Global sustainable development and academic mobility

N Polkovnikova¹, M Balk¹, A Panzabekova², A Yarygina³

¹ Global Innovation Labs LLC, 258 Harvard Str #352 Brookline MA 02446 USA
² Institute of Economics of Science Committee, Almaty, Kazakhstan
³ Triple Helix Association, Via della Lungara, 10 00165 Roma, ITALY

E-mail: info@innovationlabs.net

Abstract. Academic mobility is an important indicator of a country’s competitiveness in innovations and research. Innovations play an important role for sustainable development as defined by UN 2030 goals. In this research we have studied how academic mobility is correlated with national economies.

1. Introduction

Academic mobility has many definitions. Council of Europe describes academic mobility as movement of people: students, teachers, researchers for teaching, teaching and research. By UNESCO guidelines: academic mobility refers to the period of study, teaching or research in another country (not the country of residence of the student, teacher or researcher). In Russian regulation academic mobility is characterized by the following indicators: change of the country after defending the candidate's thesis; change of the country for preparation of the candidate's thesis; possible change of the country at achievement of scientific maturity; regularity of visit of the international conferences; long business trip as the invited Professor to other country.

Academic mobility plays an important role in global scientific and technological competition. In the search for breakthrough technologies, more and more countries realize that they are playing in the global market, competing for best science-oriented minds. In many ways, the flexibility of public policy and carefully thought-out programs aimed at scientists and science support determine the level of technological development of the country on the long-term horizon.

While academic mobility is generally viewed as an important factor of country’s status in science, we decided to see if academic mobility is in any correlation with country’s sustainable development as defined in UN Goals for 2030.

For the purpose of this research we have chosen Goal 8 “Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all”:

✓ Goal 8.2. Achieve higher levels of economic productivity through diversification, technological upgrading and innovation, including through a focus on high-value added and labor-intensive sectors.

2. Methodology and data

There are different methods to measure academic mobility [1], such as
- Regular collected statistics containing individual information (micro census, socioeconomic panel (SOEP))
- Process data from employment administration (integrated employment biographies (IEB) of the federal labor office)
- Login data of the immigration offices (central register of foreigners)
- Panel studies of career development of university alumni and doctoral candidates (e.g. alumni register)
- Data from various publications, such as change of affiliation in publications.

In this research we used the following sources as the most representative reflection of academic mobility of scientists from different countries and containing the most complete sample of primary data for the analysis of such activity with arbitrary segmentation (by disciplines, time interval, countries, etc.). Thus, the choice of data sources provides a comprehensive picture with segmentation by disciplines, countries, publications, etc.

The following information resources were used as data sources:
- data from Institute of International Education (http://www.iie.org/) (50,000 records on participants of various international programs);
- data on the participants of the Project to improve the competitiveness of leading Russian universities among the world's leading scientific and educational centers (for Russian universities, Project 5-100), times Higher Education, OS World University Ranking;
- data from WoS (the amount over 50 000 000 records);
- Scopus data (more than 100 000 000 records);
- data from Google Scholar index (more than 10 000 000 records);
- data Truth (Lomonosov Moscow state University) (more than 2 000 000 records);
- data from the Organization for Economic Co-operation and Development;
- data Card of the Russian science;
- Russian science citation index (RSCI) data);
- data from the websites of leading scientific conferences on selected disciplines;
- data from leading universities in selected countries, second-tier universities in selected countries,

The choice of these sources is determined by a number of factors, including: completeness and representativeness of the stored data, availability of easy access to the source data (raw data), availability of a convenient software interface (API) and recognition by the world scientific community.

The samples were made using social network data (LinkedIn, Facebook, VKontakte) and the above-mentioned databases (WoS, Scopus, etc.). The data of Scopus and OECD databases (based on Scopus data) were chosen as the base because it is the Scopus database that is the basis for calculating such leading rankings of the world universities as QS and THE. Web of Science data, Maps of Russian science and RSCI were used as control parameters.

For each of the groups the numerical values of the following indicators of academic productivity were determined: average and normalized impact factor (including publication activity and citation), h-index, i10 index.

Data processing methods

A number of assumptions were used in the analysis of large amounts of publication data contained in the primary data sources used. In particular, the data on the country of residence of scientists were formed by comparing a number of indicators, such as data from social networks, list of Universities, a comparative analysis of the main affiliation of the author of articles in these databases for the current year and comparing it with the main affiliation for the previous year. Moreover, the latter method was the main one in the analysis of publication activity and mobility of non-Russian scientists. For the purposes of this study, the analysis considered only authors with two or more publications. Within the calendar year, the fact of academic mobility was considered to be the fact that the last publication of the author for this year has an affiliation in another country than the previous publications of the same author. Authors who do not change the country were determined by the coincidence of the main
affiliation of the country of the last publication of the current and previous year, the remaining publications were ignored. Scientists returning to their home country were defined (except in the case of a known country of origin) as those who had moved to the country in which their first publication was recorded, and from the point of view of their previous country of residence they were recorded as decreasing.

For measuring sustainability as defined in UN sustainability goals we used data from OECD and World Bank according to the recommended UN methodology [2]:

For UN Goal 8.2 we have used annual growth rate of real GDP per employed person [3].

3. Results

Academic mobility has a great influence on the impact factor. The impact factor of scientists with high academic mobility is almost 20% higher than the impact factor of their colleagues who have never left their home country [4]. Thus, for Russia, where the average normalized impact factor (0.50) is 2 times lower than the average normalized impact factor (1.3) for scientists from developed countries, it becomes critically important to improve the performance of scientists who are not involved in academic mobility programs and the effectiveness of Russian science in general.

Another important factor affecting the quality of scientific works is international cooperation. According to 2003–2015 data [6], there are two distinct clusters of countries in the world of science: countries with impact factor below the average form a cluster with the level of international cooperation of 30% and below, while for a cluster of countries with an average normalized impact factor of more than one – the level of international cooperation is from 35% to 60%. During the study period, Russia slightly worsened its position on this indicator, reducing the percentage of articles with international cooperation from 30.3% (in 2003) to 25.9% (2015).
We have compared those two features, academic mobility (as % on all researchers in the country) and impact factor to the change in annual growth rate of real GDP per employed person, as a recommended source to measure sustainable development for goal 8.2. For this research the Pearson correlation coefficient was used to compare annual data on annual growth rate of real GDP per employed person and data on academic mobility and impact factor.

We have found that the correlation both for mobility and impact value was negative. Average number for mobility was -0.26 and for impact -0.24 indicating that there is no direct correlation between academic mobility and economics sustainability.

4. Conclusions and future research
This research has shown that although both academic mobility and GPD per employed person are important characteristics in achieving sustainable development they don’t correlate. The next step for the research will be to study whether there’re other factors correlated to academic mobility which could be used to enhance mobility in the developing countries.

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