



research update

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Research and Statistics Branch



A trio of articles ranging from African investment through systems of innovation to new priorities of industrial statistics features in the second number of *Research Update* for 2007. As well as previewing the latest UNIDO databases, this issue continues its personal perspectives column with a parable of *laissez-faire* and environmental impact.

In a paper presented at an Oxford University conference on African economic development, foreign direct investment (FDI) in 14 sub-Saharan countries is viewed from the standpoint of its impact on total factor productivity. Contrary to the common assumption that investment leads to increased productivity and greater technological change, findings emanating from the Research and Studies Branch (RST) suggest that FDI has a limited impact and, therefore, requires close scrutiny in order for African countries to capitalize on its benefits.

National and industrial innovation systems in developing countries are the focus of the latest RST seminar for UNIDO staff. Sunil Mani, Professor at the Centre for Development Studies, Trivandrum traces the process of innovation as a continuous feedback between the different stages of product development as well as between companies, research institutes, universities and other such actors.

A new statistical approach is proposed to measure industrial production factors attuned to the realities of the twenty-first century, in RST's contribution to a recent United Nations Educational, Scientific and Cultural Organization workshop. It addresses the

challenge of developing a set of indicators to measure the impact on industrial production of such recent phenomena as knowledge-based economy, technological innovation, information and communication and cleaner and renewable energy sources.

In a witty, yet serious, tale of environmental degradation, RST economist Anders Isaksson offers his perspective on the burning issue of expanding global industrial production versus over-exploitation of the natural world. Set more than two centuries ago, the fictional dialogue between two giants of early economics captures succinctly the thinking behind today's environmental debate.

This current number of *Research Update* finishes with a review of the latest edition of RST's latest flagship statistical products on compact disk, INDSTAT 4 and IDSB, which have gained considerable popularity worldwide as primary research tools.

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Presentation on foreign direct investment in Africa, by *Thiam Hee Ng*

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The impact of foreign direct investment (FDI) on total factor productivity (TFP) growth in Africa was the focus of a paper presented by RST researcher Thiam Hee Ng at the Economic Development in Africa Conference, organized by Oxford University's Centre for the Studies of African Economies, from 18 to 20 March 2007. The event attracted widespread international participation, with the keynote address being given by Louis Kasekende, Chief Economist of the African Development Bank.

Based on data from 14 sub-Saharan economies -- Benin, Botswana, Congo, Côte d'Ivoire, Gambia, Ghana, Malawi, Mauritius, Nigeria, Senegal, Seychelles, Togo, Tanzania and Zambia -- Mr. Ng examined the linkage between investment and productivity by giving an overview of FDI inflows into the region. According to data from UNCTAD, the flow of FDI to sub-Saharan Africa increased from \$1.7 billion to more than \$20 billion between 1990 and 2005. As a result, the region's share of FDI inflows into developing economies climbed from 4.7 per cent in 1990 to 6.3 per cent in 2005.

Rather than being valued for its own sake, the paper points out, FDI's real worth lies in its ability to promote development of recipient countries. It has often been argued that FDI contributes to growth beyond the direct effect of increasing the capital stock. FDI is seen to bring additional benefits to host countries such as new technology, access to foreign markets and managerial know-how. Expectations of these extra benefits constitute part of the rationale for governments in developing countries to provide special incentives to attract FDI. However, these incentives, the paper cautions, can be quite costly. Therefore, it is important that the benefits of FDI be clearly identified in order to justify the costs of their promotion.

If FDI inflows bring new technology and managerial expertise, one could expect to observe that higher FDI inflows lead to greater productivity. Presenting the results of his empirical analysis of the relationship between FDI and productivity, Mr. Ng concluded, however, that there was limited evidence of FDI inflows having contributed to increased productivity, at least in the sample of countries. While there was no evidence that FDI inflows led to greater technological change either, there was some evidence that FDI inflows resulted in higher efficiency in three of the countries.

Since the results indicate that FDI has limited effect on TFP growth, conversely, they suggest that for countries to benefit fully from the effects of FDI, there should be greater emphasis placed on the type and quality of FDI being sought. In short, higher FDI flows alone do not necessarily lead to greater productivity.

[click here to download presentation](#)

Presentation on systems of innovation, by *Sunil Mani*



National and industrial innovation systems in developing countries were the focus of an interactive seminar for UNIDO staff with Sunil Mani, Planning Commission Chair

Professor in Development Economics at Kerala's Centre for Development Studies, on 19 April 2007. Presented from two perspectives, Mr. Mani first examined in detail the concept of national systems of innovation and its empirical implementation and, then, issues relating to the design of industrial innovations systems.

Examining innovation in the context of developing countries, Mr. Mani emphasized that most innovations there were incremental in nature. Recent analysis, he pointed out, had shown that innovation was essentially an interactive process between many actors,

including companies, universities and research institutes. Individual organizations usually did not possess all the knowledge necessary for the whole process of innovation. Furthermore, innovation did not follow a linear path but, rather, continuous feedback loops between the different stages of product development.

Turning to the concept of the national system of innovation (NSI), Mr. Mani explained it as a network of organizations within an economic system directly involved in creation, diffusion and use of scientific and technological knowledge, as well as the organizations responsible for coordination and support of such processes. Basically, the role of an innovation system is to facilitate contact among the actors. He pointed out that the concept could also be applied to different levels of the economy, such as regional or sectoral.

Mr. Mani introduced the essential partners in NSI as government, research institutes, higher education system and business enterprises. For the effective functioning of a national system, several important factors are needed. First, social and human capital acts as the cement that holds the knowledge and innovation system together. Research capacity and the way in which it is intertwined with the higher education system is the second central node in NSI. Geographical proximity is also important, since regional clustering of industrial activities, based on close interactions between suppliers and users, represents a more flexible and dynamic organizational arrangement than when such learning activities are confined within the contours of individual firms. The absorptive capacity of firms, clients and consumers as well as the role of the financial system are also important for the proper functioning of a national system. Mr. Mani revealed that surveys had found that suppliers and customers were often the major source of innovation.

In the second part of his presentation, Mr. Mani examined the concept of sectoral systems of innovation. In almost all countries, he argued, overall innovative activity is largely determined by the innovative performance of a few sectors, for example, pharmaceuticals in India and semiconductors in the Republic

of Korea. Therefore, understanding how innovation is organized and applied in a specific sector of the economy is very useful in understanding the specific determinants of innovative activity, in general, in a country. To demonstrate how the sectoral system of innovation (SSI) framework can be useful for understanding why some sectors are more innovative than others, Mr. Mani contrasted the innovative performance of the pharmaceutical and telecom equipment industries in India.

The pharmaceutical industry's performance has far exceeded that of telecom equipment in a number of measures of innovation. Mr. Mani argued that the superior innovative performance of the pharmaceutical industry could be explained in terms of its SSI, where, at its core, there were business enterprises with strong research and innovative capability. As a result, pharmaceutical firms were able to apply technologies that they developed more effectively than those in the Indian telecom equipment industry, which had at its core a government research institute detached from production. Telecom equipment manufacturers lack in-house research capabilities and are completely dependent on external sources of technology.

The different ways in which the sectoral system of innovations have been developed, concluded Mr. Mani, can help explain why the pharmaceutical industry has had much better innovative performance than that of telecom equipment.

New priorities of industrial statistics, by *Shyam Upadhyaya*



An approach to capturing statistics that measure the realities of today's industrial production factors was presented by RST statistician Shyam Upadhyaya at a recent United Nations Educational, Scientific and Cultural Organization (UNESCO) workshop.

Held from 27 to 31 March 2007, in Skopje, the gathering focused on science, technology and innovation indicators. In a paper presented in the workshop, he proposed that data for most R&D expenditure- and innovation-related indicators could be collected through regular industrial surveys if only minor changes were to be made in the current questionnaire.

International recommendations for industrial statistics, which are being revised, date back to 1983 (IRIS-83), when many countries had yet to establish their national industrial statistical systems. The priority for data collection was given to such basic indicators as employment, gross output, value added and gross addition to fixed assets. In the last 25 years, however, the nature and role of industry, as well as the factors affecting its structure and growth, have changed significantly, with the emergence of knowledge-based economy, technological innovation, information and communication and cleaner and renewable energy sources as major factors in industrial production. The challenge for statistics is to develop a set of indicators to measure the impact of these phenomena on industrial growth and produce reliable data for social and economic analyses.

Among the new priorities of industrial statistics, Mr. Upadhyaya's paper lists research and development, industrial innovation, production of information and communications technology (ICT) goods and energy consumption of industrial enterprises by type. Currently, UNESCO collects and disseminates R&D statistics for four sectors: government, business enterprises, higher educational institutions and non-profit organizations. Since the business activity units are aggregated into one category, data on R&D expenditure by manufacturing branches are not available, especially for developing countries. The Organisation for Economic Cooperation and Development (OECD) has developed the *Guidelines for Innovation Surveys*, known as the Oslo manual. But few countries outside OECD have been able to conduct such surveys. For many countries where existing statistical capacity is insufficient

to carry out the national statistics programme already in place in a timely manner, an innovation survey might be regarded as an additional burden.

Therefore, Mr. Upadhyaya suggested that the countries with limited statistical capacity could collect data on R&D and innovation using the existing programme of industrial surveys. For example, expenditure on R&D in industry and payment for information, communication, computer and web services are essential parts of intermediate consumption. These items are currently combined in many countries into the single item of non-industrial services. As a main indicator of innovation, the new product could be specified, as such, in the list of those products for sale. Classification of products into new for firm or new for the country that indicates degree of innovation could also be easily specified. A slight revision in the part of capital formation would produce data on acquisition of new or technologically improved machinery and equipment. Likewise, additional data could be collected on energy consumption by type, after slightly revising the existing data items. As highlighted in the paper, data can be extracted from current sources in case of the ICT sector.

On the tragedy of the commons, by Anders Isaksson



On one of those very rare sunny and wind-free days in Edinburgh, David Hume is on his way to the hill-top known as Arthur's Seat -- a quite exhaustive climb -- when he hears a voice shouting his name.

"David, David, wait for me! I've got it, I've solved it!"

Oh no, that intense voice, Hume thinks, must be Adam. When he looks down the pathway, he sees Adam Smith's unmistakable figure struggling to catch up with him. Too late to

hide, Hume stops and prepares for what will become another intellectual wrestle.

“Blimey me”, Smith puffs, “don’t understand why I always find you in places like these!”

“Well, my dear Adam, what is it you’ve solved?”

“Can we first sit down, . . . please? What I’ve found . . . right . . . is how wealth is created and how everyone can be better off. David, as the population increases, so does demand for goods. This increase in demand leads to increased production and profit, and the profitable business owner will hire more workers. It’s a self-propagating cycle. And, what’s more, when the number of workers increases, division of labour is facilitated. All of this creates the wealth of a nation. And you know what? The engine is fuelled by natural resources, which are unlimited. Can it ever be better? Free markets and competition make the world go around. You see, it’s like an invisible hand that leads an individual solely interested in his own gains to promote public interest at the same time!

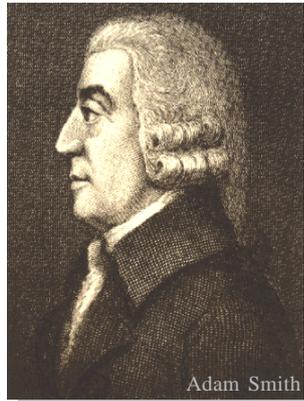
“Hm, sounds reasonable. And, you say, it works without any limits, for any product or service?”

“Since I’ve not been able to come up with any exceptions, I think it’s watertight.”

“Let me think about it a bit”, says Hume. “It certainly sounds wonderful. Oh, by the way, our community needs to drain a meadow. This is obviously a considerable amount of work for each of us in the short run, but, in the long run, it would be to everyone’s benefit. Work will begin tomorrow, at eight a.m.”

“Tomorrow, you say. Ok, sure, I’ll be there.” Smith thinks to himself, I’ll show up late and let the others do the work, and I’ll still benefit!

“Once the meadow has been drained”, Hume explains, “we’ll have a pasture open to everyone. You can let your herd graze there and so can I and everyone else.”



“I understand.” This means that I can save my own pasture, Smith calculates, by letting my cows graze on this common land and when there is

no more commons, my cows can, then, return to my farm.

“Adam, I know exactly what you’re thinking. That smug smile of yours is quite revealing.”

“What do you mean?”

“Because the pasture is a common, there is no price. That means you will bring your herd there but so will everyone. The result will be overgrazing.”

“But it’s not my land . . .”, Smith retorts.

“I know, but hear me out. What is good and rational for you might be bad for our community as a whole. We all share the cost, but only those that are able to use the land enjoy the benefit.”

Because Smith is, indeed, a genius, he quickly draws a few conclusions. “But that loch we used to fish as wee lads -- and we use to catch so many fish -- but that now only has frogs. Do you think we exhausted the fish? And who is paying for the polluted river, not that factory upstream?”

“Adam, the price implicit in your model is welfare-maximizing only if private and social costs coincide. If those costs diverge, it means that someone else bears the cost of the polluting factory. That means, old chap, the production cost faced by society is greater than that borne by the factory owner, so whatever he is paying cannot be socially optimal. The system you envisage may be wonderful for goods with a price but leads to problems for society as a whole in the case of resources not fully paid for!”

Looking at Hume with a mix of shock and scepticism, Smith remarks, “David, many thanks, I certainly understand what you mean, and I’ll go back to the drawing board and sketch a new theory” -- and thinks to himself, after you and your friends have drained the meadow and after my herd has invaded the pasture!

“No, I think your thoughts and insights are marvellous, and I’m sure they will be influential for centuries to come. It’s just that there are cases . . . well, cheerio to you, too, old friend.”

Adam Smith had already begun his descent and was beyond hearing distance. David Hume continued his climb towards Arthur’s Seat, pondering whether Smith would actually include market failures in his book.

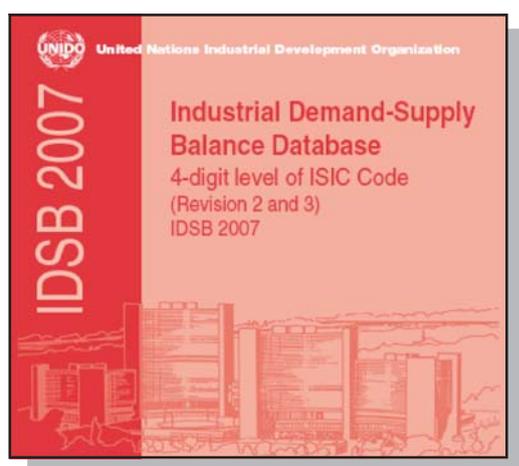
Epilogue: Except for the topic discussed here, known as the tragedy of the commons, the dialogue is fictional. David Hume and Adam Smith were both giants of a science yet to be identified as economics. But whether

they ever discussed the issue of governing such common goods as natural resources and pastures remains. What seems clear, however, is that the conversation should have taken place. When Smith refers to the invisible hand, it has to be remembered that he never argued that it would be invariably true nor did his followers. The description of the weather is, of course, fiction too -- it is, after all, Edinburgh and Scotland.

Suggested reading: Garrett Hardin's article in *Science* (1968) is the classical text on the tragedy of the commons and the expected degradation of the environment when many individuals use a scarce resource in common. However, early contributors on the topic and issues of similar kind include Aristotle, Hobbes, William Forster Lloyd and, of course, David Hume. Elinor Ostrom's *Governing the Commons: The Evolution of Institutions for Collective Action* (Cambridge) offers a fascinating discussion of ways to deal with governance of natural resources.

[The above portraits courtesy of The Warren J. Samuels Portrait Collection at Duke University]

Latest UNIDO databases on CD ROM

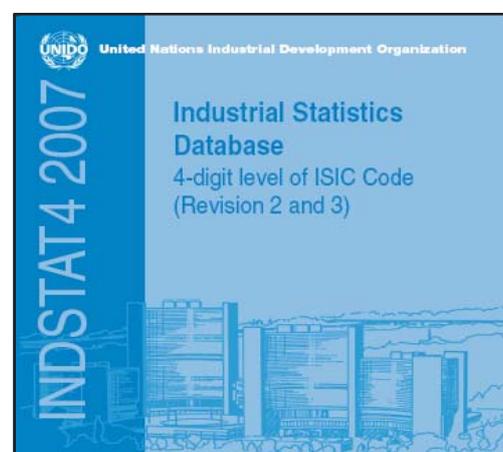


RST has just released the 2007 editions of its two flagship statistical products on CD: INDSTAT4 and IDSB. The UNIDO data are disseminated through the *International Yearbook of Industrial Statistics*, whose 2007 edition is already available in print and CD ROM, as well as on the UNIDO website, where data for selected variables are presented by country.

These CD products have proved especially popular among users worldwide, who can draw them in this format to manipulate original data for research purpose. Demand for the CD products has been increasing in recent years.

The INDSTAT4 database includes data for such principal variables as employment, value added and capital formation for some 150 countries, by ISIC, at the four-digit level. IDSB contains production and trade data by ISIC rev-3 and rev-2 at the four-digit level for output, import, export and, consequently, apparent consumption.

Previously, UNIDO used to produce an additional CD for INDSTAT3 database for industrial statistics at the three-digit level of ISIC rev-3. Due to the conversion process of the entire database, both rev-2 and rev-3, INDSTAT3 have been suspended for this year. However, in 2008, a new INDSTAT2 database will be available, which combines historic data since 1963 to the latest years, for some 180 countries.



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