrete idea that can be codified in a

patent and be represented by a new product. In fact much knowledge remains uncodified and is often even tacit, embodied in skills, experience, routines etc. (Bach & Georghiou 1998: 5). At the same time just having a patent is not enough. Knowledge only becomes of value when combined and applied with other, more practical kinds of knowledge.

This brings us to the further insight that the ability to generate and to put knowledge to use does not depend as much on the sheer volume of resources but much more on the way these resources are organised in the wider society. In this context networks that connect various kinds of knowledge become of prime importance. The key here is to optimise the flow of knowledge so that it can be combined in valuable ways. Above all this requires the reduction of transaction barriers and costs between various sources of knowledge. At times, however, barriers may also be conducive – for instance in the sphere of intellectual property protection – to prevent R&D-investments from being undermined by the spillover of its results (cf. Georghiou et al. 2002: 30).

This kind of approach challenges existing policy practices and stimulates them to re-orient themselves. It turns policies more into facilitators than motors of R&D-exploitation. Thus the (co-)financing of R&D, rather than being a way to increase the R&D-volume, becomes an instrument in stimulating the optimal flow of knowledge. Policies have to aim for the optimisation of the way R&D is organised within the economy, optimise the flow of knowledge, stimulate the formation of networks, provide for well-balance patent-policies and foster the development of standards (Bach & Georghiou 1998: 3/4).

Notably, these ideas have already found their way to EUREKA and the Framework Programme. In EUREKA cluster and umbrella projects have been fostered. These projects generally involve a whole sector and allow for a far more systematic approach. Notable examples are the successive EUREKA cluster projects in microelectronics: JESSI, MEDEA, and MEDEA+. Over the years the main participating firms in these projects (ST, Philips and Siemens) have turned from competitors into collaborators. For them EUREKA-projects have provided a context in which research efforts could be coordinated and planned. At a more concrete level this has also let to the development and adoption of common standards – that, however, often meet with competing standards developed in the US and/or Japan.

The ecological approach clearly also has its impact on the Community research policy. In preparing the 6th Framework Programme the Commission noted that "the 'structuring' dimension of the Framework Programme activities needs to be especially reinforced" (Commission 2000b: 10). This resolution led to the introduction of new instruments, 'integrated projects' and 'networks of excellence'. These two instruments distinguish themselves form the earlier instruments as they aim to bring new cross-European research structures of an unprecedented scale into place.

Even more importantly, the ecological approach provides much inspiration for the Commission initiative to move towards a European Research Area (ERA). Notably the ERA-initiative has been distinguished from the Framework Programmes in recognition of the fact that (co-)financing is not necessarily the most appropriate instrument here and moreover, for many actions desired, the Commission will require the active cooperation of public and private actors throughout Europe. Most notably, the European Research Area is to lead to the optimisation of facilities, networks and resources at the European level and to a more coherent use of public programmes at national and European level.

Eventually, however, this ecological approach raises a fundamental question about the aspirations of European R&D-policy. Obviously, it is possible to compile a list of the regulatory inefficiencies that prevent optimal knowledge diffusion in Europe. Indeed the programme of the European Research Area seems to come quite close to just that (Commission 2000a; Conceição Gonçalves et al. 2002).[4] While one may argue that the ERA introduces for the first time "a real European policy" on research (Commission 2000a), so far the ERA-concept is founded on a collection of themes rather than on a proper comprehensive vision.

It remains to be seen whether the Commission can really get a hold on what so far have remained national regulatory prerogatives (Banchoff 2002). What is more, if the ERA succeeds in moving "beyond the current static structure of '15+1' towards a more dynamic configuration" (Commission 2000a: 10), this will also force a rethinking of the way the Community's R&D-policy has so far been organised around the Framework Programme. The Commission's own philosophy behind the ERA leads away from the relative independence it has so far enjoyed in managing the Framework Programme and towards a greater emphasis on coordination, facilitation and benchmarking with national administrations.

4. Reconstructing European R&D-policies

As it turns out each of the three justifications for a European R&D-policy runs into certain problems and against certain limits. None of them provides for a comprehensive justification by itself. However, each of them grasps important insights. Clearly, R&D-investments can serve to strengthen the economy and wherever markets fail to gather the necessary investments, government has a reason to intervene. The more so because R&D can bring about specific socio-economic goods that can serve important social values like employment, health, environmental enhancement and quality of life. Finally, it is clear that within modern-day knowledge-based economies, the diffusion of ideas is of the greatest importance. Hence European R&D-policy initiatives draw upon all three justifications.

At the same time the justifications leave the exact nature of the policies required underdetermined. Notably enough one may find the complementarity of the justifications reflected in the various policy frameworks: the EUREKA-programme is mostly informed by the objective of competitiveness, socio-economic goods play a key role in the Framework Programme and the European Research Area initiative appears to be inspired by an ecological, knowledge-based economy approach. This suggests that, besides the institutionalist account emphasising the interaction of interest coalitions within a constraining institutional setting, the variety of forms that European R&D-policy takes is informed by a search for legitimacy. From this perspective the three policy frameworks appear as complementary rather than competitive frameworks.

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[4] The European Research Area initiative is organised around seven specific themes:

1. Optimisation of facilities, networks and resources at the European level
2. More coherent use of public programmes at national and European level
3. Facilitate optimal private investment
4. Integration and harmonisation of systems of scientific and technical reference
5. Greater researcher mobility
6. Making the European Research Area more open and attractive (regions, candidate countries, rest of the world)
7. Developing a shared vision on values and limits of scientific research

Still if this is the case, then one may require the overarching strategic vision to be better spelled out (cf. Kuhlmann 1999). Giving primacy to the idea of policy complementarity over competition, there is no need to impose a hierarchy between the three frameworks (like it has been suggested to integrate EUREKA in the Framework Programme (and vice versa) and like the way the European Research Area is now sometimes presented as an overarching framework). A more appropriate approach will have to start from clarifying the roles of the three frameworks.

For a start, the concept of a European Research Area does respond to a genuine policy challenge. Measures are needed to integrate and open up Europe as a research area; to remove barriers between and within (national) markets, facilitate a convergence of national structures and to optimise relations between European R&D and the rest of the world. This is basically a regulative challenge, basic elements of which are part of the ERA-initiative. It does, however, require the full commitment of the Member States and a recognition that European Research Policy goes beyond the provision of funding. As various initiatives are taken up, eventually the ERA-concept may be transformed into a genuine vision.

Given that the main research budgets are still controlled at national levels and given the idea of subsidiarity, an instrument like EUREKA would need to be invented, if it was not already there. Still one may concede the need to re-invent EUREKA, or at least parts of it (cf. Georghiou et al. 1999). EUREKA can definitely play a role in stimulating convergence of national initiatives, even if it fails to force such a convergence immediately. However, convergence will only be brought about if public authorities are willing to commit to this process as well. A further question here is whether and how the coordination of this instrument can be related to the European Union. On efficiency grounds one might argue that the EUREKA-organisation should be merged within the Commission. However, in its current form EUREKA benefits much of a variable geometry that might well be hard to preserve within the confines of the EU (or more precisely the Commission). Some will, moreover, argue that EUREKA operates far more effectively now than it could ever do when becoming part of the Commission machinery. A final thing to note is that EUREKA has an inherent bias towards market-oriented and technical research. The Commission (or the ESF) could try to initiate similar instruments using the idea of mutual recognition/ reinforcement of national support programmes in other fields of scientific research.

Finally, there do remain research initiatives that are best co-financed at the European level given that they are of a distinctive supranational nature (human mobility, ESA) or do require the mobilisation of resources at a supranational level that is unlikely to be brought about by the market alone. Thus there is an obvious point in continuing the Framework Programme. However, less obvious is what size this programme needs to be. The continuous growth of the volume of the Framework Programme so far appears to have been informed more by endogenous factors than by a systematic analysis of the number of projects that actually meet the criteria mentioned. Of course in practice every supply of public funds is bound to create its own demand. However, even if the Commission (2002b) is right in maintaining that R&D-investments in Europe need to be raised to the level of 3% of GDP, it is not obvious that Community investments need to take the lead in this.

A further question is how the balance is to be struck between programming the desired research initiatives and having them initiated by the research community itself. The definition of thematic priorities has been subject to powers working in different directions. On the one hand they have tended to cover

whole policy fields, and taken together they come close to covering the full research spectrum (with a notable weakness on the side of the humanities). On the other hand, there is the pressure to seek to define them as specifically and concretely as possible. Witnessing the eagerness with which European research communities have embraced the Community's priorities, one may well wonder whether this is eventually such a healthy development.

5. Conclusion

Two general conclusions arise from this case study of the legitimacy of the European R&D-policy. First, establishing output legitimacy is no straightforward matter. Theorists who rely on the concept may well under-appreciate the complications involved. While intuitively the efficacy and efficiency gains of policy-making at a European level may be quite apparent, they are much harder to demonstrate in practice. As a consequence there are little guarantees that the policies actually adopted do not miss the mark. Exceptions apart, technocratic approaches fall short of delivering determined and comprehensive solutions in complex policy domains. Eventually this drives towards the conclusion that European policies are probably hard to maintain by output legitimacy alone and that they do require (at least a modicum of) input legitimacy as well.

Secondly, the normative question of legitimacy does add a valuable perspective to the analysis of EU policies that is often dominated (and this applies to all European policy analysis, not only that of R&D-policies) by institutionalist approaches that fail to thematise the normative forces at play. Clearly the legitimacy perspective also needs institutionalist theory as, the political reality being as it is, it cannot account for the actual interplay of powers that eventually determines the decisions taken. Still the legitimacy perspective may be brought in again as a critical perspective that can be helpful in analysing the problems policies encounter in practice. While this paper falls short of providing a systematic method by which the output legitimacy of various policies can be explored, it does suggest certain elements that may be part of such a method: public interests and goods, demonstrable effects, additionality, complementarity of policy justifications, investment versus regulatory policies etc.

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