

The State of Research in Higher Education

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◇ 이 글은 OECD(Organization for Economic Co-operation & Development) 산하 ◇
◇ 의 高等教育政策 小委에서 發表(1981. 9, ◇
◇ 파리총회)한 Stuart Blume(諮問委員)의 ◇
◇ 고등교육기관에서의 연구활동에 관한 論 ◇
◇ 文으로, 우리 나라 高等教育機關에게 주 ◇
◇ 는 示唆점이 크리라 생각되어 全文을 掲 ◇
◇ 載합니다〈編輯者 註〉 ◇

I. Introduction

The environment of research in higher educational institutions is formed by two quite distinct sets of public policies, reflecting the multi-functional role of such institutions in advanced societies. On the one hand are policies towards higher education itself: universities and other post-secondary institutions have their parts to play within general educational policy. This does not require emphasis, and has always been (and remains) the major claim of these institutions on public resources. On the other hand are national science and technology policies. From the point of view of those concerned with formulating and implementing these policies the higher education system is a major

repository of expertise, as well as the source of research manpower needed by industrial and other social and economic institutions. In most Member countries these two policy processes have been quite separate from each other, and they remain so today. There is a danger that under the constraints of the 1980s this lack of articulation may have serious implications both for the well-being of academic institutions and for their ability properly to contribute to social and economic progress in the 1980.

In the 1960s, a period of expansion and of affluence, this lack of articulation posed no problem. As enrolments expanded, faculties and budgets expanded. At the same time funds for scientific research became increasingly plentiful: science and technology seemed to promise much, and basic research was the hope of the future. The university was the natural home of basic research, and it was never necessary to call into question the time-honoured belief in the "essential connection" between research and teaching. In many Member countries university scientists could, if they wished, easily obtain extra research funds to procure assistants and equipment from Research Councils and similar

bodies.

By the mid-1970s the very different situation which OECD countries face today was becoming visible. In most countries student enrolments grew at a very much slower rate and then gradually ceased to grow at all. The economic recession which set in, and resulting attempts to restrain the growth of public expenditure, impacted both on higher education budgets and funds for research. A series of adverse factors came together, so that as the situation deteriorated some began to speak of a "crisis" in academic research.

This paper discusses some aspects of the present situation. There is no doubt that a significant deterioration has taken place which poses major problems for higher educational policy both at the national and the institutional level. Moreover at the beginning of the 1980s these problems suddenly acquire a new saliency. Important developments are now taking place in science and technology policies which, once more, have major significance for higher education systems. Many Member governments are coming to accept that research-based industrial innovation must form an important part of a strategy to escape from the present recession. New technological opportunities must be sought, and maximum use made of available new technologies such as microelectronics. At the same time new kinds of values, often articulated by community groups or trades unions are resulting in new kinds of demands of the scientific system. These changing social values lead to demands for research directed at "clean technologies", or non-labour shedding technological change, or multi-disciplinary studies of local community problems. Various new demands are being made on the higher education system, particularly in research. Crucial questions surround the ability of the system to respond, after some years of decline. Policy-makers can

not avoid these questions, but to begin to address them is inevitably to probe more deeply into the legacy of the past decade.

II. The Current State of Academic Research

The situation of research in the higher education system is determined by higher educational policies (and demographic factors) on the one hand, and by science and technology policies on the other. Although the relative impact of these two sets of policies differs from one Member country to another (partly because of different ratios of internal and outside project funds in research support) this interaction is crucial everywhere. It is useful to distinguish these two sets of influences, for they raise somewhat different issues for policy-makers.

I. The Effects of Higher Education Policies

The crucial factor here is the succession of periods of rapid growth in enrolment, low growth, and then stagnation: a situation unlikely, at least on demographic grounds, to reverse itself before the late 1980s. These changes in enrolment affect research in four quite different ways.

(a) Student numbers are the main determinant of higher education budgets, so that as numbers have levelled off, so have the incomes of higher educational institutions. In fact budgets, when corrected for inflation, seem not quite to have kept up with the slow expansion of the mid-1970s. When salaries are paid, and teaching material provided, money left over for research has thus declined. Also, as students increasingly chose the social sciences rather than the natural sciences or technologies, there was a consequent shift of resources between fields.

(b) Changing enrolments determine recruit-

ment of new faculty members. In the 1960s expansion led to rapid recruitment. Many young scientists were appointed to senior posts in new institutions and to new posts in old institutions. The subsequent end to recruitment has led to a general ageing of academic staff. There are few or no promotion prospects for those in junior posts, and no employment prospects at all for those seeking an academic career.

(c) This has discouraged students, and worryingly perhaps the best students, from embarking on post-graduate studies. Post-graduate students in many OECD countries have largely been supported financially from project grants to senior scientists. Diminishing grants have meant less assistantships of this kind. The employment market for scientists in industry, too, has looked unattractive as industry has cut back on its research. These factors together seem to have led to significant decline in the scale of post-graduate work.

(d) This decline has been hastened too by an evolution in the composition of the student body from which research students are drawn. Measures taken to increase the access of students from less privileged backgrounds, as well as of students with work experience, have resulted in significant numbers of students who are less likely to embark on research study after graduation.

2. The Effects of Science Policies

The significant factor here is the way in which external funds for research projects (sometimes called "second and third flows of funds") are distributed. Three tendencies can be identified.

(a) Although the balance between research support from normal institutional funds and research support from external funds differs

greatly from one country to another, the tendency is towards relative growth of the latter. Thus research funds from Research Councils on the one hand and from Ministries or other sectoral bodies on the other are of growing importance. It is also apparent that Research Councils are gradually abandoning their traditional laissez faire approach for more interventionist methods. That is, they are increasingly establishing their own priorities in research, and reserving funds for these, as well as seeking to bring about co-operation between disciplines, institutions and social sectors.

(b) Bodies financing research from public funds have been under growing pressures to ensure that their resources are used as effectively as possible. The view has gained ground that research in many fields (not just those demanding major facilities like radio telescopes) is most effectively concentrated in big groups, which is also supposed to reduce duplication of effort. There have thus been attempts at concentrating resources for research in "centres of excellence".

(c) The criteria on which funds are allocated to research projects have also been changing. In particular the emphasis on research being "relevant" (to some national objective of social or economic policy) has greatly increased. This has sometimes taken the form of broadly defined national programmes towards which research should become oriented. Sometimes it has taken the form of increasingly restricting research funds to support for specific projects judged to be of immediate practical relevance for some short-term objective.

How have these two sets of policy developments interacted, and how have they affected the research activity of higher educational institutions? In what sense is there a crisis?

Among the clearly visible consequences, to which policy-makers must address themselves, are the following.

First, the decline in *post-graduate training* must be noted. Research training fulfils a number of distinct and important functions, and any decline must be judged in relation to each. First, there is the question of the supply of research manpower in relation to the future needs of the economy and society. How adequate are numbers now being trained in relation to future manpower demands? Second, consideration must be given to whether or not the pool from which new faculty will be recruited when enrolments begin once more to grow is adequate in both quantity and quality. Third, it must be borne in mind that in the laboratory subjects in particular it is post-graduate students who do most of the practical work of research. A decline in numbers may have affected the research effectiveness of academic departments. Fourth, post-graduate students also tend to have a major role in supervising the practical work of undergraduate students, thus contributing to teaching effectiveness too. This also may have been affected.

The *ageing* of academic staff is also a matter for concern. The possible consequences are various. In the first place there is an inevitable effect on the costs of higher education. An ageing faculty almost inevitably implies a growing wage bill, even apart from the effects of inflation. A growing proportion of the total income is taken up by wages and salaries, thus leaving a smaller proportion for research. It has also been suggested that as scientists, and research groups, age, their research competence and productivity begins to diminish. Similarly, it seems likely that as they grow older the willingness of scientists to change their research interests—and indeed their ability to do so—in line with changing scientific priori-

ties and scientific advances also declines.

There is evidence for growing *obsolescence* in the scientific equipment available for research in higher educational institutions (shown by declining capital expenditure per scientist). This may mean that scientists are less able to carry out research at the forefront of knowledge. It may mean that their research is increasingly directed into fields requiring less sophisticated or costly equipment. It is possible that some of the effects of this trend can be mitigated by increasingly providing equipment on a co-operative basis, to be shared between departments or institutions. But the various possible effects of such a strategy remain to be elucidated. An equivalent problem faces the social sciences and humanities, as a result of declining funds available to *libraries*, and for travel necessary where source material located elsewhere has to be consulted. Again, it may be that research is becoming less effective, or that scientists are necessarily selecting different topics for study.

What are the effects of growing dependence upon *external project funds* for research? One possibility is that academic research is becoming more useful to society: that a major resource of talented and expert men and women are now being more effectively mobilised in a concerted attack on the problems facing all Member countries today. Enlightened science policy could mean that this is indeed the case. But it is also possible that higher educational institutions are being turned into centres primarily of short-term and applied research. It is questionable whether such a transformation would represent a proper use of their expertise, or indeed the contribution which they can best make to future social and economic progress. Moreover, funds of this kind, and especially those coming from mission-oriented (sectoral) bodies, are necessarily more concentrated in

some fields than in others. The effects of this upon the balance of the academic curriculum must be borne in mind. So too must the possible disruptive effects of growing disparities in resources between academic departments upon the structure of the institution. Finally, the possible implications of academic institutions largely losing control of their own development must be considered. Growing imbalance in funds available, as mission-oriented agencies concentrate support in applied fields deemed immediately useful, may have other consequences. There is the danger that *fundamental research* will suffer in particular. It is difficult at times of financial stringency to make a strong case for continuing support for fundamental research. Attempts to demonstrate its economic value in quantitative terms have not, on the whole, been successful. Few governments have been convinced of the benefits of maintaining support for research projects judged worthwhile only in scientific terms, whilst cutting back on total support. Industry too has responded to the economic crisis by cutting back on research, and in those countries where there was some support for fundamental research in the universities, this has generally been an early industrial economy.

In a number of countries the *social sciences and humanities* are facing similar problems as a result of current emphasis on short-term utility. Again, many research funding agencies are failing to maintain levels of support for these fields. Moreover the social sciences and humanities are at risk in other ways. It is not at all clear that they are entirely suited to the project funding mode of support which seems to be gaining ground. Much such research is only carved up into discrete "projects" at considerable cost to its coherence and ultimate quality. It may well be that much work in these fields is better-supported through the

traditional medium of general university funds. But there is a "Catch 22" situation, since it is these fields precisely which are being denuded of funds as students increasingly choose subject with some vocational element.

The problems listed above are not intractable. Although they are present in greater or lesser degrees in almost all OECD countries, there is no doubt that remedial action could readily be taken, given commitment by relevant authorities. What must be considered, however, is whether a decade of decline along these various dimensions may also have given rise to more deeply rooted changes which cannot be dealt with simply by an injection of new resources.

III. The Consequences of Decline

It is less clear what form any more deeply rooted changes may have taken, but it is likely that they have been of two kinds: individual and structural. At an individual level, it must be recognised that academic scientists in many countries have become profoundly *demoralised*. Whilst it is not easy to understand what the consequences of a long period of declining research possibilities may have been, two likely consequences require consideration. In the first place the situation must appear as one in which the value which society seems to place on the work of the academic scientist—as reflected in the resources which it makes available to him—has progressively fallen. This cannot have been without psychological effect. In the second place it must be recalled just how central a place the performance of research occupies in the scientist's conception of his role, learned through prolonged professional training. It is through his research that he earns his place in the international community of his peers, and commitment to the advancement of knowledge is central to his personal values. The effects

of then being denied the practical means of pursuing this commitment may be understood in terms of the sociological conception of 'anomie'. Sociological writing suggests that a typical protective response is a turning aside, a search for gratification in other spheres. In other words it is possible that many academic scientists are *disengaging* from research: ceasing to regard themselves as researchers. If this is so, and there is slight evidence for it in some places, the effects need to be understood.

Aside from these individual consequences, prolonged decline in academic research, accompanied by the other tendencies noted earlier, might also have certain structural consequences. Perhaps the most important of these is a decreasing *flexibility* within the academic system. The importance of this, if it is indeed the case, is that the higher education system will be less and less able to respond to new challenges and new opportunities. Yet there are a number of reasons for fearing that such may be the case. Ageing is an important fact, for as already mentioned as scientists grow older they are less able and less willing to change their research interests. At the same time they are less willing to move physically. This combined with the lack of new posts has meant that there is now virtually no institutional mobility. Academic institutes and departments are less and less exposed to the essential influx of new thought, new ideas, essential to truly original research. This being the case, how is multidisciplinary research to be initiated: the very research necessary if current problems (such as the energy crisis) are to be tackled? An additional factor making for rigidity, non-responsiveness in research, is employment protection legislation. Laws introduced with the well-being of workers generally in mind has had unanticipated consequences for academic research. Higher educational institutions in a

number of Member countries are becoming reluctant to accept research assistants and technicians paid from external grants for fear that they may subsequently be obliged to offer permanent employment, and without the financial resources to do so. Have rigidities of this kind set in, and if so what might be done?

A second structural effect which investigation may diagnose is growing institutional *stratification*. Hitherto in a number of countries the tendency to concentrate research resources in a limited number of academic institutions has been largely held in check. That is, although research funding bodies have felt that effectiveness would be improved by greater concentration in "centres of excellence", they have been constrained by the legitimate desires of newer institutions to build themselves up. As this constraint is removed, what will the effect be? One possibility is a growing differentiation between research-performing and purely teaching institutions. A second possibility is that each institution will be a "centre of excellence" in one or two fields, so that there will be a clear differentiation between rich and poor fields within the institution. What might the implications of such a development be?

Responses

Although action taken by Member governments, and to some extent by academic institutions themselves, does not match the seriousness of the situation described, yet some steps have been taken. For example, in a few countries (e.g. Canada, Finland, Italy) there is a recent commitment to the "re-financing", or "re-capitalisation" of university research. Although the advantages, and the appropriateness of making a fund available for the replacement of obsolete equipment are undeniable, the problem is not solely one of extra financial resources. Much depends upon the procedures by which, and the

purposes for which, money is made available. It is worth considering the more general applicability of certain measures introduced in a number of countries.

Thus, there is no doubt of the serious effects on research of lack of recruitment. As pointed out above, this has had a number of effects: it has discouraged some of the most able students from embarking on post-graduate work; it has made it very difficult to initiate new topics of research, and so on. But given the fact that enrolments in most Member countries are unlikely, at least on the basis of demographic trends, to expand before the end of the decade, it is difficult to see how additional posts could be justified. One possibility may therefore be the creation of substantial numbers of temporary posts in higher education, at the post-doctoral level. This is the purpose of the Heisenberg Programme in Germany, in which scholars are selected extremely rigorously on the basis of research potential and offered a five-year appointment. The programme covers all fields of science and scholarship. It is nevertheless controversial (because of its acknowledgedly elitist character), and moreover it is proving difficult to find a sufficient number of young scientists of high calibre. It seems possible that the lack of permanency makes the positions unattractive, despite the considerable research opportunity offered. Nevertheless this scheme, and others being tried elsewhere, merit more general consideration, for it addresses itself to a crucial issue. How can "new blood" be brought into academic research (essential for its continuing vitality and for the requirements of emerging lines of research) if there is to be no permanent recruitment for 5 to 10 years? And how can some guarantee be secured that when new academic staff are eventually sought there will be adequate numbers of suitably talented and trained people on whom to draw?

Reference has already been made to the erosion of the funds which higher educational institutions can make available for research from their normal operating budgets. A number of Member countries (such as the Netherlands and Sweden) are attempting to protect the research element of academic budgets by "decoupling" the research and teaching elements in basic funding. Such a separation can break the direct financial influence of varying undergraduate admission on research, and thus give research activity a more independent and potentially more stable existence. The general applicability of such measures in other Member countries merit consideration. However it must be recognised that such an approach represents a very clear rejection of the idea of the inseparability of research and teaching. It could lead to a much clearer functional and social separation of the two activities. This in turn raises the danger that if many teachers were effectively barred from research, then many students would be denied contact with the fruitifying effects of original research and would become still less interested in pursuing research training. Perhaps still more seriously, there is at least the possibility that, denied contact with research activity, curricula in many departments or institutions would ossify and cease to develop (even to the extent which is now the case) in line with advancing knowledge. Some also believe that any further separation of research from teaching would lead to still more rigid stratification in the academic system: first and second class institutions, first and second class staff. And of course it is possible that higher educational institutions would become still more dependent upon government priorities in research, still more at the mercy of short-term concerns and fluctuations. It seems that an essential parallel to any procedures or initiatives of this kind is the development of more coherent planning of research priorities

by higher educational institutions themselves.

Such planning seems essential if some of the benefits of at least partial decoupling of research from teaching are to be secured whilst the worst dangers are avoided. This is indeed being attempted in a number of Member countries, in some if not all higher educational institutions. But the establishment of research priorities is not an accustomed task for such institutions and whilst it seems to imply a valuable concern for a measure of self-determination, there is the undoubted problem of how it is to be done. It may, for example, require a strengthening of the central authority at the expense of traditional departments or institutes. It will be necessary to decide whether any institutional research committee should have the responsibility for allocating the research funds available to the institution (whether or not these have been decoupled previously) and if so on what criteria. If there are to be procedures of this kind, then it will need to be considered whether a single institution possesses the breadth of expertise to make objective judgements of scientific excellence across all the fields of science. Once more there are potential dangers for social sciences and humanities in such an extension of "project support" to internal funds. There is the question of whether such a research committee should have the right to approve all applications by faculty members to outside sources of research funds: a considerable erosion of traditional independence. Whilst difficult issues of these kinds are inevitably posed, the desirability of institutional planning of this kind is increasingly being debated. It seems to be a valid response to some of the difficulties enumerated in this paper, and thus to merit still wider discussion in the light of specific characteristics and traditions of individual Member countries.

These are a few attempts, and they are few,

at accommodating to the situation in which higher education institutions now find themselves in respect of their research. How generally applicable are they, and how adequate? What other possibilities exist? How should any new resources best be deployed, and what can be achieved by better use of existing resources?

To pose these questions is to raise once more the traditional lack of articulation between higher educational and scientific policies. For a "better use of existing resources" necessarily depends upon the reconciliation of differing policy objectives at the national level. Science policy bodies have tended to think in terms of "efficiency" and "rationalisation" in research, which has led them to emphasize concentration of resources, selectivity, the avoidance of duplication. They have sought also increasingly to direct resources towards "national needs" in research. But the fact is that academic research has many functions: in respect of national research systems, economic systems, social systems, educational and cultural systems, and so on. The optimum use of resources cannot be decided in the light of one function, one objective, alone. The crucial question of how national science and higher educational policies can more adequately be articulated with each other demands consideration.

IV. The Implications of Current Trends in Science and Technology Policy

The final set of issues which require consideration give added importance, and indeed urgency, to all that has gone before.

There seems little doubt that the economic crisis which the Members of OECD have faced over the past few years will continue to be at the top of the policy-agenda for some years to come. Traditional methods of economic man-

agement are seemingly inadequate to the combination of inflation, unemployment, no growth, energy and raw materials shortages which the industrialised world currently faces. In many OECD countries traditional industries are now faced with a challenge from newly industrialising countries which they will be unable to meet in a competition based on price alone. There is growing agreement that a new economic strategy is required, and that within such a strategy industrial innovation must have a major place. Innovation would be directed towards those industries based on sophisticated new technology where the advanced OECD countries may find a secure base for exports and production in the new economic order. The strategy involves embracing the most advanced microelectronic techniques in production and other areas of the economy (whilst recognising, and taking steps to mitigate, the social effects this will have). It also involves a major commitment to industrially-oriented, and industry-performed, basic and strategic research. New technological opportunities must be sought, involving perhaps bio-technology and other technologies of general application (so-called "generic technologies") for there is the possibility that from these may come wholly new job-producing industries.

This strategy will present major challenges to higher education systems, not least to their capacities in research. The vital question is: how can they best contribute in bringing about the success of such an attempt to meet the challenge which OECD governments, and societies, now face? From this question flow a number of topics which require careful consideration.

What seems to be needed for industrial regeneration is a major investment in "strategic" research: that is, research addressed neither to problems of immediate short-term policy relevance nor to problems which derive their inter-

est only from theory. Strategic research is that which lies between the two, seeking to be truly innovative but in areas having a general relevance to the problems of today. It is here that academic institutions could undoubtedly make a major contribution. But how can their research support be enlisted in this way? How can a middle ground be steered between research of purely scientific interest on the one hand and research of no more than short-term industrial interest on the other?

It may be, for example, that new kinds of links between academic institutions and industry are required, to facilitate knowledge transfer. Such links might perhaps entail innovative approaches to research training: a new kind of partnership at the post-graduate level in which responsibility for advanced training is shared (such as has been attempted in the United Kingdom in recent years).

It seems clear that many of the technological opportunities which will have to be identified and pursued will involve new mixes of skills. Biotechnology is an example: a field in which research necessarily involves the skills of chemical engineers, geneticists, microbiologists, and a variety of other specialisms. There is no doubt that higher educational institutions have an important part to play. This is not only because they possess the mix of relevant skills (though often not the means of bringing them together), but because the training of new generations of researchers to staff new industrial laboratories will be crucial. However in few countries are academic structures and funding mechanisms flexible enough to encourage the formation of such multidisciplinary groups. Indeed it may be that such flexibility is in fact diminishing, for reasons which have been discussed. Steps need to be taken if the initiation of such multidisciplinary research is to be facilitated. But the problem is not merely one

of initiation. Research of this kind will require guaranteed funding for some years ahead if it is to progress. At a time when budgetary constraints seem to inhibit long-term financial commitments, ways will nevertheless have to be found of providing such guarantees.

To some extent identified fields of technological opportunity must—and do—reflect changing social values and aspirations: the greater emphasis now put on improved health, environmental quality, conditions of work. It is true that such aspirations have had to some extent be held in abeyance during the economic crisis, but the underlying values are undoubtedly still present. In some countries it has been recognised that they can indeed provide the basis for economic opportunity: as in development of “clean technologies,” solar and geothermal energy technologies, and so on. Much such research requires the involvement of social, scientific as well as natural and technological science expertise.

Moreover there are major problems of social adjustment which are as yet little understood. What will be the effect on the individual, and on community and family structures, of continuing high levels of unemployment? What are the implications of inequalities in the extent of unemployment between regions and age groups? What might the effects of microprocessors be, not only on overall levels of employment, but (through e.g. new communications technologies) on social structures and cultures also? The answers to crucial problems like these,

and the current situation of Member countries suggests many like them, necessitates involvement of the social sciences on a growing scale. Much of the relevant expertise is located in the higher education sector.

Legitimate pressures will continue to be exercised upon higher educational institutions to play their part in an innovation-based economic strategy. Only if higher educational institutions themselves, and higher education policy-makers at the national level play an active role in defining this contribution, in consultation with science and technology policy-makers, will the benefits be maximised and the dangers avoided.

But the current situation poses special intellectual problems for the social sciences and humanities, for many established ways of understanding (e.g. certain economic theories) are proving of little value. The 1980s are a decade of uncertainty. It is not only that governments face difficulties in framing effective policies, it is also that individuals and societies have to learn to cope with major transformations in, for example, females roles and identities, the aspirations of ethnic and cultural minorities, the changing place of paid work in the life-cycle, and the changing international balance of economic and political power. It is almost certainly the case that it is not through “crash programmes,” or two year projects, that the higher education system can best aid society in its difficult and uncertain task. It is through traditional scholarship made more widely available. *