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Book Review:

Can Physics Save Social Sciences?

Indrek Tart*

Making social sciences more scientific: the need for predictive models by Rein Taagepera, 2008, Oxford University Press, USA.

It is not easy to renew cognitive strategies of the current mainstream in the age of a 'new kind of science' (Wolfram 2005), 'the new science of networks' (Barabasi 2002, Buchanan 2002), small worlds (Watts 1999, 2003), pre-Big-Bang cosmologies (Gasperini 2008) and governing secularization (Taylor 2007). While the use of social statistics demonstrates increasing technical sophistication, some still doubt whether it can achieve the intended results or if there is any need for them at all. In his book 'Number and Numbers', originally published in 1990, Alain Badiou remarks: 'what counts – in the sense of what is valued – is that which is counted. [...] Political 'thought' is a numerical exegesis.' And even more: 'number governs the quasi-totality of the 'human sciences' [...] Statistic invades the entire domain of these disciplines' (Badiou 2008: 2). At the root of this, he sees 'blindly tested numerical correlations' and weak thinking ('an infinite excrescence of numbering'), but concludes on a far darker note that it is an incurable disease because 'the ideology of modern parliamentary societies, if they have one, is not humanism, law, or the subject. It is number, the countable, countability.' (Badiou 2008: 3).

Rein Taagepera, on the contrary, is still determined to rehabilitate the ill-used statistics and open up viable ways of using them correctly. His argument is based on an analogy with physics-style data handling. In the context where improving current ways of thinking seems to be much more difficult than inventing altogether new viewpoints, and where revolutionary attempts prevail over evolutionary ones, Rein Taagepera appears to endeavor to come up with one of the latter. He begins with the science of physics and makes an effort to adjust its way of thinking to social sciences. It is an effort worthy of praise, starting with the observation that 'contemporary social sciences are all too often a caricature of serious research. When social scientists decided to become scientific, they turned to the philosophers of science with the question 'what is the scientific method?'. This is insufficient, according to Taagepera: 'you need to practice science yourself in order to obtain a proper understanding of how the method works' (Taagepera at <http://www.ut.ee/385657>). By practicing, he means solving problems involving real-life data, combining logical, step-by-step arguments (predictable behavior of variables) and appropriate statistical analysis. It is quite relevant since there are vast numbers of social science articles that do not even ask what kinds of data they use and what manipulations are allowed for such items. Dumb, dark modeling reigns, ignoring that 'explanation must complement description' (p. 6). Right now there is an 'excessive and ritualized dependence on statistical data analysis' (p. 3) which brings about the situation where 'most numbers published in social sciences are dead on arrival' (p. 11, e.g. also chapter 7), but 'data are not sacrosanct' (p. 48). To break this vicious circle, we have to start thinking through conceptual constructs, taking into account the limits and boundaries of possible solutions ('conceptually forbidden areas', 'anchor points', p.48; 'equality lines', p. 202), and also the prevailing relationships between explanatory variables. 'One has to think. One has to consider broad conceptual constraints and the specific social framework of the problem on hand, which differs for each problem.' (p. 29)

Rein Taagepera is not alone in his critique of the methodological weakness of the current social science dealing with empirical data. A recent article by Robert Adcock and two more books (Flyvbjerg 2001, Schram and Caterino 2006) consider the same kinds of problems. Adcock found that 'the problem, as Flyvbjerg sees it, lies in the failure of social science's aspiration to emulate the successes of natural science in producing 'epistemic' theoretical knowledge. His proposed remedy is to drop the aspiration and instead pursue a 'phronetic' form of knowledge distinctively suited to the study

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of human social phenomena. Flyvbjerg's labels explicitly refer to the Aristotle's concept of practical wisdom or prudence (*phronesis*), and the contrast which Aristotle drew between practical sciences serving *phronesis* and theoretical sciences pursuing *episteme*. (Adcock 2009, p.97) Thus, the emphasis is on preserving the character of the humanities and not bending them under the practice of science. Taagepera's message is quite different and one could expect that his book will have wide exposure. However, a reference to his book can be found only in one article on physics preprints homepage: 'The ABCDs of kinetic wealth-exchange models.' by Patriarca, M., Heinsalu, E. and Chakraborti, A. (<http://arxiv.org/abs/physics/0611245>). It looks like physicists are more concerned with the fate of social science than its principal players are.

The European post-Enlightenment thinking on the human condition and the nature at large evolved into two distinct varieties – Science and Humanity. The first is concerned with discovering the most exact and profound laws of the universe, preferably stated in the language of mathematics. The latter deals with the more mundane matters of human beings, their dwelling places and conditions under which they thrive, and operates with the data subjected to interpretation. One seemed absolute and the other relative in collecting and arranging knowledge about the world and its inhabitants.

Social science¹ (including sociology² and politology³) is a later product of this development. The definitions in the footnotes reveal some of its ambiguity and ambitions to be as absolute as science and still feature the power of subjective explanation at the same time. And such ambitions do prevail, amplified by the use of sophisticated mathematical techniques and black-box computer programs that seem to vindicate human explanations. In his skillfully crafted argumentation, Rein Taagepera calls us to stop for a moment, look back at our calculations and reexamine their meaning. Does solving these equations actually bring any benefits? Do we ask the right questions? Do we perceive and notice the boundaries and limitations of our projects? Do we have a coherent chain of thought like physicists who seem to manage their complicated particle systems, instead of splashing among myriads of differently scaled (mostly survey) data? Is mimicking a physicist's thinking a way to save the common-sense style of argument?

What are our main enemies besides careless thinking and over-manipulation of empirical data, with linear regression models prevailing in the social science articles? Rein Taagepera's answer is that too much is settled beforehand: 'We often take some of our knowledge so much for granted that we do not even realize how much we know' (p. 36). And 'we presume quasi-continuity whenever we try to fit a distribution of discrete entries by a smooth normal curve (or other continuous curve), rather than as a discontinuous histogram' (p. 49). These kinds of universal statements strongly feature in Taagepera's book. The 'softer scales' (p. 232) mentioned in the book are dominant in social science, but are dealt with there only incidentally and their discussion is left open, even though this may be a central issue. The closed scales usually employed for social statistics are a more difficult subject than is generally accepted, not speaking the least of using interval scales. This is one sore point in all social science data management. As non-Gaussian, non-normal distributions are increasingly common (mostly in the form of power laws, including those of Zipf-Pareto), the choice of scaling plays a more important role than ever.

Chapter 9 of the book is particularly useful in its treatment of the characteristics and distributions of data involved in variable manipulations. In analyses of social data, the types are in many cases defined or applied incorrectly or not dealt with at all. For clarification, Taagepera argues very forcefully when and why normal or lognormal distributions are handy or correct. Also the appendix of the chapter 'Mapping Any Limited Range on the Entire Range of Real Numbers' is both insightful and practical. There is also a good discussion on the need for symmetric regression instead of originally skewed ones (pp. 162-166, 173-175, 178-180, 205).

In his quest to exorcise the devils that plague logical thinking in social sciences, Taagepera has employed a myriad of strong 'mantra-like' expressions: 'Occam's Razor is broken, thrown away and replaced by a garbage can that fits everything.' (p. 57), 'show no meaningless ciphers' (p. 64), these 'meaningless decimals' (p. 85), 'the multiplicative format, so frequent in physics, is largely absent from the usual tool kit of social scientists' (p. 68), 'it is time to ask whether social sciences face a

1 A branch of science that studies the society and human behavior in it, including anthropology, communication studies, criminology, economics, geography, history, political science, psychology, social studies, and sociology. (http://en.wiktionary.org/wiki/social_science).

2 The study of society, human social interaction, and the rules and processes that bind and separate people not only as individuals, but as members of associations, groups, and institutions. (<http://en.wiktionary.org/wiki/sociology>).

3 The branch of social science concerned with theory, description, analysis and prediction of political behavior, political systems and politics broadly-construed (<http://en.wiktionary.org/wiki/politology>).

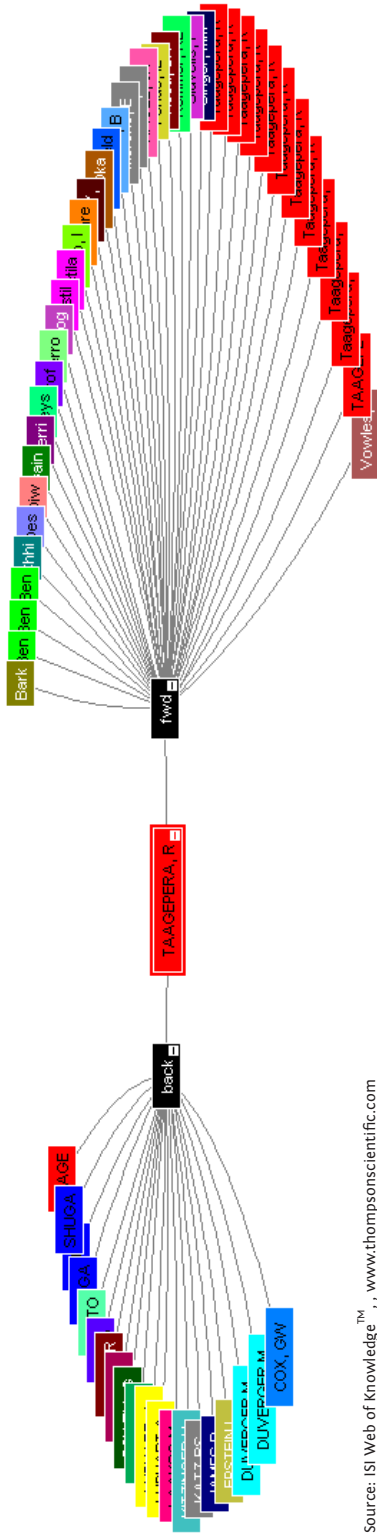
Ptolemaic syndrome' (p. 87), and 'Ptolemaic dead end' (p. 240). Or that 'multiple regression is the devil's favorite tool to induce social scientists to dump parsimony' (p. 69), 'evolving models must be substantive or broadly logical. They should be quantitative, not merely directional' (p. 237). Social science is haunted by 'Procrustean normal distribution' (p. 120), 'canned computer programs' (p. 152) and must struggle 'against the dictates of computerized graphing' (p. 204). He is calling for reason to prevail over prejudice and convenience.

As a social scientist, Rein Taagepera has been productive in three widely interesting areas: 1) the development of empires (his data are still actively used by other researchers), 2) the history and fate of the Baltic nations, and 3) electoral systems. From the point of view of scientific countability, the first field is so specific that there is no trace of it in the ISI databases, the second belongs to area studies, and only the third one is easily found in science citation databases. The explanation is that the data used in electoral studies is closer to the data in physics, compared to the data in area studies. Taagepera has managed to formulate several universal patterns in the field and has, thus, garnered more attention in the literature. However, from the bibliometric point of view even this research direction remains within the humanities and does not really look like science proper. While there are differences in thinking and in the use of computers, there are differences also in the researchers' ambitions. Physics value enduring, universal laws and patterns in and of themselves, even if their discoverers do get credit by having a law or equation named after them. But in the humanities, the scholar tends to be the center of achievement. In physics, previous knowledge forms the base for new discoveries, finer and better-tuned laws, and is not entirely invalidated or reversed by these novelties. In the humanities, however, all work begins anew with another philosopher.

If we compare success in different fields in bibliometric terms of citations and references, then we will find a simple pattern: if in the humanities references and citations are generally balanced, then in science there are many more citations than references, more users of information, more additional development of innovative breakthroughs and clever manipulations. As an example, let us compare two figures from the ISI Web of Knowledge article database (<http://www.webofknowledge.com>), presenting the most cited article by first author for Rein Taagepera (43 citations in 16 years, 20 references) and Lisa Randall, a successful physicist (3396 citations in 10 years, 28 references) respectively. In the proportion of self-references, the humanities' representative clearly outdoes the scientist (Taagepera's article has 12 (27.9% of total) while Randall has 18 (0.5%). Google Scholar citation search (<http://scholar.google.com>) results are even higher, although less reliable: 94 citations for Taagepera's article and 6828 citations for Randall. But the overall trend is the same and Taagepera's work displays a pattern characteristic of the humanities. Nevertheless, it is remarkable that both articles have retained their quotation numbers quite evenly over time: Taagepera's citation numbers over the years 1994-2009 range from 1 to 5 (apogee in 2006 and 2007), not skipping any year, and Randall's from 238 to 416 in 2000-2009 (apogee in 2001).

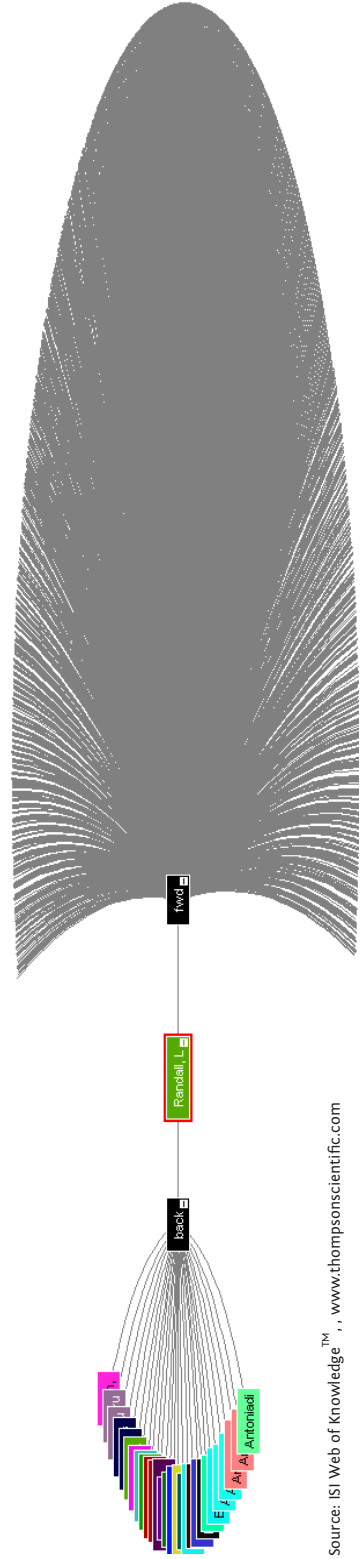
Taagepera also discusses why attempts to cure social science by adopting thinking models from natural science have met with resistance. He holds that 'for understandable reasons (complexity and fluidity of the subject, plus limited ability to experiment), the achievements of political science are more reminiscent of physics before than after Newton' (p. 193). 'One reason why some methods of natural sciences find it hard to diffuse to social sciences is dearth of people with training in both' (p. 239). Physics has a universal school of thinking for all learners, while humanities let bloom ten thousand flowers of thought at once. There is no common ground in views on the human condition and its development, unlike e.g. the Standard Model of Particle Physics, which is collectively accepted and still functions quite well, providing a springboard for inventive, if occasionally incompatible thought. Thus, we can and should appreciate the analytical mathematical tools used in the social science, but it is not enough. As Taagepera (2009: 242) puts it: 'the three laws I have described [namely: the *cube root law of assembly sizes*, the *inverse square law of cabinet duration*, the *law of minority attrition*] could hardly have been deduced from statistical analysis of empirical data.'

Figure 1. Number of references (left) and citations (right) of the article 'Predicting the Number of Parties - a Quantitative Model of Duverger Mechanical Effect' by Taagepera R., Shugart M.S. in *American Political Science Review*, volume 87, issue 2, pages 455-464 (published in June 1993). References – 16, times cited – 43, self-citations – 12. Colored by authors, ISI Web of Knowledge accessed on October 12th, 2009.



Source: ISI Web of Knowledge™, www.thompsonscientific.com

Figure 2. Number of references (left) and citations (right) of the article 'Large mass hierarchy from a small extra dimension' by Randall L., Sundrum R. in *Physical Review Letters*, volume 83, issue 17, pages 3370-3373 (published in October 25th 1999). References – 28, times cited – 3396, self-citations – 18. Colored by authors, ISI Web of Knowledge accessed on October 12th, 2009.



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