

**Warsaw School of Economics**  
**Enterprise Institute**

**Labour market in selected sectors of economy in Pomorskie voivodship in  
2008 and its changes in the years 2005-2007**

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## Introduction

This report presents basic parameters of the labour market in Pomorskie voivodship for selected economy sectors, i.e.: engineering, electronics, automotive, aviation, biotechnology, and business services in 2008 and changes thereof in the years 2005 - 2008.

Pomorskie voivodship has considerable labour resources - ca. 5% of all employees in Poland. In the years 2005 - 2007 the number of employees increased by 10.1%. This phenomenon connected with migrations of people had an impact on basic parameters of the labour market in the region, including: unemployment rate, employment rate, unemployment intensity, occupation shortage rate, etc. In 2005 - 2007 the employment rate rose from 43.5% to 48.1% and throughout the analysed period was similar to the national average. The low employment rate (in comparison with countries on high level of socio-economic development) resulted from insufficient number of new jobs, but also from considerable employment inactivity of people in Pomorskie voivodship (ca. 50% of people above the age of 15 are inactive). The main reasons for this phenomenon are: retirement, education and qualifications improvement<sup>1</sup>.

Table 1. Basic parameters of the labour market in Pomorskie voivodship 2005 - 2007

lp.	basic labour market parameters	2005r.	2006r.	2007r.
1	2	3	4	5
1	employees in thous.	694	703	764
2	employment rate in %	43,5	45,6	48,1
3	the number of unemployed in thous.	159,9	125,9	86,1
4	unemployment rate acc. to LFS in %	18,9	13,5	9,5
5	job offers	1 169	1 586	4 041
6	number of the unemployed per 1 job offer	136,8	79,4	21,3

Source: own document based on Regional Data Bank of CSO.

From 2005 to the end of the second quarter of 2008 the number of the unemployed in Pomorskie voivodship fell by 66%, including ca. 1/3 due to the failure to confirm readiness to take a job. Comparing the decrease rate of the number of unemployed people with the much slower increase of the number of employees one may conclude that migrations played a very important role in labour market changes. Consequently, the unemployment rate in the analysed period fell from 19.3% to 8.9% at the end of the second quarter of 2008, and throughout the period stayed below the national average (9.6%). The growing number of job offers in the years

<sup>1</sup> *Labour market in Pomorskie voivodship in the first quarter of 2008*, Voivodship Labour Office in Gdańsk, Gdańsk 2008.

2005 - 2007 (remarkable 245%) undoubtedly contributed to the positive changes of the unemployment rate; as a result, the number of unemployed people per one job offer fell significantly from 137 persons in 2005 to 22 in 2007 (Table 1). What is more, the number of job offers in the region's labour offices is growing, and the share of offers not used for more than one month is high<sup>2</sup>. The abovementioned trends were accompanied by a 14.1% increase of average gross wages; wages throughout this period were higher from the national average.

### **1. Employment in selected economy sectors compared with nationwide situation**

Positive changes in the labour market illustrated by the growing number of employees was observed not only in the region overall, but also in high technology sectors. In the years 2005 - 2007 the number of employees in the selected sectors<sup>3</sup> in Pomorskie voivodship increased by 23.5% (average increase of the number of employees in the voivodship - 10.1%); the number of new employees in high technology sectors nationwide grew by ca. 19%. Consequently, in the years 2005 - 2007 the share of the region's employees in the overall number of high technology sector workers grew, however the increase was different in individual sectors.

Electronics sector in Pomorskie voivodship has special significance for the national economy. Estimates suggest that in 2007 10-12% of persons employed in this sector nationwide worked in Pomorskie voivodship. Large employers in the region's electronics sector include: Jabil Circuit Poland (over 3 thousand people), Flextronics (over 2.7 thousand people), and Jabil Assembly Poland (ca. 1.4 thousand people).

Estimates suggest also that in 2007 quite a lot, i.e. 12-14% of persons working in the biotechnology sector nationwide were employed in Pomorskie voivodship<sup>4</sup>. The cluster of over 60 enterprises involved in biotechnology, pharmacy and cosmetics (biopharmco) contributed to the development of the region's biotechnology sector. The cluster includes, inter alia, Polpharma – the national leader in manufacturing of medicines and pharmaceutical substances (ca. 1600 employees), as well as Oceanic (ca. 300 employees), and Ziaja (ca. 250 employees) representing the cosmetics industry. In the region there is also a number of smaller biotechnological companies with good development perspectives, including: A&A Biotechnology, DNA-Gdańsk II, EURx, GenPandora, Immunolab i LipoPharm.pl).

Other high technology sectors of the region discussed in this analysis play a smaller role in national economy in terms of employment. In accordance with estimated data for 2007, the

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<sup>2</sup> Ibidem.

<sup>3</sup> Excluding those sections for whom data for 2005 were missing; this prevented calculation of change dynamics. Unfortunately, the employment data for biotechnology sector are incomplete both for the region and the whole country.

region had 4-5% of the overall number of employees in business services sector and 3-4% of the overall number of people working in the engineering sector.

The increased importance of high technology sectors, in terms of average employment, may also be observed in the internal structure of Pomorskie voivodship (Table 2).

Table 2. Average employment in the selected high-technology sectors in Pomorskie voivodship in the years 2005 - 2008; enterprises employing 9 persons and more

		business services sector	engineering sector	electronics sector	biotechnology sector*	au s
	average employment					
1	2	3	4	5	6	
1	Average employment in the enterprises sector (I-XI 2005)	23363	5838	11985	b.d.	
2	Average employment in the enterprises sector (I-XI 2006)	23890	5807	b.d.	b.d.	
3	Average employment in the enterprises sector (I-XI 2007)	26903	6429	15491	b.d.	
4	Average employment in the enterprises sector (I-VI 2008)	28895	7208	b.d.	2500	
5	<b>dynamics of employment changes 2005-2008</b>	<b>123.7</b>	<b>123.5</b>	<b>129.3**</b>	<b>N/A</b>	

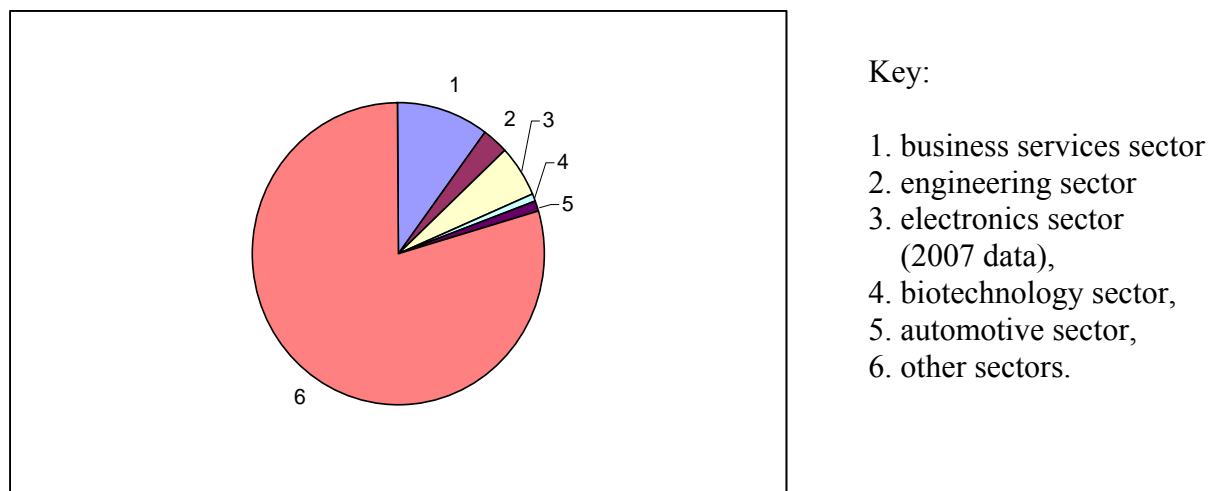
\* estimated data

\*\* dynamics in the years 2005 - 2007

Source: document prepared by WSE Enterprise Institute on the basis of "Statistical bulletins" for Pomorskie voivodship and information from biotechnology sector enterprises.

In the years 2005 - 2007 employment in these sectors compared with the overall number of employees increased from 6% to 7%, nevertheless the share was smaller than the national average (7.2% and 7.6% respectively). The abovementioned processes occurred with different intensity in each sector. In the years 2005 - 2008 in the region the highest average employment among the analysed high technology sectors occurred in the business services sector. Average employment in this sector in 2008 reached 28.9 thousand people, and its growth rate in the years 2005 - 2008 was 23.7%. In terms of creation of new jobs, the second place was taken by electronics sector with ca. 15.5 thousand average employment in 2007. Average employment growth rate in this sector was among the highest in the high-tech group (in the years 2005 - 2007 ca. 30%), which contributed to the strengthening of this sector's position not only in the region, but also in the country.

Graph 1. Employment in the analysed sectors compared with the overall employment in Pomorskie voivodship in the years 2005 - 2008; enterprises employing 9 persons and more



Source: own document based on Table 1.

In 2008 the following positions in the ranking of the analysed sectors were taken by: engineering and automotive sectors. The latter had the lowest average employment growth rate (below 10%) among the sectors in the years 2005 - 2008.

In 2008 the lowest average employment among the analysed high-tech sectors occurred in the biotechnology sector; however, this may be a result of incomplete data.

The changes in the average employment in the region's high-tech sectors were accompanied by the growing number of enterprises involved in this type of economic activity.

## 2. Graduates of post-gymnasium schools: numbers, fields of study, knowledge of languages\*

\* Structure of Polish Educational System:

- *Primary*: Primary School (Szkoła Podstawowa)
- *Basic Vocational*: Basic Vocational School (Zasadnicza Szkoła Zawodowa)
- *Lower Secondary*: Gymnasium (Gimnazjum)
- *Technical Secondary*: Technical Secondary School (Technikum)
- *Upper Secondary*: General Lyceum (Liceum Ogólnokształcące)
- *Vocational Secondary*: Vocational Secondary School (Liceum Zawodowe) /Specialized Lyceum (Liceum Profilowane)
- *Post- secondary*: Post- secondary Vocational School (Szkoła Policealna)

High technology sectors have strong demand for employees with higher, as well as secondary technical and often specialist education background. An important role in meeting the demand is played by the local education system, in particular fields of study offered on post-gymnasium and higher school levels.

In Pomorskie there are nearly 93 thousand students in post-gymnasium schools. Like in other regions in Poland, the largest group are general lyceum students; graduates of these schools every year constitute ca. 43% of all post-gymnasium school graduates. In terms of the number of graduates, the following places are occupied by: post-secondary vocational schools (18%), technical schools and vocational schools (16% each), and specialised lyceums (12%). An important thing to note in the context of high technology sectors' needs is that over the last three years the number of students in technical schools was growing, while the number of such schools was falling. This trend combined with the growing number of offers for intermediate level technical jobs should be treated as a negative phenomenon. What is more, the number of technical schools intended for adults is also decreasing (however, mainly due to the lack of interest in this type of education).

Fields of training in profession-oriented schools (specialised lyceums, technical schools, vocational schools) are in a different degree adjusted to the needs of high technology sectors. In order to assess their usefulness, professions were divided into three groups:

- economic and administrative (this group includes economic-administrative professions gained in specialised lyceums, such as: administrative technician, occupational hygiene and workplace safety technician, economic technician, trade technician, office technician, accounting technician),
- general technical (this group includes technical professions, such as: IT technician, mechanic, car mechanic),
- specialised technical (this group includes: automotive body repairer, electronics engineer, electrical engineering technician, electromechanic, electrician, car electromechanic, mechanic production technicians, mechanical machine fitter, industrial

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- *Higher education:*

- first level courses (studia pierwszego stopnia); title of Bachelor or Engineer (licencjat/ inżynier);
- second level courses (studia drugiego stopnia); title of Master (magister)
- uniform 5-year magister level courses (jednolite studia magisterskie)

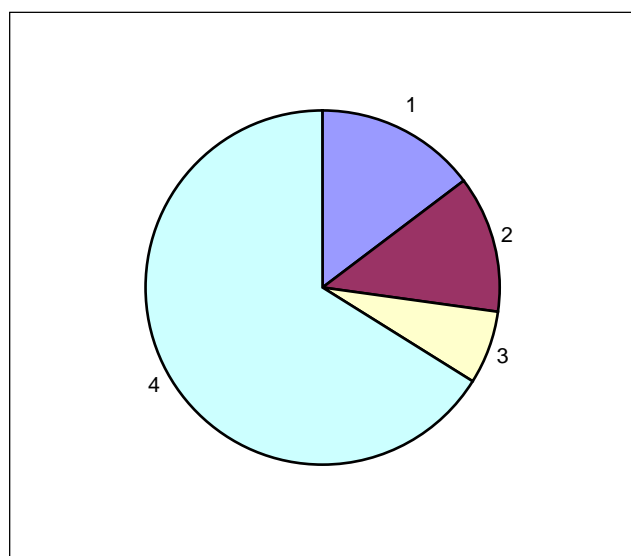
[translator's annotation on the basis of *The European Education Directory*  
<http://www.euroeducation.net/prof/polaco.htm>. (accessed: 15<sup>th</sup> December 2008).]

automatic devices and precision appliances mechanic, precision mechanic, mechatronics fitter, electronic fitter, mechatronics fitter, machine tools operator, chemical industry devices operator, electronics technician, electroradiologist, logistics technician, aircraft mechanics technician, mechatronics technician, forwarding agent, ITC technician, telecommunications technician).

In Pomorskie voivodship there are in total 31.5 thousand pupils studying the abovementioned occupation-oriented fields of training, which is equivalent to 6.1% of all pupils studying these subjects nationwide. From the point of view of high technology enterprises the most desired group are people with specialised technical occupations. The share of pupils studying specialised technical subjects in the total number of all occupation-oriented students in Pomorskie is 19.8%, which is 1.4 percentage point lower than the national average. In Pomorskie voivodship the largest portion of students - 43.9% study economic and administrative professions, i.e. 2.9 percentage points more than the national average. Number of pupils in the voivodship studying general technical occupations is also lower than the national average. Consequently, in terms of individual occupations, and in comparison with the national average, in Pomorskie voivodship there is a very large number of people learning the following occupations: economic technician, IT technician, and car mechanic.

In this context, the presence in the voivodship of two specialised lyceums providing training in electronics, as well as 76 technical schools, is a positive phenomenon, as their graduates may seek employment in the analysed sectors. This group includes technical schools providing training in: electronics, electrics, logistics and telecommunications. Another advantage for the analysed sectors are the region's 12 specialised vocational schools training the following professionals: electronics technician, electronics fitter, mechatronics fitter, building structures fitter.

Graph 2. Structure of post-gymnasium schools students by type of training in the school year 2006/2007



Key:

Fields of training:

1. economic and administrative,
2. general technical,

3. specialised,
4. other.

Source: own document based on SIO database - as of 31.03.08

Under the conditions of open economy and strong link between high technology sectors and the world economy, language learning is a very important field of education.

Table 3. Number of students learning foreign languages in vocational schools in the school year 2006/2007 – by voivodship

<b>Voivodship</b>	<b>English</b>	<b>French</b>	<b>German</b>	<b>Russian</b>	<b>Other</b>	<b>Total</b>
Dolnośląskie	45 043	3 197	50 395	3 877	44	102 556
Kujawsko - Pomorskie	39 194	1 539	31 267	14 552	0	86 552
Lubelskie	42 569	1 753	25 626	19 932	217	90 097
Lubuskie	19 310	2 219	22 276	1 659	0	45 464
Łódzkie	38 503	2 213	34 375	9 839	21	84 951
Małopolskie	67 648	7 821	56 742	9 905	264	142 380
Mazowieckie	76 090	2 989	47 116	32 650	532	159 377
Opolskie	20 342	493	21 135	544	0	42 514
Podkarpackie	52 785	2 872	44 738	8 218	0	108 613
Podlaskie	27 091	670	19 578	10 114	0	57 453
<b>Pomorskie</b>	<b>40 722</b>	<b>1 944</b>	<b>38 001</b>	<b>6 117</b>	<b>430</b>	<b>87 214</b>
Śląskie	94 321	12 295	72 503	12 879	270	192 268
Świętokrzyskie	28 453	803	21 514	7 094	179	58 043
Warmińsko - Mazurskie	30 015	598	25 834	8 151	0	64 598
Wielkopolskie	68 092	4 641	72 300	9 834	57	154 924
Zachodniopomorskie	28 417	1 501	31 179	2 747	0	63 844
<b>Poland</b>	<b>718 595</b>	<b>47 548</b>	<b>614 579</b>	<b>158 112</b>	<b>2 014</b>	<b>1 540 848</b>

Source: Own document based on *Oświata i wychowanie w roku szkolnym 2006/2007 (Education and training in the school year 2006/2007)*, GUS Warszawa 2007.

In the region's post-secondary schools ca. 94% of students learn a foreign language, including ca. 50% learning English, and 43.6% - German.<sup>5</sup> In vocational schools majority of students learn these two languages as well – table 3. Vocational schools students learning English constituted in the school year 2006/2007 ca. 50% of post-secondary schools students learning the language in obligatory and extended programmes, and 5.6% of vocational schools students in Poland learning the language. In the case of German the share was 54% and 6.2% respectively.

### 3. Graduates of higher schools: numbers and fields of study

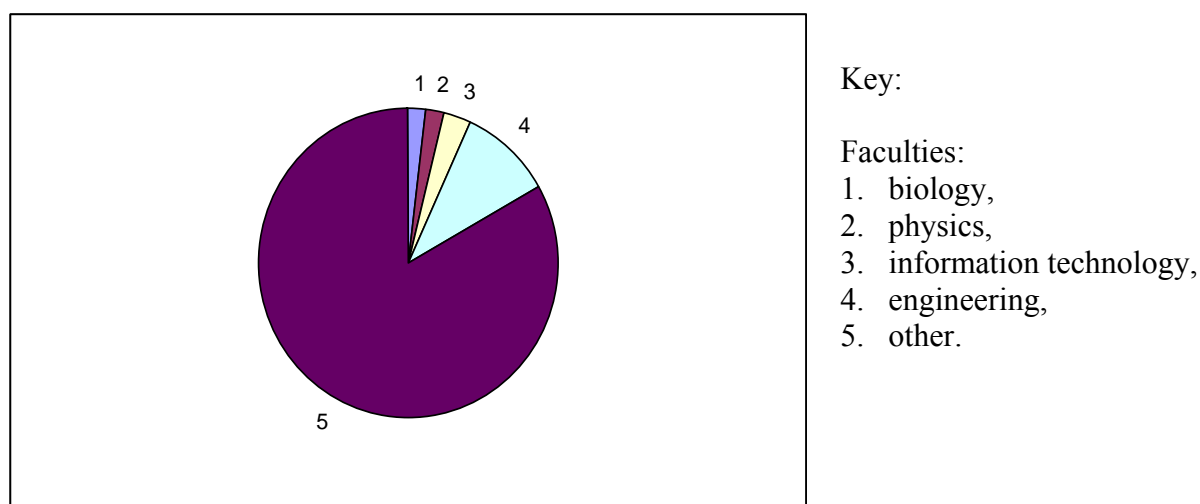
<sup>5</sup> Statistical data: *Oświata i wychowanie w roku szkolnym 2006/2007 (Education and training in the school year 2006/2007)*, GUS Warszawa 2007.



The number of students and graduates of higher education establishments is gradually growing in Poland. In Pomorskie there are 28 higher schools (including 20 non-public schools) attended by ca. 96 thousand students. In terms of the number of students the biggest educational establishment is Uniwersytet Gdański (University of Gdańsk) with ca. 29 thousand students. Other large academic centres in the region are: Politechnika Gdańska (Gdańsk University of Technology) (over 18 thousand students), Akademia Marynarki Wojennej w Gdyni (Polish Naval Academy in Gdynia) (ca. 6.8 thousand students), and Akademia Medyczna w Gdańsku (Medical University of Gdańsk) (ca. 4,5 thousand). Rare fields of specialisation may be regarded as the higher school's strength. In this context two faculties are worth mentioning: ocean engineering at the University of Technology, and navigation at the Naval Academy. Although they are not directly connected with either: engineering, electronics, automotive, aviation, biotechnology, or business services sectors, these faculties may support related kinds of economic activity contributing to the development of the high technology sectors.

Main faculties studied at the majority of higher educational establishments in Pomorskie are the humanities and economy. This is also true for the region's largest university. Dominant subjects at the University of Gdańsk are: English studies, economy, administration, management, law, finance and banking, although there are also people studying: information technology, biotechnology, electronics and communication, electro-technics, or technical physics. In Pomorskie there are no non-public technical or medical universities. Under Polish conditions non-public higher technical schools do not develop due to larger capital needs. On the other hand, young people show still too little interest in studying technical subjects.

Graph 3. Structure of higher schools graduates by faculty in 2007



Source: Own document based on *Oświata i wychowanie w roku szkolnym 2006/2007* (*Education and training in the school year 2006/2007*), GUS Warszawa 2007.

Under such circumstances the public higher education sector is the only source of information about fields of study corresponding with needs of the high technology sectors. In 2007 at the voivodship's public schools there were 27.9 thousand students in the following five educational fields chosen for further analysis: economy and administration, information technology, engineering, production and processing and services; this number constituted ca. 29% of the total number of students, and 6% of all people studying these subjects in Poland. The largest population in this group were students of administration and economy - 12 883 (46.1%) and engineering - 10 224 people (36.6%). The following places, in terms of the number of students, were taken by: information technology - 2825 persons, services - 1 536 persons, production and processing - 489 students. In comparison with the national average, the number of students in engineering faculties was very high. In 2007 the share of engineering faculty students in Pomorskie voivodship was 28.8% higher from the share of engineering faculty students in the country's overall number of students. The share of service faculties students in Pomorskie was also higher than the national average (in the region the share was 6% higher from the national average). On the other hand, the share of economy and administration faculty students was similar to the national average, and the share of production and processing faculty students constituted only 13.9% of this average.

The dominant fields of study are reflected in graduates' educational background structure; their number in Pomorskie voivodship in the years 2004 - 2007 increased by 4%, in comparison with 6% national average. Comparing the share of graduates with training adequate to high-tech company needs in the overall number of higher school graduates in Pomorskie in 2007 (over 20 thousand persons), one may conclude that:

1. The share of engineering faculties is relatively big - 10% (national average 9%).
2. The share of biology faculty graduates - 2% (national average 3%), physics - 2% (national average 3%), information technology - 3% (national average 4%) is similar to the national average.

#### **4. Research fellows (in higher schools and research and development units)**

High technology sectors have strong link with the research and development environment. On the one hand, enterprises establish their own research and development centres employing

researchers, and on the other, they use outsourced potential (regional, national, or international). An indirect measure of a region's potential in this respect is the number of employees in R+D. In 2007 Pomorskie had 6876 R+D personnel, including 5991 *actual* research workers. What is more, the latter group increased in the years 2005 - 2007 by 7% in the region; the overall number of R+D employees in Poland grew by 4%. Not all employees work full time, therefore the region's number of employees in R+D sector expressed as full time equivalent workers was slightly lower and reached in 2007 4425 persons, including 89% research and development staff. The share of R+D workers in the region's professionally active population reached 0.85% in 2007; the share in the region's population of employees was slightly higher - 0.95%.

Due to the strong development of higher education in Pomorskie voivodship, the majority of R+D workers (67%) are employed in higher schools. In 2007 the number of research fellows in higher schools was 5908, including 22% of independent researchers. Persons employed by enterprises in R+D divisions in 2007 constituted only 19.3%.

High technology sector enterprises are also supported by research and development facilities; majority of the facilities located in Pomorskie operates in the so-called governmental sector (ca. 12.5% of all R+D staff). The analysed high technology sectors may be supported, in particular, by the following facilities<sup>6</sup>:

- Pomorski Park Naukowo-Technologiczny (Pomorski Science and Technology Park) - innovativeness, entrepreneurship,
- Gdański Park Naukowo-Technologicznego (Gdańsk Science and Technology Park) - information and telecommunication technologies, nanotechnologies, biotechnology,
- Starogardzki Park Przemysłowy (Industrial Park in Stargard) - pharmaceutical industry,
- Przemysłowy Instytut Telekomunikacji (Telecommunications Research Institute) - maritime and land telecommunication systems,
- Centrum Techniki Okrętowej (Ship Design and Research Centre) - ship engineering,
- Centrum Techniki Morskiej (Maritime Technology Centre) - military maritime technologies,
- Instytutu Maszyn Przepływowych im. Roberta Szewalskiego (The Szewalski Institute Of Fluid-Flow Machinery) - engineering industry.

Given the low employment of R+D staff in enterprises, the potential of the region's scientists and researchers working at universities and R+D centres may be used through

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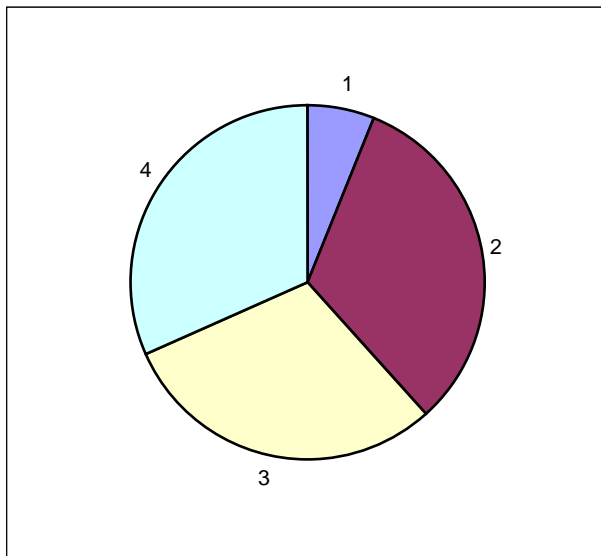
<sup>6</sup> Poll data from Polish Information and Foreign Investment Agency, Regional Cooperation Department, July 2008.

efficient networking between higher schools, R+D centres and the practice, including high-technology companies. In Pomorskie voivodship there are 28 business environment institutions in the public sector (with the exception of R+D institutions) with real influence on individual sectors (e.g. chambers of commerce, advisory companies, business incubators, business centres, HR companies, etc.); these institutions may take steps to facilitate this process. In the light of the need to transfer technologies to high-technology sectors, the following organisations in the region may prove useful: Centrum Transferu Technologii (Technology Transfer Centre) (new technologies), Fundacja Naukowo-Technologiczna (Science - Technology Foundation) (science and technical advisory services), Ośrodek Innowacji NOT w Słupsku (NOT Innovation Centre in Słupsk) (advisory and consulting services, support services - information, training), Akademicki Inkubator Przedsiębiorczości Politechniki Gdańskiej (Academic Business Incubator of the Gdańsk University of Technology) (advisory and training services), Pomorski Inkubator Innowacji i Przedsiębiorczości (Pomeranian Incubator of Business and Innovation) (biotechnology, environmental protection, information technology, industrial design).

## **5. Unemployment. Shortage / surplus occupations**

Development opportunities for high technology sectors may also be looked at from the point of view of unemployment. On the one hand, unemployment indicates maladjustment of the education system to the needs of enterprises, on the other it is an indication of the region's labour resources that may be used as a development opportunity by, inter alia, high-tech companies. In the analysed period certain changes occurred in unemployment numbers and structure. From the point of view of high technology sectors two aspects are worth pointing out: age - employers in innovative sectors prefer young people and are more willing to invest in the new staff by, e.g. providing them with specialised training; and education level. In the years 2005 - 2007 in Pomorskie region unemployment in all age and education categories decreased. In terms of age, the decrease is the smallest in the group of people aged 55 and more, which to a certain extent results from this group's smaller susceptibility to migration and smaller adaptiveness to new needs of the labour market. Nevertheless, regardless of the scale of changes, in the entire analysed period, the largest group among the unemployed were people aged 24 - 34 (at the end of 2nd quarter of 2008 19.4 thousand people); the second largest group were people aged 44 - 54 (at the end of 2nd quarter of 2008 17.3 thousand people).

Graph 4. Unemployment structure by education background in Pomorskie voivodship in first two quarters of 2008.



Key:

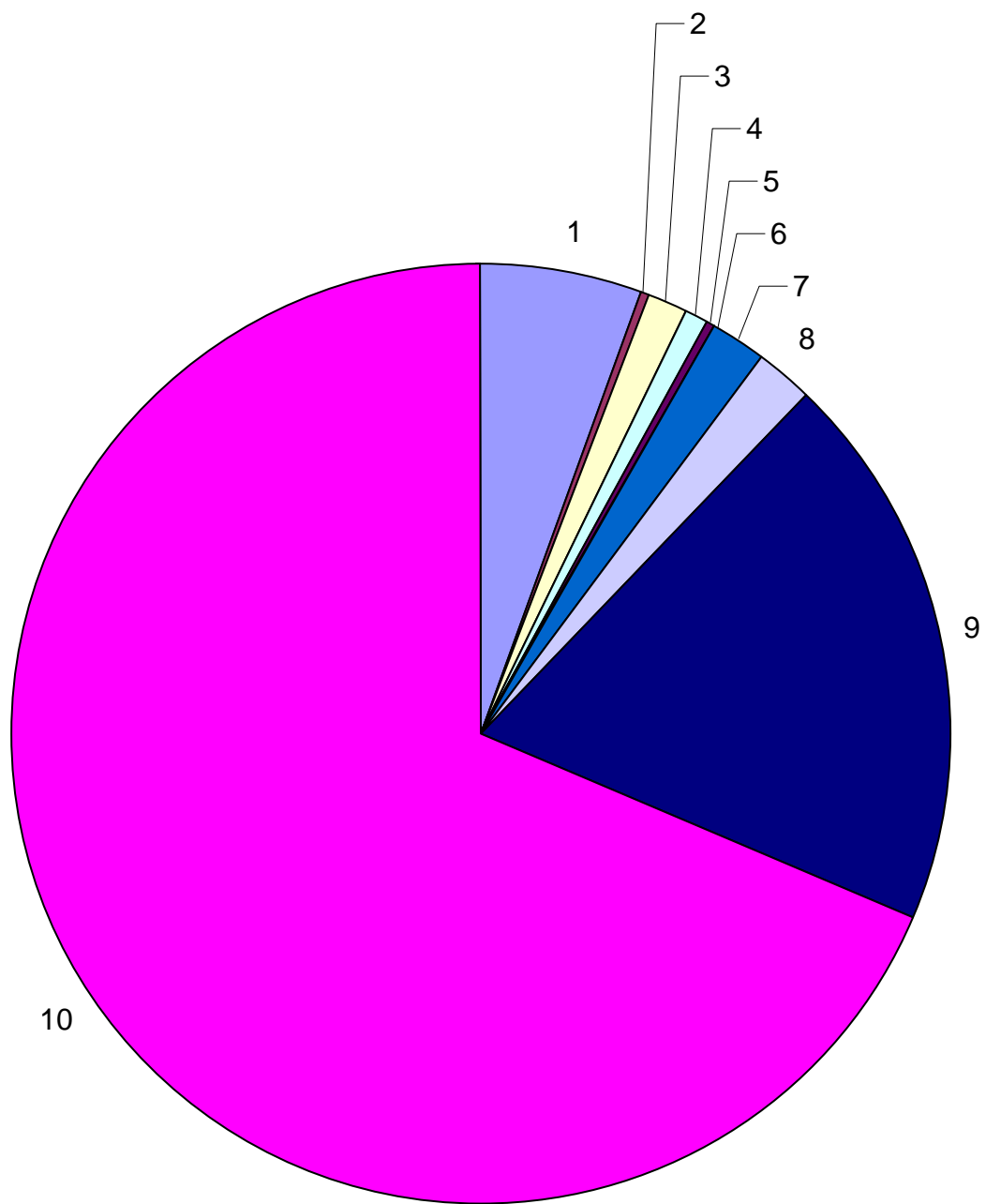
1. higher education
2. secondary and incomplete higher education
3. vocational training
4. secondary school-level education and lower

Source: own document prepared on the basis of "Statistical bulletins" for Pomorskie voivodship

From the point of view of high technology sectors and region's appeal for this type of business, education background of the unemployed is equally important. In the years 2005 - 2008 the largest group among the unemployed people were graduates of basic vocational and secondary schools. However, they would not qualify for a job in high technology sectors without appropriate training. People with higher and secondary education background are potential employees of high-tech companies. Number of unemployed higher education degree holders in the years 2005 - 2008 went down 42%, thus the decrease rate was slower than the total in Pomorskie voivodship, therefore the share of people with higher education background in the total number of unemployed rose from 4.6% to 6.1% (end of 2nd quarter of 2008 4.3 thousand people). The same trend was observed in the group of people with secondary education background. On the break of 1st and 2nd quarter of 2008 there were 15.1 thousand graduates of lyceums and secondary vocational schools.

Another piece of information used to determine potential labour supply to the high technology sector is the occupational structure of the unemployed population.

Graph 5. Unemployment structure by occupation in 2007.



Key:  
1. technical occupations,  
2. engineering professions,

3. machines and devices operators,
4. electromechanics and electrical fitters,
5. biology- and chemistry-related occupations
6. laboratory staff,
7. mechanics,
8. fitters,
9. no occupation,
10. other.

Source: document prepared by WSE Enterprise Institute on the basis of data from VLO.

In 2007 in Pomorskie there was a large group of the unemployed with the following training: technical - 4752 persons (5,5%), mechanics – 1568 persons (2%), fitters -1571 persons (1,8%), machines and devices operators – 1174 persons (1,4%), and electromechanics and electrical fitters – 834 persons (1%). The number of unemployed people with other types of training useful for high-tech companies was very low.

In market economy the information about adjustment of the broadly understood education system to needs of enterprises (supply of suitable workforce) is provided by the labour market situation perceived in terms of surplus / shortage professions<sup>7</sup>. Limiting the analysis only to professions and trades related with the high technology sector, one may notice that in the years 2005 - 2007 in Pomorskie voivodship surplus professions were more frequent than shortage professions. However, it should be noted that the data available in Poviats Labour Offices fail to reflect this phenomenon in full. Firstly - not all enterprises notify free positions to Labour Offices - in the case of rare professions they use services of specialised firms. Secondly - unemployed people who register with Labour Office often are not interested in starting to work. Therefore the analysis of shortage / surplus occupations is a mere illustration of certain general trends and relationships, rather than a full statistical analysis.

In accordance with PLO data, the surplus of labour resources in Pomorskie voivodship concerned in particular management and specialists, although it decreased in the analysed period. In the group of specialists the surplus of labour in 2007 constituted a mere 67% of this value in 2005.

In professional groups with slightly lower qualifications the supply of workforce is much higher than in the case abovementioned professions, but it is not the case for all of them. High labour supply surplus in the years 2005 - 2007 occurred in Pomorskie among technicians, financial and trade workers, technicians, biology and agriculture technicians. Like in the case of management and highly qualified specialists, workforce surplus in these occupations was also

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<sup>7</sup> In accordance with CSO definition, a shortage occupation is a situation where the market demand for an occupation is higher than the number of people looking for work in it.

much lower in 2007 than in 2005. This trend occurred also in the group of office workers and qualified manual workers. In 2007 in Pomorskie voivodship there was shortage of, inter alia, office management staff, money flow and customer service personnel and machines and devices operators and fitters. This was also true for certain manual workers.

The surplus (shortage) of an occupation is illustrated by the occupation surplus (shortage) intensity indicator expressing the relation of the average monthly number of job offers in a particular occupation notified to PLO to the average monthly number of registered unemployed representatives of the occupation in a certain period. It is assumed that:

- occupations with the indicator value  $>1.1$  are shortage occupations,
- occupations with the indicator value  $<0.9; 1.1>$  are sustainable occupations,
- occupations with the indicator value  $<0.9$  are surplus occupations.

Following this classification, in 2005 the group of shortage occupations included: middle office personnel, related (office) personnel, office management personnel; the group of sustainable occupations included: academic teachers and money flow and customer service personnel. All other occupations were in surplus in 2005. In 2007 the shortage intensity indicator value increased for all of abovementioned groups, and sustainable occupations of 2005 became shortage occupations. By the end of the analysed period this group was joined by machines and devices operators and fitters

## **6. Wages vs. expected wages**

Labour shortage in high technology sectors may be connected with the fact that actual wages do not meet employees' expectations. In the years 2005 - 2008 in Pomorskie voivodship the increase of average monthly wages in all of the analysed high technology sectors was higher from the increase of average monthly wages in the region (i.e. over 25.8%). It should be noted, however, that in 2005 the average monthly wages in the sectors, with the exception of engineering industry, were below the voivodship's average monthly gross wage. As a consequence of the dynamic growth in 2008 the wages in high-tech companies, with the exception of the fast-growing electronics sector, were higher than the region's average.

Table 3. Average monthly gross wages in selected high technology sectors in Pomorskie voivodship in the years 2005 - 2008



		business services sector	engineering sector	electronics sector	automotive sector	voivodsh
	average monthly gross wage					
1	2	3	4	5	7	8
1	average monthly gross wage in the enterprises sector (I-XII 2005)	2480	2633	2097	2505	2
2	average monthly gross wage in the enterprises sector (I-XII 2006)	2679	2837	2303	2567	2
3	average monthly gross wage in the enterprises sector (I-XII 2007)	2898	3129	2953	2859	3
4	average monthly gross wage in the enterprises sector (I-VI 2008)	3240	3453	2919	3275	3
5	<b>gross wage change dynamics 2005-2008</b>	<b>141,4</b>	<b>131,1</b>	<b>139,2</b>	<b>130,7</b>	<b>1</b>

Source: document prepared by WSE Enterprise Institute on the basis of "Statistical bulletins" for Pomorskie voivodship.

There were differences in wages and their increase rate between individual high technology sectors. In the years 2005 - 2008 the increase of average monthly gross wages in all of the analysed high technology sectors was higher from the overall increase in the region. The biggest increase occurred in the business services sector (41.4.2%). As a consequence, wages in this sector, as compared to other high technology sectors in 2008, were very high, and second only to those in the engineering industry. The latter sector, which is worth pointing out, had relatively low work efficiency in comparison to other analysed sectors. In the years 2005 - 2008 its 31% average gross wage increase was accompanied by a 16% increase of work efficiency.

Even though in the years 2005 - 2008 the region's electronics sector experienced monthly gross wage increase of ca. 40%, by the end of the period concerned its wages were still lower than in other high technology sectors, in spite of the highest increase of work efficiency.

Wages depend on the position occupied by an employee, and in Pomorskie voivodship range from 3.5 thousand for manual workers to 8.5 thousand for managers. This means, that in high technology sectors in 2007 in majority of positions average gross wages were lower than the regional average.

The survey conducted by WSE Enterprise Institute shows that wages offered in the sectors in most cases do not meet employees' expectations.

Table 4. Gross wages in Pomorskie voivodship in 2007 by position

Position	Gross wage
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		(PLN)
Production director		8500
Manager		4600
Programmer		4500
Engineer		No data
Marketing specialist		4000
HR specialist		3300
Bookkeeper		3115
Assistant		2520
Technical specialist		3550
Call centre employee		2500
Warehouse worker		No data
Manual workers	qualified, e.g. welders, machine operators	>3500
	other manual workers	
	unskilled workers	

Source: CSO data.

The analysis of discrepancies between offered and expected wages indicates that in Poland (and the average wage in Pomorskie voivodship is similar to the national average) employees (47% of managers and 57% of workers) expect a wage 1000 PLN higher than the offered one. Scarce are cases when the offered wage is higher than the expected one; this is true for 6% recruitment procedures for managerial positions, and 2% of recruitment procedures for manual workers.

### Conclusions

In the years 2005 - 2007 the number of employees in Pomorskie voivodship grew considerably; the growth rate of this value in high technology sectors was 10.3 percentage points higher than the overall average. The number of scientific workers increased as well, even though this is not a nationwide phenomenon. The most positive changes, in terms of employment, occurred in business services and electronics sector. The latter plays an important role not only in the region, but also in the country. As a result of labour market changes, in 2007 people employed in high technology sectors in Pomorskie voivodship constituted over 7% of the country's employees, even though the share of employees in the region's high-tech sectors is still lower than the national average. This is a result of, inter alia, region's education system structure, in particular on the post-gymnasium school level. The share of pupils studying specialised technical subjects in the total number of all occupation-oriented students in Pomorskie is 19.8%, which is 1.4 percentage point lower than the national average. The largest share of pupils - 43.9% - train in economic and administrative professions. These people may

potentially find work in high technology sectors, although the most probable destination for them is the business services sector. Demand for this type of employees in other high-technology sectors, in comparison with the demand for specialised technical personnel, is much lower. In a way, the high unemployment rate among young people, and over 15 thousand unemployed holders of post-secondary vocational school and secondary vocational school diplomas, confirm the maladjustment of the education system to the needs of modern economy.

On the other hand, not all graduates of specialised technical subjects find work due to the inadequate number of new jobs. In 2007 in Pomorskie there was a large group of unemployed people with the following training: technical, mechanics, fitters, electromechanics and electrical fitters, and machines and devices operators. However, in the meaning of CSO classification, the last occupation belonged to the group of region's shortage occupations.

In Pomorskie voivodship the dominance of humanist and economic faculties may be also observed in higher education. However, one should observe the big number, compared to the national average, of students and graduates of engineering faculties and the relatively high number of students in services faculties. This situation has some bearing on high employment in the business services sector (graduates of economic and service faculties), and the abovementioned fast growth of employment in the electronics sector (graduates of engineering faculties). Higher education structure is better adjusted to the demand of enterprises than that of post-gymnasium schools; this is expressed, inter alia, by the low unemployment among people with higher education diplomas. In accordance with PLO data, which are not fully reliable, in Pomorskie voivodship the surplus of jobs for managers and specialists was small and continued to decrease.

The very high increase of wages in high technology sectors (the highest in business services and electronics) is a market sign contradicting PLOs' data about surplus of highly-skilled workers in the region. Nevertheless, the wages still fall short of employees' expectations; very often wages are lower than in other economy sectors. This contributes to the emigration of high-class specialists and has a negative impact on young persons' interest in technical education on post-gymnasium and higher levels.