

POTENTIAL SCENARIOS OF ECONOMIC DEVELOPMENT OF NORTH VOJVODINA AND FORECAST OF FUTURE TRENDS OF EMPLOYMENT

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Abstract

Researchers from Scientific society from Subotica, work on regional development problems on north Vojvodina region. For defining the Regional economics development of north Vojvodina area, and role of agriculture in it, SMIC-PROB-EXPERT method is used. Method works based on tree matrix: Vector of apriority probabilities of economy process: Matrix of probability of showing processes in pairs: Matrix of showing the processes in the situation when other processes are missing.

The probability where agriculture processes have significant role in regional development is 0.428. Processes of stagnation have probability of 0.357, while, role of S.M.E. is reasonable. The goal of this paper is to present detailed results of analyses of possible scenarios of regional economy development.

Keywords: *regional development, role of agriculture*

Introduction

In last decades we have seen a considerable increase in number of mathematical models for system-prediction, but the applicability of these methods are inherently limited for prediction of extremely complex socio-economic systems (*Ketchen et al., 2008*), because their capability to characterise the future behaviour of such complex systems as a region is rather limited.

That's why the combination of a direct-question survey and an expert-based scenario-analysis method, utilising the knowledge base of specialists seemed to be the best way to set up a system of predictions for the future. In our work we used the SMIC-PROB-EXPERT cross-impact analysis tool, developed by Michael Godet (Branfield et al. 2002).

Method and data resources

The software input has three parts: vector of a-priority estimations of probability of different processes, and two square matrices. The first matrix contains the experts' estimation of pairwise probability of co-occurrence of processes. The second matrix contains the estimated probabilities of occurrence of processes in pairwise form, if the other process in the pair would not occur. The preparation of these matrices is a rather cumbersome process, because if we apply 6 occurrences, it will be necessary to determine 60 conditional probabilities. To

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save the energy of experts, we had to minimise the number of variables. The bases of choice of variables, included in scenario-analysis have been the results of the factor-analysis.

The information gathered during a SMIC-PROB-EXPERT survey is substantial as there are as many hierarchies of scenarios as there are experts questioned. There is therefore the problem of aggregating the answers provided by several experts. One solution is to draw up a typology of experts based on the closeness of their responses or to consider them in terms of actor groups. Analysing responses from the different expert groups also helps to highlight certain groups of actors' games. The raw, clear data obtained (represented most frequently in the form of histograms), enables one to identify certain consensus, to bring out schools of thought by using sensitivity analyses, and thus identify certain groups of experts or actors. Care must always be taken, however to avoid an over-mechanical application of this type of method. Participants must not forget that the probabilities obtained remain subjective probabilities, i.e. they are not based on observable frequencies but on opinions.

In our work we followed the concepts and processes of cross-impact probability methods in order to prepare input data for scenarios. In the first phase of our research a considerable number of potential tendencies of future development of the region has been collected, based on brain-writing method. In the brain-writing session 10 people participated. The participants were specialists from 8 municipalities in North Vojvodina and 2 researchers from Budapest.

In the second phase of scenario building, we employed Delphi procedure to collect probabilities for different processes. In this phase we take into consideration that the number of questions (or events) is an important limiting factor. In the opinion of experts the upper limit of questions in case of Delphi-methods is 25 items, that's why we applied 19 items (possible event or processes) as a total in our questionnaire. To facilitate the fill-out of the questionnaires, seven intervals of probability have been pre-determined. The respondents have been asked to estimate the probability of occurrence of different states or processes. As a total, 31 filled-out questionnaires have been sent back. For the statistical analysis descriptive methods, principal component analysis and structural equation modelling have been used.

With quantitative processing of the returned filled questionnaires and based on the estimated averages, we came to the probability order of the processes. The analysis of relations between certain possible processes, the demarcation of main groups of variables was done by factor analysis. The essence of the method is that based on the strength of relations between certain variables it makes it possible to delimit similar variables, and so we can eliminate those, which are similarly judged by the respondents. In other words, it means in this case that we can determine determining tendencies.

The determination of input-matrices for SMIC-PROB-EXPERT analysis was a rather difficult task. That is why a two-hour long workshop has been organised, where the different probabilities have been estimated by consensus. In the following preparatory step the research group experts formulated six potential images for examination, based on the probabilities calculated from the experts' opinions and the examined processes:

1. Due to the region's natural endowment and the structure of family farms it is possible for small and family farms to begin to develop, found cooperatives, come to an agreement with processing industry and achieve market opportunities. Labour-intensive gardening, fruit growing, viniculture and emphatically, organic farming will dominate this process, complemented with primary processing and rural tourism. Such course of economic development will engage a portion of the workforce, but because of fragmentation, the accumulation ability will be low. The research group titled this strategic option as "AGRÁRKICSI".

2. Besides the small and family farms the remnants of ever been large-scale estates are also present in the region. They may break up in the future, however it is also possible that processing industry and foreign capital will show interest in these capacities and they will invest in mass production of grain and industrial crops. This way a dual structure may evolve with small farms of high labour engagement but low accumulation on the one side, and accumulative big estates with few employees on the other side. The group titled this strategic option as "DUAL".

3. Besides developed agriculture, there is also a tradition of industrial production in the region. In the past, especially in larger cities there had been some important industrial capacities. Due to the problems of transition new owners often took down these capacities or relocated them to other parts of the country. In spite of this, we should take into consideration that the region is practically relied on the E-5 international motorway and the north-south railway, which represent opportunities for intensified development of production capacities and logistics services as an answer to the interest shown by foreign capital. In addition, we must take into consideration the fact that the areas parallel with the border between Baja – Bácsalmás – Subotica – Kanjiža – Szeged – Kikinda had been set back deliberately. The industrial and servicerelated development of this area in tune with the Danube region strategy of EU will require and engage workforce. Such strategic option may withdraw labour from agriculture, in this way pushing agriculture to the domain of part-time employment, similarly to developed countries. The group titled this strategic option as "PART-TIME".

4. According to the most pessimistic assumption, no development is possible within the region, while outside it, for example in Novi Sad, but even beyond the border a serious development will begin. This situation will force skilled, mobile, young people to leave the region – so-called exodus. This way the area will partially become empty, and only older people will remain living on small farms and in stagnant larger settlements. This loss of labour and intellectual capacities has been titled as "EXODUS".

5. In the fifth case, relying on the industrial development of the region and its environment, small and medium-sized enterprises in the fields of industry and services will begin to develop. They will accumulate a significant part of the labour force, though they will not represent a great development potential since their accumulation ability is low. This strategic option has been titled as "KKV".

6. The last one is the entirely pessimistic strategy, according to which the economy will continue to stagnate and we will make no headway. This situation will increase social tensions. The research group titled this strategic option as "STAGNÁL".

After the research group had defined the potential images with consensus, they estimated the probability of certain strategic options. These estimated values had been averaged to come to the simple probability of potential strategies shown in **Table 1**.

Table 1. The probability of images (P/i)

	Probabilities
1 : agrarkicsi	0,31
2 : dual	0,329
3 : part-time	0,339
4 : exodus	0,298
5 : kkv	0,276
6 : stagnál	0,189

In the next step everyone estimated the probability of the other strategic options for the case when one certain image realises (**Table 2**). Accordingly, the data indicate that if the strategy in the row comes true, e.g. the “agrarkicsi”, how much is the chance for realisation of “dual”, “part-time” etc. After this came the estimation of probability for realisation of other strategic options in case a specific one does not come true (**Table 3**). Accordingly, if “agrarkicsi” does not realise, its probability is 0, while 0.34 is the probability of “dual”, 0.35 of “part-time” etc.

Table 2. Realisation possibility of images in rows and columns pairwise (Pi/j)

	agrarkicsi	dual	part-time	exodus	kkv	stagnál
1 : agrarkicsi	0,31	0,25	0,234	0,02	0,118	0,124
2 : dual	0,264	0,329	0,305	0,134	0,187	0,277
3 : part-time	0,256	0,315	0,339	0,142	0,356	0,148
4 : exodus	0,019	0,122	0,125	0,298	0,058	0,329
5 : kkv	0,105	0,157	0,29	0,054	0,276	0,559
6 : stagnál	0,075	0,159	0,083	0,209	0,384	0,189

Table 3. Realisation possibility of images in columns if options from the rows do not occur

	agrarkicsi	dual	part-time	exodus	kkv	stagnál
1 : agrarkicsi	0	0,34	0,35	0,434	0,384	0,354
2 : dual	0,358	0	0,341	0,411	0,383	0,341
3 : part-time	0,377	0,351	0	0,423	0,333	0,384
4 : exodus	0,423	0,384	0,387	0	0,389	0,291
5 : kkv	0,353	0,334	0,269	0,37	0	0,21
6 : stagnál	0,241	0,204	0,244	0,181	0,115	0

Results – potential scenarios

As a result of calculations done with the software based on the previous input data, in the first step we obtained the results presented in **Tables 4 and 5**. These data present the changes of probabilities for the realisation of images presented in table 1. in case the images in table 2.

realise (the values show the changes of hypothetical probabilities). It is visible from the table that the remaining agrarian small enterprises could play especially important role in slowing

Table 4. Changes of probabilities $P(i/j) - P(i) - (I.)$

	agrarkicsi	dual	part-time	exodus	kkv	stagnal
1 : agrarkicsi	0	-0,061	-0,076	-0,29	-0,192	-0,187
2 : dual	-0,064	0	-0,023	-0,194	-0,142	-0,052
3 : part-time	-0,083	-0,024	0	-0,197	0,017	-0,191
4 : exodus	-0,279	-0,176	-0,173	0	-0,24	0,031
5 : kkv	-0,171	-0,119	0,014	-0,222	0	0,283
6 : stagnal	-0,114	-0,03	-0,107	0,02	0,194	0

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Table 5. Overview of the changes of probabilities $P(i/\text{non } j) - P(i) - \text{II.}$

	agrarkicsi	dual	part-time	exodus	kkv	stagnal
1 : agrarkicsi	-0,31	0,03	0,039	0,123	0,073	0,044
2 : dual	0,029	-0,329	0,012	0,082	0,054	0,012
3 : part-time	0,038	0,012	-0,339	0,084	-0,006	0,045
4 : exodus	0,126	0,086	0,089	-0,298	0,091	-0,007
5 : kkv	0,077	0,058	-0,007	0,094	-0,276	-0,066
6 : stagnal	0,051	0,015	0,055	-0,008	-0,074	-0,189

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down the process of emigration, decreasing its intensity. For example if the image “agrarkicsi” remains, the chance for “exodus” decreases for 0.29 (form 0.31 to 0.02). These data present the changes of probabilities for the realisation of images presented in columns in case the images in Table 1. do not realise (the values show the changes of hypothetical probabilities). Analysing the table we can see that decreasing opportunities for employment locally especially increases the probability of emigration and stagnation. In the following step we got the elasticity matrix (**Table 6**), which shows in the rows the effect of certain strategic options on other possible images, while in the columns it shows how much do they depend from the other strategic options.

Table 6. Elasticity matrix of strategic options

	agrarkicsi	dual	part-time	exodus	kkv	stagnal	Somme absolue
1 : agrarkicsi	1	-0,416	-0,434	-0,661	-0,566	-0,595	2,671
2 : dual	-0,373	1	-0,329	-0,499	-0,456	-0,377	2,034
3 : part-time	-0,392	-0,327	1	-0,503	-0,294	-0,513	2,029
4 : exodus	-0,685	-0,57	-0,563	1	-0,658	-0,427	2,903
5 : kkv	-0,378	-0,341	-0,224	-0,42	1	-0,015	1,378
6 : stagnal	-0,19	-0,144	-0,187	-0,116	-0,017	1	0,654
7 : Somme absolue	2,018	1,798	1,736	2,198	1,992	1,927	-

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After this we got the probabilities of certain scenarios – combinations of images or strategic options. The software has presented these results in a histogram. The software has examined 64 possible combinations of strategic options, i.e. 64 potential scenarios. The highest probability is in line 60 (000100), which indicates the case of exodus with no other strategic options realised.

Preferred scenario of possible economic development

It is visible from the research that there is no such a scenario, which would be especially optimistic or dominant. It is better to presume a parallel realisation of diverse processes. After analysing the combinations of possible scenarios we have found out the following:

- The combined probability of such scenarios, which bear a relation to agriculture is 0.428, which include the option of stagnation is 0.357, and of those having SMEs in the combination is 0.16.
- Relying upon these findings we assumed that the most probable combination of processes is where agrarian sector has an important role, SMEs have a slighter presence, however the whole situation is characterised of stagnation.
- Starting from the principle that the analysis of optimistic scenarios is unnecessary since that could lead to passivity, we concluded that the above mentioned is the combination of scenarios, which has to be analysed thoroughly and decision-makers should treat it seriously.
- Practically, this possibility indicates that the level of endogenous forces within the region is not powerful enough to be the development driver. Based on agrarian sector's and SMEs' accumulation level it is unthinkable to generate serious structural development based only on them.
- The way out lies in decreasing the level of taxes and increasing the ability to attract capital. Only capital from external sources would be able to create such production, service, logistic and transport capacities in the region, which could initiate the development of the SME sector as well, by this means an increased engagement of workforce.
- Agriculture is based on the natural endowments of the region. Its problems must be examined together with food industry, that is, from the fields to the consumers. The role of agriculture must not be neglected, even if its accumulating ability is limited, since agriculture is fixed to a place and it is the basic safeguard for part of the inhabitants depending from it.
- It is definitely necessary to relieve agriculture from the redundant labour, and simultaneously, to create market opportunities by the development of diversification potentials like organic agriculture, power generation, rural tourism and others, together with food industry.
- Finding and capitalisation of market opportunities is of vital importance, since not the trade of raw materials, but higher level of processing and marketing of consumer goods can provide profit.

Forecast of future trends of employment in North Vojvodina

Unfortunately, we could not make forecasts based on the number of unemployed, since we had only short time series available (for the period 2000-2008). On the other hand, we managed to obtain data on the number of employees in Serbia, Vojvodina and the municipalities of the observed region for a twenty-two-year period (between 1988 and 2009). These series of data in principle make it possible to apply forecast models. However, they also

require caution, since the confidentiality of forecasts based on time series highly depend on the length of the time period.

We applied ARIMA model of SPSS software for forecasting, with that we defined the characteristic values of the model (p , d and q) according to changes of real data.

The value of p defines how many previous data to use for calculating predictions. The value of d depends on the approximated function. If it is linear, then d is 1, for square function d is 2 and so on. Finally, q stands for the number of factors the moving average of which is used for calculating the estimated values. For self-checking we prepared a model using the EXPERT Modeller function of the SPSS software for every forecast made by ARIMA model. Using this tool we can quickly analyse historic data and estimate trends. This tool automatically determines the most appropriate ARIMA or other model for the given data. Moreover, it tests the seasonality, continuity and missing data automatically, selects the adequate model, and finally draws the diagram of the confidence interval and of the chosen model. We made forecast on the following data series:

1. number of employees in the region (the total of the eight municipalities)
2. number of employees in Vojvodina
3. number of employees in Serbia
4. number of employees in every observed municipality separately.

In case of every territory unit the R2 value of the ARIMA model is higher than 0.95, except for the region as a whole. (In statistics, the coefficient of determination, R2 is used in the context of statistical models whose main purpose is the prediction of future outcomes on the basis of other related information. It is the proportion of variability in a data set that is accounted for by the statistical model. It provides a measure of how well future outcomes are likely to be predicted by the model.) According to this indicator, in principle, the forecast results may be considered adequate. In the five-year period the forecast increase is above 10% only in Subotica, Senta and Ada, while in the other municipalities, the region as a whole, Vojvodina and Serbia its level is below 10%. In case of Čoka the forecast increase is extremely high, however we have not even calculated the confidence interval since the lower limit has a negative value. For this reason the authenticity of the forecast increase is insufficient. The comparison of the forecast employment rate for 2015 with the rates of previous years indicates that by 2015 Serbia will reach the level of employment from 2002, Vojvodina the level of 2001-2002, while the region will reach the level of 2004-2005. Certain settlements will reach the levels of the following years by 2015: Subotica 1994, Bačka Topola 2009, Mali Idoš 2004-2005, Kanjiža 2003, Čoka 2004-2005, Senta 1998, Ada 2005-2006 and Bečej 2010. The overall forecast results, namely a 2-3% yearly average increase of employment is in harmony with the expected economic development, which shows almost stagnation.

Conclusion

The results presented with the employment forecast and the potential scenarios of economic development, all indicate that the region's municipalities, but Vojvodina and Serbia also have to take urgent steps in order to prevent further regression and falling behind of the region. Primarily the central withdrawals should be decreased on account of improving available sources within the region. The capital attracting capacity of the region must be improved.

We should find proper balance of investments in fields of capacities, which are accumulative, fulfilling the international requirements of the economy of scale on the one hand, and SME

capacities on the other hand. Food production, agriculture and processing industry should be supported in market penetration, e.g. over common marketing activities similarly to other countries. The legal framework of agricultural cooperatives should be ensured. Agriculture must be freed from not utilised labour force through the development of other sectors.

The realisation of these employment forecasts must be prevented by accepting the proposals formulated based on detailed analysis of employment and unemployment, so that the development of the economy, service providing and other sectors could lead to a 4-5% increase of employment rate and prevent social tensions and emigration.

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SCENARIJ EKONOMSKOG RAZVOJA I PREDVIDJANJE TREND ZAPOŠLJAVANJA U SEVERNOJ VOJVODINI

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Rezime

Istraživači Naučnog Ruštva za Regionalne Nauke iz Subotice su u okviru šireg projekta obradili problem ekonomskog razvoja i kao rezultat izradili scenarij ekonomskog razvoja i prognozirali zapošljavanje u Severnoj Vojvodini. Scenarij ekonomskog razvoja je uradjenja SMIC – PROB – EXPERT programskim paketom i posebna pažnja je posvećena poljoprivredi.

Ova metoda koristi ulazne podatke pripremljene u tri matrice, koje sadrže različite verovatnoće ostvarivanja ili izostajanja ekonomskih procesa

Ulogu poljoprivrede u razvoju regiona determinira pokazatelj od 0.428, stagnacij je determinirana pokazateljem 0.357, a pored toga razvoj srednjih i malih preduzeća je od značaja.

Cilj je ovog rada da prikaže neke rezultate analiza, mogućih scenarija i očekivanog trenda zapošljavanja.