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SCIENCE AND TECHNOLOGY TRANSFER FROM RICH TO POOR — THE HELP OR A BUBBLE

To my suspicious teachers

Abstract: In this note some reflections on the role of science and technology in a society, especially, in developing countries are given. It is pointed out that beyond all expectations recent reforms in science and education in developing countries resulted in very limited and modest results. Some effects such us „publish or perish", „hyperauthorship" and bureaucracy that practically voided good intentions are detailed elaborated. At the end, several ideas, how to get out from the current situation and how to make science and technology more useful for the developing countries and their citizens are proposed.

Key words: *Science and technology, developing countries, publish or perish, science vs politics*

INTRODUCTION

In recent decades there have been very intense activities related to the development of research and scientific capacities in developing countries, which have been undertaken under various national, bilateral, EU, overseas and other programmes. These have been based on common and hypothetical reasoning and assumption, i. e. that „the developing and less developed countries will remain even poorer unless they can imitate what the developed countries have done: to incorporate science and research into their political and economic strategies". The idea to transfer science and technology policies and related measures from the developed to the developing became a winning combination for the policy makers in both groups of countries over the decades. Nevertheless, a very large gap between the desires and the achievements exists, and only tangible results of such activities are the side effects as „publish or perish", hyperauthorship, bureaucracy and abnormal growth in the numbers of researchers over the globe. On the other hand, the socio-economic

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indicators in majority of developing countries are in strong dissonance with, sometimes, their impressive research and scientific results.

As someone, who was born and lives in a developing country and has worked in academia and research for almost 25 years and has been involved in many international, bilateral, national projects, I feel the need to write this note in order to share my reflections on the role of science and technology in a society, especially, in developing countries, which comprise 80% of the world population. Also, guided with the Aristotle's pristine academic rule *„Plato is dear to me, but dearer still is truth"*, I would like to point out that beyond all expectations recent reforms in science and education in developing countries resulted in very limited and modest results. At the end, based on my own competencies and experience, I would like to propose several ideas, how to get out from the current situation and how to make science and technology more useful for the developing countries and their citizens.

SCIENCE VS POLITICS

This is the everlasting theme for both politicians and scientists. May be it can be best defined by two Aristotle's notions: *„Man is by nature a political animal"* and *„All men by nature desire knowledge"*. All societies, no matter what they think of each other, claim to be „knowledge based". Also, they tend to manipulate and abuse knowledge. Science becomes a part of the political process [1]. Especially, the political elites in developing countries always use the science and technology to present themselves as reformatory and „open minded".

Growing up in former Yugoslavia, I developed dreams and good habits regarding science. Also, I got good education. Yugoslavia was truly „a knowledge based country" with an excellent education system. Then, I painfully realized that the technology and science change very fast, but human nature remains unchanged. Human nature destroyed one knowledge based country. I remembered one lesson from my childhood, when Leonardo da Vinci wrote to the Duke of Milan: *„I do not want to precisely describe my method to stay under the water for a long period because people are so ill-natured that they would use it to destroy the keel of boats and to sink the crew"*. For the second time, in my middle age, I found myself again in a knowledge based society, now the EU, where I easy adapted and was relatively successful, because of good habits from youth and familiarity with the topic. The question is: what will I bring to the mankind at my old age? May be Einstein answered it at the meeting at Princeton, N. J., (Jan 1946): *„Dr. Einstein, why is it that when the mind of man has stretched so far as to discover the structure of the atom we have been unable to devise the political means to keep the atom from destroying us?"* Einstein answered: *„That is simple, my friend. It is because politics is more difficult than physics"*.

Then, do scientists need to fight against politicians and human habits to fulfil their ideas? My answer is not and never. *„Human nature is potentially aggressive and destructive and potentially orderly and constructive"* as Margaret Mead said. Obviously, we cannot change it. *„The union of the political and scientific estates is not like a partnership, but a marriage. It will not be improved, if the two become like*

each other, but only if they respect each other's quite different needs and purposes. No great harm is done, if in the meantime they quarrel a bit" [2].

Where is the problem then? Why knowledge based society of my youth was more productive than today's knowledge based society? My explanation is the following. It is because of:

— better education,
— more real verification of research and scientific results,
— more „lifelike" approach in all science activities, and
— more real „terrain" and everyday measures taken in this area by policy makers.

THE VERIFICATION OF RESEARCH AND SCIENTIFIC WORK

The „copy paste" strategy in the transfer of scientific and technological development from the developed to the developing, from „rich" to „poor" had the most negative effects in the verification process, which is mostly virtual and bibliometrically based, with many necessary implications.

„A publish or perish" effect has already derogated science not only in developing countries. The growth in the number of articles published over the last decade is enormous; from 1.3 million in 2003 to 2.4 million in 2013. The number of authorships increased from 4.6 million in 2003 to 10 million in 2013. The number of the researchers (authors of the articles) increases 5 times than the research population due to the „hyperauthorship", which has become a very profitable business. As an example, a physics paper about the Higgs boson by CERN was co-authored by more than 5,000 researchers; while a paper on the genetics was credited to 1,014 authors. To be more absurd, speaking to the Guardian (The Guardian, Friday 6 December 2013), the Nobel Prize Winner professor Higgs, said he would almost certainly have been sacked had he not been nominated for the Nobel in 1980. Edinburgh University authorities then took the view, as he later learned that he *„might get a Nobel Prize — and if he doesn't we can always get rid of him"*. Similar happened to professor Fred Sanger, a Double Nobel Laureate, about whom his friend, Sydney Brenner, also a Nobel laureate, in a fantastic article said: *„Fred would not survive today's world of science. With continuous reporting and appraisals, some committee would note that he published little of import between insulin in 1952 and his first paper on RNA sequencing in 1967 with another long gap until DNA sequencing in 1977. He would be labelled as unproductive, and his modest personal support would be denied. We no longer have a culture that allows individuals to embark on long-term—and what would be considered today extremely risky—projects."* [3]. Some of the authors warn that the bureaucracy will destroy science and education [4].

THE RESEARCH OUTPUT VS REALITY IN DEVELOPING COUNTRIES, THE CASE STUDY OF WESTERN BALKAN COUNTRIES

Western Balkan countries, where I live and work, have been very actively involved in the reform of their science and research policy for almost two decades.

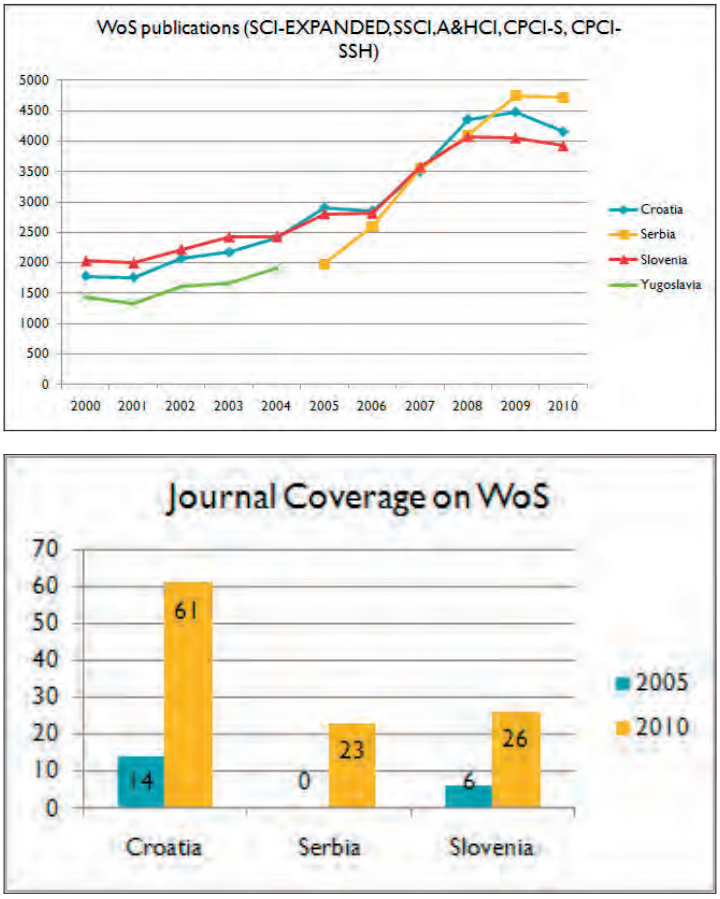

Figure 1: Web of Science published works in SCI-EXPANDED, SSCI, A&HCI, CPCI-S, CPCI-SSH databases by authors from Croatia, Serbia, Slovenia and Yugoslavia, 2000 — 2010 and Journal coverage on the Web of Science in 2005 and 2010 for Croatia, Serbia and Slovenia. Source http://www.herdata. org/in-focus/what-is-behind-bibliometric-indicators-from-the-web-of-science/7

Some of them have become the rising stars in the number of publications and citations, like Serbia. Figure 1 (left) shows the Web of Science published works in SCI-EXPANDED, SSCI, A&HCI, CPCI-S, CPCI-SSH databases by authors from Croatia, Serbia, Slovenia and Yugoslavia between 2000 — 2010. As can be seen, an impressive progress was achieved. Also, these countries significantly increased the number of the journals included in WoS, e. g. in 5 years Serbia had 23 journals included in WoS starting from 0, Figure 1 (right). On the other side, these countries are an example of how the bibliographic indicators do not influence, or do not follow the industrial production, which, in case of Serbia, experienced a very small growth (Figure 2). This confirms the thesis that even rising star countries in science and technology are still far away from the technology and science driven economy.

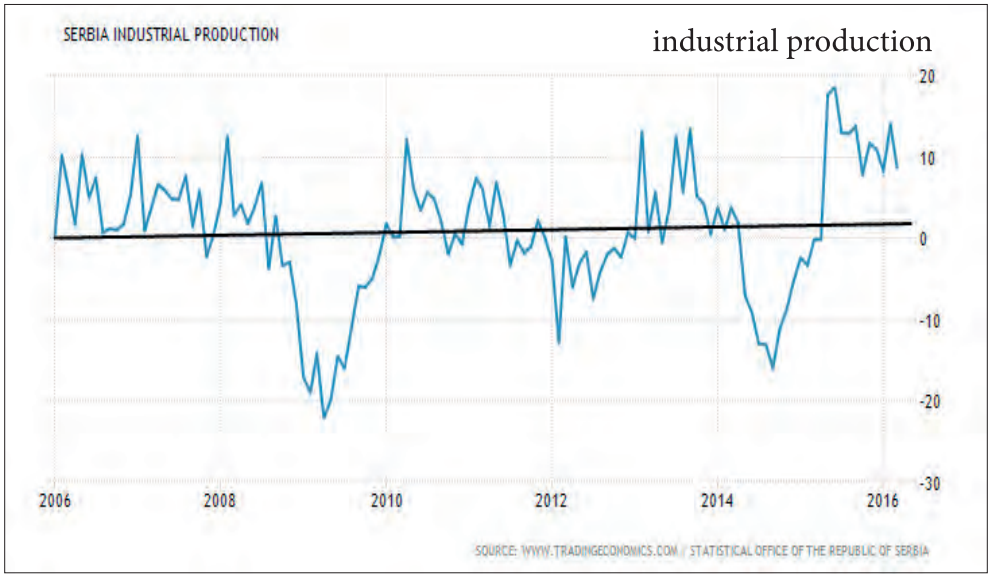

Figure 2: Industrial production in Serbia from 2006–2016. Source www.tradingeconomics.com

Science and technology in Western Balkan are not sufficiently oriented towards broadly defined social welfare, but they are more aimed at meeting the needs of narrow target groups.

CONCLUSIONS

First, the best conclusion of the above would be „*A good intention, with a bad approach, often leads to a poor result.*" (Thomas A. Edison). If developing countries like to achieve some tangible outcomes in the science and technology sphere, and not to waste time, as a first step, they need to stop to „copy paste" the solutions from the developed world. Then, they need to change their education system, by building one that emphasizes rational thinking and motivates people to create new values [5]. It is more useful for some of the countries with good education history to return to their old education systems and to improve them in some rational aspects [6]. Science and technology of developing countries should try to drive local economies instead of being an isolated island, self-sufficient for local scientific workers, scientific policy makers, international experts and interest groups. Scientific and research work should be merit-based in these countries. In the first phase, more with the emphasis on the contribution to the local economy and local development and in second phase, when the economy and the society becomes more advanced, by implementing the „Western" bibliographic approach.

The reforms during the initial/recovery phase can be implemented with relatively low expenditures which only depend on good intentions of local policy makers: decentralizing the decision making in the area of science and research, creating pools of trained people, creating small groups around outstanding individuals, im-

proving the relative status of local scientists, choosing rational and useful research projects, introducing small national funding schemes, removing unnecessary bureaucracy and making the import of scientific knowledge easier. These countries need to build their own small flexible centres of excellence in science and technology that are especially relevant for their own societies and economies.

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