Micro-economic analysis of households restructuring in the pre-accession period to the EU

Mikroekonomická analýza reštrukturalizácie vidieckych domácností v predvstupovom období do EÚ

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Abstract: Transformation process and restructuring of the existing enterprises started in the Slovak Republic in 1990, what influenced all companies alike as well as rural households. Business companies and private farms were established. Private activity in agricultural sector became a dominant source of income for many rural households. In 2000, there were 21 thousands private farms registered in Slovakia with the average size of 10.4 hectares. There is also significant group of unregistered farms that get part of their income from agriculture.

Key words: restructuring, households, cooperatives, individual farms

Abstrakt: Po roku 1990 sa v slovenskom poľnohospodárstve začali uskutočňovať procesy transformácie a reštrukturalizácie existujúcej podnikovej základne. Tie sa nedotkli len štátnych podnikov a poľnohospodárskych družstiev, ale aj vidieckych domácnosti. Mali za následok nielen vznik obchodných spoločnosti, ako aj rozvoj súkromného hospodárenia na pôde, ktoré sa stalo pre mnohé domácnosti hlavným zdrojom ich príjmov. V roku 2000 na Slovensku bolo registrovaných viac ako 21 tisíc súkromne hospodáriacich roľníkov hospodáriacich na priemernej výmere 10,4 ha poľnohospodárskej pôdy. Okrem tejto skupiny z poľnohospodárskej činnosti dosahuje príjmy aj početná skupina vidieckych domácnosti tzv. neregistrovaných súkromných fariem.

Kľúčové slová: reštrukturalizácia, vidiecke domácnosti, poľnohospodárske družstvá, súkromne hospodáriaci roľníci

INTRODUCTION

We use micro-economic analysis to study firm restructuring in the Slovak agriculture after year 1990. We say that there were dramatic changes in the structure of enterprises. Number of legal entities in agriculture after implementation of transformation law sharply increased. On the other hand, average acreage decreased by 50%. The state owned agricultural farms disappeared. Agricultural cooperatives still preserve their dominant position (their share in the cultivated agricultural land fell about 15%). Due to economic problems, some cooperatives ended agricultural production and they exist as fictive enterprises.

Proportion of other forms of legal entities increased to 25%. Their number and average acreage were effected by privatization of state owned farms, and their transformation to joint-stock companies.

Private farmers are special form among these entities. Since the year 1990 they were privileged to cooperatives and state owned farms in the terms of subsidy policy.

The trend in private farming is documented by the following data. In the year 1990, 2 347 private farmers operated 0.25% of agricultural land, their average size was 2.6 ha. In the year 1997, there was registered 16 909 private farmers, operating 7.88% of agricultural land, and their average size was 11.4 ha. In the year 2000, there was registered more than 21 000 private farmers with average acreage 10.4 ha. Except private farmers, there were more than 279 000 of small agricultural land owners.

OBJECT AND METHODOLOGY

The basic purpose of the survey was to obtain information on the functioning of the farming units, namely households and enterprises, which include farming as a part of their productive activities. This population was not the same as the population of units or households that own some agricultural assets, as some of these units may choose not to utilize these assets productively themselves, but instead lease them to others, or leave idle. These owning but not productive households or firms were not part of the target group. The target population included both rural and urban-based farming units. This was because there might be urban-based productive

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units (households and firms) that also do farming. The reason why such urban based units are important, was because they face different opportunities than rural based farming households and firms.

The survey was based on random sample that had to be representative of the classes surveyed.

The survey targeted two classes of production units. First were the household based private farms, or individual farms (IFs). The second class was composed of co-operatives (either former coops now restructured, or newly developed ones), joint stock companies, and other private corporate farming entities. This class included former state farms that have been privatised. The sampling frame for the analysis was a list of all agricultural production units, those classified as individual farms (IFs), as well as those that are classified as co-operatives (Coops), and those that are classified as limited liability, joint stock or other types of companies.

The frame was obtained from the Central Statistical Office (SU SR – Infostat). The Central Statistical Office possesses a register of economic subjects based on branch classification of economic activities (OKEC). All economic subjects the activity of which is related to plant production, animal production or combined production formed the frame for the survey. Branch classification of economic activities comprises a list of work activities conducted by collective subjects or individual subjects. The list is based on activities (farming), not ownership of agricultural assets (land ownership).

STATISTICAL METHODS[1]

Our methodology was based on the following procedure.

The methodology heavily draws from the procedure made by Sarris.

Assume that the number of strata S has been chosen. Then the next step is to partition or apportion the total number of individual private farm units (IFs) in the original frame (for the two regions) into the strata. At this point, the only number that is needed, is the total number of IFs in each stratum and the two regions. Denote the total number of farm units in stratum i as N_i ($I = 1, \ldots S$, where S is the total number of strata that have been identified in both of the regions) , and the total number of IFs in the two regions as N. Then

$$N = \sum_{i=1}^{S} N_i \tag{1}$$

The number of farm units to be sampled in each stratum will be in proportion to the population of farm units of each stratum. If we denote by m_i the number of farm units to sample in each stratum, then m_i is found as follows:

$$\frac{m_i}{m} = \frac{N_i}{N} \tag{2}$$

where m is the total size of the sample of IFs (400) and N is the total number of IFs in the two regions (e.g. 5 000). If m_i is not an integer, then round out to the nearest integer.

Once the m_i are chosen for all i ($i = 1,\ldots, S$), then we specify the number of samples per settlement, and divide m_i by this number to obtain the number of settlements in each stratum. The proposed number of primary sampling units per settlement, to be denoted by q, is proposed to be around 5–10 (the exact number will be chosen once S and the populations N_i are known). This number q will be fixed for all settlements. If we divide the survey population in the stratum by q, we obtain the number of settlements to sample in each stratum i. If we denote this number by ns_i then we have.

$$ns_i = m_i / q \tag{3}$$

The number ns_i will normally not be an integer. We will round these numbers upwards or downwards to the nearest integer. To keep the selection probabilities unaffected we should then make the q for each stratum slightly larger or smaller (by the addition or subtraction of one or two sample units per settlement) so as to make (3) come as close to the desired number of samples as possible. In other words if, for instance, the ratio in (3) turns out to be 5.3, with m_i equal to 53, and initial q equal to 10, then choose 5 settlements (the integer closest to 5.3) and select a number $q = 11$ of samples for each settlement, to make the product of ns_i times q closer to 53 (the actual number of samples taken will be $5 \times 11 = 55$ which is closer to 53 than $5 \times 10 = 50$). This will give us a slightly different sample than the originally planned 400 but will maintain the selection probabilities largely intact. It is clear that if we have a large number of strata then the number of settlements will depend on the choice of q. The larger the q, the smaller the number of settlements visited, and vice-versa. However, we do not want to make q too large, because then we will lose the variability within each stratum. The proposed number of q is 10, but if it is seen from the frame that the number of IFs is spread thinly across the settlements of each region or stratum, then q should be adjusted downwards to say 5 or 6.

Once the numbers q and ns_i are chosen, the actual places (settlements) to visit must be chosen. Within each stratum, choose the ns_i settlements to visit among the NS_i settlements of the stratum by a procedure called Probability Proportional to Size (PPS). In other words, a large settlement will be more likely to be selected than a small one (on the basis of the number of farms) according to this method. This is different than the Simple Random Sampling (SRS) design, where each settlement would have exactly the same probability of being selected for a visit. The PPS procedure is fairly standard in statistics and is explained in detail in appendix B.

If we denote the number of individual farm household units in each settlement by P_j ($j = 1, 2,\ldots, ns_i$), then, if the PPS method of choosing settlements is followed, the

[1] Sampling methodology draws heavily on Sarris (1999)

probability of choosing a particular settlement j among the ns_i settlements of stratum i, will be proportional to P_j (exactly as the name denotes).

Once the exact location of the ns_i settlements to visit in each stratum i are chosen by PPS, then for each settlement, obtain the detailed list of individual private farm households from the Central Office of Statistics. It can be seen then that a detailed list (namely with addresses names, locations etc.) is needed only for the settlements that will be visited, and not for all settlements in the regions. From that list, draw a random sample (following the procedure of appendix A) of $1.3q$ to $2q$. The reason for drawing a sample larger than what will be needed is to have a reserve list, in case of non-response. These first q among these farm units will be those that will be visited, with replacements obtained from the list in case of total non-response. The procedure for drawing the simple random sample of q units is indicated in appendix A.

If the q IF households within each selected stratum are chosen randomly, then the selection probabilities of all the chosen households will be equal to the overall sampling fraction f, where

$$f = \frac{m}{N} = \frac{m_i}{N_i} \qquad \text{for } i = 1, 2, \ldots, S \tag{4}$$

Notice that the above selection probability can be written as follows:

Prob(Selection of a farm) = Prob(Selection of a settlement) Prob(Selection of farm/Given Selection of a settlement), with

$$\text{Prob(Selection of a settlement)} = \frac{ns_i P_j}{\sum_k P_k} = \frac{m_i P_j}{qN_i} = \tag{5}$$

$$\text{Prob (Selection of a farm/Given Selection of settlement)} = \frac{q}{P_j} \tag{6}$$

Notice in the above two equations, that it is only if the product of q and ns_i is equal (or near equal) to m_i that the selection probabilities are all equal to f. This is the reason for which we want to make the adjustments in q and ns_i mentioned above. When the selection is made in the above fashion, then we can use simple averages to calculate all the descriptive statistics in the sample.

The statistics that will be computed from a sample of this form will weigh each household's data equally. For instance if the value for a household h for a given variable is x_h then the average value for the whole sample will be equal to

$$\bar{x} = \left(\frac{1}{\sum_h w_h}\right) \sum_h w_h x_h = \frac{1}{m} \sum_h x_h \tag{7a}$$

while the aggregate computed over the sample but representing the whole of the sampled two regions is

$$\bar{X} = \sum_h w_h x_h \tag{7b}$$

where the value of each weight w_h is equal to the inverse of the overall selection probability f, given in (4). In other words, w_h represents the number of individual farm units in the two regions that are represented by the given sampled farm household.

Notice here a rather subtle problem. In choosing the sample, since the lists of IFs will concern farms and not households, the smallest sampling units included in each frame are the individual farms, not the households operating them. Hence the household visited will be the household, where the operator of the selected farm unit belongs. However, this household might include more than one farm operator, each with individual farms registered and included in the frame. If this is the case, then while we are sampling one household, the information we obtain about land and other farm activities of the household pertain to more than one individual farms. In this case, this information about the number of independent individual farms operated by members of the household should be recorded in the questionnaire. This will affect the computation of variables at the analysis stage. If for instance the analysis seeks to identify some farm related variables at the regional level (for instance the average number of workers hired per farm), then the data from a household that includes say two independent farms should be weighted by a weight half of that of households that include only one independent farm. This is because the selection probability of the given farms in the said household is twice as large as that of the other, and hence the household represents twice the number of farms than other households. Similarly if the desire is to compute a variable that pertains to farm households (for instance the average ownership of tractors by farm households), then again the weight for this household should be halved, as it is twice as likely to be chosen in the frame.

Another problem what will almost surely arise is that the "size" of each settlement P_j, namely the number of registered IFs that is used for the selection of the number of settlements ns_i in each stratum i and the sampling rate q, may be based on some census or registry that is outdated. In other words, the actual number of IFs at the time of the visit by the survey team (early 2000) may not be the same as that that is available at the Central Statistical Office. The procedure to follow in such a case is the following. Suppose that the "estimated" size available centrally for a settlement j is P_j, while the actual or true size that is found upon visit is equal to P_j^a. The procedure to be followed is that instead of selecting a sample of size q in the particular settlement, the actula sample drawn will be equal to q', where

$$q' = \frac{P_j^a}{P_j} \tag{8}$$

If q' turns out to be a fraction, then choose the integer closer to the fraction (e.g. a 5.7 becomes 6, etc.). In the sequel, whenever the number q is mentioned, it must be understood that the number q' will be the actual one used whenever q is different than q'.

Irrespective of the subtleties and adjustments outlined above, the above sampling design will make it difficult to sample rare populations. In our case, a rare population is that of large individual farmers. In the Slovak Republic for instance, while there are about 7 600 registered IFs, there are only 363 IFs, or a bit less than 5% of the total number of IFs, that cultivate 59.2% of the land. In the Czech Republic the situation is similar. However, with a random sampling design as outlined above, the probability of including one of these large farmers in a sample of 400 would be small. In fact only about 20 of these larger farmers would be included on the basis of random sampling. Hence we need to oversample this group in order to be able to make comparisons among the larger and smaller farm groups. In fact if we need to make comparisons between different size classes, which we almost certainly will, we need to allocate the sample in a non-proportional way.

Suppose that the population P_j in a settlement j, that is selected, is composed of P_{jl} number of large farmers, and P_{js} number of small farmers, where large and small are defined in some way, and

$$P_j = P_{jl} + P_{js} \tag{9}$$

The proportions of each group into the total number of farms in the sample (namely the ratios P_{jk}/P_j) are very unequal. Suppose that the number q of the sampled farm households is allocated among the three groups in some fashion. Hence

$$q = q_l + q_s \tag{10}$$

The selection probability of each type of farm k is then equal to q_k/P_{jk} for $k = l, s$. These will be different than the overall selection probability of the settlement which is q/P_j. Therefore, if we do disproportional sampling, in the subsequent statistical analysis the sampled farm households in each of the three groups must be weighed by different and unequal weights in computing the means, and other statistics. The weights of each household in formulas such as (7) must be inversely proportional to their overall selection probabilities. Given the above selection probability formula, and assuming that each farm corresponds to only one household, the only thing that needs to be changed is the expression in (6) for the final stage selection probability. Hence the selection probabilities for a large, medium and small farmer in a settlement j of a stratum i will be as follows.

$$\text{Prob(Selection of a } k\text{-type farmer in settlement } j \text{ of stratum } I) = \frac{ns_i P_j}{N_i} \cdot \frac{q_k}{P_{jk}} \tag{11}$$

where $k = l, s$. The weights w_h in (7) will then need to be just the inverses of the selection probabilities in (11).

RESULTS AND DISCUSSION

Structure of the sample according to acreage of agricultural and arable land.

Table 1 and Figure 1 depict sample distribution of cultivated and arable land respectively. There are both small farms and large farms. Around 8% of the sample cultivate more than 100 hectares of land. There is strong group of rural households with land size in the range of 25 to 100 hectares and in the range of 0 to 2 hectares. Average size private farm cultivates 43 hectares of agricultural land and 40 hectares of arable land.

Table 1. Sample distribution based on size of arable land and agricultural land

Size categories (ha)	Agricultural land [1)]	Share (%)[2)]	Arable land [1)]	Share (%)[2)]
0	37	8.98	40	9.71
0–2	83	20.15	104	25.24
2–5	62	15.05	49	11.89
5–10	45	10.92	39	9.47
10–25	64	15.53	72	17.48
25–100	83	20.15	70	16.99
100–500	33	8.01	34	8.25
500 and more	5	1.21	4	0.97
Together	412	100.00	412	100.00
Average size[3)]	43.22	x	40.42	x

1) number of private farmers
2) share of the group in the sample
3) in ha per 1 private farm in sample

Source: own calculation based on data gained from questionnaire survey PHARE-ACE n. P97-8158-R, year 2001

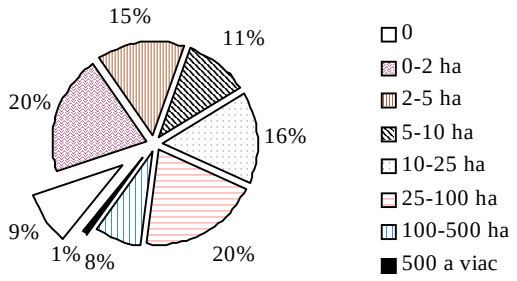


Figure 1. Sample distribution based on size of priv. farm

Source: own calculation based on data gained from questionnaire survey PHARE-ACE n. P97-8158-R, year 2001

Structure of agricultural legal entities (cooperatives, joint-stock companies, limited liability companies)

The group with the highest proportion are subjects operating on 500–1 500 ha of agricultural land. The aver-

Table 2. Structure of agricultural business according to acreage of agricultural and arable land

Size categories (ha)	Agricultural land [1)]	Share (%)[2)]	Arable land [1)]	Share (%)[2)]
Up to 500	25	16.67	46	30.67
500–1500	54	36.00	60	40.00
1500–2500	34	22.67	20	13.33
2500 and more	37	24.67	24	16.00
Together	150	100.00	150	100.00
Average size	1 866.77	x	1 153.10	x

1) number of businesses
2) share of the group in the sample
3) in ha per 1 private farm in sample

Source: own calculation based on data gained from questionnaire survey PHARE-ACE n. P97-8158-R, year 2001

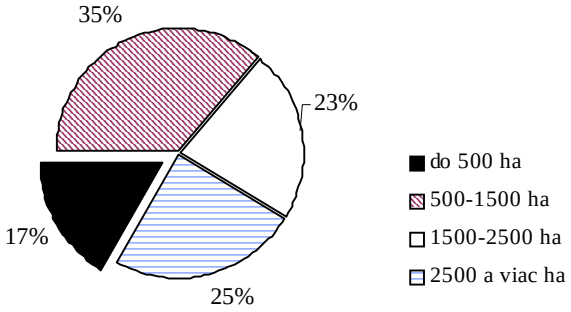
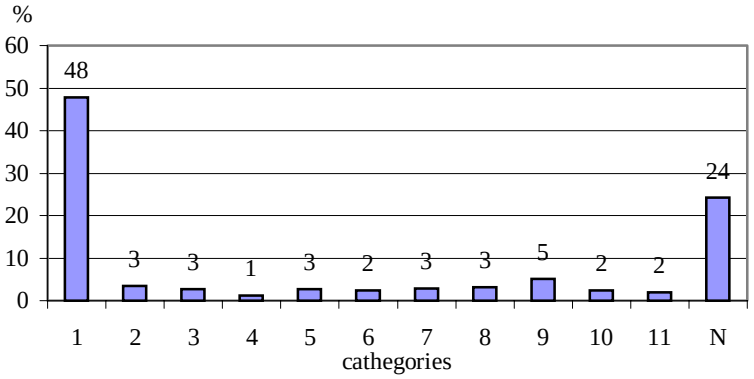


Figure 2. Structure of agricultural businesses by acreage

Source: own calculation based on data gained from questionnaire survey PHARE-ACE n. P97-8158-R, year 2001



1 – private farmer
2 – agricultural private firm, manager or professional
3 – agricultural private, worker
4 – agricultural public firm, manager or professional
5 – agricultural public firm, worker
6 – own non-agricultural firm
7 – non-agricultural private firm, manager, professional
8 – non-agricultural private firm, worker
9 – non-agricultural public firm, manager, professional
10 – non-agricultural public firm, worker
11 – other
12 – non-applicable

Figure 3. Main income activity of private farmer.

Source: own calculation based on data gained from questionnaire survey PHARE-ACE n. P97-8158-R, year 2001

age size of agricultural business in sample was 1 866 ha of agricultural land (Table 2 and Figure 2).

Household categorization by main income activity

For 48% of analyzed sample, the main income activity is private farming, as documented in Figure 3. Almost quarter of the sample (24%) is represented by households with main income in form of pension, for example old age pension.

CONCLUSION

Our micro-economic analysis of rural household and legal entities restructuring in the Slovak agriculture shows dynamic changes in the current field of study. We came to the following results. Agricultural cooperatives and other legal entities represent the predominant form cultivating 280 015 ha of agricultural land, their average size is 1 867 ha. The highest number in our sample is represented by private farmers, but their acreage and share in cultivated agricultural land are much lower. Average size of private farm is 10.4 ha.

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