NIDECO Inaugural Seminar
ETH Zurich, Switzerland
Friday, 31 January 2003, 2:30 – 6 PM.

PRESENTATION OUTLINE

Inge Kaul and Pedro Conceição[1]
Office of Development Studies
United Nations Development Programme

The Global Knowledge Divide: Can the Global Public Goods Perspective Enhance Understanding for Action?

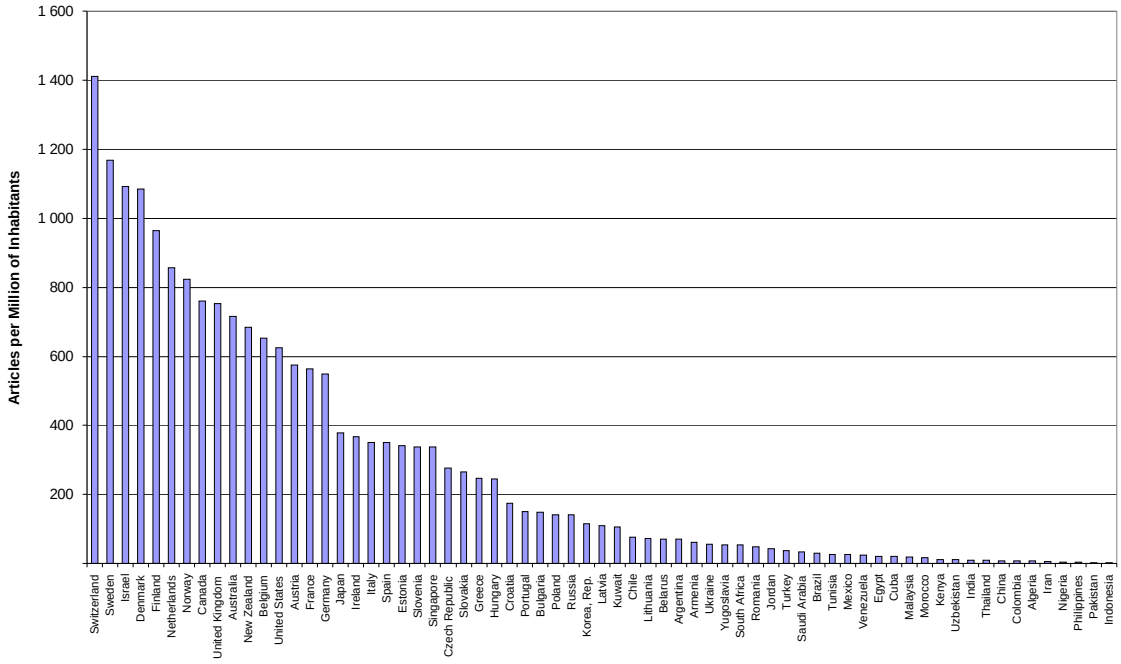
The objective of the presentation is to illustrate how the global public good perspective is a useful lens to better understand the existing "knowledge divide" between developed and developing countries, as well as to suggest policy responses to help bridge this divide. To do so, the presentation will proceed in four steps. First, evidence on the extent of the existing knowledge divide between developed and developing countries will be presented. Second, important reasons that contribute to the existing knowledge divide will be discussed. Third, the concept of global public goods will be introduced and applied to generate policy measures that could contribute to bridge the knowledge divide. In order to ground the discussion on concrete substantive issues, many of the examples and specific suggestions discussed will focus on health-related aspects. Finally, some suggestions on the role that epistemic communities could play to contribute to bridge the knowledge divide will be briefly considered.

1- The Global Knowledge Divide

1.1 The world today faces a "knowledge divide" that is much deeper and wider than even the large "income divide" of which we are all well aware of. Consider, as an example, the distribution of the number of US patents with origin in different countries. Patents are (an imperfect, but informative) measure of the ability to produce new knowledge. The top 10 patent-submitting countries (accounting for 14% of the world's population) produced in 2000 94% of all US patents. By contrast, the top 10 countries in terms of national income account for "only" 76% of the total world's income in 2000 (and for 37% of the world's population) – a "wider" gap in knowledge production than in income. This means that the ratio between the top 10 countries and the rest of the world is of 96 when one considers the number of patents per capita and of 5 when one considers income – a much "deeper"

[1] The views expressed are the authorss and do not necessarily reflect those of the organization with which they are affiliated. Please direct all comments and inquiries to the author at pedro.conceicao@undp.org.

gap in knowledge production than in income. Developing countries have shown virtually no ability to produce new knowledge. Sub-Saharan Africa as a whole (excluding South Africa) submitted only 3 patents in 2000 (Nigeria 2 and Kenya 1), in a total of more than 150 thousand patents submitted from around the world. If one considers scientific publications instead of patents – more fundamental, less commercial, knowledge – the situation does not change. Developed countries publish at a rate per capita that is several orders of magnitude higher than that of developing countries (see figure below).



Scientific Production in 1997 (Number of Articles per One Million of Inhabitants)
Source: US NSB (2000)

1.2 Developing countries have severely limited resources (human and financial) allocated to research and development and to technological innovation. The wealthiest countries typically allocate above 1% of their national income to research and development. These resources are valuable not only in terms of the research outcomes they generate but, sustained over time, contribute to the establishment of a national scientific and technological capacity. Developing countries, by contrast, allocate very little (if any) of their own resources to R&D (see table below).

R&D as a Percentage of Gross Domestic Product in 1997 (Values for years other than 1997 are noted)

Sweden	3.85	Canada	1.60	Poland	0.76	Argentina	0.38
Japan	2.92	Belgium (1995)	1.58	Hungary	0.73	Panama	0.38
South Korea	2.89	Iceland	1.56	Cuba	0.70	Malaysia (1994)	0.34
Finland	2.78	Austria	1.52	South Africa	0.69	Bolivia (1996)	0.33
Switzerland (1996)	2.74	Singapore	1.47	China	0.65	Tunisia	0.30
United States	2.60	Ireland	1.43	Portugal	0.65	Egypt (1996)	0.22
Germany	2.31	Czech Republic	1.19	Chile	0.64	The Philippines(1992)	0.21
Israel	2.30	Slovak Republic	1.18	Uganda (1996)	0.57	Burkina Faso	0.19
France	2.23	Costa Rica (1996)	1.13	Indonesia (1995)	0.50	Madagascar (1995)	0.18
Netherlands (1996)	2.09	New Zealand	1.10	Greece (1993)	0.48	Thailand (1996)	0.12
Denmark	2.03	Italy	1.08	Togo (1994)	0.48	Ecuador (1996)	0.08
China (Taipei)	1.92	Russian Federation	0.95	Turkey (1996)	0.45	Rwanda (1995)	0.04
United Kingdom	1.87	Venezuela	0.89	Uruguay	0.42	Senegal	0.01
Australia (1996)	1.68	Spain	0.86	Mexico	0.42		
Norway	1.68	Brazil (1996)	0.76	Colombia	0.41		

Source: US NSB (2000: table 2-14, page 2-46) and UNESCO (1999a) for the African countries except South Africa.

1.3 The lack of "knowledge output" and of scientific and technological capacity of developing countries would not be that harmful if the knowledge produced by developed countries was to address systematically the specific problems of developing countries. However, while often relevant for both developed and developing countries, research outcomes and new technologies that emerge in developed countries do not always address the specific needs of developing countries. For example, the disease environment faced by developing countries is very different from the one that developed countries face. Infectious and parasitic diseases account for one third of the burden of disease in developing countries, but only 3% of the burden in high-income countries. Non-communicable conditions, such as cancer and cardiovascular disease, account for more than 80% of the burden of disease in developed countries. Thus, it is not surprising that the focus of research and development in the health area that is performed in developed countries focuses on these conditions. The result is a systematic and persistent neglect of the diseases that affect predominantly developing countries: close to $70 billion is spent every year on health research and development by the public and private sectors, but only an estimated 10% of this is used for research into 90% of the world's health problems (the "10/90 gap").

1.4 Even when knowledge produced in developed countries is relevant to developing countries, the latter are often barred from accessing this knowledge. Again using an example from health, there are now medicines available to address HIV/AIDS that are too expensive (given that patents have been attributed to them in developed countries) for the poor to afford. Knowledge that is relevant exists, but access to it has been barred to many in need. Thus, developing countries face a wide and steep knowledge divide because: 1) they cannot often access existing knowledge that is relevant to them; 2) knowledge that meets their needs fails to be generated by others; 3) they do not have the capacity nor the resources to generated knowledge relevant to them. Why does the world face this situation?

2- Why is there a Knowledge Divide?

2.1 Providing incentives for knowledge production requires striking a balance between static efficiency (promoting the broadest possible use of existing knowledge) and dynamic efficiency (promoting the generation of new knowledge). Given that knowledge is strongly non-rival, maximizing static efficiency appears to be the best (most efficient) option. However, private actors will not be engaged in knowledge production if they are not rewarded for new discoveries. Therefore, intellectual property rights place (typically temporary) restrictions on access to knowledge so that private benefits can accrue to the innovator. This restriction on access is detrimental to static efficiency, but enhances *dynamic efficiency*, that is, increase the overall supply of knowledge over time.

2.2 In the name of enhancing dynamic efficiency, intellectual property rights have been strengthened and extended at the national level. At the same time, they have been broadened to the international level, namely in the context of trade related negotiations and agreements. The argument for this is that little matters more than the incentives to produce a stream of scientific and technological results, even at the expense of significant reductions in static efficiency.

2.3 When one considers the situation in developing countries, the incentives on the private side for engaging in research fail. The extension, deepening and broadening of intellectual property rights is not useful when markets are small and "thin", as they are in developing countries. The incentives from the public side fail also, since developing countries lack the resources or the capacity to develop their own publicly supported research, official development assistance and other forms of international aid only rarely go to support research, and the research performed in developed countries is not always enough, as illustrated by the case of health.

2.4 Are there ways to enhance both dynamic and static efficiency? Is it possible to think about incentives in which both types of efficiency are promoted and, at the same time, the knowledge divide is reduced? A global pubic goods perspective on "knowledge management" suggests that the answer to both questions is yes. We will see why next.

3- Can the Global Public Good Perspective Contribute to Improve the Policy Response?

3.1 Public goods are goods that are in the public domain. Essentially, one finds in the public domain three types of goods. First, those goods that are, for technical or economic reasons, non-excludable, and therefore, are non-exclusive in their consumption (e.g. the sun). Second, goods that are made public by design (e.g. the judiciary system). Third, goods that are left in the public domain by policy default or neglect (e.g. pollution). Thus, public goods are not only those that, as economists tell us, are non-excludable and non-rival. It is useful for a policy relevant analysis to expand the definition of public goods somewhat, as goods that are non-exclusive—that is, goods that are in the public domain, affecting all.

3.2 More precisely, it is important to distinguish between: 1) a good's *potential* for being public (which is shared by all goods that are nonexcludable, nonrival, or both) and, 2) a good actually, *de facto*, being in the public domain (that is, being nonexclusive, even if it is either rival or excludable). This definition of public goods is dual, in that a good being public depends, first, on its intrinsic nature and, second (and most importantly) on a policy choice.

3.3 What about "globalness", the other component of *global* public goods? In a way, "globalness" can be considered a special dimension of "publicness," and, therefore, is also dependent on policy choices. Globalness is in many respects an openness of borders and an interlocking of national public domains, forming a larger, "global" public domain. Global public goods can, therefore, be defined as goods whose benefits and costs cut across national borders—as goods that are in the global public domain. Such goods are public in consumption, as their effects can be felt broadly. But an additional dimension of their publicness is that they also often require cross-border cooperation in order to be made available locally and nationally—that is, they are also public in production.

3.4 To address the knowledge divide it is important to explore how incentives for knowledge generation that have so far been thought of at the national level can be considered with an added component: cross-border cooperation. This may benefit from extending beyond national borders incentives that have been implemented only at the national level and using imaginative and innovative ways to bring together the potential and value-added of different actors.

3.5 One challenge is to bring the scientific power and technological capacity of private actors in developed countries to focus on problems of the poor. This requires thinking about "pull" incentives, which work through market forces. One possibility, in the health area, is offering tax credits to developed countries' pharmaceutical firms for sales of new vaccines to address conditions specific to developing countries, which provides an incentive not only for vaccine discovery, but also for its distribution and sales to those in need. Another option, again in the health area, would be a commitment by developed countries to purchase vaccines for neglected diseases. Resources would come from governments and private foundations in developed countries, with disbursements occurring only if vaccines are actually developed. Pharmaceutical companies in developed countries, attracted by the prospects of a sure buyer, would engage in research relevant to developing countries. Finally, still in the health area, the expansion in the coverage of the usage of existing drugs and vaccines in developing countries, through pooled funds such as GAVI and Global Fund to Fight AIDS, Tuberculosis and Malaria, can indirectly stimulate research and development. These funds, by buying existing medicines and taking them to developing countries, contribute not only to reduce their prices (thus making them more accessible) but create also the expectation that a market will exist for better drugs and new vaccines oriented to the needs of developing countries. Even if these countries themselves are not able to buy the new medicines, the funds are likely to do so. All of these examples combine public, private and cross-border dimensions.

3.6 Another challenge is to provide incentives for more basic research to yield the fundamental scientific results upon which later technological development can be built. "Push" incentives may be more effective in this case. One possibility, which taps again the scientific capabilities of the private sector in developed countries, is to offer tax credits on research and development expenditures associated with efforts oriented towards the diseases affecting predominantly developing countries (such legislation has already been proposed in the US Congress and will be introduced in the UK). Another possibility, still oriented to private firms, is extending national orphan drug legislation to the international level. National orphan drug legislation gives access to special public funds for research oriented towards diseases that affect only a minority of the national population (along with special treatment in the regulatory drug approval process and other benefits once the medicine actually exists). Bringing to same principle to be applied not only to diseases that affect only a few nationally, but also to those that have been neglected in developing countries, would provide added incentives for research. Yet another possibility is to tap into the research capacity of national laboratories and research universities by establishing at the international level the equivalent to the National Institutes of Health in the US or the Medical Research Councils in the UK.

3.7 Finally, it is important to consider also if access to existing knowledge can be improved. As mentioned before, in many cases existing knowledge presents, at present, barriers to access due to the assignment of intellectual property rights. There are, however, ways to improve access even within existing restrictions. One option, already being implemented in the health area, is to pool purchasing funds for patented medicines. The result is not only that these funds deploy the medicines that are bought in developing countries, but they also contribute, through economies of scale in consumption and enhanced bargaining power, to price reductions. Another option, also being considered in the health area, is to adopt differential pricing for patented technologies. This option is efficient (Pareto improving) since developed countries would not be worse off (they would still pay the same they pay now, or even slightly less), with developing countries facing a substantially reduced price (based on ability to pay and the marginal costs of production). Existing intellectual property rights contemplate other exceptions that could enhance access to knowledge, including parallel imports and compulsory licenses.

4- What Role for Epistemic Communities?

4.1 Incentives are important to provide indications and "reward systems" that lead both private and public actors across borders to engage in knowledge production in a way that enhances both static and dynamic efficiency, while, at the same time, reducing the knowledge divide. But there is also a role for epistemic communities, which could take the lead in initiatives that contribute to bridging the knowledge divide and enhance static and dynamic efficiency. These could include the development of research that considers:

- The costs imposed by incomplete or absence of action to address global challenges, as compared to the costs of taking corrective action using known interventions and researching towards the development of new solutions; this type of research could be an important lever to mobilize cross-border cooperation to

address global challenges. In this case, both the outcome and the process of doing research could be useful.

- Related with the latter point, research could take a cross-issue perspective, comparing costs of inaction and corrective action across challenges, and adding other considerations to establish which interventions are more urgent.
- Ways in which developing countries could become more deeply involved in the design of research projects, as well as in their implementation. It is important to find ways to approach research design and implementation in a more democratic and pluralistic way.
- How to share available knowledge and how to systematize what is known, perhaps extending the way in which GDN works on development-policy related research to other areas of science and technology.