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DOES THE CAPITAL OF KNOWLEDGE AFFECT THE ECONOMIC GROWTH – ECONOMIST'S VIEW

Summary

The author distinguishes three fields of research concerning knowledge and the so-called knowledge-based economy:

– definitions and general reflections based on theory;
– *international comparative analyses of general character;*
– international comparisons and analysis based on statistical and econometric methods.

Then, the results of research within the three afore-mentioned disciplines are discussed.

The conclusion states that knowledge is the main determinant of growth in the long run, but in the short and medium perspective, it is only one of a number of other determinants affecting the growth rates.

In the final part, the author emphasizes the role of the quality of education and intellectual capital in the long-term economic growth of the country.

Keywords: knowledge, knowledge-based economy, determinants of the development

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Knowledge – this word is a key that opens many doors. It is used or rather overused in different meanings, without a clear definition. And thus, for instance, politicians often say "I have no knowledge regarding this subject" (e.g. corruption in town X) instead of saying "I have no information regarding this subject". Similar doubts can rise to the expression "knowledge-based economy" frequently used by economists and economic activists and completed by the statement that

it came into existence only at the turn of the XXth and XXIst centuries, without an attempt at formulation of a precise definition.

The scientific works that focus on the problems of economy - knowledge relationship deal with – to simplify it – subject groups as follows:

– definitions of the concepts of "knowledge" and "knowledge-based economy" and considerations of generally theoretical nature;

– comparative international analyses and formulation of general conclusions based on them;

– formalised statistical and econometric methods applied in order to discover relations between knowledge and economic development level as well as growth rate.

As publications characteristic for the first tendency two volumes of papers edited by Antoni Kukliński under the title "Gospodarka oparta na wiedzy" (The Knowledge-based Economy") should be mentioned (some fragments could qualify them to the second subject group mentioned).

Two publications: „Wiedza a wzrost gospodarczy" (Knowledge and Growth Rate) ed. Leszek Zienkowski and „Rola polskiej nauki we wzroście innowacyjności gospodarki" (The Role of Polish Science in the Growth of Economic Innovativeness) ed. Ewa Okoń-Horodyńska could be included to the second group of studies (as above both publications contain papers which should rather be included to the third mentioned tendency of scientific research).

Finally as a publication characteristic for the third subject group, to which the papers on the issues of formalised econometric methods and the results of empirical research which uses these methods, I would mention the book „Gospodarka oparta na wiedzy" (The Knowledge-Based Economy) edited by Władysław Welfe (the title identical with the publication edited by Antoni Kukliński!).

It should be added that a recently (in 2008) published „Raport o kapitale intelektualnym Polski" (The Report on Poland's Intellectual Capital) prepared by the Prime Minister's Team of Advisers, led by Michał Boni, presents in a popular form current data concerning Poland's intellectual capital juxtaposed against data of other EU countries

All above mentioned publications contain relatively highly generalised analyses both as far as situational diagnosis and forecasts are concerned.

I would like to stress that the selection of publications is subjectively mine and covers a small number of Polish, arbitrarily chosen, publications whereas rich references in foreign languages are purposely omitted.

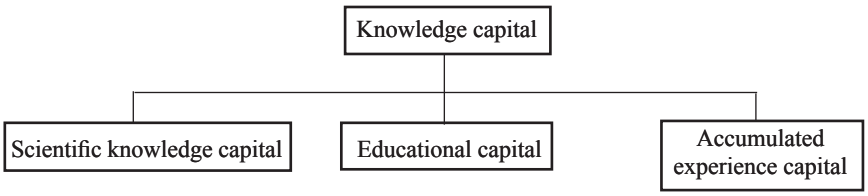
Further on I will concentrate on the issues of the impact of knowledge on economic growth, before however, I will try to define what, in this context,

I understand under the concept of "knowledge" and "knowledge-based economy" (a knowledge-managed economy", "a new economy").

According to the PWN encyclopaedia (an encyclopaedia edited by Polskie Wydawnictwo Naukowe, Polish Scientific Publishers) knowledge is "a total of pieces of information acquired through learning, stock of information from a certain field". Not every piece of information or piece of news is tantamount to the concept of "knowledge". A stock of information is defined as knowledge (e. g. knowledge of agriculture, military knowledge, knowledge of the world etc.), however always provided that a piece of news or information refers to some broader field and it is not limited to an individual piece of information or knowledge. It should be added that a learning process which leads to acquisition of knowledge cannot be reduced to studying and obtaining higher education. "Learning" also takes a form of scientific-research works and proceeds through an ordinary cumulation of experience within a specific field.

Abstaining from a lengthy discussion about the very definition I will further suggest a list and classification of the fields in which knowledge capital (accumulation of knowledge) comes into existence within the context of knowledge-economy correlation. In this case a term "capital" refers to the traditional in economics definition of factors of production: land, labour, capital (fixed capital). Recognizing that knowledge is a mean of production different from others, accumulation of knowledge can be called knowledge capital. Thus domestic product is manufactured not by three but four factors of production: land, fixed capital, labour, knowledge capital (or by three, if land is to be treated as fixed capital). It is evident model simplification, as knowledge is objectified in fixed assets (fixed capital) and creating the so called educational capital it materialises in people the factor of production which "labour" is. Thus an approach stating that knowledge is not a separate factor of production is possible.

Knowledge capital consists of: (I) scientific knowledge capital (knowledge being a result of scientific research), (II) educational capital (knowledge resulting from education – real knowledge, different from the formal one), (III) accumulated experience capital (knowledge and skills acquired through experience). Knowledge capital is sometimes defined as intellectual capital.



Starting my discussion of the concept of knowledge-based economy I will state that this concept was introduced at the end of the last century and its meaning and scope have not been unambiguously defined yet, neither generally accepted.

According to Professor Andrzej Koźmiński "knowledge-based economy is such an economy in which a prevailing number of enterprises base their competitive advantage on knowledge" (quoted after Balicki[1]). While agreeing with the merits, a comment is necessary that it is not clear how the knowledge-based "competitive advantage" should be defined. Thus operationalisation of the definition is indispensable.

Then Zienkowski[2] has proposed a somewhat different definition, according to which: as a contemporary existing knowledge-based economy could be recognized the economy in which knowledge (knowledge capital) has become a crucial growth factor (growth determinant), as opposed to fixed capital and labour. Econometric analyses can confirm or deny the existence of such an economy.

Looking at those issues from a broader historical perspective, in my opinion it was knowledge that from time immemorial has determined, as the so called last resort, on development of knowledge. Wasn't it knowledge that was the basis of striking fire skills or wheel construction, that is two "inventions" which, probably to the highest extent, were decisive for the development of the Earth's civilization?

The impact of knowledge and scientific progress as well as innovativeness of economy on growth rate deals with a long time, i. e. dozens or even hundreds of years. Development of knowledge has decided on emergence of new economic powers and intellectual stagnation resulted in their fall (China, Egypt, Arab countries, Turkey). Economic development has always been strictly connected with innovativeness of economy coming into existence basing on knowledge. Knowledge has been "a tool of all progress" and it is not a specificity of the XXth or XXIst century.

However, let us be back to the present. As I am going to prove the results of many economic analyses enable us to formulate a thesis that at the turn of the XXth and XXIst centuries knowledge capital was not a main growth determinant

[1] Andrzej Balicki, *Uwagi dotyczące realizacji w Polsce programu budowy gospodarki opartej na wiedzy*, (Comments on Realisation of Building the Knowledge-based Economy Program in Poland) [in:] *Gospodarka oparta na wiedzy, perspektywy Banku Światowego*, (Knowledge-based economy, The World Bank's Perspectives) KBN 2003, ed. Antoni Kukliński, p. 123.

[2] Leszek Zienkowski, *Gospodarka „oparta na wiedzy"– mit czy rzeczywistość,* (The Knowledge-based Economy – a Myth or Reality) [in] *Wiedza a wzrost gospodarczy, (Knowledge and Economic Growth)* ed. Leszek Zienkowski, Scholar 2003, p.15.

in a medium 10–15 year period. At the same time a hypothesis cannot be rejected that in the future, in thirty – forty years, the situation of the European continent will change so, that exactly knowledge will become a crucial growth factor also in the medium and not only long-run period.

Economic growth determinants

Direct determinants – short-run

Capital, labour, independent technical-organizational progress (TFP)

Indirect determinants – medium-run

Conditions of runnning business activity

Economic and social policy

Indirect determinants – long-run

Science, knowledge, innovativeness (scientific knowledge capital)

Education and level of society's knowledge (knowledge capital)

Level at civilization and culture – mentality (social capital)

The so called endogeneous growth theory should be considered as a main trend in the economic thought of nowadays as well as the formalised endogeneous growth models based on the above mentioned theory.

Let us remind that the essential assumptions made at construction of an endogeneous growth model are as follows:

– All factors of production (and not only fixed assets) come into existence as a result of accumulation – and it refers in particular to accumulation of the so called knowledge capital.

– Technical and organizational progress depend on a broadly understood social-economic policy and broadly understood society's culture and mentality.

– The factors of production are effectively used only when there exists a stable legal framework that regulates business activity and protects ownership rights.

Thus knowledge is one of the factors of production in theory (and as a model). Accumulation of knowledge capital, that is the results of outlays for science (R&D) and education give grounds for the growth of economic innovativeness,

which in turn is a factor highly decisive for competitiveness of economy. In parallel with knowledge capital the outlays for fixed assets are determinants of economic growth rate, in a degree dependent on development level. Contrary to numerous opinions this "traditional" factor of production keeps playing an important role.

Further on, I give some international comparisons results that characterise the relations between the GDP *per capita* level and volume of fixed assets and level of knowledge (scientific knowledge capital and educational capital). The comparisons results refer to the OECD countries in 1999 and their interpretation should be very cautious, as direct transfer of relations concerning one point in time on change of relations between various points in time (time series) is at the very least doubtful.

The results of analysis of correlation between fixed capital resource (here limited to machines, equipment and means of transport) and the GDP (*per capita*) level indicate – as it could have been expected – a very high relation ($R^2 = 0,87$) between fixed capital resources and the GDP level. Empirical data deviations from the theoretical curve are relatively small.

The correlation between scientific knowledge resources and the GDP level is not so strong as in the case of fixed capital, however also definitely high ($R^2 = 0,69$). What is more important, however, considerable deviations of empirical data from the theoretical curve occur here. The countries having relatively large scientific knowledge capitals are Sweden, Japan, Korea, whereas the ones with relatively low are, as ususal, the countries of Southern Europe (Greece, Spain, Italy) and Ireland.

Then, the comparisons of educational capital *per capita* with the real GDP *per capita* level achieved in 1999 indicate existence of a statistically essential and strong relationship between the society's formal knowledge level (formal education level) and the GDP level. Empirical data are very close to the theoretical curve, except that Switzerland is the country with capital level relatively higher in relation to the theoretical curve and Ireland - relatively lower (Poland – the position close to the theoretical curve).

Actual knowledge level (scholarisation level) is also distinctly correlated with the GDP *per capita* level, although – which can be strange – this relationship is not so strong as in the case of formal knowledge capital ($R^2 = 0,54$). Also considerable differences occur between empirical data and the theoretical curve. The countries in which scholarisation level is particularly high in comparison to the achieved development level are Sweden and the Czech Republic. Relatively low scholarisation level in relation to the GDP level especially occurs in Portugal,

Slovakia and Ireland (!) as well as – at a high absolute level both of the GDP and scholarisation – in the USA (in Poland relatively low levels both of scholarisation and the GDP were observed).

The conclusions that could be formulated on the basis of international comparisons results discussed in the book "Knowledge and Growth Rate" are as follows:

– the structure of the use of available factors of production can differ considerably between the countries with similar economic development level (various "development paths" are possible),

– the impact of scientific knowledge capital on economic development depends not only on the volume of outlays for science but also on the effectiveness of the outlays, creativeness of scientific – research workers and domestic institutions either supporting or slowing down initiatives and innovativeness,

– the innovativeness of economy is not the effect of domestic research and development activity but also of the modern technologies and "know-how" imports

– one can risk a hypothesis on mutual synergistic relationships between the GDP level and outlays for R&D (outlays increase along with the GDP growth, whereas the GDP level increases with the increase of outlays),

– ability to create and absorb technical development, indispensable for achievement of the high economic development rate, must be connected with high outlays for fixed assets (infrastructure included) especially in the countries that are catching up with highly developed countries) – in these countries growth of fixed assets volume keeps being a fundamental factor decisive for economic development; simultaneously economic growth rate is strongly dependent on the advancement of reforms of economic institutions (law and its enforcement, simplicity and clarity of regulations, reduction of bureaucracy etc.),

– the GDP *per capita* level is relatively strongly related to the volume of the so called society's knowledge capital (education level) – the dependence is significant over time, especially as the long-run processes are concerned.

Here, a commentary on recent (2006) international research results referring to intellectual capital of 16 European Union countries. Intellectual capital measures have been presented in *Raport o kapitale intelektualnym* Polski (The Report on Poland's Intellectual Capital). Generally speaking they support the results formulated on the grounds of international comparative analyses carried out a few years ago.

Further on, I will limit myself to these intellectual capital measures that only refer to educational capital (EC). Educational capital measures which characterise

quality of knowledge of primary, secondary and higher schools students, middle age and senior people (people included in the study have been conventionally divided into such groups) enable to distinctly discern "the leading countries" with relatively high EC and "the straggling countries" with a relatively low EC). Simultaneously it should be stressed that the results base on cross-sectional study, i. e. deal with one moment in time.

The countries which can be called leaders in all mentioned groups are Finland, Holland, Sweden, then Germany, Austria, Ireland (a completely different evaluation of educational capital level in Ireland from the one resulting from the studies carried out in the years 1994-1998 is remarkable), Great Britain and Belgium. The straggling countries are: Greece, Portugal, Spain, Italy, Poland and the Czech Republic, whereas the two last ones achieve – which is surprising – rather good results in the evaluations of intellectual capital of school youth.

Of particular interest are EC evaluations of students, that is the group of future intellectual elites. Leading countries are Great Britain, Sweden, Ireland and Finland. Poland is here at the very end together with Greece, Portugal and the Czech Republic, and from among high schools only two from Poland have been included in the world's ranking of 500 best schools. Greece, Portugal and the Czech Republic come close to Poland. Four first places are taken by: Germany, Great Britain, Italy and France.

Highly possible is a hypothesis that a low average EC level of Polish students is affected by a low level of numerous private high schools, which exist as high schools in name only and the low EC level of extramural students. The increase of students number in Poland is not equivalent to the increase of educational capital.

As indicated by the results of analyses carried out a few years ago, a clear relationship was observed, what has not been reflected in *Raport*, between a country's economic development level measured by the GDP *per capita* and educational capital level. In the educational field the GDP *per capita* of eight "leading countries" is running at a considerably higher level from the average in the EU countries (EU 27), and in six "straggling countries" – at the considerably lower level from the average GDP level in the EU countries. In that context a low position of Poland, after all one of the EU's poorest countries, is not a surprise and what is rather interesting, the quality evaluation results of knowledge of school youth are surprisingly good.

A completely different picture of situation appears from the analysis of relationships in time, between the GDP growth rate in the last decade (1995–2006) and the level of education (educational capital) in those same sixteen countries.

And so the GDP dynamics in Greece, Spain, Poland and the Czech Republic, that is in the low educational capital countries, is distinctly higher than in the "leading countries" in the educational field, i. e. there is no clear correlation between the GDP growth rate and the level of education.

Here it can be added that also the econometric analyses carried out in Instytut Ekonomiczny NBP (The Economic Institute at National Bank of Poland) by S. Roszkowska, based on the measures presented in *Raport,* show that there is no statistically essential correlative relationship between the educational capital level (of school youth, students, adults and seniors) and the GDP dynamics in the decade of 1995 – 2006. Simultaneously it can be stressed that the results of analyses indicate the occurrence of a very weak (hardly noticeable) correlation between the educational capital level (students, adults, seniors) and the dynamics of social labour productivity.

The results of analyses confirm the existence of correlative relationship (albeit rather weak) between the GDP per capita level (2006) and the educational capital of students, adults and seniors. No correlation between educational capital and the GDP in the group of school youth can be explained by a small differentiation between the European countries under analysis. Moreover educational capital in this group has no direct impact on the actual GDP level. The latter can be affected only in the future.

A general conclusion to be drawn from all those international comparisons can amount to confirmation of the formerly formulated thesis, according to which educational capital level and scientific knowledge level have a weak impact on the economic growth rate within an average ten-fifteen year period. The effect of other factors is stronger. At the same time the hypothesis according to which a relatively high growth rate in the low GDP per capita countries in the initial time has been achieved, to a large extent, not by the development of domestic scientific research or increase of education level, but due to imports of new technologies and new generation machinery requires in-depth verification. The imports raised a total efficiency of factors of production by leaps and bounds, which is by the way, consistent with basic convergence theory propositions. Simultaneously the achievements of countries were considerably different – some achieved successes, other, and especially Portugal, increased distance to higher developed countries.

It can supposed, however, that a relatively insignificant effect of knowledge capital on yearly acceleration of growth rate cumulates and becomes vital for the changes of relative position of the country in economic growth scale over a long thirty-forty year period. If the hypothesis formulated here matched the reality,

it would indicate there is no contradiction between the results of cross-sectional analyses and the results of time series analyses.

Moving to a concise characteristics of the results of studies based on formalised econometric models I would like to state that, in my opinion, international comparisons and theoretical considerations provide us with irrefutable arguments supporting the thesis on the impact of knowledge capital on economic growth level and dynamics. That does not mean, however, that knowledge capital is a basic factor decisive for growth rate over short and medium periods. Also other factors of production play essential roles here. Thus a task of econometric type analyses is to examine the impact strength of knowledge capital on growth rate and period (long, medium) of its manifestation, moreover a possible indication of the specific conditions found in some countries or periods in which the impact on knowledge capital, or to be specific, educational capital, is negligible.

While evaluating credibility and precision of the results of calculations and model simulations one should realise that behind a description of explanatory variables lie symptomatic measures strongly, as a rule, simplified with regard to the definition of variable. And thus, for instance, writing about human capital it is not always stressed that in reality measurement deals with educational capital, and what more, sometimes measured in a so to say "simplified manner" – this is e. g. the share of expenses for education or scholarisation level in the GDP[3]. Let us remind that theoretically human capital it is not only education level but all psychophysical characteristics, so also inborn skills, cultural level, mentality in general, as well as physical condition and state of health.

Analysing relationship between scientific knowledge capital and the GDP level and dynamics the relations of cumulated expenses for R&D to the GDP are frequently assumed as a measure symptomatic for scientific knowledge capital[4]. Such and similar simplified research procedures are unavoidable, yet it should be remembered.

Unambiguous conclusions regarding the phenomenon dynamics in time are often formulated on the grounds of international cross-sectional studies (dealing with one moment in time) or cross-time ones. In my opinion this kind of interpretation of results of studies is debatable. Frequently, the results of cross-sectional

[3] This measure can lead to particularly erroneous conclusions in analyses referring to highly developed countries – possibilities of further increase of scholarisation are limited there which can lead to decreasing impact of education on economic growth.

[4] Leszek Zienkowski, *Gospodarka oparta na wiedzy – mit czy rzeczywistość* Knowledge -based Economy – a Myth or Reality), [in:] *Wiedza a wzrost gospodarczy (Knowledge and Economic Growth)*, Scholar 2003, p. 26.

comparisons can lead to erroneous conclusions when they are unreservedly transferred to change processes in time in one country.

Excluding extreme cases the results of econometric models, while confirm theoretical considerations on the impact of knowledge capital on economic growth, considerably vary in the assessment of the scale of this impact.

According to e. g. W. Florczak[5], it can be assumed that economic growth elasticity in relation to human capital (educational capital) in the renown models runs from 0,125 to 0,655. For the economist-researcher so considerable differences in results are very uncomfortable. The same author states that the range of 0,08 to 0,79, thus even larger, should be assumed for the studies on the impact of human capital on economic growth in Poland.

Finally, it is worth stressing that the most general assessment derived from the results of model econometric analyses comes down to a conclusion on a clear very essential impact of the increase of knowledge capital on economic growth in the long-run, lack of short-run effects and an essential impact in the medium period, conditional, however, on co-appearance of other factors, especially such as outlays for fixed assets and openness of economy (in closed economies that have no access to the newest technologies, the domestic knowledge capital does not contribute to the aggregate productivity growth of factors of production).

Accepting as an initial point a realistic assessment of situation – relatively low expenses for R&D, especially in the sector of enterprises, unsatisfactory number of highly qualified scientific and engineering staff, relatively low level of educational capital (formal knowledge) and low scholarisation level (actual knowledge as opposed to formal education level) – one cannot expect a significant increase of outlays (provided it would be possible) for R&D in Poland in the nearest years would bring far reaching effects.

Much better chance of the increase of innovativeness in Polish economy and acceleration of growth rate in the coming years consists, not in a quick growth of outlays for domestic R&D, but in the increase of import of new technologies and technical thought (case of Ireland) and their adequate use for transformation of economic structure. Then outlays for R&D would be oriented to provide for accelerated absorption of imported technologies.

Only higher educational capital of the society and the intellectual elites of all areas of life created on its basis and supported by social-economic policy, as

[5] Waldemar Florczak, *Kapitał ludzki a rozwój gospodarczy (Human Capital and Economic Development*, [in:] *Gospodarka oparta na wiedzy (Knowledge-based Economy)*, ed. Władysław Welfe, PWE, p. 166.

well as a change of society's mentality can bring about the situation in which domestic scientific-technical thought will make a fundamental development agent. Only then a significant increase of outlays for domestic R&D (up to the level of Finland) can result in the essential acceleration of economic growth rate.

Financial effort of the country directed to R&D can be wasted and the economy unable to effectively absorb the produced scientific-technical progress unless a parallel growth of knowledge and number of educated staff occur.

As the past and present history shows, the inclination for innovations resulting in the fast rate of economic growth is significantly affected by "the social climate". The state can create a climate favourable for creators and talents through its social-cultural policy exposing a role of human thought in development processes. At the same time promotion of elites in all milieus and at every level, starting with school, and not yielding to pressures of mediocrities are necessary. Not lowering but rising the educational quality standards paves the way for progress. It is not an easy task – requires tact and can provoke social conflicts, however necessary, because the very growth of only formally well educated population number does not contribute to economic or social development.

An adequate social climate can create proper conditions for rewarding intellectual achievements adequately to their significance and one does not have to be afraid of public reprobation for the resulting increased differentiation of incomes.

Ethos of a poor outstanding scientist or inventor, if it has ever existed, belongs to the past. This is not an example to be followed by students. Young talented people, who to the benefit of all could be involved in scientific career and even prefer freedom offered by practising science to money, cannot accept exceptionally low material status a scientist has in Poland (an average clerk in the Ministry of Foreign Affairs, not to speak about banking sector earns more than a full professor).

One should agree that doubling the amount of remunerations of all involved in science and technology surely would not give desired results. However a chance of promotion for those who achieved success in science should be created, accompanied by pecuniary advancement on a large scale in order to motivate talented and ambitious people. Economic development is created by elites and, for public good, their remuneration should be considerably higher from an average (incidentally, only then it is possible to prevent emigration of the most talented). "One distinguished professor brings more credit and benefit than a great number

of less talented people", are the words of the emperor Joseph II of the XVIIIth c. (quoted after K. Zienkowska)[6].

It should be emphasised that the impact of knowledge on economic growth rate in a medium period should not be overestimated in the countries catching up with highly developed countries and Poland belongs to them. It is one of, but not the only one, factors crucial for narrowing the development gap.

In the less economically developed countries, catching up with highly developed countries, the fixed assets resources (fixed capital) are considerably smaller than in the highly developed ones. That is the importance of outlays for investments in fixed assets is different in those countries in relation to the importance of outlays for knowledge and innovation interpreted as factors of production. The thesis matching with the higher developed economies does not correspond with the situations of less developed countries.

In the economy which has relatively small fixed capital, every additional unit of it results in the growth higher than in the economy which has relatively large capital (falling extreme productivity of factors of production). Thus the impact of outlays for fixed assets on economic growth in less developed economies is relatively significantly higher than in higher developed economies. Whereas the impact of knowledge and innovations is relatively lower than in highly developed economies, which because of already high saturation with fixed assets, have to a large extent base their development on the so called immaterial factors (it should be noted that also in such economies the relation between the level and rate of investment growth and the GDP growth is still essential).

In accordance with model simulations by W. Orłowski[7] a gradual increase of outlays for R&D in Poland from the actual level of 0,7% in relation to the GDP up to 3,7% (as it is nowadays in Finland) can rise, in the year 2040, the GDP level by 8% in comparison to the situation where there is no increase in the share of expenses for R&D in relation to the GDP. Simultaneously, as it results from the model, relatively inconsiderable, only by two per cent points, increase of the share of investments in the GDP, in comparison with the present low level, can bring – at the assumption that the share of expenses for R&D in the GDP does not increase – almost the same percent increase (by 7% percent) as the increase

[6] Krystyna Zienkowska, *Korzenie polskiego zacofania* (The Roots of Polish Underdevelopment), [in:] *Wiedza a wzrost gospodarczy, (Knowledge and Growth Rate)* ed. by Leszek Zienkowski, Scholar 2003, p. 66.

[7] W. M. Orłowski, *Scenariusze rozwoju sektora wiedzy w Polsce do roku 2040* (The Scenarios of Development of Knowledge Sector in Poland) [in:] *Wiedza a wzrost gospodarczy* (Knowledge and Economic Growth),Scholar 2003, pp. 2009–2210.

of the share of outlays for R&D in the GDP by 3 per cent points at the end of analysed period.

In Poland the significance of knowledge and innovations, understood as the economic growth factor, will keep rising along with the increasing volume of capital resources and reduction of distance towards highly developed countries. Thus significance of the outlays for domestic R&D will increase. All the same in the nearest decade economic growth will still considerably depend on the growth of investment volume and the relevant increased absorption of imported technical progress as well as the advancement of economic reforms.

The above does not mean that already at present economic policy should stop attempts at the increase of knowledge capital and, especially, development of scientific staff and their level as well as at improvement of education quality at the elementary, secondary and higher level. The gap separating Poland from highly developed countries is dramatically high. In the future a significant growth of intellectual capital can condition achievement of success in levelling differences in civilisational development level and living conditions between Poland and highly developed countries.

As many things point to the fact[8], we are the day before the world educational revolution which will result in improvement of education quality not only in the highly developed countries but also in the countries of Asia, Africa and South America until recently considered backward in terms of education level. One can be afraid if Poland, by any chance, does not stand aside of this process considering conservatism and resistance of the circles connected with education, starting from primary through higher education. I would like to believe the fears are groundless. What is alarming, however, is the fact that *Raport* o *kapitale intelektualnym Polski* prepared by the Prime Minister's Team of Advisers has not aroused any particular interest of media and provoked almost no debate. None broader understanding exists for the needs of improvement of the education quality and lowering the age of children starting their education.

BASIC PUBLICATIONS IN POLISH

Gospodarka oparta na wiedzy – Wyzwania dla Polski XXI wieku (The Knowledge-based Economy – The Challenges for Poland of the XXIst Century), Komitet Badań Naukowych (State Committee for Scientific Research), Warszawa 2001, ed. by Antoni Kukliński.

[8] See: *Special Report: Education*, „Newsweek", August 18/August 25, 2008.

Gospodarka oparta na wiedzy – Perspektywy Banku Światowego (The Knowledge-Based Economy, The World Bank Perspectives) Komitet Badań Naukowych, Warszawa 2003, ed. by Antoni Kukliński.

Gospodarka oparta na wiedzy (The Knowledge-based Economy), Państwowe Wydawnictwo Ekonomiczne, Warszawa 2007, ed. by Władysław Welfe.

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