On Oecd Science&Technology indices

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In memoriam A. Benedetto

ABSTRACT
A taxonomy of S&T indices measured according to Oecd's standards is not useless. The order that it puts in such measurement favours the progress in quantitative studies on activities of scientific research and technological innovation.

KEYWORDS: S&T indices; Oecd.

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1 SEARCHING FOR ORDER

By accelerating the selection of the best methods and ideas for the scholars' discussion to conceive, measure, and test S&T indices, a new original taxonomy of these S&T indices (which are collected worldwide applying Oecd standards) may strongly favour the progress in the quantitative measurement of scientific research and technological innovation activities. Indeed, just the great number of competing theories providing explanations of technological change witnesses a difficulty in devising and performing the crucial experiments which would allow a rational choice among alternative explanations. There is no scarcity of quantitative indices suggested for the collection of statistical information on scientific research and technological innovation: far from it. However, the very plenty of magnitudes may in the end spoil the coherence of theoretical constructions, and it must be reined in by a rigorous set of rules. In normal science, the conception of these rules, resulting in consistent and exhaustive taxonomies, must be completed in advance, for any theories to be conceived.

2 ANALYSING A CRUCIAL FEATURE OF S&T

In order to increase the relevance of our taxonomy, we have based it on a basically important characteristic of S&T activities: both, the (abstract) science and the (practical) technology, aim at reaching |REPRODUCIBLE • RESULTS| and therefore consist in a search for |GENERAL • SOLUTIONS| – i.e., neither ad-hoc solutions (in science) nor "magical", irreproducible methods (for technology). Such a basic feature of science and technology can be disentangled along three analytical dimensions:

i) the "degree of generality" of new, original knowledge;
ii) the contrast between the (scientific) search for the abstract knowledge and the (technological) search for practical knowledge;
iii) the problem-solving nature of innovative activities.

In short, three couples of twin characteristics can be derived from the |GENERAL • SOLUTIONS| binary relationship, by simultaneously allowing for the |Science *versus* Technology| divide:

i) general *versus* particular;
ii) abstract *versus* practical;
iii) questions *versus* solutions.

3 THE EIGHT CATEGORIES

3.1 Contemplative research

First comes the category of indices on those S&T activities which consist in the investigation of |general • abstract • questions|. The Oecd poses clear and firm bases for the measurement of financial and human inputs invested for this activity, that its *Frascati Manual* defines as "Pure research".

3.2 Practical research

The second category is made up by indices measuring the S&T activity identified by the triplet: |general • practical • questions|. Also, this category of indicators is neatly identified by the *Frascati Manual*, which provides scholars and statisticians with a safe basis for the measurement of "Applied research".

3.3 Scientific literature

The third category of our taxonomy is formed by indices measuring S&T activities resulting in: |general • abstract • solutions|. Scientists usually put forth new solutions to the questions posed by their disciplines' research programmes, and submit them to their peers' scrutiny, by publishing them. Publication count is commonly considered a way of measuring the value of scientific output, on condition that this evaluation applies to large aggregates, which will average out the relevant differences among the qualitative values of every article or citation.

3.4 Technological innovations

Our fourth category is made up by indices measuring the S&T activities, which have resulted in: |general • practical • solutions|. These consist in indices measuring the introduction of new ways to satisfy general practical needs: namely technological innovations. About the statistical collection of the data which produce such indices, Oecd's *Oslo Manual* establishes sound, straightforward guidelines.

3.5 Experimental science

The fifth category of indices include those measuring S&T activities aimed at answering |particular • abstract • questions| through new empirical observations. The progress that new evidence would in the end bring about in a scientific discipline can prove impossible to forecast even for specialists. The indices most plausibly attributed to Category 5 shall be input ones, such as the investment in equipment needed to perform scientific experiments, and the wages paid to personnel involved in experimental research projects. Indeed, these proxies might sensibly estimate the importance that, ex-ante, both the scientific cadre and the policy-maker following its advice attribute to a specific theoretical question.

3.6 Engineering

The sixth category of our taxonomy covers the indices measuring S&T activities that have produced |particular • abstract • solutions|. These indices ought to gauge correctly the value of the new practical applications which engineers derive from currently available theoretical knowledge. It is difficult to estimate the precise value of this knowledge for the economic system or the society as a whole. Statisticians will usually have to settle for a second best, by referring to a proxy such as the investment in engineering activities.

3.7 Inductive science

The seventh category is meant to include indices measuring S&T activities of researchers working on |particular • abstract • questions|. It mainly consists in magnitudes estimating the value that the scientific community and the policy-makers attribute to the collection of data aimed at deriving general conclusions through their elaboration: for instance, human and financial resources devoted to national statistical bureau.

3.8 Experimental research on practical questions

The last category refers to indices measuring the activity identified by the triplet |particular • practical • questions|: namely, data on inputs invested in the search activity "Experimental development", as it is qualified in the *Frascati Manual*.

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