ACTA UNIVERSITATIS AGRICULTURAE ET SILVICULTURAE MENDELIANAE BRUNENSIS

Volume LIX 21 Number 4, 2011

REGIONAL MARKETS WITH AGRICULTURAL WORKFORCE BASED ON LABOUR OFFICES' DATA

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Received: February 11, 2011

Abstract

NOHEL, F., SPĚŠNÁ, D., POSPĚCH, P.: *Regional markets with agricultural workforce based on Labour offices' data*. Acta univ. agric. et silvic. Mendel. Brun., 2011, LIX, No. 4, pp. 177–186

The changes in Czech agriculture over the past twenty years have had their impact on the agricultural labour market, too. The regional differentiation of the chances of applicants on the labour market as well as the agricultural enterprises' chances of hiring employees fitting their requirements, are, among others, influenced by the specific conditions of agricultural production. The aim of this paper pertains to two basic problem areas: first, the differentiation of respective regions based on the number of agricultural applicants and job vacancies, and second, the identification of disequilibrium on the agricultural labour market. The latter is based on a theoretical framework defined by approaches in economy dealing with labour market equilibrium. Due to the unavailability of economic data (including wages, economic performance, etc.) on the regional level, authors develop their own methodological approach, based on the number of applicants per job vacancy. A database of applicants and vacancies available from the Labour Offices is used as a source for the analysis and interpretation of data, enabling us to study the agricultural labour market not only sector-wise but also region-wise.

regional disparities, supply, demand and equilibrium on the labour market, applicants, vacancies, Gini coefficient, Lorenz curve

The economic transformation after 1989, the following decrease in economic significance of agricultural sector for the national economy, and the European integration are among the chief factors responsible for current changes in Czech agriculture. The changes in corporate structure have been accompanied by a steady decline in the numbers of agricultural workforce: over the past 20 years, the numbers have decreased by more than three quarters, reaching approximately 120,000 in 2009 (excluding workers in hunting and related services). Changes in production, technical development and the demographic aging of agricultural workers have also influenced the structure of the workforce. The specific position of agricultural sector is further fuelled by low wage levels (the disparity between the sector and the national economy amounts to 70 %) and a decrease in the options of agricultural education, both in high schools and in universities. All these social and economics determinants, along with other socioeconomic and geographic factors, contribute to regional differences in the distribution of agricultural jobs: both the supply and the demand on agricultural labour markets are regionally differentiated.

This paper deals with the regional agricultural labour markets and it aims to establish criteria of regional distinction, based on the labour market conditions. Two basic steps will be taken in order to reach this goal:

1. Analytical establishment of the levels of differentiation in the allocation of jobs and job applicants in the Czech Republic
2. Differentiation of the regions, based on the discrepancy levels between the number of jobs and the numbers of job applicants. This will allow us to observe the regional levels of agricultural labour market disequilibrium.

The present analysis will also offer regional maps focusing on regions with a particularly high

(or particularly low) concentration of jobs and job applicants. This will also include highlighting of the regions displaying the highest disequilibrium levels on agricultural labour market.

MATERIAL AND METHODS

Material

The analysis is mostly based on the data published by the Labour offices on the Integrated portal of the Ministry of labour and social affairs (http://portal.mpsv.cz/sz/). In the following text, the term *supply* will refer to the job applicants (also referred to as simply „Applicants" or „JAs") and the term *demand* will be reserved for job vacancies available at the labour market („JVs")[1]. The JAs and JVs are categorised according to the standards of Classification of Occupations (KZAM)[2], with a special focus on the categories of agriculture-related jobs. These are listed in table I. The data are calculated as average values for the year 2009, aggregated at district levels.

Measuring the inequality of a distribution

The districts of the Czech Republic vary in size as well as in population, with ratios of mutual difference reaching up to multiples. This has a substantial impact on the numbers of applicants and jobs. At the same time, these numbers are affected by various geographic, environmental and socioeconomic characteristics of the respective districts, providing for different conditions for agricultural production. Following this, we can assume an unequal distribution of JAs and JVs across the districts. Now we must determine the level of inequality.

This can be achieved by referring to the Gini coefficient. The values of the coefficient range between 0 and 1, with 0 describing a situation where the distribution is completely equal across the districts, and vice versa: a Gini coefficient of 1 suggests that all JAs and JVs are concentrated in only one district. The area used for calculation of the coefficient is delimited by a so-called Lorenz curve: the curve takes on a diagonal shape for situations where the Gini coefficient equals 0 (indicating an completely equal distribution across the districts). The more the Lorenz curve differs from a diagonal shape, the more is the balance shifted towards unequal distribution. Further information regarding the construction of the Gini index and the Lorenz curve can be found in Minařík (1995), Samuelson and Nordhaus (1995), etc.

I: *Codes and titles of selected unit groups of KZAM[1)] assigned to agricultural occupations*

Code	Job category
1221	Specialized managers in agriculture, forestry and hunting
1311	General managers in agriculture, forestry and hunting
2213	Agronomists and related professionals
3212	Agronomy and forestry technicians
6111	Field crop and vegetable growers
6112	Tree and shrub crop growers
6113	Gardeners, horticultural and nursery growers
6115	Mixed crop growers
6121	Dairy and livestock producers
6122	Poultry producers
6123	Apiarists and sericulturists
6124	Mixed-animal producers
6130	Market-oriented crop and animal producers
6210	Subsistence agricultural and fishery workers
8331	Motorised farm and forestry plant operators
9211	Farm-hands and labourers

1) There are a total of 499 unit groups defined by KZAM; 16 of those have been chosen as „agricultural"

1 The total supply on the labour market consists of the sum of work-capable workforce, which is a much larger pool than the one of the JAs. In a similar vein, the total demand for workers is broader than what is available from the Labour office data. In this paper, however, the „narrow" (Labour office-based) definitions of supply and demand are employed.

2 For an overview of the KZAM classification, see the website of the Czech statistical office: http://www.czso.cz/csu/klasifik.nsf/i/klasifikace_zamestnani_(kzam_r).

Economic approaches to the problem of labour market equilibrium

The second part of the analysis will focus on the comparison between the number of applicants (supply) and the number of jobs (demand). We want to identify the districts that are in a position of discrepancy between supply and demand, or, in other words, the regional labour markets in disequilibrium.

According to the paradigms of economic theory, a state of equilibrium is reached on a perfectly competitive labour market where supply equals demand. At this point, an equilibrium real wage level is reached, which guarantees a satisfaction for every amount of work supplied and every amount of work demanded. A natural level of unemployment is present in these conditions, allowing for the phenomena of both frictional and structural unemployment. However, the equilibrium model does not account for the existence of involuntary unemployment (Mach, 1998).

This theoretical model can work only if the following conditions are satisfied (Sloman, 2000):

- no subject, be it on the supply or on the demand side, has the power to influence the actual level of real wage. The equilibrium wage is a result of the interplay of supply and demand with no other factors involved. As such, it can rise and fall in time;
- actors are free to enter and to leave the labour market;
- both the supply and the demand side have accurate information about the situation on the market;
- all actors on the supply side are homogenous.

Usually, none of these conditions are satisfied on actual labour markets. Thus, achieving of the equilibrium state, even in long-term perspective, is rendered impossible. The imperfections of the labour market and the dynamics of its changes cause the actual state of the market to oscillate around the equilibrium condition, never reaching it.

Following such a strict definition, we could simply cast aside all regional labour markets as being in a state of disequilibrium. Since such an approach would be analytically useless, it is suggested that we should try considering varying degrees of equilibrium, with the goal of reaching a „certain level of equilibrium", enabled by (Kuchař, 2007):

a) economic prosperity which is grounded in the growth of productivity and which generates job opportunities and a progress in the standard of living;
b) demand for labour in conditions of predominance of supply over demand;
c) a sufficient adaptability of the workforce, both in terms of geographical mobility and qualification structure.

Therefore, these criteria can be used to analyse the problem of regional labour market equilibrium. In doing so, however, we have to face the problem of data availability, all the more when concentrating on a limited section of the market, such as the agricultural labour market. The information about wages in agriculture is available only at NUTS3 level and the sectorial economic prosperity can only be measured at national level (using, for example, the method of the Economic accounts for agriculture). Other methodological issues (including the inaccessibility of regional data) arise when calculating work productivity and the same goes for the adaptability levels of agricultural workforce, which are difficult to measure both in terms of data collection and analysis.

Taking these difficulties into consideration, we have devised our own methodological approach towards the labour market equilibrium measurement, based on Kuchař's second condition (Kuchař, 2007). We will define disequilibrium as a state of a heavy predominance of supply over demand, as well as that of a heavy predominance of demand over supply. In order to establish a clear analytical division between equilibrium and disequilibrium, we will refer to the number of applicants per job vacancy (JAs/JVs). Our approach will be as follows:

1. A JAs/JVs share lower than 1 will be considered a sign of regional disequilibrium. In such regions, the employers generate enough work opportunities and vacancies; however, there is an insufficient level of competition among the applicants. In such conditions, the employers are forced either to raise the wage or to look for employees in remote labour markets.
2. Kuchař's second condition requires a sufficient demand for labour in conditions of predominance of supply over demand. When applying this condition to the JAs/JVs indicator, one could render all labour markets exceeding the value of 1 disequilibrious. However, since we consider a certain level of competition among the applicants beneficial, we can move the upper limit of equilibrium above 1, still maintaining a state of equilibrium. Establishing this critical upper limit can be based on expert opinion or on the relevant literature[3]. If we take the empirical data as our departure point, we can define the upper limit as a value separating the extreme outlier values.
3. If none of these conditions of disequilibrium are met, we will consider the regional labour market in question equilibrious.

3 The lower border between the equilibrium and disequilibrium states is defined as 1 JAs/JVs; the upper limit by the aforementioned critical value.

The distribution of applicants and job vacancies in the regions of Czech Republic

There were on average 6,558 agricultural job applicants in 2009, which amounted to approximately 1.4% of the total number of JAs in the Czech Republic (473,000). An average total of 1,219 agricultural job vacancies were offered by employers throughout the same period, which amounted to 2.6% of the total number of vacancies in the country (approx. 46,000). Over the past years, we have witnessed an increase in the number of applicants and a decrease in the number of vacancies, as a consequence of the economic recession. A stronger development in the same direction has been noted in other sectors too, putting the agricultural sector in a better position relative to other sectors.

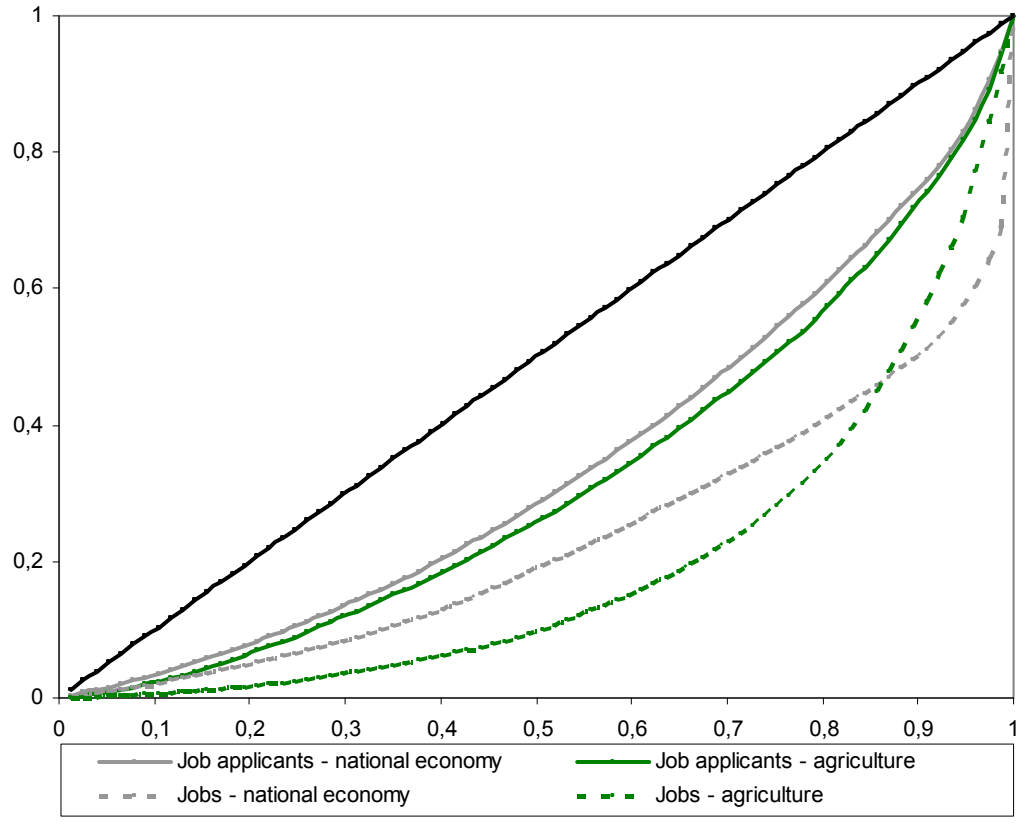
The Gini index values are presented in table II. and the Lorenz curves are plotted in picture 1. While the actual numerical values do not provide us with too much useful information, the comparison does: the Gini index for JAs was approximately the same in agriculture and in national economy, with values slightly above 0.3. This suggests a roughly equal distribution of applicants across districts. In case of JVs, however, the distribution seemed to be much less equal, both with regard to agricultural vacancies and to vacancies in general. It thus appears that job vacancies were concentrated in a small number of districts.

II: *Gini coefficient of the number of applicants and vacancies for all occupations and selected agricultural occupations*

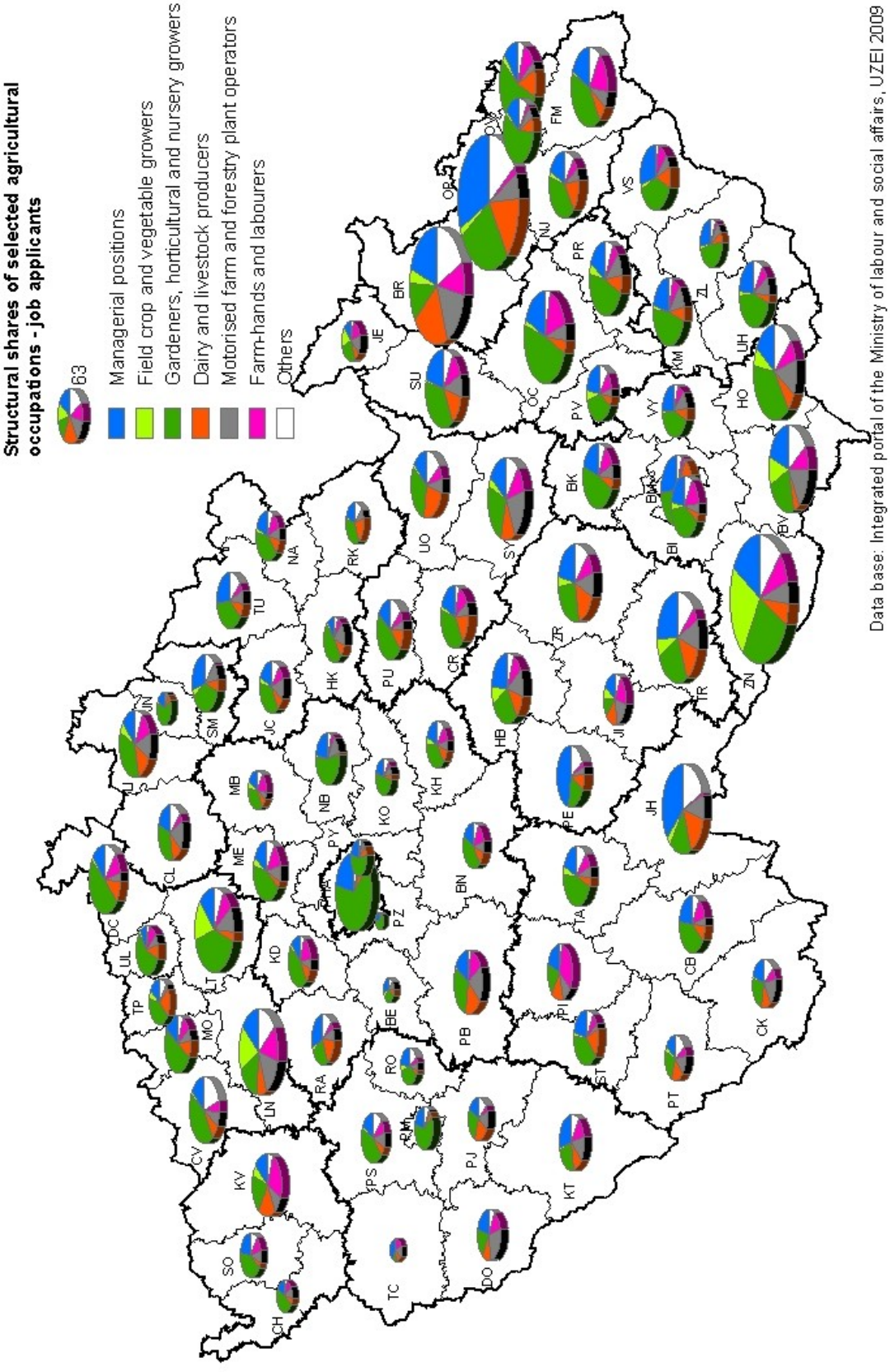
	Job applicants	Jobs
National economy	0.32	0.54
Agriculture	0.36	0.61

The irregularities in distribution are clearly visible in pictures 2 and 3. While the five districts with the highest number of applicant together accounted for about 1/5 of the total number of applicants for agricultural jobs, the situation was different with vacancies: a total one third of agricultural vacancies were concentrated in five districts. Again, we can see the distribution patterns differ, the distribution of vacancies being much more unequal.

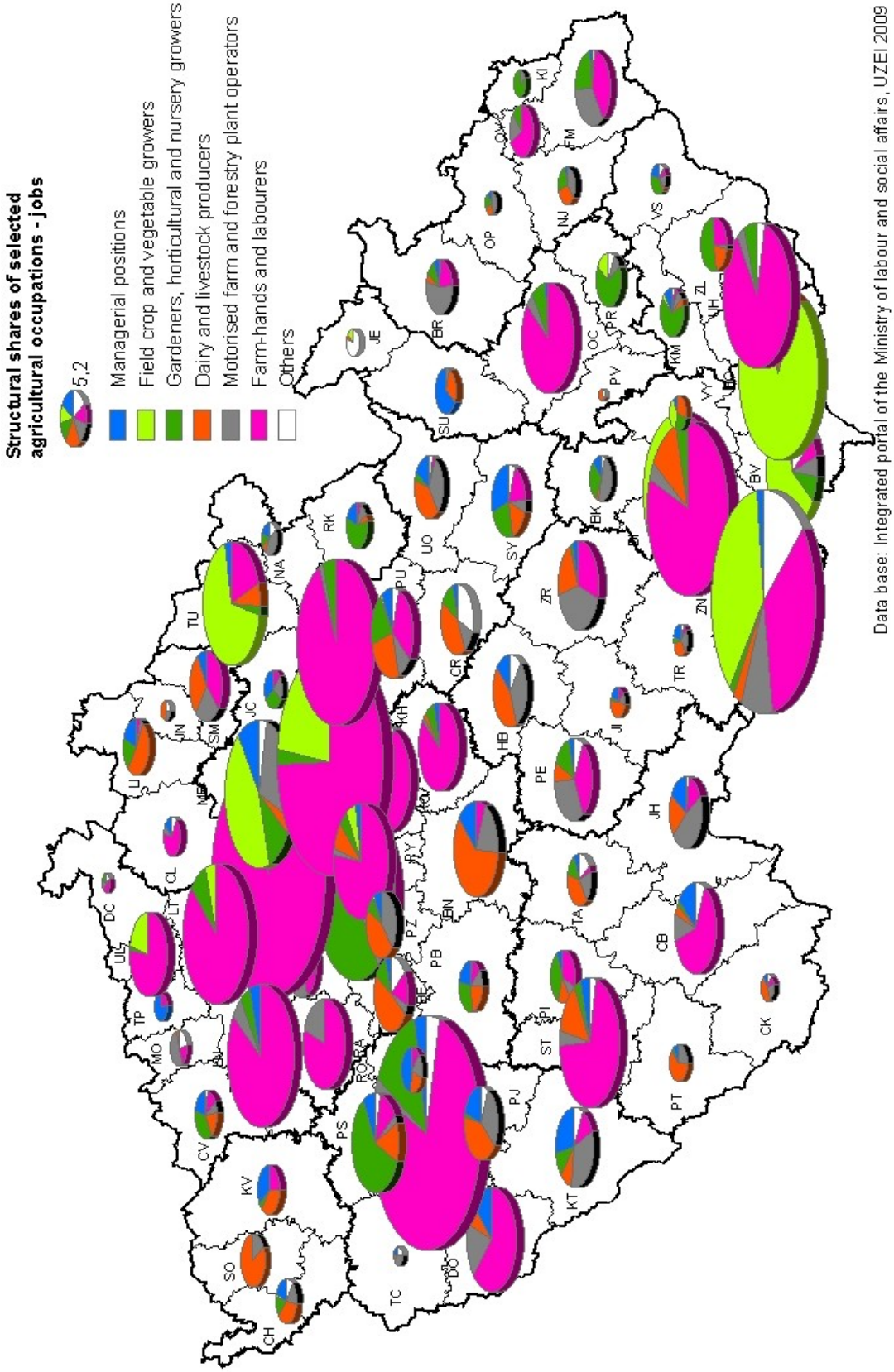
The range between the minimum and maximum value was also higher in JVs than in JAs: in 2009, 8.2% of all agricultural vacancies were offered in the Mělník district, but only 0.02% in the district of Prostějov. The smallest share in the total number of applicants was reported from the district of Praha-Západ (0.09%) and the highest in Opava district (5.7% of the total number of agricultural applicants).



1: *Lorenz curves of the number of applicants and vacancies for all occupations and selected agricultural occupations*



2: *The distribution of agricultural applicants and the share of selected agricultural occupations in the districts of the Czech Republic*



3: *The distribution of agricultural vacancies and the share of selected agricultural occupations in the districts of the Czech Republic*

Agricultural labour market equilibrium

The average number of applicants per vacancy (JAs/JVs) in agriculture amounted to 5.4 in 2009 (as compared to 10.3 in the whole country's economy). The minimum was observed in Plzeň-město district (0.4) and the maximum in Opava (409.9). The value of the observed range reached 409 and the coefficient of variation amounted to 220%, which again highlights the inter-regional differences. Only 6 districts displayed a JAs/JVs share lower than 1. For the 2009 data, we have used the value 32 JAs/JVs (critical value) as a criterion of disequilibrium, as it separates the extreme values and outliers in the population. This value is six times the average ratio across all districts. There were a total of 13 districts peaking over the critical value.

The total numbers of agricultural applicants and vacancies and the JAs/JVs share is to be found in picture 4, respective districts are summed up in table III.

Region-wise, the situation can be described as follows:

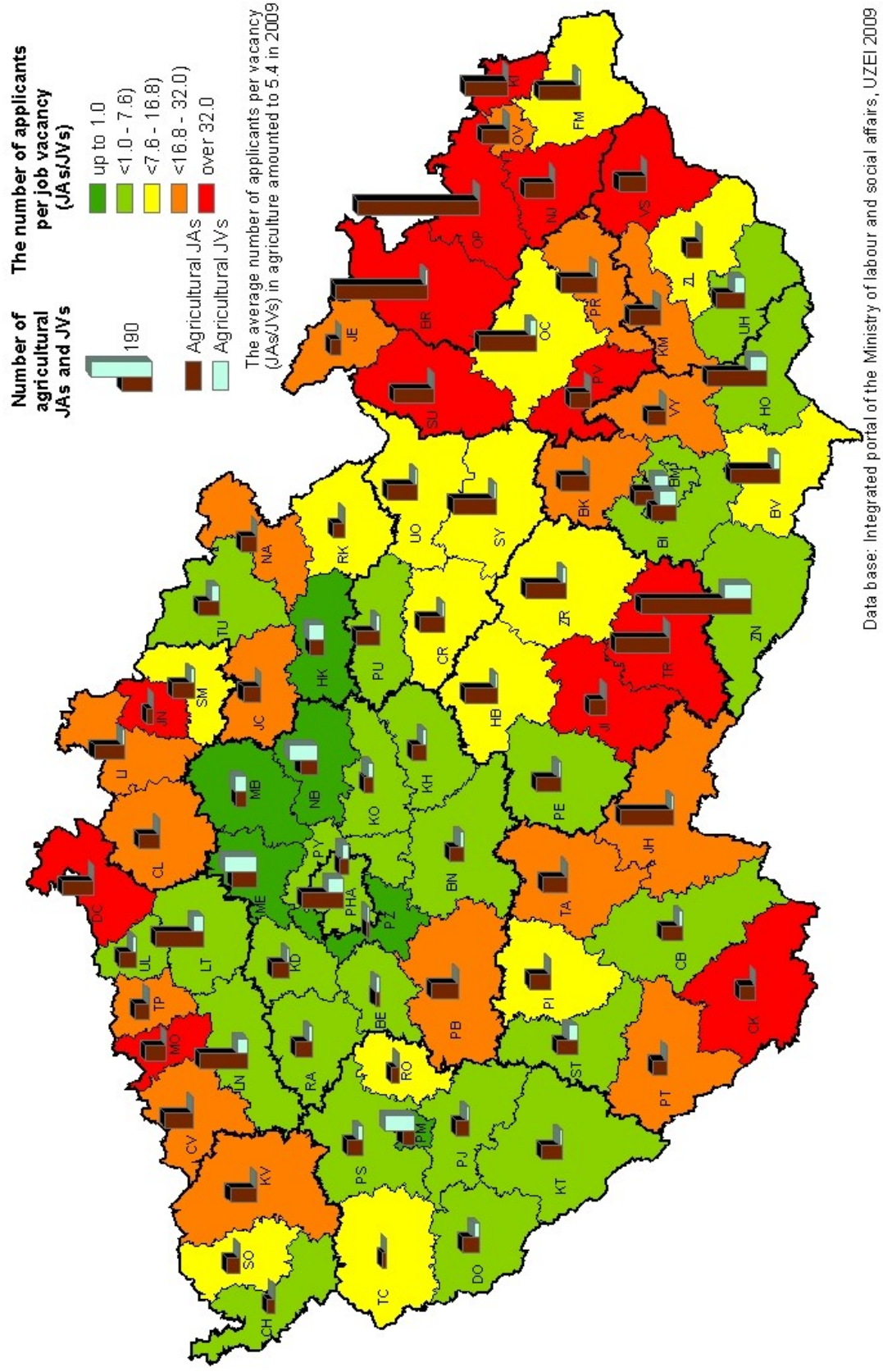
- Most of the districts in Středočeský and Plzeňský region displayed a low but balanced JAs/JVs ratio. Out of 19 districts, 14 displayed a value smaller than the country's average. Of these 14, however, five districts displayed a state of disequilibrium with a number of applicants per vacancy smaller than 1. This pertained in particular to the districts of Plzeň-město, Nymburk and Mělník. Both regions offered 40% of agricultural vacancies in 2009, but there were only 12% of the total number of applicants.
- The Jihočeský region reported a specific dynamics with applicants' opportunities ranging from very good (the Strakonice district with a share of 2.2 JAs/JVs) to very unfavourable (40 JAs/JVs in Český Krumlov). A similar situation could be found in Jihomoravský and Zlínský regions. The traditionally agricultural districts located in southern parts of these regions (including the city of Brno and its surroundings) had a low share of JAs/JVs (about 3.5 on average). On the other hand, there were tens of applicants for one agricultural vacancy in the districts of Vyškov and Vsetín. Together, the three regions had a 29% share both on the number of agricultural vacancies and on the number of applicants.
- The situation was favourable for agricultural job-seekers in three other regions: Pardubický, Královéhradecký and Karlovarský. In the latter case, however, this was caused mostly by the low number of applicants, since the actual number of agricultural vacancies in Karlovarský region was very low. The accumulated share of these three regions, both on the total number of vacancies and on the total number of applicants, reached approximately 11%.
- Vysočina, being the region with the highest share of agricultural employment in the Czech Republic, reported less favourable conditions for applicants. A state of disequilibrium in the districts of Třebíč (106 JAs/JVs) and Jihlava was caused in particular by a low demand for agricultural workers. A similar situation was in Ústecký region: while the districts of Louny, Litoměřice and Ústí nad Labem offered enough opportunities for agricultural job-seekers, the situation in other districts was less favourable, peaking in Děčín (165 JAs/JVs). Together, these two regions offered 10% of all agricultural vacancies for 18% of the total number of agricultural applicants.
- The worst conditions for those looking for jobs in agriculture were reported from Liberecký, Olomoucký and Moravskoslezský regions – the latter two in particular. These regions consistently reported high numbers of applicants and the JAs/JVs ratios by districts reached tens or hundreds. A half of the districts in these two regions were facing the state of labour market disequilibrium. The worst situation, as mentioned before, was in Opava, where there were 409 applicants per one agricultural vacancy and a monthly average of 375 applicants. The three regions together yielded only 6% of agricultural JVs but a total 28% of agricultural JAs.

The regional conditions of equilibrium between the supply of and demand for workforce were determined, among others, by the following:

1. Of all the country's job applicants, only 1.4% were looking for jobs in agriculture. Of all the vacancies, only 2.6% offered agriculture-related jobs. Given these small numbers, the meeting of supply and demand on the labour market

III: *Districts of the Czech Republic by JAs/JVs ratio*

Market dis/equilibrium	JAs/JVs	Districts	Number of districts
Market disequilibrium (predominance of demand)	up to 1.0	ME, MB, NB, PZ, PM, HK	6
Market equilibrium	<1.0–7.6)	PHA, BN, BE, KD, KO, KH, PY, RA, CB, ST, DO, KT, PJ, PS, CH, LT, LN, UL, TU, PU, PE, BM, BI, HO, ZN, UH	26
	<7.6–16.8)	PI, RO, TC, SO, SM, RK, CR, SY, UO, HB, ZR, BV, OC, ZL, FM	15
	<16.8–32.0)	PB, JH, PT, TA, KV, CV, TP, CL, LI, JC, NA, BK, VY, JE, PR, KM, OV	17
Market disequilibrium (predominance of supply)	over 32.0	JN, JI, TR, PV, SU, VS, BR, KI, NJ, OP	13



4: *The number of agricultural applicants (JAs) and vacancies (JVs) and the number of agricultural applicants per vacancy*

becomes increasingly difficult. The problem could be partially solved by means of geographical mobility or by change in qualification structure. However, the low agricultural wage levels do not provide a sufficient incentive for the applicants to move or to participate in a requalification programme. In most cases, agricultural employers cannot afford to increase the wages. Therefore, they often tend to seek the needed workers in foreign labour markets, which is cheaper but more demanding in terms of administration.

2. The structure of Czech agriculture has changed substantially since 1989. Some branches (such as greengrocery, pomiculture, beet growing, pork farming, etc.) have gone through a steep decline, which decreased the opportunities for whole groups of specialised professionals. The development has been furthered by a slow reaction of the agricultural education system (Spěšná, 2009).
3. Agriculture and agricultural employment depend on climatic conditions, which can be observed in the seasonal fluctuation of production as well as the fluctuation of supply and demand. The analysis of the numbers of applicants and vacancies has proved that the seasonal fluctuation is more likely to affect the positions in crop production rather than in livestock production and manual workers rather than managers[4].
4. There are certain limitations in the choice of agricultural professions for this analysis. For instance, it is not entirely clear whether the category „gardeners" should be treated as agricultural or not. This problem is particularly important given the fact, that there is a large proportion of gardeners among the agricultural job applicants. On the other hand, employers are often not successful in finding unqualified workers. A question is, what share of these positions is generated by agricultural businesses.
5. The analysed data are based on a classification of job applicants according to KZAM. However, the KZAM code assigned by Labour Office does not necessarily reflect the applicant's actual job preference.

A separate analysis of the influence of some of these factors on agricultural employment would be useful. However, such an analysis is beyond the scope of the present work.

CONCLUSION

The distribution patterns of JAs and JVs across the districts of the Czech Republic are different, with the vacancies being more prone to unequal concentration.

The share of JAs and JVs, used to indicate a state of disequilibrium on regional labour markets, varied considerably. In 2009, 6 districts reported a figure smaller than 1 (indicating a predominance of demand) and 13 districts reported a figure higher than the critical value of 32 (the upper border of the equilibrium interval, indicating a predominance of supply).

The smallest number of applicants per agricultural vacancy was reported from the districts of Středočeský and Plzeňský regions: five of these districts had a JAs/JVs share smaller than 1.

The situation is favourable for agricultural job-seekers in Karlovarský, Pardubický and Královéhradecký regions, less so in Jihočeský, Jihomoravský and Zlínský regions, even though the three latter regions displayed a substantial discrepancy across the districts. The situation was less favourable in Ústecký and Vysočina regions where the JAs/JVs share was higher than the country's average. The worst conditions for those interested in agricultural jobs were observed in Liberecký, Olomoucký and Moravskoslezský regions. Most districts within these regions reported tens of applicants per vacancy and half of them were in a state of disequilibrium.

SUMMARY

This paper deals with the issues of supply and demand on the agricultural labour market. The different constellations of these phenomena in respective regions are analysed with a focus on the states of disequilibrium.

The major data source is the Labour Offices' database of job applicants and vacancies, where both categories are listed with reference to Classification of Occupations (KZAM). The database provides us with information regarding the supply of and demand for agricultural workforce, which is then analysed on the district level. A mutual comparison of the number of applicants and the number of vacancies (JAs/JVs) and estimates of critical values form a basis of the definition of disequilibrium on the agricultural labour market.

It has been proved that while agricultural job vacancies tend to be concentrated in a small number of districts, no such process is to be observed in case of job applicants.

4 see also Spěšná (2009)

Regarding the problem of labour market disequilibrium, there are substantial differences among the districts, even though the average share of agricultural applicants per vacancy (JAs/JVs) is comparably low in the Czech Republic. In 2009, 6 districts reported a share lower than 1 (implying a stronger demand and a higher number of vacancies), establishing the bottom critical value. The upper critical value, 32 JAs/JVs was exceeded in 13 districts (implying a substantially stronger supply and a higher number of applicants).

The most favourable conditions for agricultural job applicants were reported in Středočeský and Plzeňský regions, although some of the districts in these regions report a JAs/JVs share lower than 1, thus suggesting a departure from the equilibrium status towards the prevalence of demand over supply. On the contrary, the least favourable conditions for agricultural applicants hold true for Liberecký region and, in particular, Moravskoslezský and Olomoucký regions, where the share of JAs/JVs exceeded 100 in some districts and approximately a half of districts faced the condition of disequilibrium on the agricultural labour market.

Acknowledgment

This research was supported by a research grant of the Czech Ministry of Agriculture No. 0002725101 Assessment of potential of Czech agriculture and rural areas to be sustainable: under umbrella of European model of agriculture.

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Zpráva o stavu zemědělství ČR za rok 2009. 2010. Praha: MZe ČR.

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