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FORECASTING THE LABOUR FORCE DEMAND AND SUPPLY IN LATVIA

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Abstract. The purpose of this paper is to analyse the problems of Latvian labour market and its possible development. An econometric model for labour force demand and supply forecasting is elaborated and it comprises 120 professions, 37 aggregated groups of professions and covers time period 2007–2030. The results of the quantitative and qualitative Employers' Survey are analysed and taken into account. The novelty of this research study lies in the complex approach to the labour force demand and supply analyses and to the forecasts to the Latvian economy in general and for its 15 separate sectors.

Keywords: labour market, labour force supply, labour force demand, production function, forecast.

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1. Introduction

Development processes underway in the economy of Latvia comply, to a large extent, with guidelines of strategic documents on the development of national economy and employment in the country, reflecting goals and tasks defined by EU programmatic documents for the areas of competition and employment. The main goal in ensuring social development, prescribed by the long-term economic strategy of Latvia and the Single National Economy Strategy, is to raise the employment level to 70 % during the coming 20–30 years and to reduce the unemployment rate to the natural unemployment level (Lisbon Strategy 2000; LR Ministru kabinets...2005).

During the development of the national economy of Latvia the labour market structure undergoes not only quantitative changes but also qualitative changes, creating disproportions between the labour force supply and its demand in sectors of national economy, which

generates a range of problems when implementing national employment and social development programmes (European Employment Strategy 2005; Latvijas Nacionâlais…2004).

Under these conditions enterprises have to invest not only in capacity development but mainly in efficiency improvement for reducing the negative impact of the growth of labour force costs on competitiveness and to address the problem of labour force deficit. The question of a more efficient restructuring of national economy sectors, that would promote a more rapid development with a higher value added as well as the question of developing a more flexible and balanced labour market, taking into account the actual demographic situation and its development forecasts become all the more topical. In order to develop successfully in future, the national economy of Latvia needs significant structural changes and reorientation to the manufacture of products and services with a higher added value, essentially increasing labour productivity and competitiveness in the European and global markets. A more detailed analysis of national employment and education policies highlights certain changes required in these areas Research "Detailed Study of the Labour Force and the Labour Market in Sectors of National Economy" was developed from 2005, August till 2007, May. That was a framework of the National programme of the European Union Structural Funds "Labour Market Studies" project "Ministry of Welfare Studies" (Latvijas valdîbas…2003, LR Ministru kabinets 2006).

2. Research methodology

The objective of this research was to identify and forecast the Latvian labour market demand and the supply of labour force in 15 sectors of national economy as well as to determine causes of the disparity between the labour force supply and demand and to identify alternatives for solving these problems.

In the course of the study issues concerning the information base were specified and the emphasis was put on the model of the 120 professions and the model of 37 aggregated groups of professions for the forecast and analysis of the labour market from 2007 till 2030. In this research methodical guidelines of analogous foreign studies (the experience of Ireland, Sweden and Czech Republic) were used.

The following tasks were defined and carried out in the study:

- The analysis of the general situation in Latvian labour market taking into account guidelines of strategic and programme documents and regulatory legal acts of the EU and the Republic of Latvia in the area of employment.
- An analysis was made of the most significant labour market studies undertaken to date in Latvia and abroad.
- An innovative quantitative and qualitative Employers' Survey (2502 enterprises) was developed; the Employers' Survey results were analysed.

The following tasks were defined and carried out in the study:

- A scheme was developed and improved for acquiring updates on the labour force market demand and supply.
- A scheme of information flows among related institutions was formulated for the Latvian labour market study.

- An econometric analysis of factors, influencing the labour force demand and supply, was undertaken and methodology for designing econometric models was developed.
- Forecast calculations of the labour force supply and demand and the analysis of disproportions in the short-term, medium-term and long-term period were undertaken.

The study and forecast of the labour force supply and demand according to the 120 identified professions in the medium-term regime (2007–13), according to the 37 aggregated groups of professions in the long-term regime (2014–20) and vision-making regime (2021–30) on the basis of forecasts of the Ministry of Economy of Latvia on GDP and national economy sectors until 2030 and labour force demand time series formulated on the basis of data of the CSB (1997–2005).

The methodology of the studies is mainly based on data of different surveys and statistical information, expert evaluations, involving the use of methods of mathematical statistics and econometrics on a limited scale. Foreign labour market studies, started in the sixties of the previous century and the analysis of the forecasting practice prove the common approach to the methodology in forecasting labour demand and supply. Still there are some peculiarities in the labour market study in each country depending on the available databases used for forecasting. The "manpower requirement" methodology is widely used in forecasting. The average term of the forecasting period in foreign studies on the labour force supply and demand is 5–7 years and long-term forecasts are based on long-term development scenarios for national economy. It is possible to take over such experience also in Latvia.

The Ministry of Welfare of the Republic of Latvia and its subordinated institutions, in particular the Employment State Agency alongside with other state institutions conduct important work in formulating and implementing national employment policy guidelines. Extensive information on labour market issues has been accumulated and systematised in the data bases of the Central Statistical Bureau of Latvia. Separate studies in the area of the labour market and employment, commissioned by the Ministry of Economy and the Ministry of Education and Science of the Republic of Latvia have been undertaken by professional associations, in most parts covering specific sectors or labour market sectors. Labour market studies, undertaken in Latvia until now, although interesting and performed at an appropriate professional level, have an episodic, fragmented character, there is a lack of co-ordination of the undertaken studies that does not allow summarizing the acquired data and drawing conclusions about the labour market situation in general.

When assessing the research undertaken in recent years in Latvia on the labour market, a particular attention was paid to the acquired data, research methodology and conclusions as well as possibilities of applying experience in successful further labour market research and forecasting.

Research methods depend to a large extent on the possible and selected sources of statistical data and short-term forecast data. One of the key principles, followed during the study "Detailed survey of the labour force and the labour market in sectors of national economy" was to make the best use of the published surveys and, in particular, the official statistical data. Databases containing official statistical data on the labour market in Latvia contain information not yet subject to analysis. The CSB (Central Statistical Bureau), for example, has performed an annual survey of professions every October since 1997. Results of each survey

are published in the data volume which provides information on a number of employees and their wages in the reference period. However, no research institution or group of researchers has yet made and analyzed time-series of the size and composition of the labour force. There is no doubt that such time-series are extremely useful in forecasting. Researchers involved in the study "Detailed Study of the Labour Force and the Labour Market in Sectors of National Economy" have used CSB data to create time-series and analyze data on the number of occupied jobs, the number of persons employed in their principal job etc.; hence, this has been an innovative activity.

Adherence to the above principle and the inclusion of new surveys only when they are effective from the point of view of the entire national economy (not only from the point of view of the commissioner or project implementer) ensures also a significant reduction of the work load of respondents.

Another principle followed during the research study "Detailed Study of the Labour Force and the Labour Market in Sectors of National Economy" was the complex use of the available data; and this principle was applied at times even to a single table or figure. It was also applied when obtaining data from different sources: both traditional statistical labour market surveys and macro-economical statistics and qualitative research.

Researchers have made a much more extensive use of publications on the labour market surveys in Latvia and other EU states as well as of the information obtained from traditional market conjuncture surveys.

The Employers' Survey was undertaken during the research to obtain data important for the analyses and forecasting but not yet available in the official statistics or in the labour market research studies.

Various statistical and econometric analysis methods of data collation have been used, the main being:

- the statistical grouping;
- the calculation of the mean values;
- the calculation of relative values;
- the calculation of indexes;
- the modelling of time-series;
- the table method;
- the graphical figure method;
- the assessment of autocorrelation;
- the normality assessment test;
- the least squares method;
- the restricted least squares method;
- the heteroskedasticity test;
- the assessment of serial correlation.

The research study "Detailed Study of the Labour Force and the Labour Market in Sectors of National Economy" has employed both primary and secondary grouping, done according to attributive as well as quantitative parameters. As to the type of grouping, the typological grouping is the most frequently used type of grouping, structural grouping has been applied less often.

Researchers have used both the simple arithmetic average and the weighted average.

Relative values have been expressed in the form of coefficients and in percentage terms. Growth coefficients (basic and chained) and growth rates in percentage terms are the most frequently calculated values among dynamic relative values. Quite frequently calculation has been made also of the absolute differences of relative values in percentage points.

Individual indexes, group indexes and common indexes are calculated in the course of the research.

Time-series of absolute, relative and average values are developed and analysed, most often these are time-series of intervals. Time-series indicators serve as the basis for calculating the base indicators and chain indicators. Time-series indicators ensure establishing the development tendency or trend.

In order to improve the information support researchers offer a unified flow chart of the research information for the labour force demand and supply, providing in it the introduction of the Register of Employees which in the event of implementation, would increase the reliability degree of the labour force demand and supply forecasts (Fig. 1).

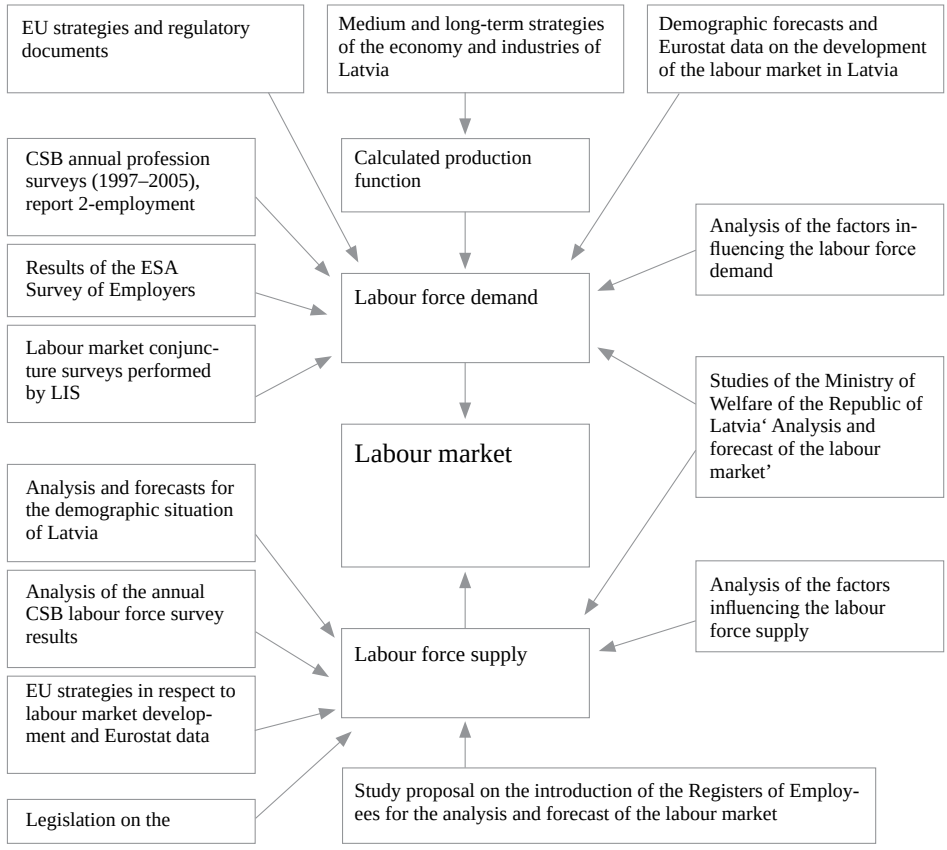

Fig. 1. Scheme of information flows of the labour force demand and supply research study

The situation of the labour market is influenced by the production structure of the country, which is determined by products offered by sectors and the total demand of the labour force by specific skills, types of occupations and the level of education. This theoretical and widely accepted assessment is affected by globalization processes and their further expansion. The employees also become more and more aware of the possibilities offered by the global market. It requires not only a structure of labour market forecast models but also a discussion on the strategic choice of countries, concerning the employment policy and the provision of the necessary skills to the population.

The labour market, in general, is also affected by the following factors:

- the labour force supply, based on forecasts of the number of the population and age structure as well as migration forecasts;
- the development of human resources that is based on qualitative and quantitative indicators of education, further education and life-long education;
- the effective impact of new technologies and business organization forms on production processes and productivity;
- the effect of labour costs, as well as taxes and indirect costs of factors regulating the labour market;
- changes in the global division of labour, caused by differences in prices, wages and interest rates.

The interaction of the most important factors of the labour market is displayed in Fig. 2.

The methodology of forecasting the labour force demand is based on the labour market projection methods, widely applied abroad. By using the manpower requirements method, the labour force demand is forecast in a break–down by profession in the following stages:

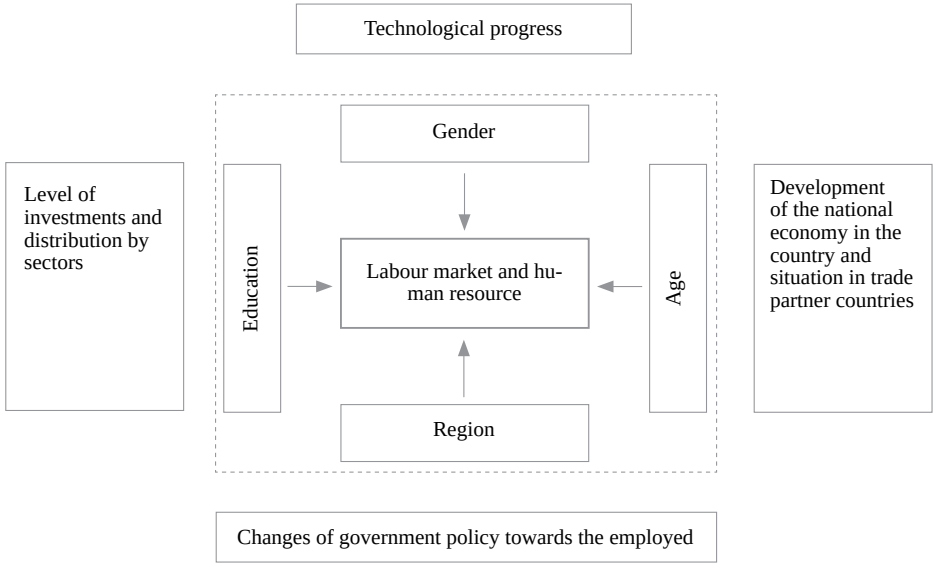

Fig. 2. Factors influencing the labour force demand

- In cooperation with the Ministry of Economics of the Republic of Latvia, forecasts are formulated for added value and investment volume sectors, as well as for the national economy of Latvia, in general. Trends of the recent years are taken into account, as well as all the available information about the changes, which may be expected in external markets, technologies and other changes, which may have a significant impact on the structure of the national economy sectors in Latvia.
- Forecasts of added value sectors are used in forecasting the number of the employed by a sector. The added value and employment forecasts are linked with the help of the production function, in which the increase in the added value is associated with the increase in the amount of production factor (the labour force and capital) and technological progress.

Thus, the increase in the labour force demand by profession is formulated as follows: the total increase in employment; changes in the distribution of employees by sector (caused by the fact that growth rates of sector added values, capital growth rates as well as technological growth rates differ and subsequently in time the structure of the number of employees also undergo changes), which reflects the effect of the sectoral ratio; changes in ratios of professions in sectors that reflect the effect of the ratio of professions. The method for the assessing of both effects is described below. The technological process is a determining factor of the effects of the professions ratio.

The questionnaire of the Employers' Survey was developed during the accomplishment of the research study „Detailed Study of the Labour Force and the Labour Market in Sectors of National Economy".

The form of the Employers' Survey is a combination of quantitative questions usually acquired in the form of interviews (Part A of a questionnaire), and quantitative indicators usually submitted in the form of reports (Part B of a questionnaire).

The subcontractor SIA "Latvijas Fakti" has surveyed 2 502 enterprises and organizations in Latvia by sector of national economy and by region.

The quantitative results of the Employers' Survey have been used as supplementary and adjusting information in labour force demand forecasting, while qualitative results have used as relevant descriptive information for the analysis of the labour market in Latvia.

The questionnaire used in the survey of employers enables to acquire a detailed information on the number of persons working in specific professions broken down by age groups, the level of education and statistical regions, as well as data on unoccupied jobs in each profession. It must be particularly pointed out that in the course of the survey employers' assessments were obtained on changes in the number of employees expected at the enterprise during the period until 2020. Moreover, these assessments were done for each profession, which makes it possible to discuss information acquired for analytical purposes in aggregated groups of professions.

The analysis is based on the statistically weighted data of 2502 questionnaires, thus providing a possibility of attributing these results to all employers in Latvia as well as to all employees in a breakdown by the most significant features.

The list of 120 professions was supplemented with some professions with higher employee numbers from the Ministry of Welfare list of 197 professions, thus ensuring a better coverage of the sample in respect of the number of employees.

The aggregation of professions in 37 groups, which ensures that thematic groups established in the Classification of Education in Latvia correspond to the professions established in the Classification of Professions both at the level of the small groups and the separate groups, was a effective measure to establish a long-term balance between the labour force demand and the labour force supply. A mandatory condition while developing 37 (or close to this figure) aggregated groups of professions is to include all professions existent in the country.

In the course of the survey focus groups with businessmen were organised and in-depth interviews conducted with officials of local governments and various ministries with the aim of ding out experts' opinion on the labour market situation in Latvia and its development trends in the near future.

Focus group discussions include the following themes:

- The current economic situation in Latvia. Forecast on its development in the coming 5–10 years
- The quality of the labour force in Latvia
- Labour market policy problems and failings, solutions for its alignment
- Education and labour market demands
- Employment differences in regions
- Involvement of the economically inactive and social exclusion groups in employment
- Resources of the European Social Fund and the European Regional Development Fund
- The role of trade unions
- Unofficial employment
- Gender equality on the labour market
- Forecasts on economic migration.

In-depth interviews cover the following themes:

- A general description of the Latvian labour market, the assessment of sectoral and regional development
- The assessment of the legislation regulating the labour market
- The labour force structure, its insufficiency in regions and sectors
- The attitude towards the existing Classification of Professions, possibilities and problems in using the said classification
- The main directions for achieving a balanced labour market upon the integration of Latvia into the EU

Materials provided by transcripts of focus group discussions and in-depth interviews were used as the basis for statements and assessment given by experts that were later used for the formulating certain conclusions, which, amplified by materials of the quantitative survey of employers and their analysis, will serve as the basis during the subsequent stages for complex proposals concerning issues of labour market improvement, the institutional cooperation of public agencies and non-governmental organisations, the further development of legislation, education and information flows.

The Methodology of the forecast of the labour force demand in the break-down by profession is outlined in Fig. 3.

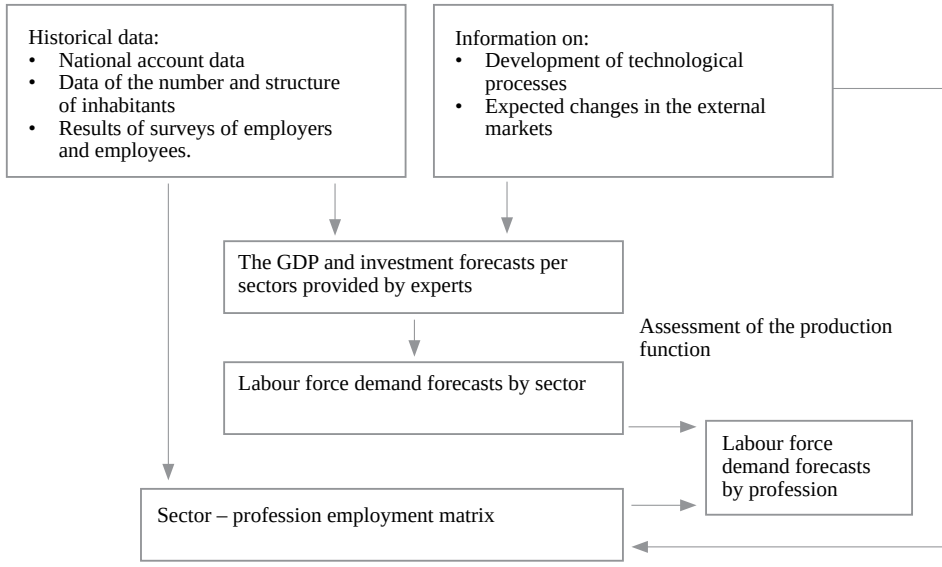

Fig. 3. Scheme of the labour force demand forecasting methodology

3. Econometric model of forecasting

The labour force demand forecast for Latvia undertaken during the research, is based on production functions developed for 15 sectors of national economy in line with the convergence and slow convergence scenarios for the development of national economy developed by the Ministry of Economy. During the demand forecasting the number of the economically active population by groups of profession was established by applying economic and demographic forecasts. Assuming that preferences of choice remain unchanged, labour force demand forecasts are formulated for groups of professions (Project... 2007).

Production functions were formulated by sector of national economy sectors for forecasting purposes in the course of conducting the analysis on the disparity between the labour force supply and demand by 120 professions and the 37 aggregated groups of professions, taking as the basis the existing studies on the labour market in Latvia (the Survey of Professions of the Central Statistical Bureau and the survey of 20 025 employees within the frame of the study "Compliance of the Professional and Higher Educational Programmes to the Demands of the Labour Market" of the project of the Ministry of Welfare of the Republic of Latvia "Labour Market Studies" of the National Programme "Labour Market Studies" of the European Union Structural Funds), as well as using methodical guidelines of analogous foreign studies (the experience of Ireland, Sweden, the Czech Republic and other countries) (LR Ekonomikas ministrija 2004; Bradley and Kearney 2000; Fuchs and Tessaring 1994; Papps, Kerry 2001).

The Cobb-Douglas production function (hereinafter C-D production function) is very widely used in economic studies and forecasting, analyzing the return of the production factor (capital and labour force), as well as in estimating the level of technological process and

the trend in the country. It is the general practice to use linear design methods for assessing the C–D production function. In order to assess this function, the standard C–D production function with constant returns of scale is frequently applied, which has the following presentation:

$$Y_t = A_t K_t^{\alpha} L_t^{1-\alpha}, \tag{1}$$

where Y_t is GDP in comparable prices, A_t – the total productivity of factors or the technological progress, K_t – the actual volume of the accumulated capital, L_t – the labour force in the economy, α – the return on capital.

Testing the Latvian data showed that the C–D production function with constant returns of scale could not be applied for each individual sector of economy. The best results were given by the C–D production function with a variable return of scale:

$$Y_t = A_t K_t^{\alpha} L_t^{\beta}, \tag{2}$$

where the variables remain the same as for the K–D production function (1), in which α is flexibility or the return on capital and β – flexibility or return to the labour force.

In designing the linear type C–D production function, it is assumed that the aggregate development of the productivity of factors in the course of time or the technological progress is determined as follows:

$$A_t = A_0 e^{\frac{1}{t}\lambda + \varepsilon_t}, \tag{3}$$

where A_0 is the primary level of technology, e – the exponent, t – the trend of productivity, which is dependant on time, λ – determines the increase in the productivity trend, ε_t – the assessment error – a stochastic process.

By combining the equations (2) and (3) and applying a logarithm, we obtain an equation used in the linear designing, in determining returns of the production factor and technological process:

$$\log(Y_t) = a + \lambda\frac{1}{t} + \alpha\log(K_t) + \beta\log(L_t) + \varepsilon_t. \tag{4}$$

The inverse production function against employment in theory will be represented as follows:

$$\log(L_t) = \frac{1}{\beta}\log(Y_t) - \frac{a}{\beta} - \frac{\lambda}{\beta}\frac{1}{t} - \frac{\alpha}{\beta}\log(K_t) - \frac{1}{\beta}\varepsilon_t. \tag{5}$$

Changes in the capital depend on the extent of returns to investments in the respective sector. A sector with a relatively higher level of return attracts investments and demonstrates a relatively higher capital growth, which, at the given growth of the sector and the technological progress rate, means a relatively lower increase of the employment level. Similarly, a sector

with a relatively higher rate of technological progress means a relatively lower increase in employment. It is necessary to note that the added value in the sector of services is estimated on the basis of the amount of production factors involved in the production, because the technological progress in this sector is of relatively less importance. Thus the added value and employment in the sector of services has a tendency to increase with an identical rate.

The labour force demand is forecast in the break-down by profession on the basis of labour force demand forecasts by sectors. To implement this, an employment matrix of sectors-professions is developed, containing ratios of representatives of each profession in each sector.

$L_{1,1}$	$L_{1,2}$	.	.	.	$L_{1,15}$	L_1^O
$L_{2,1}$	$L_{2,2}$	.	.	.	$L_{2,15}$	L_1^O
.	.	.	.	.	.	.
.	.	.	.	.	.	.
$L_{120,1}$	$L_{120,2}$	.	.	.	$L_{120,15}$	L_{120}^O
L_1^I	L_2^I	.	.	.	L_{15}^I	L^A

The above-mentioned employment matrix of sectors-professions consists of the following elements $L_{ij,t}$:

where $L_{ij,t}$ is the number of the employed in the profession *i* (*i*=1,..,120) and sector *j* (*j=1..,15)* during the time period t. Respectively

$$L_{j,t}^I = \sum_{i=1}^{120} L_{ij,t} \tag{6}$$

is the number of the employed in the sector j during the period t,

$$L_{i,t}^O = \sum_{i=1}^{15} L_{ij,t} \tag{7}$$

is the number of the employed in the profession i during the period t, and

$$L_t^A = \sum_{i=1}^{120} L_{i,t}^O = \sum_{j=1}^{15} L_{j,t}^I \tag{8}$$

is the total number of the employed during the period t. For 37 aggregated profession groups all calculations are carried out in a similar manner as for 120 professions, by replacing 120 professions with 37 aggregate groups.

The calculation of the matrix and evaluation of the effect of the ratio of the sector and professions is undertaken according to the following algorithm:

Based on the data of the number of the employed in the breakdown by sector and profession for the time period from 1997 till 2005, the trend time-series of the number of

the employed for each sector j (j = 1..., 15) $L^I_{j,t}$ and every profession I (I = 1...120) $L^O_{j,t}$ are developed.

The sector-profession employment matrix is obtained from the temporary sector-profession employment matrix, using the sequence and column totals obtained in the 1st step (respectively $L^I_{j,t}$ and $L^O_{j,t}$), $L^I_{j,t}$ using RAS (*restricted additive Schwarz*) method.

Time-series with ratios of 120 professions in sectors are obtained as follows:

$$S_{ij} = L_{ij,t} \Big/ \sum_{i=1}^{120} L_{ij,t} \ . \tag{9}$$

It allows estimating the mean annual variations of the specific ratio trends of professions, Δs_{ij} which will be considered constant within the forecast period.

We will assume that the year 2007 is the beginning of the forecast period (*t=1*) and the year 2020 is the end of the period (*t = 13*). Growth rates of the sector labour force demand $\gamma^I_{j,t=1}$ for the time period of 2007 to 2020 were obtained, using forecasts produced by the Ministry of Economics and with the help of the rates appraised by the production function. The number of the employed was calculated as $L^I_{j,t=1} = \left[1+\gamma^I_{j.t=1}\right] L^I_{j,t=0}$, ratios of professions as $S_{ij,t=1} = S_{ij,t=0} + \Delta S_{ij}$ and elements of sector-profession employment matrix as: $L_{ij,t=1} = S_{ij,t=1} L^I_{j,t=1}$. The sum totals of the sector-profession employment matrix elements by sequences form the time-series for the breakdown of the number of the employed by profession, whereas the sum totals of sector-profession employment matrix elements by columns constitute the time-series $L^A_{j,t=1}$ of the number of the employed by sector.

The previous step is repeated for each subsequent year, up to and including 2020.

The growth rates of the number of the employed are calculated as follows:

$$\gamma^A_T = \left[L^A_{20} - L^A_0 \right] \Big/ L^A_0 \ , \tag{10}$$

$$\gamma^I_{j,T} = \left[L^I_{j,20} - L^I_{j,0} \right] \Big/ L^I_{j,0} \tag{11}$$

(in the breakdown by sector), and

$$\gamma^0_{i,T} = \left[L^O_{i,20} - L^O_{i,0} \right] \Big/ L^O_{i,0} \tag{12}$$

(in the breakdown by profession).

The total effect of the sector ratio for a profession is calculated as follows:

$$e^I_{i,T} = \left[\sum_{j=1}^{15} L_{ij,t=0} \left(1+\gamma^I_{j,T}\right) - L^O_{i,t=0} \right] \Big/ L^O_{i,t=0} - \gamma^A_T \ , \tag{13}$$

where the total $\gamma^A_T + e^I_{i,T}$ is the growth rate of the number of the employed in the profession i on condition, that the distribution of professions in sectors in the forecast period remains unchanged.

The total profession ratio effect for the profession i is calculated as follows:

$$e_{i,T}^{O} = \gamma_{i,T}^{O} - \gamma_{i,T}^{A} - e_{i,T}^{I}, \tag{14}$$

where $e_{i,T}^{O}$ is the part of the growth rate of the number of the employed in the profession *i*, which is explained by the changes in the distribution of professions in sectors during the forecast period.

When developing the forecast for the supply, a very simple method was selected, based on demographic forecasts. In many countries the supply is forecast on the basis of forecasts of university graduates in terms of specialities; however, it does not allow to determine the supply by profession, because in practice there are cases, when upon graduating a certain discipline the person works in a totally different field.

Thus, in the present study, according to the selected methodology, the number of the inhabitants is projected first, then – the level of economic activity, which determines the forecasts for the labour force supply in the national economy, in general. It is assumed in the forecasts that preferences of the inhabitants in the choice of professions will not change and remain the same as in 2005. Taking into account that a decrease in the number of the population is projected in future, the forecast is that the labour force supply will decrease in all professions.

The research study establishes the forecast demand and supply of the labour force in 120 selected professions and in 37 aggregate groups during the period from 2007 till 2013 as well as trends and visions for 2020 and 2030.

The production function has been identified for each sector of national economy in two variants in line with the approved national economy development scenarios of convergence and the slow convergence. As economy of scale may be observed in economy, in general, but in the analysis by specific sector it may not be the case, the general Cobb-Douglas functions have been identified. Each sector of national economy has been identified its own function. The assessed production function of each sector was tested for the significance of coefficients assessed by these functions. The undertaken analysis of equations of production functions shows that the distribution of the balance not explained by equations is, to a large extent, with the normal distribution in all equations. A more profound analysis of errors in production function equations shows that, irrespective of the short-time series from the CSB (1997–2005), equations do not suffer from serial correlation, autocorrelation and heteroskedasticity. Tests prove the quality of equations. On the whole, it may be concluded that production functions have been structured in line with a specific task and may provide reliable forecasts according to the approved scenarios of economic development.

The acquired production functions are at the basis for the calculation of coefficients $C, \alpha_0, \alpha_1, \alpha_2$ for the logarithmical equation of the labour force

$$\log L = C + \alpha_0 \frac{1}{t} + \alpha_1 \log K + \alpha_2 \log Y . \tag{15}$$

Table 1. Coefficients of the labour force logarithmical equation

Sector	C	α_0	α_1	α_2
A	11,82	0,90	0,21	–0,67
B	6,49	–0,44	0,28	1,50
C	6,07	8,34	0,38	1,28
D	5,17	–30,29	0,06	1,44
E	9,75	–30,03	0,01	0,51
F	6,93	–11,53	0,17	1,00
G	–0,89	0,15	0,00	2,69
H	7,40	–35,39	0,03	1,02
I	1,08	–37,22	0,37	2,18
J	9,64	–25,95	–0,03	0,72
K	7,36	0,01	0,04	1,12
L	8,11	–10,14	0,02	0,84
M	7,91	–9,25	0,01	0,73
N	9,21	–8,95	0,05	0,33
O	10,01	–21,54	–004	0,41

Note: Calculations of the production functions and the labour force logarithmical equation are based on the data of the CSB (1997–2005).

The coefficient α_1 in Table 1 shows the change in the use of the labour force in percentage terms if the accumulated capital (K) increases by 1 %, but GDP in comparable prices remains unchanged. In a similar way the coefficient α_2 shows the change in the use of the labour force in percentage terms if GDP in comparable prices increases by 1 %, while the accumulated capital (K) remains unchanged. Table 1 shows that, for example, the use of the labour force in sector B increases by 0,28 %, if the accumulated capital (K) is increased by 1 %, but GDP in comparable prices remains unchanged; and in the same sector the use of the labour force increases by 1,50 % if GDP in comparable prices increases by 1 %, while the accumulated capital (K) remains unchanged.

Coefficients of the acquired production function and the labour force logarithmical equation are used for the calculating of the labour force demand forecasts. Like production functions, the labour force forecasts in sectors of national economy are also calculated in two variants according to the convergence scenario of the development of national economy and the slow convergence scenario of the development of national economy.

The forecast of the labour force supply is based on the data of surveys of the number of employees, gender and the age structure, employment by profession and preferences in choosing an occupation (profession).

The comparison of results of the labour force demand forecasts with the acquired forecast results on the labour force supply in specific years of the forecast period provides information about the potential imbalance of the labour force demand and supply in the identified 120 professions or in the aggregate groups of professions in the forecast period.

The average values of changes in the ratios of groups of professions are calculated by using the historic CSB data for the period 2002–2005. The mean values of changes in the ratio of groups of professions are retained for the whole forecasting period, calculating a new distribution of ratios for each forecast year.

The labour force supply is projected by using demographic forecasts. They allow establishing the number of the population and then to determine the number of the economically active population by employing economic development forecasts. By the assumption that priorities of the choices made by people remain unchanged, the labour force supply forecasts are formulated.

The description of the research methodology shows that there are a quite large number of employees in Latvia, working in two and more jobs. Coefficients have been calculated in the course of the research that determines the ratio of jobs against the actually working employees. Taking into consideration this fact, it is possible to adjust the forecast required labour force amount. Forecast adjustments have been made for 120 selected professions as well as the 37 aggregate groups of professions.

The analysis of the acquired forecasts shows that in 2007 the insufficiency of employees appears in 82 professions of the 120 and in 2013 it might be experienced in 99 professions. The highest deficit of employees – in excess of 50 % – is forecast in 2007 for the following professions: senior specialists of natural sciences (a deficit of 1567 employees), foresters and employees of related professions (a deficit of 2452 employees), and agricultural, ground work, lifting and other loading/unloading equipment operators (a deficit of 13946 employees). In 2007, a significant surplus provision exceeding 110 % might develop in such professions as civil security and defence specialists (a surplus of 1376 employees), pharmacists (a surplus of 497 employees), stall and market salespersons (a surplus of 1741 employees), manufacturers of furniture and other wooden products (a surplus of 779 employees) and employees of other types of services (a surplus of 248 employees).

Fig. 1 shows the forecast on the labour force demand and supply for those 6 aggregated groups of professions, where the highest insufficiency of employees might appear. The number of employees has been given on the vertical axes. These graphs show the forecast number of employees (assuming that employees work in several jobs on part-time basis).

The large discrepancies in the results of the medium-term forecasts (2007–2013) for the labour force demand and supply in separate professions can be explained by several factors:

The low "prestige" of professions in the preferences of the population that is significantly influenced by a low remuneration level;

Employment of employees in several additional jobs that is not shown with sufficient precision by the initial data.

The insufficient assessment of the development of the technological progress;

An insufficient activity of entrepreneurs in capitalizing the production processes in practice may lead to a significant decrease in the labour force demand.

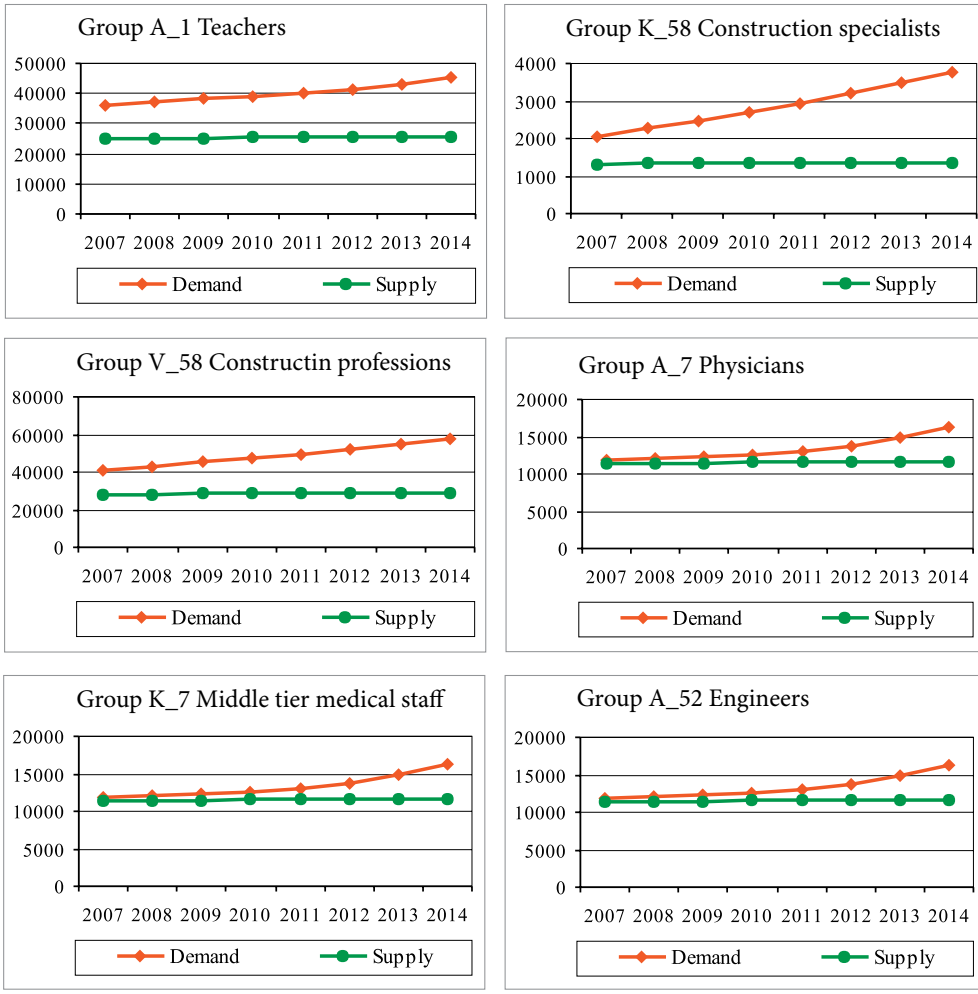

Fig. 4. Forecasts of the labour force demand and supply by a group of professions

The comparison of forecasts for 120 professions and 37 aggregate groups of professions shows that, undoubtedly, the forecasting for the aggregate groups of professions provides more precise results. It is confirmed by the first forecasts that have been acquired, i.e. the forecasts on the ratios of professions. Significant deviation errors in excess of the permissible precision interval appear for the forecasting period that exceeds 3 years, for 120 professions. Therefore forecast calculations for specific professions are permissible for a very short period – 2 to 3 years. When calculating forecasts for the 37 aggregate groups of professions, already the forecasts of the ratios of groups of professions show that deviation errors do not appear. Thus, undeniably, forecasting for the 37 aggregate groups of professions provides more precise forecast results for short-term period and in particular for the medium-term and long-term period.

The medium-term forecasts (2010–2013) show that the highest growth of the labour force demand is expected in the sectors of construction, manufacturing, mining and quarrying. In order to satisfy the labour force demand in these sectors, the educational system must create the necessary capacity for training specialists in the required professions. The additional demand for the labour force might be reduced by increasing the capital in agriculture, fishing, mining and quarrying, manufacturing, wholesale and retail sale, transport and communications as well as financial intermediation. The increase of capital will have the most significant impact on sectors of industry. The improvement of labour productivity is the most realistic option for reducing the number of employees in construction, wholesale and retail sale, in the sector of hotels and restaurants.

The analysis of the acquired short-term forecasts has allowed detecting that in 2007 the insufficiency of employees appears in 106 professions of the 120. For example, the highest insufficiency of the labour force is found in the following professions – building construction workers, construction electricians, senior project management specialists, labour safety inspectors, physicians, and electro-mechanic specialists. In the medium-term 2010–2013 the highest increase in the insufficiency of labour force is projected in the following professions: construction engineers, electric engineers, dentists, other specialists of physics and engineering, computer equipment operators. Coefficients of the labour force logarithmical equation allow assessing the impact of various factors on changes in the labour force demand. An increase in the capital in agriculture, fishing, mining and quarrying, manufacturing, wholesale and retail sale, transport and communications as well as financial intermediation will allow reducing the number of the labour force employees in these sectors. In this respect the increase in capital will have the greatest impact on both sectors of industry.

The results of employers' qualitative and quantitative surveys were used in assessing the results acquired as a result of forecasting in particular in the long term (2014–2020) in cases of the possible imbalance in the labour force demand and supply, that also confirmed difficulties encountered by practitioners in assessing trends in the development of the labour market and employment by professions or groups of professions in the long-term. The interpretation of the acquired forecasting results may be significantly influenced by the situation that has developed. Employers' surveys confirm that almost 52 % of employees do not work in professions of their acquired education. Labour market studies also reveal a situation that employees occupy simultaneously several jobs (in 2005 it was on the average 14,6 % of the total number of employees in national economy) and adjustment coefficients were applied to specific professions during the forecasting process.

4. Conclusions

Data bases of the official statistics on the labour market of Latvia provide information, which until now has not been analysed in the country. Project implementers used data provided by the CSB to develop for the first time in the country time-series (1997–2005 years) about the number of occupied jobs, the number of employees working in principal jobs and other indicators characterising the labour market, and analysed these indicators by sectors of national economy, by professions and by groups of professions.

Upon the assessment of results provided by forecast, the achievement degree of tasks identified by the forecasting of the labour force demand and supply by time horizons and the reliability of forecasts, researchers established that forecasts by 120 professions were more appropriate for short-term and medium-term forecasting, forecasts by 37 aggregate groups of professions – for medium-term and long-term forecasting as well as for the formulation of the labour market development visions.

The considerable disparities in forecast results in labour demand and supply by specific professions can be explained by the following factors: the "low" prestige of specific professions in the preferences of the population, that is to a considerable degree influenced by the low remuneration and the assessment of the significance of these professions in the community; employees working in several places that are not reflected by statistical data with sufficient precision; the insufficient assessment of the development of the technological process; the insufficient activity of employers in capitalising the production process that can in future maintain an unjustifiably high labour force demand in specific professions.

The analysis of results of the Employers' Survey focus attention on insufficiently resolved issues in the labour market policy and generates reflections about respondents' understanding relevant aspects promoting the development of economy, for example, the impact of the technical progress on labour productivity. Results of the Survey confirm the orientation of employers towards an extensive increase in the labour force in future, which contradicts conclusions of demographic forecasts about the expected decline in the number of the population and the number of inhabitants capable of work. It is nationally important to achieve the understanding of employers about the actual demographic processes expected in the near future and to stimulate reorientation from an extensive approach (an increase in the number of employees) to an intensive approach (the improvement of labour productivity) in using labour resources.

Data of the qualitative survey of employers undertaken within the frame of the research provide an assessment of the current situation of the Latvian national economy. Positive factors that are mentioned: the growth of investments, the improvement of the quality level of goods and services, increased cooperation with foreign enterprises, and the growth of exports. In their turn, negative trends, that are mentioned, include the arbitrariness of officials in Latvia in interpreting European Union requirements, symptoms of the "overheating" of the economy (the high and lasting inflation, unjustifiably easy access to loans, in particular, in the real estate market, the high ratio of speculative business in entrepreneur activities), difficulties encountered by employers in paying the wages, required by the employee as well as the under-motivated labour force.

When describing problems of the Latvian labour market policy, respondents – employers emphasize the excessive protection of employees' rights provided by legislation; as a result, it is difficult for employers to get rid of unprofessional and negligent employees. The vulnerability of employers is emphasized as concerns their investment in the professional growth of employees that stimulates the use of the illegal labour force and the system of "salaries in envelopes", reduces motivation to send employees to upgrading courses and reduces the motivation of employers to work effectively within the frame of an official employment contract.

Data of the Employers' Survey show that the existing disproportions in the labour market development, violations of labour legislation and the existence of the "shadow economy" distort, to a certain extent, the labour market (12,3 % of employees working in the public sector have had violations of labour law), creating high-risk professions and even sectors (the main risk sectors are security, construction, agriculture and forestry). The labour force in general, as well as in separate professions is influenced by internal and external migration factors creating a "relative" labour force deficit in the main sectors of national economy. Respondents' answers concerning ways of addressing the labour force shortage problem that in almost 20 % of cases the hiring of new employees is simultaneous with the reduction of requirements concerning applicants' education and experience, is a disturbing symptom that in future may lead to a significant decline in the quality and competitiveness of the labour force.

The considerable disparities in forecast results on the labour demand and supply by specific professions can be explained by the following factors: the "low" prestige of specific professions in the preferences of the population, that is to a considerable degree, influenced by the low remuneration and the assessment of the significance of these professions in the community; employees working in several, that is not reflected by statistical data with sufficient precision; the insufficient assessment of the development of the technological process; the insufficient activity of employers in capitalising the production process that can in future maintain an unjustifiably high labour force demand in specific professions.

Labour market studies confirm the fact that in Latvia a large number of employees simultaneously occupy several jobs. In 2005, the number of people working in extra jobs constituted 14,6 % of the total number of the working population in Latvia. During the forecasting process adjustment coefficients that determine the actual number of employees, have been calculated and used for specific professions and sectors.

According to production functions an absolutely identical development in both scenarios of convergence and the slow convergence is projected in such sectors as public administration and defence, education, health and social care, community, social and individual services.

The analysis of the labour force demand by region and by gender for the selected 120 professions, confirmed in numerical terms the statement about the existence of the so-called "male" and "female" professions as well as numerically small professions and professions with marked employment fluctuations. Professions of the last two groups make forecasting more difficult as in numerically small professions ratios are practically 0, while professions, where employment fluctuates, have very changing ratios that may also cause imprecision in forecasting. The fluctuation of professions was discovered through the analysis of the labour force demand by factors of impact at the regional level. It is necessary to disperse the stereotype prevailing among labour market research commissioners and often also among project implementers that a new research study means also a new survey. From the point of national economy it is more efficient to channel funds consistently into the improvement of the official statistics for regular labour market forecast needs. It is appropriate to establish samples of labour market – related companies, institutions and organisations on the basis of the Enterprise Register of the CSB as the population source. The Employers' Survey and the Job-seekers' Register of the Employment State Service, conjuncture surveys of the Latvian Institute of Statistics may be effective information sources also in future for the labour market in the country.

It is recommendable to use the method for calculating the coefficient of the number of employees in principal work against the number of occupied jobs in sectors (regions) as well as in professions in the subsequent labour market studies. They have been used in forecasting the labour market supply, which will give an opportunity to considerable increase the reliability of forecast results.

Researchers recommend organising the Register of Employees (the State Revenue Service being the potential holder of the register) as the most perspective source of data for labour market analysis and forecasts.

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LATVIJOS DARBO JĖGOS PAKLAUSOS IR PASIŪLOS MODELIAVIMAS

E. Dubra, M. Gulbe

Santrauka

Šio straipsnio tikslas – išanalizuoti Latvijos darbo rinkos problemas ir galimus pokyčius. Sudarytas darbo jėgos paklausos ir pasiūlos prognozavimo ekonometrinis modelis, kuris susideda iš 120 profesijų ir 37 jų grupių. Modelis apima laiko periodą nuo 2007 iki 2030 metų. Atliktas kiekybinis ir kokybinis darbdavių tyrimas, o jo rezultatai naudojami skaičiuojant. Šio tyrimo naujumas yra tas, kad darbo jėgos paklausa ir pasiūla nagrinėjama kompleksiškai, skaičiavimai teikia prognozes Latvijos ekonomikai bendrai ir atskiriems 15 sektorių.

Reikšminiai žodžiai: darbo rinka, darbo jėgos pasiūla, darbo jėgos paklausa, produktyvumo funkcija, prognozė.

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