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Matching higher education offer with labour market needs till 2020 - the case of Lodzkie Region

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1. Introduction

The Lodzkie Region is seen as a region with high development potential. The excellent location (the Lodzkie Region is located in the central part of Poland, at the intersection of several major arterial roads: Berlin-Moscow and Gdansk-Vienna) combined with solid research base and focus on the concept of Open Innovation, create competitive environment for regional development[1].

Strategic planning in the Lodzkie Region is based on two main regional strategies: the Regional Development Strategy for the Lodzkie Region 2020 and the Regional Innovation Strategy LORIS 2030, which were adopted by the Regional Parliament in the first half of 2013. The main pillar of development, pointed out in the Strategy, is advanced economy of knowledge and innovation[2]. To create such economy, a technological restructuring should take place by 2020.

The analysis prepared in the framework of RIS LORIS 2030 distinguished six regional smart specialisations: modern textile and fashion industry (including design); advanced building materials; medicine, pharmacy, cosmetics; energy, including generation of energy from renewable energy sources; innovative agriculture and food processing; IT and telecommunications. Simultaneously, four key technological areas, that should support economic development of the region, were chosen: biotechnology; nanotechnologies and functional materials; mechatronics; and Information and Communication Technologies[3].

At the same time, one of the main challenge is counteracting the effects of the society ageing and negative migration balance. The forecasted decline in population in the Lodzkie Region,

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[1] OECD (2013), *Łódzkie Region: Demographic Challenges within an Ideal Location*, OECD Local Economic and Employment Development (LEED) Working Paper Series
[2] Lodzkie 2020 (2013), *Strategia Rozwoju Województwa Łódzkiego 2020*, Biuro Planowania Przestrzennego Województwa Łódzkiego, Lodz, p. 73.
[3] LORIS 2030 (2013), *Regionalna Strategia Innowacji dla Województwa Łódzkiego – „LORIS 2030”*, Deloitte, ŁARR, Lodz.

according to the Polish Central Statistical Office, will continue to the year 2035, resulting in a loss of young and skilled professionals for the region, unless strategic decisions are made to rectify the situation[4].

One of key challenges to achieve the strategic development goals of the Lodzkie Region is to adapt labour force, quantitatively and qualitatively, to the changing demand for labour. Changes on the regional labour market are determined by transformation to post-industrial or knowledge-based economies that is characterised by growing demand on highly-qualified workforce. Creation of adequate stock of human capital requires smart investments. Therefore the higher education system, which is supposed to supply people with high-level skills and knowledge, plays crucial role in this process.

The paper focuses on the linkage between higher education offer and labour market needs in the regional perspective. The goal of this paper is to analyse the extent to which the higher education is able to response to demand-driven changes on the Polish labour market, especially in the Lodzkie Region, till 2020.

We use the newest employment forecast data to 2020 to present the development patterns of the labour demand in Poland and in the Lodzkie Region. The analysis of the data seems to confirm, that shifts in the sectoral and occupational structure of employment will follow the path consistent with the hypothesis of the skill-biased technical change. This implies growing demand on skills, and thus growing importance of the ability of higher education system to meet this challenge in coming years.

2. Determinants of changes in the system of higher education in Poland

Since 1990, higher education in Poland has undergone profound and dynamic changes, which have been determined by shifts in the organization of the state and the economy. The Polish transition enabled introduction of legal, organizational and institutional changes in the field of higher education while the market economy has intensified the process of "massification" of higher education[5]. As a result, Polish institutions of higher education in the early 1990s began to catch up, meeting the society's expectations and the demands of the economy. The processes of European integration and globalization have determined new conditions and environment of functioning of the higher education institutions (Table 1).

[4] OECD (2013), op. cit.

[5] The process of "massification" of higher education took place in other countries much earlier – e.g. in the United States - in 1960s, in Canada - in 1970s, and in the Western Europe - in 1980s.

Table 1. Determinants of educational policy of the higher education institutions in Poland

	Political and institutional determinants	Economic determinants	Social determinants
1990s	➢ Lack of comprehensive education policy at the national level ➢ The new legal framework for the activities of higher education	➢ Dynamic socio-economic changes ➢ „Privatisation" of education services ➢ The demand for highly qualified managers	➢ Changing the approach to acquiring knowledge ➢ Competition on the labour market ➢ Unemployment avoidance
1997-2006	➢ Further legal changes in response to the rapidly growing demand for educational services (e.g. establishment of the Polish Accreditation Committee)	➢ Lack of adequate financial support for education and research ➢ Decrease of expenditures per student	➢ "Massification" of higher education ➢ Availability of student loans ➢ Growing availability of higher education - development of university subsidiaries
2006-2012	➢ The introduction of educational standards ➢ Intensification of actions constituting the European Higher Education Area	➢ Building a knowledge-based economy ➢ Extensive possibilities to obtain external funding for the modernization and development of higher education institutions	➢ Wide opportunity of formal and non-formal education ➢ The internationalization of the education process ➢ Increase of the "price" of knowledge
since 2012	➢ The introduction of the National Qualifications Framework for higher education and life-long learning	➢ A clear emphasis on the link between education and the economy especially in the context of the Europe 2020 Strategy	➢ The ongoing wave of population decline ➢ Promotion and intensification of mobility

Source: own analysis

Within more than twenty years of the evolution of the Polish higher education system, revolutionary changes, which have led to the development of the education market, modifying its structure and reorientation of priorities of education policy, can be indicated. The first years of the reform of higher education resulted in the development, on an unprecedented scale, of the educational offer. As a result, in years 1990-2000 gross enrolment rate increased from 12.9% (1990/1991) to 40.7% (2000/2001), while the net enrolment rate from 9.8% to 30.6%. In those years the first problems of "overproduction" of graduates with higher education, mismatch of graduates' qualifications to the changing labour market needs and the assessment of the quality of education appeared.

Polish accession to the European Union and the signing of the Bologna Declaration led to reorientation of the perspective on the organization of higher education system. "Europe of Knowledge" is the idea, which determines the successive stages of Community and Member States actions aimed at building an European Higher Education Area (EHEA) and improving the international competitiveness of the European higher education. National

Qualifications Framework is a new instrument serving to increase the transparency and comparability of qualifications and recognition of qualifications (of students and graduates), obtained in the framework of national education systems in the European Higher Education Area. The aim of the NQF development is not an unification or increasing rigidity of national systems of education (the Bologna Declaration favours sustaining and developing various forms, programmes and institutions of education) but providing a framework of comparability. This will enable comparison of levels of qualifications in one country with qualifications in other European countries by referring to the competences defined in the European Qualifications Framework[6]. The direct effect of the introduction of the Framework in higher education across Europe is creation of a dynamic "map" of qualifications appropriate to the levels of education (1st, 2nd and 3rd degree), which allows to increase the mobility of students by choosing the path of education at different levels in different countries of the European Higher Education Area[7].

3. Educational policy of the higher education institutions from the perspective of socio-economic environment - towards development of Human Resources for Science and Technology

More and more attention is paid to the linkage between the education system and the needs of the knowledge-based economy. Labour market in Poland and in the Lodzkie Region is changing under the influence of national, international, if not global factors. In recent years, the global financial crisis has had a significant impact on the labour market. However, in the long run it is expected that the global economy will return to growth path - as a result, fundamental challenges faced by the labour market (in Poland as well as in the Lodzkie Region) will be associated with a response to the main determinants of the development of labour markets on a global scale. These main determinants include three following megatrends:

- globalisation processes;
- technological development, especially development of Information and Communication Technologies,
- society ageing.

[6] The paper focuses on the European Qualifications Framework for Higher Education. Nevertheless, it should be noted that, in accordance with the recommendations of the European Parliament and the Council of 23 April 2008, it is assumed that eventually all qualifications awarded in Europe will contain a reference to the European Qualifications Framework for lifelong learning.

[7] *Autonomia programowa uczelni. Ramy kwalifikacji dla szkolnictwa wyższego*, Ministerstwo Nauki i Szkolnictwa Wyższego.

Globalisation has a significant impact on the labour demand, reinforces the duality of the labour market and leads to the development of the knowledge-based economy. In the era of globalisation, one of the most mobile production factors is the knowledge accumulated in the form of human capital. Dynamic technological development affects not so much the size of the labour demand as its structure – competence profiles of the employees are changing. New technologies require a higher level of skills - especially generic skills, not associated with a single company[8]. Many traditional occupations becomes redundant. Rapid progress and diffusion of new technologies, accompanied by new forms of work organization, lead to significant decrease of demand for low and unskilled workforce. The development of technology also results in the relocation process - the manufacturing industry, and, especially, market services are becoming increasingly universal and global, and the place - in terms of geographic location - in which they are produced is not important anymore. The processes of population ageing in developed countries (particularly in Western Europe) lead to lengthening the period of labour market participation of individuals. This implies a need for continuous updating of competences, because the economic obsolence of human capital[9] takes place in an ever faster pace, due to the rapid technological development.

All these processes lead to change in the paradigm of work - from industrial to post-industrial (information) paradigm. Full-time employment in standard hours and social security guaranteed by the state were features of the industrial paradigm, that dominated a few years ago in highly developed economies. Post-industrial (information) paradigm completely changed the hierarchy of values - spatial dislocation has taken place – work, in many cases, can be done anywhere, at any time, while working time has become flexible.

All megatrends that create post-industrial paradigm of work, point out to two important issues. Firstly, the modern labour markets require increasing flexibility to respond as quickly as possible to changes in the product, services and financial markets. Secondly, the role of human capital is growing – it becomes the main factor for maintaining competitiveness in the global market. It translates into the need to invest in human capital (in Poland and the Lodzkie Region), and, at the same time, to create such conditions that make the highly qualified staff to stay in the region to prevent the brain drain to other Polish regions or abroad.

[8] We refer to universal and transferable human capital in line with the Becker's human capital theorem.

[9] Economic obsolence of human capital is manifested in the inadequacy of skills of the labour force to the demands of employers - even though employees have some stock of human capital, this human capital is "outdated" and not suitable to the needs of the modern labour market. This can manifest in the fact that the demand for certain skills/occupation has ended and the market value of these skills has dropped to zero (see Allaart P., Kerkhofs M., de Kning J. (2002), *Skills Obsolescence and Technological Progress: an Empirical Analysis of Expected Skill Shortages*, The Economics of Skills Obsolescence, Vol. 21, pp. 119-138).

One of the main challenge for educational institutions is to train individuals in line with the needs of regional and national economy and to deepen the integration of the so-called „knowledge triangle" of research, education and innovation[10]. In particular, the universities are an important element of the educational system that reflects comprehensive, territorial and systemic approach to the problems of economy's innovativeness. The universities are a leading institution that shape the stock of human capital and raise the quality of labour force through education, training, consultancy services, and stimulating positive actions undertaken on the market (pre-incubators and academic incubators).

The EU documents clearly emphasises the role of universities as a strategic partner in the knowledge society and economy. This role consists of: the creation of new knowledge, its transfer through educational activities and training with the use of information and communication technologies, and the application of the knowledge for modern solutions in manufacturing and service industries[11].

The Europe 2020 Strategy[12] continues the process of building a knowledge-based economy advocated by the Lisbon Agenda. Its main targets focuses on employment, research and development, climate change and energy, education and reduction of scale of poverty. Two flagship initiatives, that are to catalyse the progress of the Strategy, are closely linked to the educational policies of universities. The goal of the "Youth on the move" initiative is to enhance the performance of education systems and to facilitate the entry of young people to the labour market. While the initiative "Innovation Union" puts emphasis on ensuring that the national systems of education provide adequate number of graduates in science, mathematics and engineering, as well as on the introduction of elements of creativity, innovation and entrepreneurship into curricula.

Knowledge-based economy sets new requirements not only to businesses, local and regional authorities, but also to universities which are to be a "producer" of knowledge, skills and social attitudes. In this context, education within the science and technology (S&T), especially in the following fields: biological sciences, physical sciences, mathematics and

[10] Matusiak K.B. (2010), *Uwarunkowania rozwoju infrastruktury wsparcia w Polsce* [in:] *Ośrodki innowacji i przedsiębiorczości w Polsce*, Raport 2010, Polska Agencja Rozwoju Przedsiębiorczości, Warszawa, p. 10.

[11] *The role of the universities in the Europe of knowledge* (COM/2003/0058 final). Communication from the Commission, 5th February 2003, http://eur-lex.europa.eu/legal-content/PL/ALL/;ELX_SESSIONID=wPPPTtPJ1LKPbNhSv8cfW9VQZ2vb1YcqpYH5ylhRw2J7yvtPXt1W!-1690509470?uri=CELEX:52003DC0058, accessed 12.05.14.

[12] Communication from the Commission *EUROPE 2020 A strategy for smart, sustainable and inclusive growth*, Brussels, 3.3.2010 COM(2010) 2020 final, http://eur-lex.europa.eu/legal-content/EN/ALL/?uri=CELEX:52010DC2020, accessed 12.05.2014.

statistics, computer and information sciences, engineering and technology, production and processing as well as architecture and construction, has been seen as of a great importance[13].

Since 1990s number of pupils studying technical sciences in Poland has decreased rapidly. In the academic year 1990/1991 in technical sciences studied 17% of pupils, in academic year 2005/2006 in engineering and technology sciences: 7.9% and in computer and information sciences: 5.3%. Three years later, the percentage of students in these fields decreased, respectively to 6.9% and 4.6% (academic year 2008/2009)[14]. Economics, administration and educational sciences have been so popular, that significantly weakened the demand for courses in technical sciences.

The external forms of support to education policy of higher education institutions play significant role in counteracting the negative trends in the demand for certain fields of study. This support is aimed at linking education to the needs of the labour market and economic conditions, at initiating and developing cooperation between universities, employers and R&D institutions, and at increasing the importance of practical forms of learning (apprenticeships). The most important initiatives include programs aimed at:

1. Strengthening and development of universities' learning potential and increasing the number of graduates in the fields of studies crucial for the knowledge-based economy. This includes opening new courses or specialization within existing courses, and introduction of the postgraduate studies. In addition, expansion of the educational offer within existing fields of studies, particularly in the areas relevant to the development of the economy, takes place.
2. The development and modernisation of the infrastructure of higher education institutions that is used for learning and research and development activities.
3. Supporting innovative academic entrepreneurship through cooperation of the R&D sector and businesses, where the key tasks are, among others, development of standards for cooperation between the universities and industry, the development of technology transfer centres, etc.

As a result, in recent years we have seen the catching up process in education in science and technology in Poland. In 2011 students in S&T in Poland accounted for 21.9% of all university students, in 2012 this share increased by 1.4 pp. In the European Union in 2011

[13] In the paper we focus on these selected fields of study that constitutes the category of human resources in science and technology – education (HRSTE).

[14] *Szkoły wyższe i ich finanse w 2005r*. (2006), Główny Urząd Statystyczny, Warszawa; *Higher Education Institutions and their Finances in 2008 (2009)*, Central Statistical Office, Warsaw; *Higher Education Institutions and their Finances in 2010 (2011),* Central Statistical Office, Warsaw.

in S&T studied 5.1 million people (25.3% of all university students). The highest percentage of individuals studying the S&T field of study was reported in Finland: 34.1% (a decrease by 1.0 pp compared to the previous year), Greece: 32.4%, and Germany: 32.1%, while the lowest percentage of S&T students was registered in the Netherlands: 13.9% and in Belgium: 15.6%[15].

4. Human Resources for Science and Technology in the educational policy of the higher education institutions in the Lodzkie Region[16]

The challenge for universities is to launch courses awaited by the economy, and to design these courses in collaboration with businesses and public institutions. "Knowledge-based enterprises" address most of their expectations to universities, which are perceived as a main partner for investment in knowledge and human capital[17]. Equally important impetus for starting new courses is the policy of the European Union that supports and promotes education in the science and technology field of study, on which the philosophy of "knowledge-based economy" and the targets of the Europe 2020 Strategy are based.

The largest share of individuals that constitutes a human resources for science and technology (HRSTE) in the group of people with higher education degree in Poland, was registered in the Mazowieckie Region: 19.7%. Slightly lower percentage was reported in the Silesia Region: 12.1%, and then in the Malopolska Region: 8.7%, the Wielkopolska Region: 7.9%, the Lodzkie and Lower Silesia Regions: 7.2%[18].

In recent years (2008-2013) in the Lodzkie Region we have observed a systematic increase in the rate of individuals studying in the field of study needed by the economy. Even though this rate increased by 6 percentage points through those 6 years, it still was lower compared to the leading European countries (Table 2).

Table. 2. The percentage of students in Science and Technology field of study in the Lodzkie Region

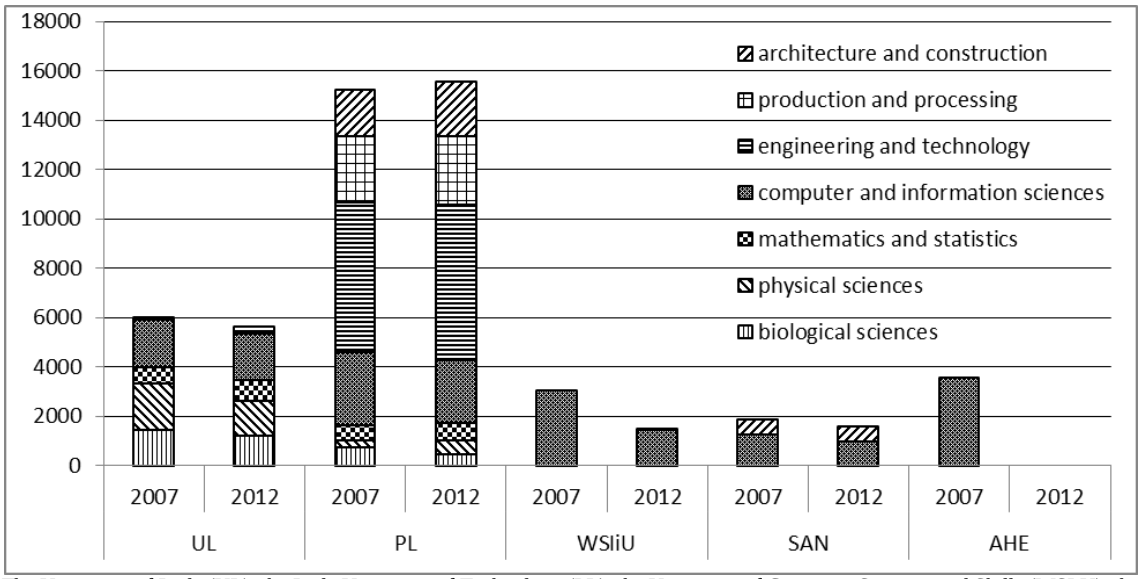
2007	2008	2009	2010	2011	2012	2013
21.1%	19.5%	20.3%	20.9%	22.0%	23.3%	24.6%

Source: own calculations based on data from the Statistical Office in Lodz.

[15] *Science and Technology in 2012* (2013), Główny Urząd Statystyczny, Warszawa.
[16] The analysis presented in this part of the paper was prepared within the research project „Policy and tools of creating human capital in the region" – project no N N 114 183938, 2010-2013, Principal investigator - Zbigniew Przygodzki, Ph.D.
[17] Przygodzki Z. (2014), *Zdolność absorpcji i percepcji roli kapitału ludzkiego w innowacyjnych środowiskach przedsiębiorczości w regionie łódzkim* [in:] Kapitał ludzki w regionie łódzkim z perspektywy przedsiębiorstw i rynku pracy, Przygodzki Z. (ed.), Wydawnictwo Uniwersytetu Łódzkiego, Lodz, s. 64-65.
[18] *Science and Technology in 2012* (2013), op. cit.

In 2000, 19 universities with 99 712 students operated in the Lodzkie Region. In 2012 there were 29 universities with 107 227 students. However, it must be emphasised that since 2009 systematic decrease of the number of students has been witnessed. The University of Lodz is a leader in the region - in 2012 38% of the total number of students (more than 40 thousand) studied at the University, which offers the largest range of courses. Slightly more than 20 thousand students studied at the Lodz University of Technology, that offers 37 courses, and over 16 thousand in a non-public University of Social Sciences, offering 21 courses. Nearly one third students in the region are enrolled in private higher education institutions[19].

Figure 1. Number of students in the selected S&T field of studies in the higher education institutions based in Lodz in 2007 and 2012



The University of Lodz (UL), the Lodz University of Technology (PL), the University of Computer Sciences and Skills (WSIiU), the University of Humanities and Economics in Lodz (AHE), the University of Social Sciences in Lodz (SAN).
Source: own calculations based on data from the Statistical Office in Lodz.

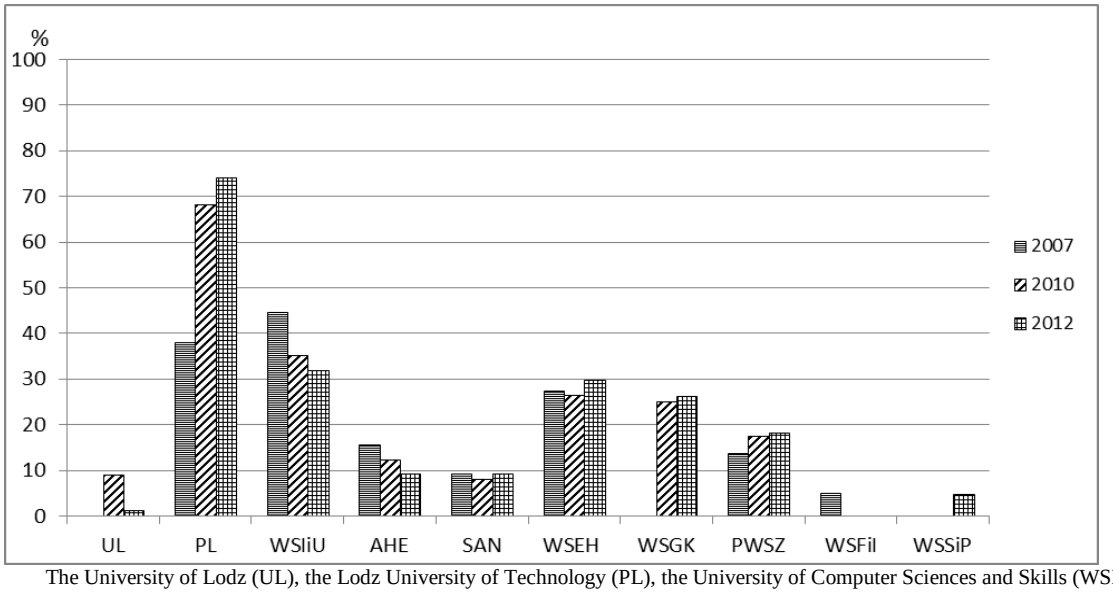
In 2012, the science and technology field of studies were offered at 9 higher education institutions in the Lodzkie Region (with the most popular computer and information sciences). Definitely the most diverse range of S&T courses has the Lodz University of Technology - about 76% of its students is enrolled in S&T courses, while at the University of Lodz it is nearly 14%. The other universities, which also offer S&T courses are[20]: the University of

[19] This ratio is much higher than in other European countries. In 2006, in Portugal it was 25%, in France: 14% and in Spain: 11% - see Teixeira P. (2009), *Mass Higher Education and Private Institutions*, in OECD *Higher Education to 2030*, Volume 2, *Globalisation*, OECD Publishing, p. 238.
[20] In one university in the region – the Higher Vocational School of Lodz Educational Corporation, a small group of students (in 2012 there were 45 students) attended one course in chemistry science.

Computer Sciences and Skills in Lodz (WSIiU): 39.9% of students, the University of National Economy in Kutno (WSGK): 20.8%, the University of Social Sciences in Lodz (SAN) - 9.8%, the State Higher Vocational School in Skierniewice (PWSZ): 7.2%, the Higher School of Art and Design in Lodz (WSSiP): 5.3%, and the Medical University of Lodz (UMed): 3.7% (Fig. 1)

In 2007, in the Lodzkie Region, 22.4% of all 1st degree students attended engineering courses. To 2012 this rate significantly increased to 29.1%. At the Lodz University of Technology, the only technical university in the Lodzkie Region, in 2007 only 37.9% of students were enrolled in engineering courses. In 2012, the situation changed dramatically - more than 70% of the students attended engineering courses. Recent years, mainly due to the "contracted courses"[21] have brought positive changes in this area. Other universities, including the private ones, have expanded their portfolio of engineering courses (Fig. 2). Currently, nine universities in the Lodzkie Region offer engineering courses such as information technology, logistics, mechatronics, geodesy and cartography.

Figure 2. The share of students of engineering 1st degree course in the total number of students in 2007-2012 in the Lodzkie Region



The University of Lodz (UL), the Lodz University of Technology (PL), the University of Computer Sciences and Skills (WSIiU), the University of Humanities and Economics in Lodz (AHE), the University of Social Sciences in Lodz (SAN), the S.A. Pieniążek University of Economics and Humanities in Skierniewice (WSEH), , the University of National Economy in Kutno (WSGK), the State Higher Vocational School in Skierniewice (PWSZ), the J. Chechlinski University of Finance and Computer Science in Lodz (WSFiI)), the Higher School of Art and Design in Lodz (WSSiP)

Source: own calculations based on data from the Statistical Office in Lodz.

[21] Systemic project "Contracting education in technical, mathematical and natural sciences", aimed at improving attractiveness of these fields of study and supporting their development. Funded by the Sub-measure 4.1.2 "Increasing the number of graduates from faculties of key importance for the knowledge economy", Priority IV of the Human Capital Operational Programme.

5. Employment forecasts

The specificity of higher education (the process of investment in human capital takes 3-5 years) causes that in order to match human resources competences to the needs of the labour market it is necessary to have information about the labour demand in at least a 5-year horizon. Thus, it is crucial firstly to have a system for employment forecasting in the occupational cross-section, and secondly, to link it to the education system.

Unfortunately, till recently (2014) there was no integrated system of labour market forecasting in Poland (on the national or regional level). The previous main national initiative within this framework was the Labour Demand Forecasting System (*System Prognozowania Popytu na Pracę – SPPP*), which was launched in 2004. Regrettably, since 2006 *SPPP* system has not been neither updated nor available to users.

In 2011 a Task "*Establishing the integrated forecasting and information system providing employment forecasts*" within an EU funded project "*Analysis of the processes on the Polish labour market and in the area of social integration in the context of conducted economic policy*" was launched[22]. The aim of this task is to implement an up-to-date, integrated employment forecasting system in Poland, that would be available on-line to all stakeholders, including higher education institutions. The forecasting tool, that is part of the system and enables visualisation of forecasts, was officially launched on 25th June 2014 during the international conference "The system of employment information and forecasting in Poland" held in Warsaw.

The forecasting methodology is built on models of the demand side of the labour market, with the control from the supply side (population, labour force participation). The flexibility of econometric models is provided by their hierarchical structure and the possibility of expert adjustments at each stage of modelling and forecasting.

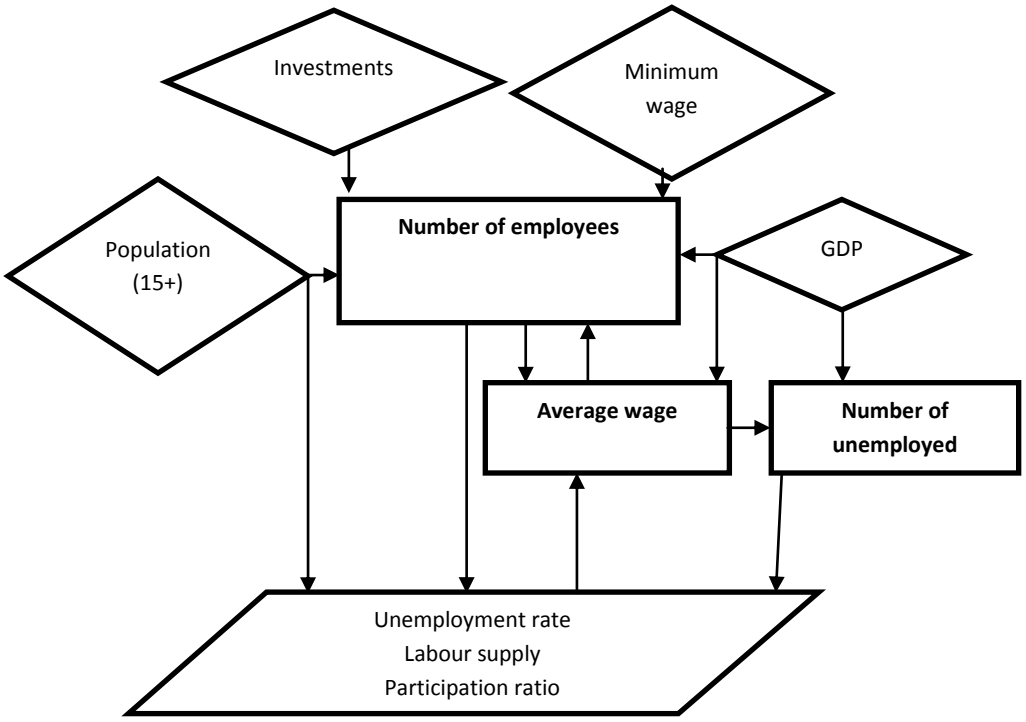
Employment forecasts at the national level are developed through the use of a hierarchical approach to econometric modelling, with ensuring consistency of the forecasts at every level of disaggregation (for each cross-section).

Global (POLMOD 2013) model, which is a multi-equation econometric model, generates an overall employment forecast. The model consists of two sub-models: macroeconomic model and model of the labour market. The macro-model takes into account interactions among incomes, consumption, capital accumulation, investments, export, import, added value and yields GDP and final domestic demand values. The sub-model of labour

[22] The project conducted by the Human Resource Development Centre (Leader) and the Institute of Labour and Social Studies (Partner). More information on: www.prognozowaniezatrudnienia.pl

market is based on 5 stochastic equations and 4 identity equations. Interactions in the sub-model of labour market are presented on the Figure 3.

Figure 3. Interactions in the sub-model of labour market



Source: Arendt Ł., Gajdos A., *Labour demand forecasting in Poland – a new approach*, presentation on the Conference *Long-term labour market forecasting in Europe*, Nuremberg 24-25 October 2013.

Global model by region (that includes spatial interactions) and a global model by sectors (multi-equation panel data model) allow to forecast independently the number of employees at, respectively, spatial and sectoral level, taking into account the forecasts from the POLMOD model. Regional model is a multi-equation recurrence model that estimates GDP in each region and then, with the use of Seemingly Unrelated Regression Equations system with spatial interactions, yields employment number in a given region. The sectoral model is based on modified Cobb-Douglas production function – it consists of long-run employment functions for a given economic sector. The total number of employees in a given region or economic sector is then split by the occupational model into occupational groups.[23]

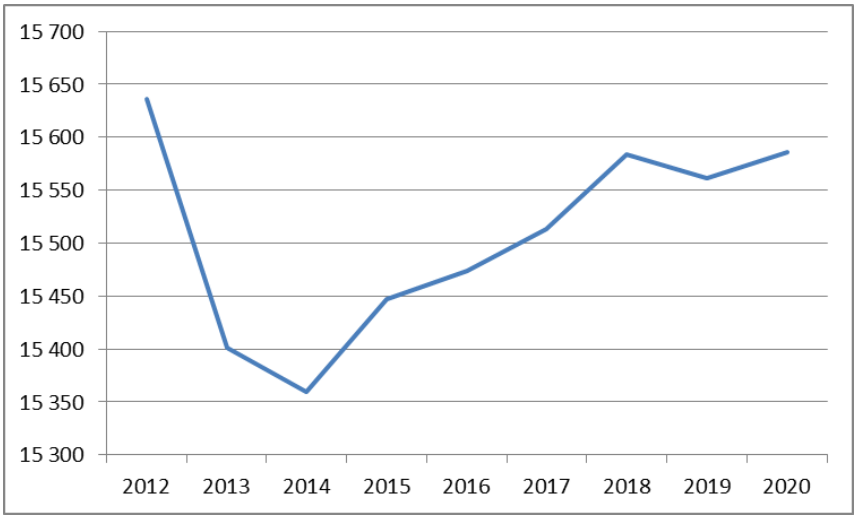
This system generates employment forecasts in the following cross-sections:

[23] The new approach to forecasting employment in Poland is consistent with the modern labour market forecasting systems existing in developed economies. All of those systems are based on macro-modelling framework combined with labour market sub-models which generate employment forecasts at occupational, regional and sectoral level.

- occupational groups (major, sub-major and minor) according to ISCO-08 classification;
- economic sectors (agriculture, manufacturing, market services and non-market services);
- regions (NUTS2).

The analysis of employment forecasts generated by the system shows that at the aggregated level, changes in the employment numbers will be moderate. By 2020 Poland should witness a slight decrease in employment – employment will fall between 2012 and 2020 by 0.32%, from 15636 ths to 15587.7 ths people.

Figure 4. Employment in Poland – forecast (in ths) 2012-2020



Source: forecast results database

However, as presented in Figure 4, Polish economy will suffer from a sharp decline of employment between 2012 and 2014, which may be attributed to the long-lasting effects of the world economic crisis that began in 2008 in the U.S. It is predicted that from 2015 to 2018 employment will recover, followed then by slight changes and stabilisation till 2020.

The biggest increase in labour demand should take place in the 2nd major group "Professionals". Analysis of data confirms the international trends related to development of information society and growing importance of Information and Communication Technologies for economy's performance – the biggest rise in number of employees (by almost 60%!!!) is forecasted in the minor group of professionals employed in IT branch – exactly the software and applications developers and analysts as well as database and network professionals.

High increases are also reported in occupations that require technical knowledge and education (e.g. physical and earth science professionals, mathematicians, actuaries and statisticians, engineering professionals, electrotechnology engineers, architects, planners, surveyors and designers). Financial knowledge and managerial skills also seem to be in a high demand.

The biggest decrease of labour demand is concentrated within two major occupational groups: skilled agricultural, forestry and fishery workers, and craft and related trades workers. These results reaffirm two phenomena. The first phenomenon is connected with the fact that changes in the sectoral structure of the Polish economy have led to decline of the role of agriculture and growing importance of services and manufacturing sectors. This, in turn, affects the employment structure, which is going to be more and more modern – that means higher employment in service sector and shrinking number of employees in agriculture. The other phenomenon is related to skill-biased technological change that favours highly skilled professionals – technology is replacing human resources in simple operations that may be automated. Thus, demand for low-skilled employees performing simple tasks is going to fall by 2020

Changes in employment will be distributed unevenly between regions. Unfortunately, the Lodzkie Region is in the group of regions that will witness a decline in total number of employees between 2012 and 2020 (by 1.5%, from 1207.9 ths in 2012 to 1189.3 ths people in 2020).

6. Convergence of the fields of study and labour market needs in the Lodzkie Region

To assess if higher education offer (as for fields of study) in the Lodzkie Region is consistent with the forecasted changes on the labour market by 2020, the labour demand at the level of the minor occupational groups, which correspond to the S&T fields of study has been analysed. Given that we focus on selected fields of study within S&T, which constitute only part of Human Resources in Science and Technology (HRSTE), it was necessary to tie these fields of study with specific occupations (ISCO-08 classification) constituting HRSTO category (Human Resources in Science and Technology – Occupation). It should be emphasised, that we took into account only occupations from the 2nd ISCO major group – Professionals, assuming that linking individuals with third-level education to 3rd ISCO major groups – Technicians and associate professionals, might lead to the "over-education" issue.

It was assumed that the minor occupational group corresponding to certain field of study is the one in which dominate the occupations that may be performed after completion of

a course within the field of study. This brought the following relations between HRSTE and HRSTO (Table 3)[24].

Table 3. Relation between HRSTE and HRSTO used for the analysis

HRSTE	HRSTO
Biological sciences	Life science professionals (213)*
Physical, mathematics and statistics sciences	Physical and earth science professionals (211); Mathematicians, actuaries and statisticians (212)
Computer and information sciences	Information and communications technology professionals (25)
Engineering and technology	Electrotechnology engineers (215)
Production and processing	Engineering professionals (excluding electrotechnology) (214)
Architecture and construction	Architects, planners, surveyors and designers (216)

* number of minor/sub major occupational group according to ISCO-08
Source: own analysis

The analysis of the number of employees in these occupational groups (historical data and forecasts), leads to a few important conclusions (Fig. 5).

Firstly, in all these groups the increase of the number of employees by 2020 is expected, which is not surprising, since these occupations constitute the major group "Professionals". This would imply the need for educating the youth in these fields of study in order to satisfy the future labour demand, and to minimise a structural mismatch.

Secondly, there are significant differences in the scale of future demand for various professions. The greatest demand, in the analysed minor occupational groups in the Lodzkie Region in 2020, is forecasted for ICT professionals (28.33 ths) and engineering professionals (15.17 ths).

Moreover, the group of ICT professionals is the one, in which the most dynamic employment growth between 2011 and 2020 is expected [25] (an increase of 78%).

Life science professionals is another group with expected high employment increase (51%). Nevertheless, this is a group that will generate relatively low demand for workers - in 2020 the number of employees in this group is expected to account for only 3.68 thousand[26].

[24] One should bear in mind the fact, that this linkage is not a perfect one, in the sense that on the one hand, the minor occupational group comprises also jobs that can be performed after completion of another field of study, and on the other hand, those who have completed a certain field of study can perform jobs within other minor occupational groups.

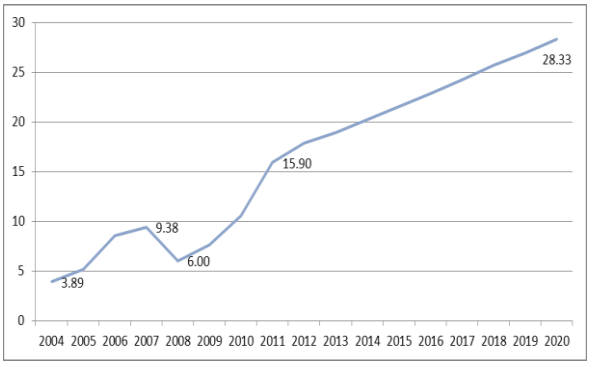
[25] At present, the last historical observation in the forecasting system comes from 2011 - for this reason, in the dynamic analysis we always refer to 2011 as the base year.

[26] The methodology and data sources (LFS) used for employment forecasting in Poland cause that forecasts in detailed cross-sections, especially for low values of the variables may not maintain the statistical representativeness of the projected number of employees. A limit below which the inference may be subject to considerable error, is assumed to be 5 thousand. This means that only in case of a minor group 214 – Engineering professionals, throughout the whole analysed period (2004-2020), and a group of ICT professionals

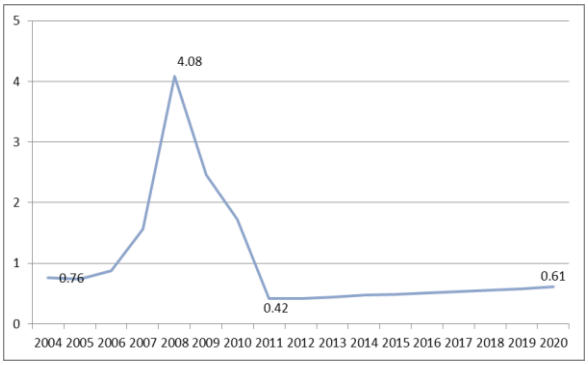
Slightly higher demand is forecasted in the groups of architects, planners, surveyors and designers (5.66 ths in 2020) and electrotechnology engineers (6.9 ths). In the case of the electrotechnology engineers, a continuous upward trend in the number of employed has been seen since 2004, while in the group of architects the downward trend reversed in 2012 and return to stable growth path over the forecast horizon.

Figure 5. Employment prospects (in ths) in selected HRSTO in the Lodzkie Region

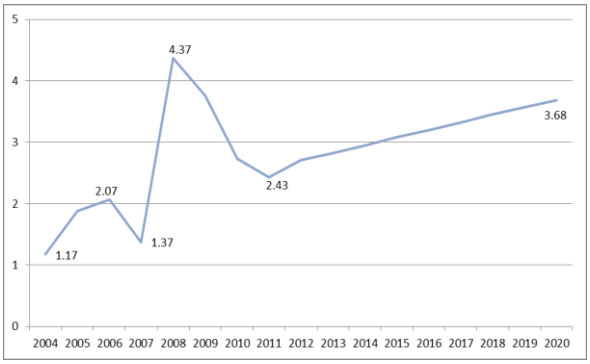
Information and communications technology professionals



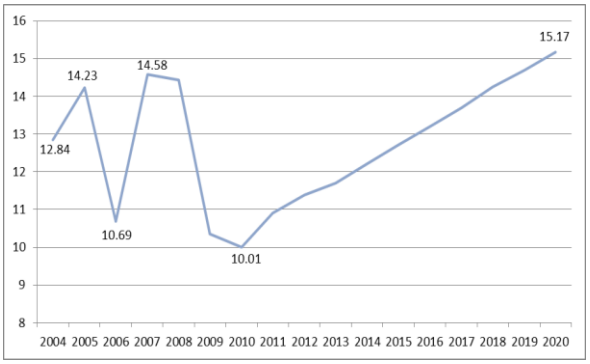
Physical and earth science professionals Mathematicians, actuaries and statisticians



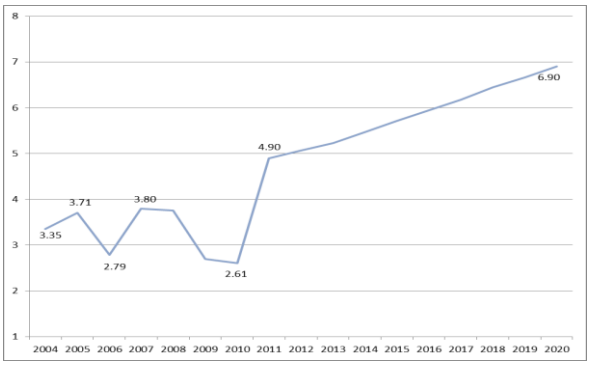
Life science professionals



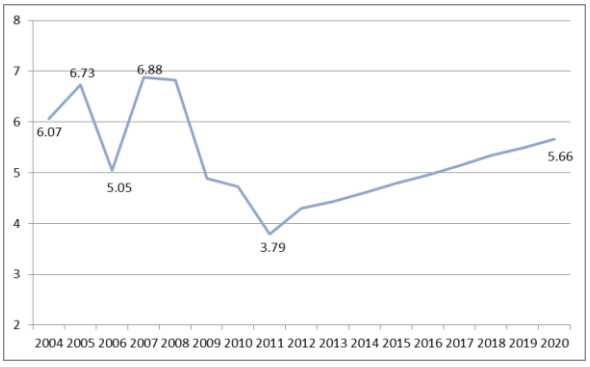
Engineering professionals



Electrotechnology engineers



Architects, planners, surveyors and designers



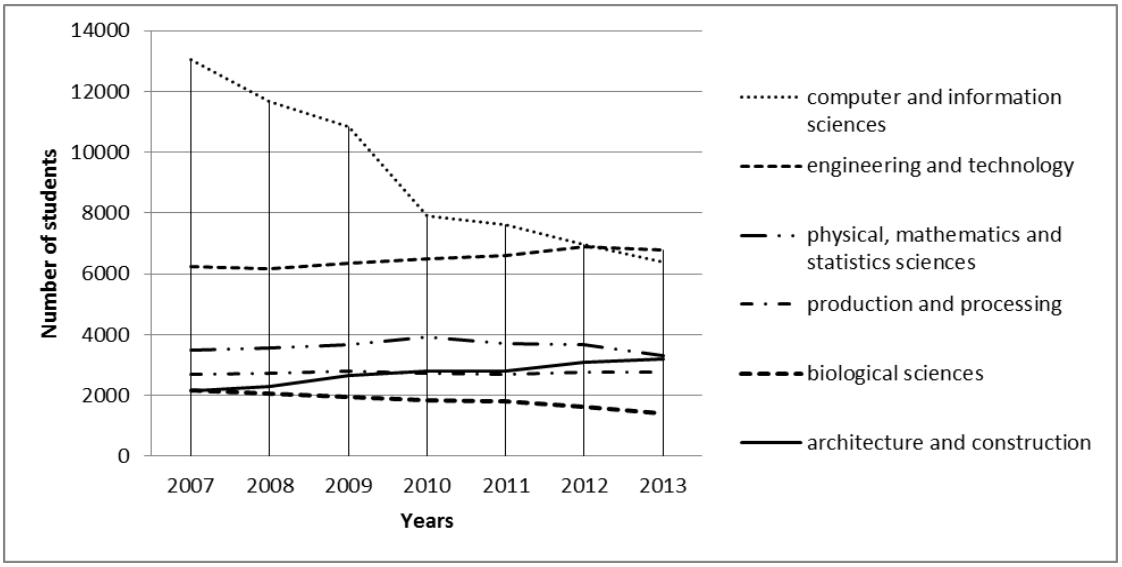
Source: forecast results database

since 2005, presented data are reasonably reliable. In other cases the principle of limited trust shall be used, and drawing conclusions should be based on an analysis of employment trends.

At the same time it should be emphasized that the demand for physical and earth science professionals as well as for mathematicians, actuaries and statisticians has always been (except 2008) low and, according to the forecast, will stabilise at the level of 0.5-0.6 thousand people till 2020. It seems that these groups will not play an important role on the labour market in the Lodzkie Region.

However, the number of people studying physical, mathematics and statistics sciences in the Lodzkie Region in 2007-2013 greatly exceeded the demand for professionals in this field of study (Fig. 6). In spite of the apparent downward trend in the number of students, there is a high probability that most of the graduates of these courses will not find employment in their learned profession. Similar problem, but on smaller scale, may affect engineering and technology students – in years 2007-2013 the number of graduates in these fields of study exceeded, each year, the demand, and even relatively high forecasted demand growth for electrotechnology engineers may be not enough to absorb the growing number of graduates.

Figure 6. Human resources for Science and Technology by field of study in the Lodzkie Region in 2007-2013



Source: own calculations based on data from the Statistical Office in Lodz.

Nevertheless, the mismatch between labour supply and demand as for ICT professionals is even more alarming. The number of students in computer and information sciences in the Lodzkie Region has been gradually decreasing since 2007, while demand for this type of competences has been already high, and is expected to grow significantly till 2020. It means that the labour shortage in the group if ICT professionals in the Lodzkie Region will be even more painful that it is at present.

The labour shortage may also occur in the group of engineering professionals, as the number of students in production and processing fields of study were stable (at the 2.7-2.8 ths level) in 2007-2013, while forecasted demand shall grow to 15 thousands in 2020.

Diverse trends are reported in biological sciences. The number of students in biological sciences has been decreasing since 2007, while employment in the group of life science professionals has been growing, and according to the forecast, is expected to maintain this growth to 3.7 thousands in 2020.

Number of students in architecture and construction fields of study and employment in the group of architects, planners, surveyors and designers (216) follow a similar growth trends. However, taking into account the number of such professionals, who already are on the labour market, it seems that we will witness a tight market in this occupational groups in the nearest future.

7. Summary

International (global) challenges related to building a competitive knowledge-based economy, that reveals the importance of human capital, define higher education institutions as one of the leading stakeholders of these processes. New models of the organisation of universities, based on the link between science and economy, that emphasise their role in the economic development of the region or country, do not undermine the role of the university as an educational institution. On the contrary, they underline the importance of education for delivering human resources to the economy.

It results in:

1. higher education institutions' openness to change and acceptance of market drivers as for the organisation of the education system,
2. seeking competitive advantages in order to limit the impact of demographic decline by, among others, providing life-long learning offer,
3. defining educational offer in line with the labour market needs.

Human Resources for Science and Technology are seen as the key factor of the success of regions and countries. However, the huge pressure and expectations toward education in this field are not always reflected in undertaken actions. Our research study clearly indicates that:

- changes on the education market are determined by the demographic processes – they will have a major impact on the demand for education services, education offer and structure in the nearest future,

- the government intervention that granted support to education in S&T fields of study (programme of courses contacting in 2007-2013) has led to significant shift towards technical, mathematical and natural sciences education. Unfortunately, this shift has not always been linked to the needs of the labour market (as we can see in case the Lodzkie Region). In the new programming period 2014-2020, the governmental program supporting social competence is going to be launched. Therefore, we may expect a decrease of interest in education in the S&T fields of study, and development of educational offer that will be focused on social competences.

It should be remembered that the higher education market, like the labour market and institutional market, is significantly affected by the consumer market[27]. The nature of educational services causes that the assessment and value of these services are identified and defined individually, and critically dependent not only on the university capability or its relationship with the environment, but mainly on client's potential and her/his willingness to acquire knowledge. The value of educational product - in the form of knowledge, skills and social competences - is co-created by the client[28]. At the same time, there is a clear asymmetry of information on the market of educational services, which concerns, among others, the assessment of the quality of educational services. Similarly, the lack of transparency on the labour market makes it difficult to assess the suitability of a particular education to achieve attractive and profitable job. Both benefits and costs may be shaped by the individual's characteristics, the environment in which s/he grew up, and depend on individual's readiness to meet the educational requirements and to make the right choices which foster achieving high efficiency of education[29].

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