International Research Partnerships on the move[1]

Luc Soete

UNU-MERIT,
University of Maastricht,
The Netherlands
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Introduction

The title of this conference is *Knowledge On the Move* and while I have been asked to address specifically the issue of international research partnerships within the context of the relation between Dutch development cooperation and international research cooperation, I will use the opportunity of this talk to broaden the spectrum of my remarks not just to the Dutch, but to the international scene. If there is one area where research for development has been well in advance of many other research areas, it is in the international broadening and networking of research communities beyond the national and/or European borders. It is here that development studies has actually much to offer to many other research fields which have, as yet, barely adjusted to the global research arena of the 21st Century.

Returning to some extent to issues of development studies and cooperation after 30 years, I also admit at the outset a major lack of knowledge not only with respect to development practices as they have been developed over the last thirty years but also with respect to development theories, and development economics in particular. While I was present in Ghent in 1974, as a young research assistant of Jef Van Bilsen at the creation of the European Association of Development Institutes, my last contribution to development economics dates back from 1981 when I was research fellow at the Institute of Development Studies in Sussex. It was the time of Dudley Seers' strong plea that development studies had "to come home". For Seers, development economics had already died by then[2], the new changes in the developed world – the oil shock of the

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[2] See Dudley Seers' article on "the birth, life and death of development economics" in *Development and Change* 10 (1979): 707-719.

early 1970s – showed that there would no longer be a distinct frontier between North and South. In his view development economics could now be disposed of, and greater emphasis placed on the similarities rather than the differences between countries. Thus to quote Seers, "development economics died young, after much suffering… The history of economic thought shows that, in the end, irrelevant theoretical frameworks are discarded." Henceforth, "the logical future . . . is the study and teaching of development in a social and political as well as economic sense, with a wider geographical coverage and special emphasis on European development needs" [p.717].

Viewed in retrospect it is as if I took Seers' comments seriously and that unconsciously I turned my research attention over the last 25 years or so to those European development needs.

In the first section of this paper I focus very much on my own research field that of S&T and innovation studies, a rather specific research area but one which has of course been central in attempting to explain economic growth and development. I'll do so under three, hardly surprising, but logical headings: reflections on the past, on present developments and on what I would consider as the central future challenges. In a second section I then enter into the debate about what those developments imply in terms of international research partnerships: how they are currently shifting from national or European networks of research to international research partnerships and what I consider to be the future challenges of international research partnerships in this future knowledge on the move world. In conclusion I raise the question whether those international research partnerships actually fit global sustainable development. My reflections are, very much personalized accounts, giving you though hopefully some inspiration when addressing some of those issues in the various workshops over the next days.

1. S&T and Innovation studies *on the move*

a) S&T, the emergence of formalized industrial research activities and national obsessions... : reflections of the past

It is always good to remind policy makers that the current strong focus on industrial R&D as one of the central factors behind economic growth and development in developed countries as well as emerging economies is actually of relatively recent origin. Up to the late 50's, industrial R&D was barely recognised by economists, despite the recognition that "something" (a residual, a measure of our ignorance) was behind most of the economic growth in the 20th Century and the rapid catching up growth of the European countries and Japan after the post-war period in particular. But long before, experimental development work on new or improved products and processes was of course carried out in ordinary workshops[3]. What became distinctive about modern, industrial R&D was its

[3] As we noted elsewhere: "The early classical economists were well aware of the critical role of technology in economic progress even though they used a different terminology. Adam Smith (1776) observed that

scale, its scientific content and the extent of its professional specialisation. Suddenly a much greater part of technological progress appeared attributable to research and development work performed in specialised laboratories or pilot plants by full-time qualified staff. It was also this sort of work which got officially recorded in R&D statistics; if only because it was totally impracticable to measure the part-time and amateur inventive work typical of the nineteenth century (Freeman and Soete, 2006).

As historians have argued the industrial research “revolution" was, however, not just a question of change in scale. It also involved a fundamental change in the relationship between society on the one hand and technology and science on the other. The expression "technology", with its connotation of a more formal and systematic body of learning, only came into general use when the techniques of production reached a stage of complexity where traditional methods no longer sufficed. The older, more primitive arts and crafts technologies continued to exist side by side with the new "technology". But the way in which more scientific techniques would be used in producing, distributing and transporting goods led to a gradual shift in the ordering of industries alongside their “technology” intensity. Thus, typical for most developed and emerging industrial societies of the 20th Century, there were now high-technology intensive industries, having as major sectoral characteristic the heavy, own, sector-internal R&D investments and more low-technology intensive, more craft techniques based industries, with very little own R&D efforts.

In many policy debates, industrial dynamism became as a result somewhat naively associated with the dominance in a country’s industrial structure of the presence of those high-technology intensive sectors. It led to what I have called elsewhere within the European context, a somewhat dangerous obsession with national technological competitiveness. The European, so-called Barcelona 3% R&D/GDP target e.g., arose primarily from concerns that Europe’s industrial R&D appeared to lag far behind that of the other technologically leading countries such as the US and Japan. The assumption was that more R&D carried out in Europe would be a crucial factor behind Europe’s attempt at becoming the most competitive region in the world. At the same time, it was also obvious that R&D as an investment cost target was somewhat of an odd policy target. Much more important is the question what the results – in terms of efficiency and effectiveness – of such investments will be. Firms are not interested in increasing R&D expenditures just for the sake of it but because they expect that the new or improved

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improvements in machinery came both from the manufacturers of machines and from "philosophers or men of specialisation, whose trade is not to do anything but to observe everything". But although be had already noted the importance of "natural philosophers" (the expression "scientist" only came into use in the nineteenth century), in his day the advance of technology was largely due to the inventiveness of people working directly in the production process or immediately associated with it: "... a great part of the machines made use of in those manufactures in which labour is most subdivided, were originally the inventions of common workmen" (Smith, 1776, p. 8). Technical progress was rapid but the techniques were such that experience and mechanical ingenuity enabled many improvements to be made as a result of direct observation and small-scale experiment. Most of the patents in this period were taken out by "mechanics" or "engineers", who did their own "development" work alongside production or privately. This type of inventive work still continues to-day and it is essential to remember that is hard to capture it in official R&D statistics.” (Freeman and Soete, 1997)

production processes, technology concepts, or new products responding to market needs emerging from these activities, will improve their efficiency and hence their long term competitiveness. One could imagine that countries would have similar interests.

Furthermore given the much higher risks involved in developing new products for global markets, firms today will often prefer to license such technologies or alternatively outsource the most risky parts to small high tech companies which operate at arms length but can be taken over, once successful. Not surprisingly in most EU countries, the large R&D intensive firms appear today less interested in increasing their R&D investments in Europe than in consolidating them or where possible reducing the risks involved in carrying out R&D by collaboration with others sometimes through publicly sponsored or enabled programmes or through so-called open innovation collaboration.

Not surprisingly many small, traditionally high R&D intensive EU member countries such as Finland or Sweden, have no longer witnessed strong growth, but sometimes even declines in their privately funded R&D intensity over the last years with little or no relationship to their economic performance. The central question appears to be whether the benefits of knowledge investments can be appropriated domestically or will "leak away" globally. In the old development and catching-up growth literature[4], it was already emphasized how this phenomenon would be characterized by lagging countries benefiting from the import and transfer of technology and knowledge, formally and particularly informally. As a logical extension, in the current global world economy, it seems obvious that increasing R&D investment is unlikely to benefit only the domestic economy. This holds *a forteriori* for small countries, but is increasingly valid for most countries with only a couple of exceptions left. Thus, as Meister and Verspagen (2003) calculated, achieving the 3% Barcelona target in the EU by 2010 would ultimately not reduce the income gap between the EU and the US, the benefits of the increased R&D efforts not only accruing to Europe but also to the US and the rest of the world. In a similar vain, Griffith, Harrison and Van Reenen (2004) illustrated how the US R&D boom of the 90's had major benefits for the UK economy and in particular for UK firms having shifted their R&D to the US. A UK firm e.g. shifting 10% of its R&D activity to the US from the UK while keeping its overall R&D expenditures at the same level, would witness an additional increase in productivity of about 3%, an effect which appeared to be of the same order of magnitude "as that of a doubling in its R&D stock" (Griffith et al. 2004, p.25).

In short the link between the location of "national" firms' private R&D activities and national productivity gains appears today increasingly tenuous. The same holds for universities and other public research institutes. In many research areas, European welfare will in the long term be less influenced by the development of local knowledge, its international commercial exploitation and intellectual appropriation, than by global access to such knowledge, the development of joint global standards and the rapid world-wide diffusion of such new technologies to other, non-EU countries. One may think of areas such as energy saving technologies, research on sustainable development and climate change, health and the spreading of diseases, food safety, security, social sciences

[4] For overviews see Fagerberg, 1991 and Verspagen, 1991. For more recent overviews see Szirmai (2008).

and humanities, etc. We come back to what are the implications for such trends for international research partnerships in section 2.

b) The present debate: between industrial R&D and innovation without research

As acknowledged by many innovation studies scholars ranging from economists such as Paul David and Dominique Foray (2002) to science and technology studies scholars such as Mike Gibbons (Gibbons et al. 1994) and Helga Nowotny (Nowotny et al. 2001), a significant shift in the understanding of the relationships between industrial research, innovation and development occurred beginning this Century. It is actually interesting to note that both the more economically embedded innovation research community as well as the more STS embedded research community more or less converged on this issue: in each case the perception of the nature of the innovation process has changed significantly.

Innovation capability is today seen less in terms of the ability to discover new technological principles, but more in terms of an ability to exploit the effects produced by new combinations – one is actually very much reminded of Schumpeter's already old notion of "neue Kombinationen" – and the use of pieces from the existing stock of knowledge (David and Foray, 2002). This alternative model, closely associated with the emergence of numerous knowledge "service" activities, implies a more routine use of an existing technological base allowing for innovation without the need for particular leaps in science and technology, sometimes also referred to as "innovation without research".

This shift in the nature of the innovation process implies actually a much more complex structure of knowledge production activities involving a greater diversity of organizations having as explicit goal knowledge production. The old S&T industrial system was based on a relatively simple dichotomy between knowledge generation and deliberate learning taking place in R&D laboratories, including engineering and design activities, and activities of production and consumption where the motivation for acting was not to acquire new knowledge but rather to produce or use effective outputs. As David and Foray have argued, the collapse of this dichotomy has led to a proliferation of new places having as an explicit goal the production and use of new knowledge which may not be readily observable from national R&D statistics but which appear nevertheless essential to sustain innovative activities in a global environment.

In short, traditional R&D-based technological progress, still dominant in many industrial sectors ranging from the chemical and pharmaceutical industries to motor vehicles, semiconductors and electronic consumer goods has been characterized by the S&T system's ability to organise technological improvements along clear agreed-upon criteria and a continuous ability to evaluate progress. At the same time a crucial part of the engineering research consisted, as Richard Nelson put it, "of the ability to hold in place": to replicate at a larger industrial scale and to imitate experiments carried out in the research laboratory environment. As a result it involved first and foremost a cumulative

process of technological progress: a continuous learning from natural and deliberate experiments.

The more recent mode of technological progress described above and more associated with the knowledge paradigm and the service economy, with as extreme forms the attempts at ICT-based efficiency improvements in e.g. the financial and insurance sectors, the wholesale and retail sectors, health, education, government services, business management and administration, is much more based on flexibility and confronted with intrinsic difficulties in replication. Learning from previous experiences or from other sectors is difficult and sometimes even misleading. Evaluation is difficult because of changing external environments: over time, among sectors, across locations. It will often be impossible to separate out specific context variables from real causes and effects. Technological progress will be much more of the trial and error base yet without as in the life sciences providing "hard" data, which can be scientifically analysed and interpreted. The result is that technological progress will be less predictable, more uncertain and ultimately more closely associated with entrepreneurial risk taking. Attempts at reducing such risks might involve, as Von Hippel (2004) has argued, a much greater importance given to users, already in the research process itself.

In this new mode, a national R&D investment target appears not only odd from the analytical economic perspective as discussed above, it makes also little sense within a global knowledge world in which private R&D has become by and large a mobile production factor, with firms locating such activities where the local conditions appear optimal. Among the most important factors in this regard is a sufficient supply of highly qualified human resources in particular in science and engineering, the availability of a public research base flexible and sufficiently open to interactions with the private sector, and a local environment characterized by a dynamic entrepreneurship culture particularly with respect to potential suppliers and users. These appear to some extent the crucial "attractor" factors, which domestic policy makers should address.

c) Innovation for development: the future challenges

The implications of this new mode of technological progress for development are rather striking. Suddenly they bring to the forefront the importance of endogenous innovation processes in both developed ***and*** developing country situations. In the old industrial S&T model, the focus within the context of development was quite naturally on technology transfer and ***imitation***: imitation to some extent as the opposite of innovation. In the new model, innovation is anything but imitation. Every innovation appears now unique with respect to its application. Re-use and re-combinations of sometimes routine, sometimes novel pieces of knowledge are likely to be of particular importance, but their successful application might ultimately well involve engineering expertise, design capabilities even research.

The need for such a shift in research on innovation towards development can be found back in many recent new concepts made popular in the development literature either through communities of practice such as micro-credit financing, in many ways a social innovation, or through the description of business case studies such as in CK Prahalad's popular book: The Fortune at the Bottom of the Pyramid (2004) with the provocative subtitle "*Eradicating Poverty Through Profits.***"** One of the most well-known examples of a BoP innovation is actually the Dutch designed multiple-fuel stove innovation developed for the rural poor, in which cow dung and biomass (sticks and grass) are used as cooking fuels. Traditionally these fuels are completely inefficient, even dangerous due to the smoke inhaled from indoor fires. But with the so-called "combination stove" that costs less than $20, the user can now switch instantly from biomass to natural gas, according to his/her needs. Drawing on the example, Prahalad observes that "the process of designing these breakthrough innovations started with the identification of the following four conditions:… 1. The innovation must result in a product or service of world-class quality. 2. The innovation must achieve a significant price reduction — at least 90 percent off the cost of a comparable product or service in the West. 3. The innovation must be scalable: It must be able to be produced, marketed, and used in many locales and circumstances. 4. The innovation must be affordable at the bottom of the economic pyramid, reaching people with the lowest levels of income in any given society." (Prahalad, 2004).

Exactly like in the 70's when the first cases of successful and failed innovations were being collected (project SAPPHO at the Science Policy Research Unit, University of Sussex[5]) in developed countries, there seems now an urge to collect as many cases as possible of such BoP innovations so as to understand better the complex characteristics of such innovations for development.

Let me on a more speculative note add some observations on conditions for successful innovation for development:

1. Following the new innovation mode described above, the likely and most successful location of BoP innovation activities will be close to *BoP users* contexts[6]. If one is to believe the crucial role of users in the innovation and subsequent research process, this will involve in the case of BoP research, BoP users. The role of local communities of increasingly professionalized non-governmental grass roots organizations will be often crucial here[7]. One of the most interesting and exciting new developments might well consist of new strategic alliances emerging between NGO's and multinational firms in the development of BoP laboratories which are embedded in such environments and are not part of traditional high tech R&D centres and enclaves whether in developed or developing countries.

2. Second, and again following from the shift in the research paradigm described above, in the case of innovation for development, the innovation process itself is likely to be

[5] See Rothwell et al., 1993.
[6] See also Ghosh and Soete, 2006.
[7] A fascinating example of the role of NGOs was given by Shyama Ramani in her Charles Cooper lecture 2008 on individual toilets in India. See Ramani (2008).

reversed, starting with the design phase which will be confronted most directly with the attempt to find functional solutions to the BoP users framework conditions. This will involve not just the need to bring the product on the market at a substantially lower price than existing goods, as Prahalad noticed, but also a clear adaptation to poor local infrastructure facilities: e.g. with respect to energy delivery systems, water access, transport infrastructure or digital access. It is in this sense that one might talk about "***appropriate innovation***" and that there seems to be some analytical similarity with the old notion of "appropriate technology"[8].

3. The feedback from BoP users and from design developers upstream towards more applied research assistance, even fundamental research in the core research labs of Western firms is possibly the most interesting new example of reverse transfer of technology (from the South to the North), re-invigorating and motivating the research community in the highly developed world increasingly "in search of relevance." Not surprisingly, the main focus within the developed world at the moment is on BoP innovations in the health area, a sector where applied medical research is increasingly dominated by access to new technologically sophisticated equipment (e.g. combined PET - positron emission tomography ct-scanners), and much less by more down to earth research questions about, and the list is non-exhaustive: anti-biotic resistance, infectious diseases or resistant tuberculosis. Not surprisingly, health is the sector most in need for what could be called a bottom of the pyramid research re-prioritization.

[8] The notion of appropriate technology has of course been much formalized; e.g. defined in terms of a rational set of economically determined "choices of technique" (Sen, 1960, Cooper 1973), the term "appropriate innovation" by contrast is much more open.

2. Innovation international research partnerships on the move

As in the previous section, the discussion on international research partnerships will follow a similar structure: first some reflections on the past, focussing very much on the tendency from national to European international research networking in my own research area of the economics of technological change and science, technology and innovation studies, and second the present challenges which respect to new forms of global North-South research partnerships. The final third part discussing some of the future challenges for international research partnerships is at the same time the concluding section of the paper.

a) Emerging European research networks and knowledge diversion

There is little doubt that the economic integration process in Europe, as it became gradually enlarged in the late 70's to include a broader set of European policies aimed at fostering stronger intra-European co-operation in areas such as pre-competitive research, had a major effect on intra-European research cooperation and networking. Higher education and research had been left out of the European treaties and remained the prerogative of national member states' policies (Caracostas and Soete, 1998). However, with the gradual increase in size and scope of the so-called Framework Programmes (FP), researchers in different EU member states found themselves gradually pulled into closer European networking and cooperation. In some European countries, national funding of research was actually reduced with the amount of European funding obtained by national researchers. In a similar way to trade theories about economic integration, it could be argued that this European research integration process had both positive and negative effects. Positive effects in the form of new European research "creation" through the additional amount of joint EU research projects initiated and the new insights such research would provide into specifically European problems; negative effects through what could be called research "diversion", i.e. the redirection of research activities, nationally funded but with an international focus, towards European research issues.

Elsewhere[9], I have suggested how these diversion effects of knowledge with researchers preferring to network with other European colleagues primarily for the sake of European financial support might well have led to a *cocooning* of knowledge inside a region's physical borders, as typified today in the notion of a "European research *area*", precisely at the moment that knowledge is internationalising. As discussed above, the European Framework Programmes were designed at a time when strengthening the international competitiveness of particular European high-tech firms and sectors, was considered essential for Europe's long term welfare. It led undoubtedly to the strengthening of a number of industrial firms/sectors some of which became successful at the world level, others which failed dramatically. Today most of those EU sponsored programmes benefit as much firms of European or foreign origin, as long as they are located in Europe.

At the same time, and of direct relevance to most of the research communities in the world, the international accessibility to what has been called "codified knowledge"

[9] See amongst others Soete (1997).

increased dramatically through the use of new information and communication technologies (ICTs). While support for intra-European research collaboration certainly with respect to the joint use of large research facilities in areas such as “big science” is still very much welcome, many of the most interesting research collaboration is today global in nature, going well beyond the European borders. Particularly in applied research such as engineering, including energy saving technologies and medical sciences and technologies as well as social sciences and humanities, knowledge diversion might well have been a major factor, the intra-European exchange having taken place at the expense of extra-European exchange. In the more basic research areas where open international access has always existed, such "diversion" might have ultimately had little impact.

It is what could be called the "European paradox": as Europe invested in intra-European research, in the collaboration and exchange of scientific knowledge among European scientists, or even in the technological strengthening of the competitive potential of European firms, the advantages of such geographically "bounded" collaboration have become marginal, given the dramatically increased opportunities for the fast exchange of information and co-operation. To some extent, it could be argued that the Lisbon 2000 summit represented the final, major EU attempt at formulating a set of combined European and national members policy priorities with respect to domestic European knowledge creation and its diffusion, and social and macro-economic policies aimed at bringing about more European growth dynamics. A final attempt at inward-looking integration setting out for the early 21st Century the European dream “to become the most competitive and dynamic knowledge-based economy in the world capable of sustainable economic growth region with more and better jobs and greater social cohesion”: the crowning, but implicitly also, the coming to an end of 50 years of policy priority to European internal integration.

b) Recherche sans frontières

The analytical shift which have occurred from science and technology to innovation described in section 1 have brought to the forefront a vision on development which fully acknowledges the “endogenous” nature of innovation, rather than the external nature of technological change. That process of innovation is actually much more complex in a developing country context than in a developed country one. As has only recently become recognized in the endogenous growth literature10, the appropriate innovation policy challenge for a country will be closely associated with its level of development.

In a high income country context, the innovation policy challenge will increasingly become directed towards questions about the non-sustainability of processes of “creative destruction” within environments that give increasingly premiums to insiders, to security and risk aversiveness; ultimately to the maintenance of income and wealth. In an emerging, developing country context, by contrast, the innovation policy challenge appears more directed towards traditional, “backing winners”, industrial science and

[10] This view of the philosophy and aims of innovation policies differing amongst countries according to their level of development, reminiscent of many of the arguments of the old infant industry type arguments has now become very popular in the endogenous growth literature. See Aghion and Howitt (2005).

technology policies. How to further broaden an emerging national technological expertise in the direction of international competitiveness and specialisation? Such broadening often already involves a much stronger recognition on the part of policy makers of the importance of engineering and design skills and of accumulating "experience" rather than just R&D investments. Finally in most least developed countries, often characterized by "disarticulated" knowledge systems, with a couple of islands of relatively isolated, under-funded public research labs, the endogenous innovation policy challenge is most complex of all, but has at the same time, the highest chances to contribute directly to development.

At all levels of development and independent of the particular location of formal R&D activities, the most important enabling feature for such endogenous innovation processes appears today to be access. Access not just to the formal pieces of codified knowledge alone, but also access to the tools and (legal) ability to replicate and improve upon existing knowledge. It is in this sense that international research collaboration takes on a new meaning, one not just of open research and open science, but one also of research collaboration and collaborative innovation.

The implications for international research partnerships are straightforward.

First, and to some extent at the opposite of Dudley Seers post-colonial vision of the 70's, research for development shouldn't "come home" in terms of a geographical focus on Europe's development challenges, but should rather become systematically and fully integrated in any research activity in the developed country world. Become a core part of most research (public or private) and higher education institutions within an open, global research without borders environment. In most research areas, whether dealing with health, life sciences and the spreading of diseases, food safety and nutrition, material sciences, energy saving, water management, waste disposal, migration, urban development, sustainable development, social sciences and humanities, economics and business studies, some of the most challenging research questions are taking place within development contexts.

Second, research for development involves also the broadening of the scope of research activities to include much more systematically users groups, and in particular various communities of practice. Involvement of those groups appears increasingly essential for successful innovation. As highlighted in section 1c) above, certainly with respect to applied research, including design, the possibilities of such collaborative innovation processes will have to involve much stronger collaboration, interactions, and partnerships with research communities in developing countries.

Third, the particular role of involving users in international research partnerships point to the particular role of NGOs, as initiators of research for development projects. NGOs have grown worldwide to become often sophisticated, professional organisations with a wealth of user knowledge, local community expertise and a not-for-profit interest which gives in a certain way a "voice" to many needs at the bottom of the income pyramid where markets are invisible. Elsewhere, we have used Hirschman's (1970) "exit, voice and loyalty" framework to analyze the particular contribution of NGO's to the global

governance debate (Soete and Weehuizen, 2003). NGO's provide, by no means exclusively, to some extent the voice of the 'voiceless'.

c) Twinning as a new mode of international research partnerships

Along the lines sketched out above many new forms of international research partnerships are likely to emerge. The time appears actually ripe for such a more radical renewal.

North-South research partnerships have of course dominated the development cooperation agenda in The Netherlands for some time now. Already in 1991, the then Dutch Minister of Development Cooperation, Jan Pronk asked the RAWOO, the Dutch Development Research Council at the time, to advice on how one could pull in more effectively Dutch research capacity to the benefit of development cooperation. The RAWOO set some ambitious standards at the time for such North-South research partnerships, pointing amongst others to the need for research being demand-led, society-driven, inter-disciplinary and also contributing to capacity development in the South[11]. Unfortunately and probably also because of the research diversion pressures discussed above under 2a), the initiative failed by and large to pull in the Dutch, non-development cooperation oriented research community in a research for development agenda.

The standards and criteria set by the RAWOO reflect in many ways many development cooperation concerns which have traditionally been associated with North-South research partnerships, in particular the question of the so-called "ownership" of the *research for development* agenda and the need for a strong Southern, demand led influence on such a research agenda. I don't want to enter here this debate and leave this to the workshop discussions, but the failure in getting a comprehensive research for development agenda off the ground in The Netherlands might well have to do with the multitude of criteria imposed on North-South international research partnerships within the Dutch development cooperation research agenda. Those criteria will practically automatically eliminate large parts of the Dutch research community not interested in demand-led or inter-disciplinary research but keen and eager to get involved in research for development issues. Considering the current policy trend towards a more bottom-up research funding approach benefiting primarily excellent young researchers both in The Netherlands and the EU, it should actually come at no surprise that development cooperation research initiatives such as those of the RAWOO would fail to pull in the Dutch research community.

In my view, one should opt for a more radical and at the same time more straightforward approach in developing international research partnerships. First, and as an absolute priority, explore systematically the opportunities for a full integration of *research for development* aspects in the curricula and the research activities of university departments and institutes in the North. In many medical faculties, and food and nutrition departments

[11] See in particular ECDPM review of North-South partnerships under the RAWOO (Engel and Keijzer, 2006)

this integration process has developed rapidly in line with some of the arguments set out in the previous section. Higher education training and research is continuously in search of challenging application environments. Bringing in systematically the development environment as one of the most challenging ones for applied research offers new opportunities to prioritize development issues within higher education training and research. In many such developments environments standardized data are now for the first time available, opening up new opportunities for micro-based evidence and case study research. In short there is a natural expansion of the geographical coverage of applied research beyond the developed world. In section 1b and 1c, I discussed in some detail what this could imply for S&T and innovation studies[12].

Subsequent steps can then go in many different directions.

A second step which we are currently examining in cooperation with both Maastricht University and the UNU is the notion of a formal twinning between higher education establishments and/or research institutes in the North with one (or two) similar establishments/institutes in the South. Such a twinning process could actually offer interesting opportunities for re-invigorating North-South research partnerships. Applied to the whole of The Netherlands with its 50 or so universities and professional higher education establishments and at least a similar number of large research institutes, a coordinated twinning between Dutch higher education and research institutions with similar institutions in the South could represent a major impulse in capacity building in the South. The twinning concept consists in working out more formal international research partnerships with some specific privileged research groups in the South with whom one could develop stronger research collaboration involving ultimately a formal twinning partnership with exchange of staff, students.

An alternative, or subsequent step could involve physical presence in different developing countries context aimed e.g. at a closer involvement of local users and communities of practice. Here our main attempt so far has been directed at setting up, in collaboration with FAO, an international Southern based research network looking more specifically at pro-poor innovation policies in agriculture and rural development.

In short, a new, more radical vision of "*recherche sans frontières*" might well lead to a significant renewal of international research partnerships going way beyond the traditional development cooperation scope of such partnerships and pulling in the core of Dutch higher education and research activities in research for development aims.

[12] In line with the observations made in section 1, and at the more personal level, I witnessed e.g. over the last decade, the gradual cross-border need for an increased involvement of innovation researchers in development studies research at the purely theoretical, applied or policy related research level. That was also the main reason for integrating MERIT, an economics faculty research institute of the Maastricht University and UNU-INTECH, a development research institute on new technologies, into UNU-MERIT. . Within UNU-MERIT research synergies became something self-evident, something natural.

By way of conclusion: international research partnerships and sustainable development

International research partnerships are clearly on the move. In this they follow the globalisation and international spreading of research activities with new research hotspots emerging no longer solely in the developed world but also in emerging and even developing countries.

A final provocative question I would like to put forward here is whether this "knowledge on the move" process is actually sustainable in the long run: by sustainable I mean environmentally sustainable. We are to some extent all part today of an international research community which has grown rapidly, spreading today across the whole world motivated by, and in search of, relevance rather than just research excellence. Researchers, "knowledge workers" without frontiers, as I suggested here. Our research networks have, or will continue to grow bigger. Notions like a European research area have proved ultimately to be rather meaningless. Research, and the knowledge which it generates, has ultimately no borders. Geographically bounded research networks will always shrink in their relevance through their cocooning visions.

But the question is of course whether such global international research networking and partnering with the continuous travelling it brings about of researchers going to conferences, seminars, workshops, joint network meetings, partner institutes is sustainable. Is a global knowledge society of the networking and international partnering sort described here, sustainable from an environmental perspective?

It is to some extent surprising that the European Commission did not include in its plans for CO2 reductions for the next ten to twelve years, the research sector in the broadest sense of the term. It could be argued that as in other sectors, one should develop an international trade scheme between the North and the South in the CO2 emissions of universities and research institutes. In such a scheme researchers in the North would have to reduce e.g. by 2020 20% of their CO2 emissions associated with air travel, freeing space for air travel for researchers from the South[13]. At the same time by forcing travel reductions in such a scheme, institutions and researchers in the North would actually also have a strong interest in establishing digital communication facilities in the South, possibly even investing in those, so as to enable effective digital international research collaboration and partnerships. In short, here too international research partnership are likely to take on new meanings involving less, and/or more equal, physical travelling and much more digital exchange.

Like knowledge, international research partnerships are indeed on the move... The challenges ahead of us also.

[13] In a local newspaper (Dagblad De Limburger, January 12 2008) I have briefly elaborated on how I intended to start applying such a scheme for myself!

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