RELATION BETWEEN PERSONAL MANAGEMENT AND RESEARCH RESULTS IN PHYSICS

Artur Czerwiński*

Abstract:

In this article we study the relation between personal management and research results in Physics. We postulate a hypothesis that the quality of personal management is correlated with the research results. The main motivation for this research comes from modern macroeconomic models of growth which indicate the link between technological (scientific) progress and growth of the whole economy. Thus, we believe that implementing efficient management strategies in research can improve research results and consequently contribute to the growth of the economy. In order to confirm the main hypothesis we designed a research and conducted it among physicists from all over the world. The questionnaire devised for the study consisted of two parts – in one the respondents were asked to say how much they personally agree with given sentences about management, in the other they were asked to provide two pieces of information concerning their research results for the year 2014 (number of publications and total impact factor). Since in the first part of the questionnaire we have implemented the Likert scale, it was justifiable to assign numbers to possible answers and, therefore, for each respondent on the basis of his/her answers we could calculate the score which indicated the personal management effectiveness (PME). Apparently, PME introduced in this way is a quantitative rate, which allows one to consider for a given set of results the correlation between PME and a quantity that indicates research results. To determine the research results we asked in the second part of the questionnaire about the number of articles published in 2014 (denoted NA) and the total impact factor (TIF) of those articles, which should be understood as sum of impact factors of the journals in which the respondent published his/her articles in 2014.

Keywords: management, management in research, management in Physics, personal management, economic growth, science, effective measurement, Spearman's rank correlation coefficient.

* 1. Faculty of Economic Sciences and Management, Nicolaus Copernicus University, Gagarina 13a, 87-100 Torun, Poland

2. Institute of Physics, Faculty of Physics, Astronomy and Informatics, Nicolaus Copernicus University, Grudziadzka 5, 87-100 Torun, Poland

Introduction

The main motivation for the study included in this article comes from modern macroeconomics. One of the toughest questions that arise in macroeconomics is to explain why some countries create more income than others and what factors influence the growth of income the most. Some studies (Romer 2011, p. 6) point out that the average real income in United States these days is between 10 to 30 times higher than a hundred years ago. What is more – the rate at which the income increases (growth) is not constant. It was observed that growth has been rising for most of the modern period of history. However, the general tendencies are not true any time for any country. When the growth in one country differs significantly from the world average we talk about growth miracles or growth disasters. The first one take place when the growth in a given country significantly exceeds the world average. An example of this kind of event can be the situation in Japan after World War II or in China starting around 1980. We talk about the other kind of phenomena when the growth in the country is significantly lower than the average. Sub-Saharan African countries (Chad, Ghana, etc.) are examples of this economic phenomena. If one tries to explain why those countries have been extremely poor throughout their history, one can refer to the concept of the Malthusian trap. Thomas Robert Malthus at the end of XVIII century suggested that economic progress leads only to an increase in the population, rather than improvements in the living conditions for people. He also postulated that the land available for agriculture is limited and, therefore, the growth of population would sooner or later be stopped by a hunger catastrophe. Obviously, most modern economies have broken this trap due to industrial and agricultural revolution – read more in (Galor 2005) and (Clark 2007). It is thought that many countries in Africa are still stuck in the Malthusian trap (Zinkina and Korotayev 2014).

The problem of inequalities in income distribution has been the subject of many economic analysis. One of the first macroeconomic models of growth which aimed to explain the reasons and stimulus for the growth of income is referred to as the Solow-Swan model. It originated in 1956 in two articles (Solow 1956) and (Swan 1956). In later years the model was developed by many researchers, but still it is commonly used as a starting point when somebody is trying to comprehend the economic nature of growth. The introduction to the Solow-Swan model can be found in many academic books on economics, for example one can refer to (Romer 2011, pp. 6-

48). Solow-Swan model can be considered a breakthrough in economic analysis of growth because these researchers for the first time in history included the notion of knowledge (or technology) in a macroeconomic model. Knowledge in the Solow-Swan model is quantitative, though its definition is rather vague. The volume of the production in the whole economy depends on the quantity of knowledge. Currently, practically everybody agrees with this approach – in order to explain the nature of the economic growth we have to take into considerations not only traditional factors of production like land, labor and capital, but also technological progress which is connected with the knowledge stored in the minds of the people. As mentioned before, knowledge has no specific definition, although it possesses properties which make it a unique factor of production. Above all, at the same time many people can utilize the same piece of knowledge. Moreover in the modern world knowledge is easily accessible provided one has a connection with the Internet.

The Solow-Swan model enables one to draw to very significant conclusions concerning the point of long-term economic balance (the so-called steady state).

1. The rate at which GDP (Gross Domestic Product) increases (or decreases) is equal to the sum of the growth of knowledge and labor.
2. The rate at which GDP *per capita* increases (or decreases) is equal to the growth of knowledge.

By growth of knowledge we mean the time derivative of knowledge, which practically means the pace at which the amount of knowledge in the economy increases (or decreases). From the point of view of an individual person GDP *per capita* is a more important indicator than GDP, because the first one refers to an average wealth of a single person and the latter reflects the condition of the whole economy. One the basis of the Solow-Swan model one can observe that GDP *per capita*, which can be also understood as an indicator of standard of living, increases in time at the same rate as knowledge. This fundamental conclusion explains the reason why nations should invest money in scientific progress. Though the Solow-Swan model is simplified and many factors that appear in the real world are not taken into consideration, we believe that, most importantly, this model pointed out a new direction for macroeconomics as it introduced the notion of knowledge (also referred to as technology) into economic analysis.

We have already mentioned that Thomas Robert Malthus believed that due to the limited amount of land sooner or later humanity would be starving, which would lead to a significant decrease in the number of people. Currently we know that introducing new technology and effective management to agriculture helped most countries overcome the Malthusian trap. This observation can be generalized to saying that if you possess a limited amount of some resource, by improving your management you can obtain better and better effects. Thus, it is not necessary to have more resource in order to improve the results. This rule can be applied to knowledge and technological progress. If you do not increase the resources in science (like number of employees or apparatus) but you introduce new management techniques, you can still increase the growth of science, which will finally influence GDP *per capita*. Therefore, we believe that management in science can have significant impact not only on the development of knowledge but also on the whole economy. This paper has one major aim which is to prove on the basis of data provided by a survey that better management is correlated with better research results. Apart from that, we believe that this article may encourage scientists to take interest in management.

How to evaluate research results?

The problem which is strictly connected with the research presented in this article refers to evaluation of a researcher's work. Apparently, there is a need to devise a model which will allow one to assess a researcher and compare his/her results with others. Naturally, the parties which are the most interested in effective methods of evaluating a researcher are employees (universities, institutes, etc.) and funding organizations. So far no agreement has been reached concerning a complete evaluation system. However, there have been many attempts to indicate factors which demonstrate the quality of research. Nevertheless, in many cases the evaluation of a researcher is subjective and depends on the referee. In this chapter we shall briefly mention different indicators of scientific performance.

One of the indicators which are most commonly taken into considerations when evaluating someone's performance is the Hirsch index introduced in (Hirsch 2005) and denoted by h. Basically, for an individual researcher h is the number of publications which has been cited at least h times. Relatively quickly this index became popular. However, many disadvantages of this indicator have been pointed out (Bornmann & Marx 2011). One can easily agree that the number of citations is strictly connected with the field in which the researcher works. Papers concerning areas of science with significant practical applications (e.g. medical sciences) tend to on average obtain more citations than articles from purely theoretical areas (like mathematical physics). Moreover the Hirsch index can be increased by self-citations. Another disadvantage of the Hirsch index is the fact that it does not reflect the quality of recently published papers because usually, even in case of breakthrough papers, it takes some time for other researchers to notice a work and cite it. Finally, the last argument against the Hirsch index is the observation that different scientific databases give different results when calculating the number of citations. For example, quite often researchers indicate a significant discrepancy between the number of citations given by Google Scholar and ResearchGate. The reason for such differences stems from the number of reference styles and the mistakes researchers make when citing someone else's work. Thus, depending on which scientific platform you use you might get different values of the Hirsch index. Nowadays, it is quite common to consider the data gathered by the Web of Science as the most reliable. On the website we can read that "by meticulously indexing the most important literature in the world, Web of Science has become the gold standard for research discovery and analytics. Web of Science connects publications and researchers through citations and controlled indexing in curated databases spanning every discipline[1]". In spite of many disadvantages of the Hirsch index, the data gathered by the Web of Science makes it possible to determine the most reliable value of this index and, therefore, this value is widely used to evaluate a researcher who is applying for a grant or higher academic degree. However, in the study described in the current article have decided not to consider the Hirsch index as an indicator of scientific performance because in the opinion of the author all the disadvantages would influence the final conclusion concerning the research – the relation between personal management and research results.

Another way to evaluate a researcher's work is to look at the publication he/she has written. Apparently, the most obvious indicator is simply the number of publications. However, not quantity of work should matter but the quality of research. Therefore, there is a tendency to estimate the quality of a publication on the basis of the knowledge about the journal in which it

1 The information comes from the website: http://wokinfo.com/ [date of access: 25.07.2015]

was published. Different academic environments approach this problem in a different way, because there is not one commonly accepted way to assess the level of a scientific journal. In case of Poland the Ministry of Science and Higher Education introduced in 2012 an evaluation system of scientific journals. A team of specialists takes into considerations different data connected with each journal and on the basis of those numbers calculates points for an article published there[2]. The points for publications are taken into account during the assessment of any academic institute as well as in case of individual researchers. However, the system introduced in Poland requires a lot of data and a lot of effort to compare in a just way different journals. Moreover, by many researchers this system is seen as subjective. Therefore, there is a tendency to consider indicators which are easier in calculation and more objective.

The indicator which is very commonly used to compare journals is called impact factor. To calculate the impact factor for a considered year for a specific journal you need to take the number of all citations that in the year in question received the articles published in two earlier years and divide it by the number of those articles. As mentioned before number of citations that articles receive differs between disciplines, thus, it makes sense to compare by means of the impact factors only those journals that belong to the same are of science. Even though, the impact factor as an indicator of the quality of research has been criticized. First of all, the number of citations is not always strictly correlated with the quality of research and, more importantly, the fact that some article has been published in a journal with a high impact factor, does not mean that the particular article will be cited many times. In spite of all arguments against the impact factor, nowadays it is widely known and respected indicator of the scientific level of a journal and articles published in it.

In the study presented in this article we have decided to take into considerations as indicators of scientific performance two values. In the survey we asked the respondents about the number of

2 Complete information about the evaluation system of a journal can be found at the website of the Polish Ministry of Science and Higher Education http://www.nauka.gov.pl/komunikaty/komunikat-ministra-nauki-i-szkolnictwa-wyzszego-z-dnia-2-czerwca-2015-r-w-sprawie-kryteriow-i-trybu-oceny-czasopism-naukowych.html [date of access 16.07.2015]. Though this information is published only in Polish. The lists of scientific journals with the assigned points can also be found at the website of the Polish Ministry of Science and Higher Education: http://www.nauka.gov.pl/komunikaty/komunikat-ministra-nauki-i-szkolnictwa-wyzszego-w-sprawie-wykazu-czasopism-naukowych_20141231.html [date of access: 26.07.2015]

articles published in 2014 in journals from Thomson Scientific Master Journal List which they have written (it does not matter if somebody was the only author or one of the authors). The other piece of information was the sum of the impact factors of the journals in which the respondent published his/her articles. Apparently, we know that these two values are not sufficient to determine the scientific performance accurately. However, we did not want to discourage the respondents by a large number of detailed questions. Thus, we have decided that the data concerning the number of publications and the total impact factor should be sufficient to confirm or contradict the main hypothesis behind the research. Nevertheless, more thorough research into the relation between management and research results are planned for the future and in the prospective research the up-to-date knowledge about scientific performance evaluation will be taken into account (Bornmann and Marx 2014), (Wilsdon, J., et al. 2015).

Methodology of the study

Main goal of the research

The main goal of the research presented in this article is to confirm or to contradict the hypothesis which claims that in case of doing research into Physics personal management is correlated with research results, i.e. researchers who plan, organize their work and motivate themselves obtain on average better research results. Obviously, the relation between management and research results can be observed only if we take into account researchers with some experience, that is why in the research the study population constitute people with at least two years' experience in Physics.

Data needed to achieve the goal

To achieve the goal set for the research we need data concerning two aspects: management practice among researchers in Physics and the research results.

Sample

Naturally, there is no way to obtain a random sample as we do not have a list with all physicists from which we could randomly choose a sample for the study. Therefore, the have to consider a convenience sample, which in this case means that on social media (Research Gate and Twitter) we post information about the study and ask volunteers to contribute with their answers.

Data gathering procedure

In order to gather the data necessary for the study we decided to employ the online internet survey. There are two main arguments in favor of this method. One is connected with low cost of conducting research by this method. Practically, the only resource you need is time. The other advantage of this method is the possibility to gather data from respondents all over the world. In this study it is especially important because researchers in Physics work in almost every country and it would be highly desirable to diversify the sample by taking respondent from different places.

The questionnaire

The tool employed to gather data from respondents is a questionnaire. Currently, one can easily create a questionnaire online because there are many platforms which offer this possibility. In this study we decided to use Google Docs in order to create a questionnaire. The questionnaire prepared for this study consists of two main parts – one deals with personal management and the other with research results. In **the first part** there were 18 sentences and every respondent was asked how much he or she agrees with each of them. We implemented the Likert scale with 7 levels, from 1 "I strongly disagree" to 7 "I strongly agree". The 18 sentences are listed below.

1. I always set specific and ambitious goals concerning my research.
2. I always clearly write down my research goals.
3. I use brainstorming when looking for specific ideas how to achieve my research goals
4. I always write detailed plans to achieve my research goals.
5. Every day in the morning I have a clear plan what to do in my work.
6. When I do my work I do not let other things (like facebook or e-mails) to distract my attention.
7. I always do the hardest thing first.
8. I focus my attention only on the issues I can influence.
9. I know ways to motivate myself to research work.
10. I do not get discouraged by minor difficulties that arise in my research.
11. I feel my work brings value to the scientific world.
12. I'm not thinking of changing my job in the future.

13. I use justifiable critical remarks from other researchers to improve my work.

14. Writing about the results I obtain in my work is one of my habits.

15. When I am going to write an article, I first plan its structure (sections and what will be included in each part).

16. When I start writing an article I set up a deadline when this article will be submitted.

17. When preparing an article I focus not only on the scientific description, but also I want to present my research in an attractive way.

18. I do not procrastinate different duties connected with publication (e.g. filling in a copyright form, returning corrected proof of the article).

In the **second part** of the questionnaire we asked the respondents to provide two values connected with research results.

1. Please, provide the number of your research articles which were published in 2014 in journals belonging to Thomson Scientific Master Journal List.

2. Please, provide the total impact factor of the journals in which you published the papers in 2014.

Apart from the two main parts there was an initial question that every respondent was asked at the very beginning. The questions was: "Do you have at least two years' experience as a researcher in Physics?". The respondent could choose an answer only between "yes" and "no". If the answer was "yes", he or she could proceed to the main parts of the questionnaire. If the answer was "no", he or she was not able to complete the main parts of the questionnaire.

Data analysis methods

Google Docs, which was employed to facilitate the research, transferred the answers provided by the respondents to a spreadsheet. This enabled faster analysis of the obtained data. Because answers given by Likert scale can be in general treated as numbers, for every respondent we calculated the personal management effectiveness (PME) score which equals to the arithmetic mean of the answers provided in the first part. The value of this score was then compared with the values provided in the second part of the questionnaire. To prove the main hypothesis, which claims that there is strong correlation between PME and research results, we shall employ the

Spearman's rank correlation coefficient.

Data reduction

Because of the fact that Google Docs was implemented in the research, it was possible to mark all the questions as “required”. Therefore, we could avoid the problem of receiving incomplete questionnaires. However, still it was necessary to evaluate the suitability of the answers provided in the questionnaire. The first step of the data reduction was to delete the records of the respondents who did not have at least two years' experience in research into Physics. The other step of the reduction was a brief assessment of the data provided by the respondents in the second part of the questionnaire. In that part every respondent was asked two questions concerning his/her research results and he or she could fill in some arbitrary answers. Based on the initial assessment of the answers provided in the second part we observed two things.

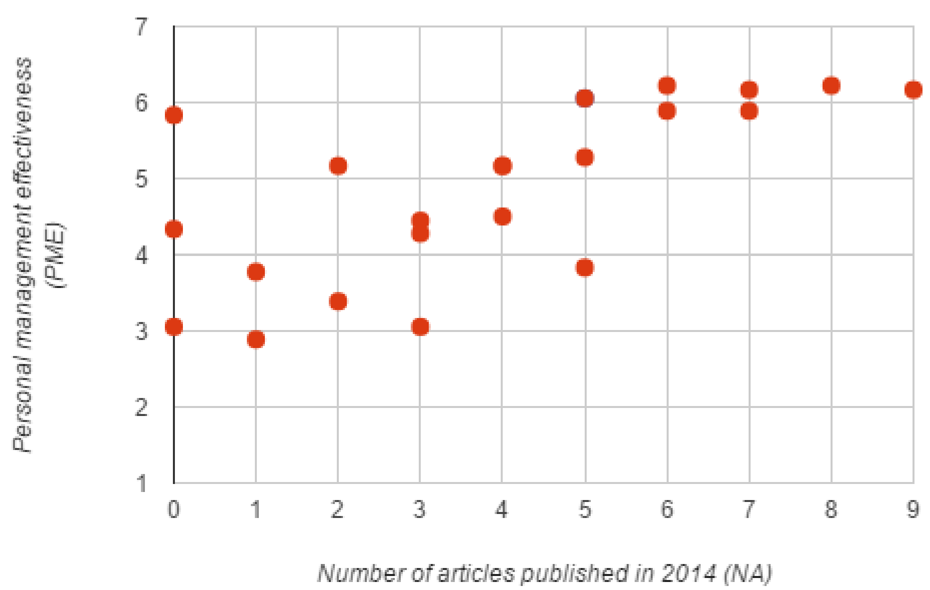
1. Some researchers did not provide a sensible answer to the question 1. concerning the number of articles published in 2014. Instead of giving a one specific number those researchers put for example “1 or 2 or 3” or “not sure”. Since we were not able to correct such answers, the entries with unclear number of articles were deleted. Finally, we had 22 records from respondents who completed the first part of the questionnaire and who provided an answer to question 1. from the second part.

2. When it comes to the question 2. from the second part, which concerned the total impact factor of the journals in which a researcher published his/her articles in 2014, it turned out that only **one respondent** provided a sensible answer to that question. It remains unknown why almost all respondents instead of an answer provided phrases like “I don't care”, “I don't know”, “xyz”. It seems that in some communities the impact factor is not widely recognized as the indicator of scientific performance and, therefore, researchers do not even know its value for the journals they publish in. Probably there is also a group of researchers who were not willing to provide this data, because they might have thought it would be too time-consuming to look up the values and summarize them. Since we received only one answer to the question concerning the impact factor, we obviously could not take this data to the analysis. We decided then that personal management effectiveness (PME) will be compared only with the number of articles published in 2014 in journals belonging to Thomson Scientific Master Journal List (this quantity shall be denoted NA for short).

The analysis of the results

The first part of the questionnaire, which dealt with management practice among physicists, has been divided into three sections – planning and organizing your work (questions 1-8), motivation to work (questions 9-13) and communicating about the results (questions 14-18). To every respondent we can assign a personal management effectiveness score which is simply the mean value of all the answers provided to the first part of the questionnaire (this indicator shall be denoted by PME). Then this value shall be compared with the number of articles published in 2014 in journals belonging to Thomson Scientific Master Journal List (denoted by NA). Therefore, naturally with every respondent we associate a point on the real plane such that its first coordinate is equal to NA and the other to PME. Finally, we obtain 21 points because two respondents have the same scores in PME and NA. Thus the main result of the research can be presented by means of a scatter diagram (chart 1.).

Chart 1. Comparison between PME and NA



The main goal of this research is to prove the hypothesis postulated in the introduction, which claims that there is a positive correlation between the quality of personal management and research results. We shall confirm this hypothesis by proving that there is a strong positive correlation between two quantities introduced before – PME (personal management effectiveness) and NA (number of articles published in journals belonging to Thomson Scientific Master Journal List). Obviously, PME indicates the quality of personal management and NA refers to research results.

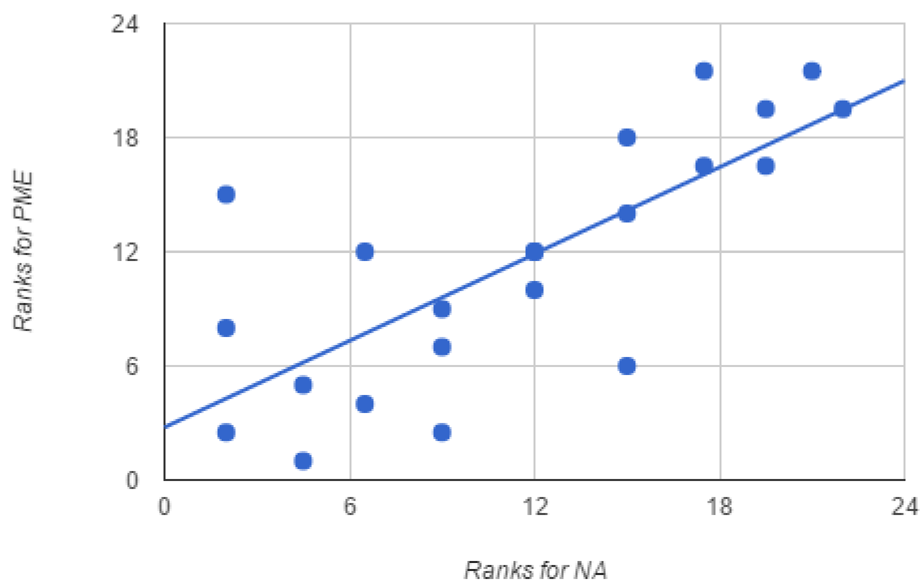
In statistical analysis of data we can come across several numerical measures which indicate the extent of statistical dependence between pairs of observations. The measure which is commonly used in social sciences is called the Pearson correlation coefficient. However, the application of this coefficient is limited only to the cases when there is linear relationship between the observations. Therefore, in this article we shall consider a more general measure that can be used to indicate any kind of mutual interdependence – we mean Spearman's rank correlation coefficient, which is often denoted by a Greek letter ρ.The main idea of this coefficient is that we measure the correlation not between the raw data obtained from research but between the grades which are assigned to every piece of information. The list of data obtained from research is ordered from the lowest to the greatest and to every item we assign a rank according to the fractional ranking approach, i.e. the item that are equal receive the same rank which is the mean value of what they would get under the ordinal ranking. In this way we obtain two sets of data – two sets of grades corresponding to data received from research (PME and NA). The Spearman's rank correlation coefficient between PME and NA is the equal to the Pearson correlation coefficient for the grades corresponding to the experimental data. In our analysis we have obtained:

$$\rho = 0.756.$$

The value obtained from calculation indicates first of all positive correlation, which means that PME and NA are linked and increase together. Furthermore, one can agree that this value is close to 1 and, therefore, we can talk about strong correlation between PME and NA. Thus, we can agree that this calculation confirms the main hypothesis of the research.

The second step of the analysis is to transform the chart 1. into a diagram which presents the Spearman's ranks for the analyzed data. Now, to every respondent we assign a point such that its first coordinate is equal to the rank for the respondent's NA and the other coordinate is equal to the rank of the respondent's PME. For such points we can calculate a trend line based on least-squares estimation method. Chart 2. presents the Spearman's ranks and the trend line.

Chart 2. Spearmans's ranks and the trend line



The formula for the linear function which fits best to the data is:

$$y = 0.75x + 2{,}83.$$

The trend line is monotonically increasing which is connected with the fact that there is a positive correlation between NA and PME. One can notice that a number of points lie relatively distantly from the trend line. Some of those point lie above the trend line – like for example point (2; 15), which represents a respondent who is good at personal management but did not publish any articled in 2014. The reason for such situation might be the fact that the respondent is a young researcher and he or she has not published the results yet. Also we have some points which lie below the line – this situation means that they achieve relatively good research results but their management performance is weak. Apparently, the research results those respondents achieved in 2014 can be assigned to factors different than personal management – like great talent or successful cooperation with other scientists. Nevertheless, this research has proved that effective personal management goes together with good research results and, therefore, we believe that scientists representing all different areas of science will be encouraged to take interest in personal management.

Conclusion

The main goal behind the research has been achieved – we have confirmed that the quality of personal management is correlated with research results. The questionnaire devised for this research enabled us to calculate for each respondent personal management effectiveness score (PME), which was later combined with the number of articles the respondent published in 2014 (NA). By means of the Spearman's rank correlation coefficient we have proved that between PME and NA there is a strong positive correlation with the coefficient $\rho = 0.756$. Therefore, we can conclude that PME and NA increase together.

Naturally, there are certain drawbacks connected with the conducted research that may have influenced the final result. First of all, the number of respondents who contributed with complete answers is not sufficiently high to generalize the conclusion for the whole population of researchers in Physics. Furthermore, in this article we have limited our consideration about research results to the number of articles published in 2014. We asked only about the articles published in journals belonging to Thomson Scientific Master Journal List, because in this way we wanted to take into account only articles of relatively high quality. However, the problem concerning how to evaluate someone's research performance is an open question. Surely, one piece of information does not reflect perfectly the level of research performance. In the questionnaire we put also a question concerning the impact factor of the journals in which a respondent published his/her articles, but only one person filled in properly an answer to this question. Naturally, in future research we will try to come up with more complex formula to evaluate research results. This issue is currently a hot topic and is widely discussed, for example a recent report Wilsdon, J., et al. (2015). Even when one finds a method for research results evaluation which is commonly accepted, there still will be a risk that researchers might be unwilling to contribute to the research because they find it too time consuming to complete a questionnaire.

This article is the first step towards an answer to the question: “What makes a good researcher in Physics?”. We wanted to indicate that a good physicists is also a good manager. Apparently, there are more factors that determine how successful a person is as a scientists. For the future we are planning more elaborate research concerning the factors that affect the research results in Physics. We are planning to research among both individual researchers and research teams. We do hope that determining the crucial factors that influence the research results will contribute to the growth of Physics.

References

[1] Bornmann L., Marx W. (2011). The h index as a research performance indicator, European Science Editing 37(3), pp. 77-80.

[2] Bornmann L., Marx W. (2014). How to evaluate individual researchers working in the natural and life sciences meaningfully? A proposal of methods based on percentiles of citations, Scientometrics, 98(1), pp. 487-509.

[3] Clark G. (2007). A Farewell to Alms: A Brief Economic History of the World. Princeton, Princeton University Press.

[4] Elliott A.C., and Woodward W. A. (2007). Statistical analysis quick reference guidebook. With SPSS examples. Thousand Oaks, Calif: Sage Publications.

[5] Galor O. (2005). From Stagnation to Growth: Unified Growth Theory. Handbook of Economic Growth, 1(1), pp. 171–293.

[6] Gatignon H. (2010). Statistical Analysis of Management Data. New York, Springer-Verlag.

[7] Hirsch, J. E. (2005). An index to quantify an individual's scientific research output. Proceedings of the National Academy of Sciences of the United States of America, 102(46), 16569-16572.

[8] Kothari C. R. (2009). Research Methodology. Methods & Techniques, Delhi, New Age International Publishers.

[9] Romer D. (2011). Advanced Macroeconomics. New York, McGraw-Hill Education

[10] Solow R. M. (1956). A Contribution to the Theory of Economic Growth, Quarterly Journal of Economics, 70(1), pp. 65 – 94.

[11] Swan T. W. (1956). Economic Growth and Capital Accumulation, Economic Record, 32(2), pp. 334 – 361.

[12] Wilsdon, J., et al. (2015). The Metric Tide: Report of the Independent Review of the Role of Metrics in Research Assessment and Management. DOI: 10.13140/RG.2.1.4929.1363

[13] Zinkina J., and Korotayev A. (2014) Explosive Population Growth in Tropical Africa: Crucial Omission in Development Forecasts (Emerging Risks and Way Out). World Futures, 70(2), pp. 120–139.

Appendix 1. Data analyzed in the research: NA and PME scores and Spearman's ranks

No.	NA	PME	NA rank	PME rank
1	0	5.83	2	15
2	0	4,33	2	8
3	0	3,06	2	2.5
4	1	3,78	4.5	5
5	1	2,89	4.5	1
6	2	5,17	6.5	12
7	2	3,39	6.5	4
8	3	4,44	9	9
9	3	4,28	9	7
10	3	3,06	9	2.5
11	4	5,17	12	12
12	4	5.17	12	12
13	4	4,5	12	10
14	5	6.06	15	18
15	5	5,28	15	14
16	5	3,83	15	6
17	6	6,22	17.5	21.5
18	6	5.89	17.5	16.5
19	7	6.17	19.5	19.5
20	7	5.89	19.5	16.5
21	8	6.22	21	21.5
22	9	6.17	22	19.5