

Intertemporal analysis of employment decisions on agricultural holdings in Slovenia

by

Luka Juvančič ^{a,*}, Emil Erjavec ^a

^a University of Ljubljana, Biotechnical faculty, Groblje 3, SI-1230 Domzale, Slovenia.

* Corresponding author. Tel. + 386 1 72 17 925; Fax: + 386 1 72 41 005

E-mail addresses: luka.juvancic@bfro.uni-lj.si (L. Juvančič), emil.erjavec@bfro.uni-lj.si (E. Erjavec)

Contributed paper selected for presentation at the 25th International Conference of Agricultural Economists, August 16-22, 2003, Durban, South Africa

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Abstract

The paper attempts to quantify determinants influencing dynamics of employment decisions on agricultural households in Slovenia and to test specific aspects of labour reallocation during transition period by application of agricultural household model. Through the use of 1991 – 2000 panel data for 22,055 farm households, quantitative analysis of intertemporal employment decisions of farm holders is carried out by the use of probit techniques. Determinants tested refer to personal characteristics of reference persons (gender, age, education level, opportunity off-farm income), household characteristics (size, structure), characteristics of the agricultural holding (economic size, labour input, labour intensity) and local labour market conditions. The model results generally confirm the existing empirical evidence on asymmetrical and irreversible participation of holders at the labour market. Despite intensive restructuring of agriculture and profound changes in non-farm labour market in the analysed period, labour supply of farm holders remains rigid. Mobility of labour supply is lower than expected, which can be attributed to the importance of structural problems constraining intersectoral mobility. A marked tendency towards upkeeping of the same employment status is more distinct in the case of holders employed on the farm. A low level of labour supply mobility worsens efficiency of labour allocation on agricultural holdings in Slovenia. Elements of this problem emerge on both, supply (e.g. low level of educational and professional attainment of reference persons) and demand side of labour market (e.g. unfavourable local labour market conditions).

Key words: employment decisions, mobility of labour supply, off-farm employment, probit model

JEL classification code: J2, J6

1. Introduction

Intensive outflow of labour out of agriculture can be observed as a general economic trend. This can be attributed to two mutually related processes: restructuring of agricultural production, which reflects in its growing specialisation and concentration, and technical progress, which constantly reduces labour force requirements (Mc Namara and Weiss, 2001). Adaptational strategies of agricultural households to this trend are often linked with off-farm employment of family labour (Eurostat, 2000). Zurek (1986) points out that motives and interests for off-farm employment differ and can be influenced by various determinants, e.g. transfer of excessive family labour, satisfaction of income expectations, or personal preferences.

The paper analyses intertemporal employment decisions on agricultural households in Slovenia and attempts to estimate the extent of labour supply mobility. Slovenia has entered the transition period with a highly fragmented land ownership structure¹, majority of farms

¹ In contrast to other ex-socialist European countries (with a sole exception of Poland), the predominant share of agricultural production was attributed to privately owned farms also throughout the socialist period.

operating on a part-time basis (Bojnec and Swinnen 1997). There are two processes that have acted simultaneously and contributed the most towards such structure: (i) agricultural policy discriminating against and oppressing private farmers (e.g. introduction of 10 hectares land ownership maximum, heavy tax burdens, disincentives towards private investment in agriculture) and (ii) increasing demand for labour caused by intensive (and spatially dispersed) industrialisation. Despite unfavourable policy climate, the farm structures have remained fairly static throughout the socialist period, reflecting importance of the role of social buffer of emerging social tensions and distinctive emotional connotation attached to farming.

Entering the period of transition towards a full-market economy with uncompetitive agricultural sector characterised by diseconomies of size and inefficient labour allocation, one would expect immediate outflow of labour from agriculture and intensive consolidation of the remaining farms. Yet the statistical evidence (Kovačič et al., 1995; SORS, 2002) shows that the structural changes in the first ten years of transition were somehow mixed. The aggregate number of farms has decreased markedly (by 22.9 per cent), which can be attributed primarily to the outflow of marginal self-subsistence oriented marginal producers. On the other hand, outflow of labour out from agriculture in Slovenia in the transition period was rather low (Macours and Swinnen, 1999; Dries and Swinnen, 2002) and thus not solving the problem of low labour productivity in agriculture. Labour supply in Slovene agriculture remains persistently rigid.

The primary aim of the paper is to explore the determinants hindering intersectoral mobility of agricultural labour in Slovenia. The paper intends to test additional aspects that might be specific for analysis of labour reallocation during transition period.

The starting point of empirical verification of employment choice determinants would be an application of cross-sectional model of employment choice, which intrinsically assumes symmetrical and reversible labour supply. The paper puts these two restrictive assumptions under empirical scrutiny by analysing the case in a dynamic setting (Gould and Saupe; Weiss, 1997; Corsi and Findeis, 2000). The paper attempts to check validity of these assumptions in a transition economy by using the data for Slovenia. The dynamic dimension of the analysis (its time span extends over the period of economic transition) attempts to account for eventual changes of labour supply on agricultural households in a changing economic and policy environment.

Structure of the paper is organised as follows. A systematic classification of employment choice determinants on agricultural households that hold for the Slovenian case is presented. Further, the theoretical background of the model is explained and the data is described. This is followed by the reporting and commenting of the model results. Paper concludes by summarising the results and discussing their policy implications.

2. Determinants of employment choice

Labour allocation on agricultural households and the corresponding employment choice of the household members is a dynamic process influenced by various factors. Questions such as labour allocation and employment choice are difficult to study without a thorough understanding of the microeconomic behaviour of agricultural households. That means it is essential to know what factors determine the demand and supply of labour within the agricultural household, and how the interactions between these factors act.

There is no uniform classification of factors that influence decisions on labour allocation on agricultural holdings and consequent employment decisions of agricultural household

members. For the need of the present research, we have developed a classification of these factors that best describes the decision making process about employment on Slovene agricultural households and thus represents a starting point of the empirical analysis. Basic structure of this classification is resumed from Quaranta and Marotta (1998), whereas further classification is entirely adapted using various sources from theoretical background (Huffman, 1991, 2000; Andermann et al., 2000; Hanushek and Kimko, 2000; Sadoulet et al., 1996) and statistical evidence (SORS, 2002; Eurostat, 2000). Explaining various factors influencing labour allocation more formally, they can be grouped as: (i) those affecting the marginal rate of substitution between labour and income (hence, personal and household characteristics) and (ii) all those affecting labour productivity on the farm (hence, farm and personal characteristics) and off the farm (hence, labour market and personal characteristics).²

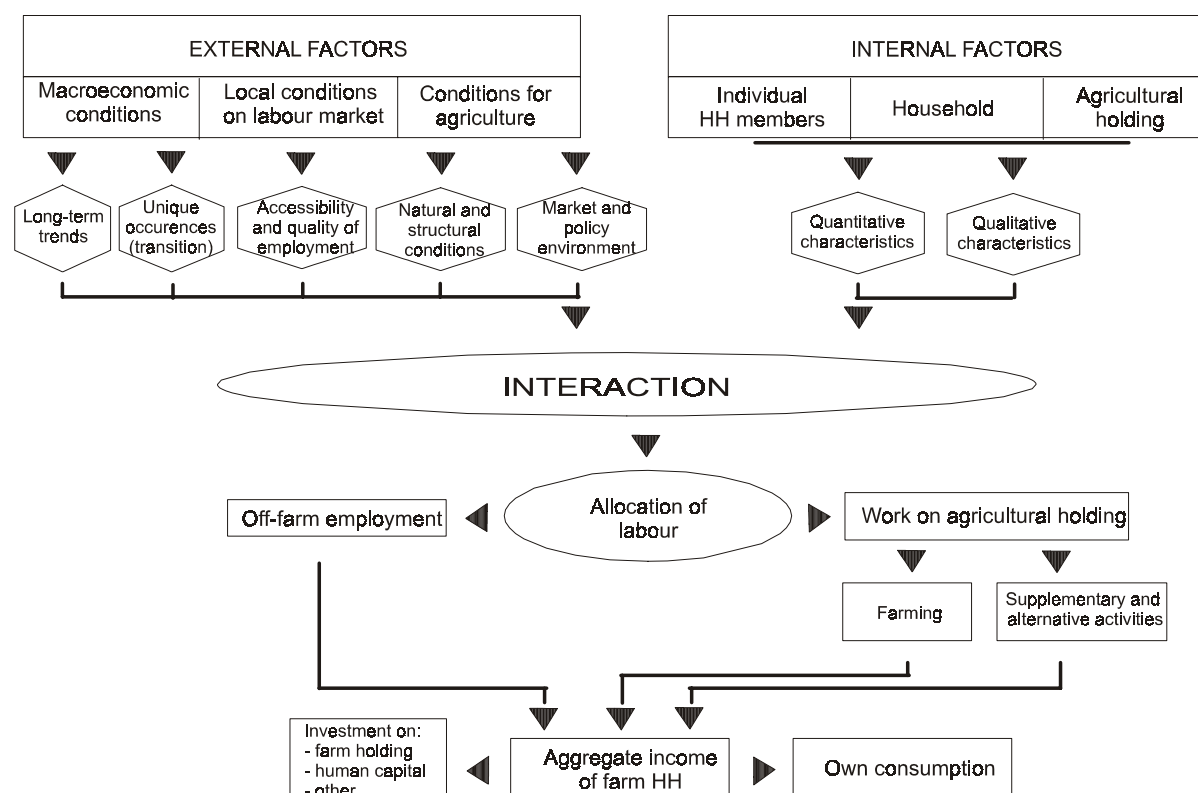


Figure 1: Labour allocation on agricultural households

In the case of transition economies Davis and Pearce (2000) suggest deepening of analysis on labour force on agricultural households by verification of additional factors. Individual's decision on continuation or cessation of farm work can, according to Davis and Pearce (2001), depend on adaptation to the favourable situation on (off-farm) labour markets ('demand-pull' factors). On the other hand, continuation of (low-paid) farm work can also be an individual's survival strategy in the case of rigidity on off-farm labour markets ('distress-push' factors).

On the longer run, employment decisions can be influenced also indirectly by conditions on agricultural markets and by agricultural policy measures (Weiss, 1997; Kimhi, 1994). Especially in the case of agricultural policy, the influences are complex and uneasy to predict (Weiss, 1997; Chang and Stefanou, 1988).

² The authors wish to thank the anonymous referee for this suggestion.

3. Modelling of employment decisions in a dynamic setting

Most studies on employment choice typically use cross section data and thus implicitly assume a steady state relationship between the variables of interest. There is however a growing consensus that this implicit assumption fails to take sufficiently into account employment decisions of individuals at different points of time (Weiss, 1997). Little econometric work is yet available for labour allocation in transition economies. Nevertheless, due to profound changes in the political and macroeconomic environment, resulting also in intensive adjustment of the agricultural sector (Rednak et al., 2003), the standard cross-sectional model might be particularly unrealistic for a transition economy like Slovenia.

Similarly to Corsi and Findeis (2000), the paper attempts to test to what extent the individuals' employment decisions are influenced by their previous employment status ('state dependence') and to what extent to other reasons and preferences ('heterogeneity').

Available empirical findings about intertemporal analysis of employment choice (Nakamura A and Nakamura M, 1985; Gould and Saupe, 1989; Weiss, 1997; Corsi and Findeis, 2000) agree that individuals with previous off-farm employment record are more likely to participate on the off-farm labour market than those who have not (and vice versa). However, the authors advocate different assumptions about the influence of individual's previous employment status. As a result, two different sets of empirical specifications are used in econometric analysis of employment decisions.

In the first case, the assumption states that off-farm employment preferences are more distinctively expressed when an individual has already been active at the off-farm labour market. Nevertheless, influences of other explanatory determinants on employment choice do not differ according to the individual's employment status. In other words, previous employment status only changes the initial probability of off-farm employment, whereas it has no influence on the coefficients relating to other determinants of employment choice. According to this assumption, the effect of individual's employment status is validated by the use of a dummy variable that relates to individual's employment status in a previous period $t-1$ (Nakamura A and Nakamura M, 1985). The model can be estimated by a simple probit approach:

$$y_{it} = \alpha y_{it-1} + \beta X_{it} + \varepsilon_{it} \quad \dots (1)$$

Differently as in the upper case, we can also assume the presence of differences in employment choice patterns according to an individual's prior employment status. Although the model can be estimated by a probit technique also in this case, the structure of the model is more complex. It analyses separately the impact of explanatory determinants of employment choice for those individuals who were employed off-farm in $t-1$ and separately for those employed on the farm in the same period. Similar approach had been used by Gould and Saupe (1989) and Weiss (1997). The model structure can be specified as follows:

$$y_{it} = \alpha_0 X_{it} y_{it-1} + \alpha_1 X_{it} (1 - y_{it-1}) \quad \dots (2)$$

In the analysis that is subject to the present paper, both above described approaches were tested. Adopted analytical approach allows for the initially stated research objectives: quantification of impact of previous employment status and testing of hypotheses relating to symmetry and reversibility of employment choice.

Apart from the prior employment status, empirical analysis attempts to explain the employment decision behaviour by quantifying impact of other determinants, such as characteristics of farm holdings, individual and household characteristics, labour market characteristics and location.



Interpretational capability of the model coefficients estimated by the equations (1) and (2) is limited, since they do not reveal the magnitude of impact of a chosen explanatory variable. In order to enhance interpretational capability of the model, quasi-elasticities of model coefficients were calculated. Calculation of quasi-elasticities is based upon the results of marginal effects, i.e. partial derivatives of the probability function. Analogously to the basic definition of elasticity, marginal effects are multiplied by the ratio between average values of explanatory and endogenous variables:

$$\varepsilon_q = \frac{\partial Y}{\partial x} \frac{\bar{x}}{\bar{Y}} \quad \dots (3)$$

Similarly than the 'standard' elasticity coefficients, the quasi-elasticity coefficients can be interpreted as a percentage impact of a unit change of explanatory variable to probability of the observed outcome.

4. The data

The empirical approach is based on a panel of 72,438 farm households, consisting of the matching observations from the 1991 National Census and 2000 Agricultural Census datasets. The data include information on characteristics of the farm, farm household and personal attributes of the farm holder. The original dataset was supplemented by secondary statistical data on local demographic and socio-economic characteristics. Unfortunately, the dataset was lacking information about the income status of household members. This obstacle was surmounted by estimation of the 'potential wage' for farm holders. The corresponding database for estimation of potential wages was acquired by an income function estimated from an independent set of data.³

Due to dataset limitations (employment status for both reference periods is recorded only for farm holders), the analysis is restricted only to the employment choice of farm holders. The classification criterion for division between off-farm and on-farm employment refers to the legal employment status reported by the farm holders.

The frequencies of reported employment status of farm holders for both analysed periods are presented in the Table 1. In the model estimation, farm holder's employment status is used as the lagged endogenous variable (in the case of holder's employment status in 1991) and endogenous variable (in the case of holder's employment status in 2000). Definitions of the explanatory variables together with their descriptive statistics are presented in the Annex A1. The model of farm holders' employment mobility, presented in the following chapters, attempts to describe the quantitative relationships between these outcomes and selected explanatory variables.

Selection of the sample was undertaken in a stepwise manner. Only the cases where the farm holders were the same in both reported periods and have reported to be actively participating at the labour market (thus not being retired or unable to work). This limits the number of analysed observations to 22,055 cases.

³ Description of the income function estimation procedure is presented in Annex A3.

Table 1: Employment status of holders in the data sample of the model of employment mobility

Holder's employment status		Number of observations	Dependent variable (H_EMPL)
1991	2000		
on-farm	on-farm	7,434	0
on-farm	off-farm	1,494	1
off-farm	off-farm	10,401	1
off-farm	on-farm	2,726	0
Total observations		22,055	

Since the criteria for sample selection in our analysis were arbitrary (i.e. criteria based upon the research questions), the model results were checked against eventual bias due to the sample selection procedure, in which endogenous variables (in our case farm holders' employment status) are only partially observable. Due to a large number of observations excluded from the initial dataset, there is a possibility of biased model results. In order to check whether there is a model bias, a sample selectivity test as suggested by Meng and Schmidt (1985) was carried out.⁴

One of the main sources of partial observability in our case was the sample attrition due to farm exits. In the observed dataset, 11.1 per cent of farm holdings have ceased to operate in the period 1991-2000. Share of farm exits in cases where the holders were employed on farms was 11.1 per cent, whereas it amounted to 8.9 per cent in cases where the holders were employed off-farm. Beyond any doubt, explanation of the farm exit behaviour can be of a great significance to provide us information about the possible interactions between employment decisions and structural adjustments in agriculture. Nevertheless, the scope of analysis and questions raised by this issue go beyond the research focus of this paper.

5. Results

Table 2 reports the results of three alternative models of employment choice. As a starting point of analysis, a simple probit cross-sectional model has been run in order to test significance of past employment status in employment decisions of farm holders (Model 0). Model 1 stems from the assumption of different patterns of holders' employment choice with regard to their prior employment status (equation (2)). The first column of coefficients relates to the cases where holders were employed off-farm in 1991 and the second column to the cases where they were employed on the farm. Model 2 includes holder's previous employment status as a dummy variable, inferring that the patterns of employment choice do not differ with regard to their prior employment status (equation (1)).

⁴ The procedure of sample selectivity test and its results are presented in the Annex A2.

Table 2: Results of the model of employment mobility of holders (1991 – 2000)

Explanatory variable	Model 0		Model 1				Model 2	
	Cross-section model		Probit model, separated with regard to the 1991 employment status				Probit model, 1991 employment status as a dummy variable	
			Holder employed off-farm		Holder employed on-farm		All farms	
	Coefficient	t-statistic	Coefficient	t-statistic	Coefficient	t-statistic	Coefficient	t-statistic
Constant	-1.625	-2.420	-2.923	-2.871	2.106	1.930	-1.197	1.698
<i>H_EMPL91</i>							1.352	56.994
<i>L_ESU00</i>	-0.705	-61.507	-0.515	-32.243	-0.554	-26.193	-0.543	-43.940
<i>H_LINC</i>	0.112	3.006	0.135	2.331	-0.071	-1.417	0.030	0.792
<i>AGE</i>	1.302	3.165	2.510	4.324	-1.663	-2.465	0.506	1.155
<i>AGE_2</i>	-0.898	-5.696	-1.330	-5.884	0.411	1.634	-0.455	-2.717
<i>H_GENDER</i>	-0.030	-1.136	0.287	7.182	-0.687	-17.246	-0.185	-6.521
<i>M_STATUS</i>	0.223	7.812	0.156	3.751	0.114	2.504	0.093	3.051
<i>N-15</i>	-0.045	-3.885	-0.043	-2.568	-0.008	-0.392	-0.024	-1.909
<i>N_15-65</i>	0.058	6.202	0.034	2.577	0.014	0.865	0.035	3.519
<i>N+65</i>	0.029	1.641	0.057	2.269	0.010	0.327	0.039	2.041
<i>AWU</i>	-0.001	-1.892	-0.007	-2.291	0.007	2.133	-0.001	-1.921
<i>F_SUCC</i>	-0.089	-3.722	-0.089	-2.645	-0.038	-0.902	-0.075	-2.909
<i>H_EDAGR</i>	-0.489	-11.362	-0.146	-2.298	-0.192	-2.456	-0.220	-4.669
<i>H_ED_P</i>	-0.938	-2.359	-0.739	-1.193	-0.377	-0.551	-0.769	-1.780
<i>H_ED_V</i>	-0.361	-0.907	-0.476	-0.767	0.031	0.045	-0.412	-0.952
<i>H_ED_H</i>	-0.193	-0.482	-0.415	-0.668	0.038	0.056	-0.338	-0.780
<i>I_UNMPL</i>	-0.350	-7.379	-0.257	-3.860	-0.127	-1.494	-0.218	-4.246
<i>I_PDENS</i>	-0.048	-5.244	-0.060	-5.212	-0.050	-2.675	-0.059	-6.081
<i>LFA</i>	-0.101	-3.562	-0.005	-0.122	-0.159	-3.158	-0.067	-2.196
<i>C_SLO</i>	1.479	6.993	1.554	6.634	0.785	1.606	1.488	6.938
<i>W_SLO</i>	1.694	8.055	1.820	7.569	0.927	1.883	1.689	7.926
<i>E_SLO</i>	1.694	7.892	1.803	7.760	0.962	1.975	1.695	7.774
<i>LR test</i>	8749.2 (21)			12813.1 (43)			12186.9 (22)	
χ^2 (d. freedom.)								
<i>LRI</i>	0.287				0.421		0.400	
% of correct predictions								
- Total	77.1				82.5		82.3	
- <i>H_EMPL91=1</i>	79.2				87.2		86.8	
- <i>H_EMPL91=0</i>	74.6				77.0		77.2	
<i>LR test/model 0</i> χ^2 (d.f.)					4063.93 (22)		3437.74 (1)	
<i>LR test/model 2</i> χ^2 (d.f.)					626.18 (21)			

Based on the results of likelihood ratio test (Pindyck and Rubinfeld, 1991), all presented models are statistically significant at 99% or above. Results of χ^2 test reveal that the differences between model coefficients are statistically significant. The values of LRI goodness-of-fit coefficients are satisfactory (Greene, 1997). With regard to the results of the sample selectivity test presented in Annex (A2) we can also state that model bias due to the pattern of farm exit behaviour does not represent a major econometric problem.

Comparison of the result of cross-sectional model with those from the longitudinal ones clearly shows that the explanatory power of the cross-sectional model is lower (likelihood ratio index of cross-sectional model is 0.287, compared to 0.421 and 0.400 reached by the longitudinal models. The percentages of correct predictions in the cross-sectional model are lower. Based on these results we can reject the 'no state dependence' hypothesis contained in the cross sectional model. Moreover, impact of the prior employment status is confirmed by the t-value of the dummy variable referring to the previous off-farm employment (*H_EMPL91*) in the Model 2, which provides an implicit test of state dependence.

Comparison of the two alternative longitudinal model specifications (Models 1 and 2) was carried out as suggested by Corsi and Findeis (2000). Since the model specification of the probit model separated by the 1991 employment status of holders (equation 2) nests the model with lagged endogenous variable (equation 1), the test can be carried out simply by testing the restriction $\alpha_0 = \alpha_1$ (equation 2)). Since results of the LRT suggest rejecting this restriction, the probit model separated by the 1991 employment status of holders can be regarded as preferred.

Quasi-elasticity coefficients were calculated as specified in equation (3). Coefficients for models 1 and 2 are presented in the Annex (A4).

The impact of holder's prior employment status is highly significant, which can be inferred explicitly by the corresponding coefficient in the model 2 (*H_EMPL91*) and implicitly by the overall significance and explanatory power of the Model 1. This implies that labour supply of farm holders in Slovenia is highly immobile. The quasi-elasticities for holders' employment status in 1991 (model 1) imply that probability of off-farm employment is 54 per cent higher on farms whose holders were employed off-farm already in 1991. There are also statistically significant differences between the two sets of parameter estimates distinguishing between the holders with off-farm and on-farm prior employment status (Model 1). This allows for rejection of the initial model assumption of symmetry and reversibility of their labour market participation.

In this respect, the results are similar than reported for the case of Upper Austrian farms by Weiss (1997). His argumentation to this finding relates to *'the cycle of low incomes and high agricultural labour input'* on full-time farms and the opposite *'cycle of high incomes and low agricultural labour input'* experienced by their part-time counterparts. There is no reliable data on total income of agricultural households in Slovenia and the importance of various income sources. However, first estimations (Erjavec et al., 2002) imply that the hypothesis of low income on full-time farms can not be fully confirmed. The reasons for the 'trappment' of individuals in the same employment status can therefore be attributed primarily to low labour mobility.

Significant influence of opportunity off-farm incomes (*H_LINC*) on employment choice, which is consistent with similar findings established already by Huffman (1980) and Pfaffermayr et al. (1991), can be found only in the case of farm holders that were previously employed off-farm. The impact of potential off-farm incomes can not be confirmed in the cases where holders were employed on farms in 1991. This result might be attributed especially to the rigid labour supply of farm holders due to their poor educational attainment and correspondingly uncompetitive position at the (off-farm) labour market. This is strongly supported by the statistical data: according to the results of the 2000 agricultural Census, 58 per cent of farm holders have finished only grammar school or less (SORS, 2002).

Model results confirm that economic size of farms⁵ (L_ESU00) has a significant influence on employment decisions of farm holders in slovenia and on mobility of their labour supply. The probability function is monotonously decreasing, therefore probability of off-farm employment decreases simultaneously with growing farm size. The highest quasi-elasticities can be found in the cases of farms where holders were employed on-farm in 1991. In these cases, the probability of holders' off-farm employment on farms of economic size 30 ESU and larger, is practically negligible.

Holders' age was included in the model in its original form (AGE) and in its quadratic transformation (AGE_2), controlling for eventual non-linear relationships. In analyzing the holder's age, a direct and indirect impact of this variable can be analysed. Holder's age is indirectly included in the model through the imputed potential off-farm income (estimated from the income function). According to the income function results, the income increases with age (in combination with the educational attainment) and thus positive impact of age on off-farm employment can be expected. On the other hand, direct negative impact of age on off-farm employment can also be expected. Coefficients for the age variable are significant only in the part of model 1, dealing with the holders with off-farm employment status in 1991. The probability of their off-farm employment increases until 38 years of age and then decreases. With needed caution due to insignificance of some age coefficients, our model results indicate that direct negative impact of age is prevailing. Except for the abovementioned case, the probability function for holders' off-farm employment is monotonously decreasing. Model coefficients reveal that direct negative impact of holders' age on labour supply mobility is prevailing, although the trend is not distinctive. Probability of persistance in the same employment status remains high for all age groups of holders.

The coefficients referring to the gender of farm holders (H_GENDER) are statistically significant in both cases – when farm holder was employed off-farm and on-farm in 1991. The impact of holder's gender differs considerably with regard to their prior employment status. As a general observation, men tend to demonstrate a lower level of mobility of labour supply. According to the model results, probability of the holder's off-farm employment in the case of male holders employed off the farm in 1991 increases by 16.5 per cent (thus reducing their possibility of transferring to on-farm employment in 2000). Similarly to this, probability of the holder's off-farm employment in the case of male holders employed on the farm in 1991 decreases by 4.4 per cent (thus increasing their possibility of retaining on-farm employment in 2000).

As expected, model results imply that agriculture-related education as a proxy for professional qualification (H_EDAGR) decreases probability of off-farm employment. Contrary to this, the impact of variables relating to general education level is in most cases insignificant. Exception to this is the case of farm holders with finished primary education or less (H_ED_P), where the model results imply that low educational level decreases individual's off-farm employment potential.

Insight to the impacts of household characteristics on employment decisions of farm holder, was tested by inclusion of five various explanatory variables. Probability of off-farm employment is higher in the case of farms where farm holders are married (M_STATUS). It is perhaps interesting that holders on farm holdings with identified farm successor (F_SUCC)

⁵ The economic size of farms has been calculated from the 2000 Agricultural Census data by the Statistical Office of the Republic of Slovenia. The economic size of farms is expressed in the European Size Units (ESU), which is based upon the calculation of farms' standard gross margin. Initial values of economic farm size in ESU were logarithmically transformed.

are more likely to switch from off-farm to on-farm employment. In the case when the holder was employed on-farm already in the previous period, this variable has no impact on his employment decisions. This implies that farm succession might be linked with the successor's on-farm employment status. However, this issue would have to be tested formally by additional research.

One could expect more distincted changes in the holders' employment status in the cases farm transfer has occurred in the analysed period. This issue might be subject to further empirical analysis. However, application of an appropriate empirical approach for modelling farm transfer⁶ (Kimhi 1994) was not possible with our dataset, because the exact period when farm transfer took place was not recorded.

In order to test the impact of household size and structure, the number of household members by three age groups was included in the model. Although statistically significant in the case of holder's off-farm employment, the number of children under 15 years ($N-15$) has only a slight negative impact on probability of off-farm employment. More distincted is the impact of the number of the number household members in active age between 15 and 65 years ($N-15-65$). Probability of farm holders' off-farm employment increases with the number of household members within this age group, implying that increased family labour potential can replace a part of holders' labour input on the farm and thus enable participation of farm holders at the off-farm labour market. This interpretation is reinforced by the positive impact of household members older than 65 years ($N+65$) on the probability of holders' off-farm employment. Significance of this variable reflects the country-specific structural drawback of Slovene agriculture with high representation of aged labour force in total labour input.⁷

Regional unemployment index ($I-UNMPL$) as an indicator of local labour market conditions reveals a statistically significant and relatively high impact on farm holders' employment decisions. Rising level of regional unemployment results in a marked decrease of probability of labour participation on the off-farm labour market in the case of farm holders previously employed off the farm. This impact can not be confirmed in the case of farm holders previously employed on the farm, which reinforces the previously mentioned finding about their uncompetitive position at the (off-farm) labour market..

Location of farm holding in areas with aggravated conditions for agricultural production (LFA) decreases the probability of holders' off-farm employment. This can probably be attributed to remoteness and correspondingly lower availability of off-farm jobs. Statistical significance and negative impact of coefficients of population density ($P-DENS$) additionally supports this interpretation.

6. Conclusions

The paper attempts to provide an empirical insight to determinants influencing employment choice behaviour of farm holders in Slovenia in the period 1991-2000 and to provide satisfactory explanation of the results obtained. It explores whether the observed dynamics of labour supply on agricultural households in Slovenia can be explained by the existing empirical evidence on this subject and attempts to identify some specific features to this process. The task is even more appealing since most of related research was carried out in

⁶ The authors wish to thank to anonymus referee for his valuable suggestions about possible approaches towards modelling of farm transfer.

⁷ Persons over 55 years represent almost a half of the labour force (41.6 per cent), whereas the labour input of people over 65 years amounts to 18.8 per cent (SORS, 2002).

countries with stable macroeconomic and structural conditions. With a relatively short period of formal transition to a market economy, Slovenia can not be entirely compared with these countries. On the other hand, unlike most of the other post-socialist countries, Slovenia has preserved the traditional ownership structure with prevalence of family farms throughout the socialist period. Therefore, the acquired results do not reflect impacts that could be interpreted as universal for transition economies in general.

The model results generally confirm that the existing empirical evidence on labour supply dynamics on asymmetrical and irreversible participation of holders at the labour market in developed economies (Weiss, 1997; Corsi and Findeis, 2000; Nakamura A and Nakamura M, 1985; Gould and Saupe, 1989) holds also in the case of Slovenia. This is not surprising, since in most cases they infer relatively simple and straightforward economic relationships (e.g. probability of off-farm employment Vs. income potential or economic size of farms).

Despite the intensity of structural changes in Slovenian agriculture in the analysed period (SORS, 2002), a low level of employment mobility remains a distinctive feature of intertemporal employment choice of farm holders. Due to unfavourable structural conditions for agricultural production (small farm holdings, fragmented land parcels), necessity of diversified income sources in agricultural households is perceivable⁸. However, the model results imply that farm holders often insist in on-farm employment, despite limited production (and thus employment) potentials of their farm holdings. Mobility of farm holders' labour supply in terms of transfer from one employment status to another is rigid. This can be attributed especially to the toughened conditions on the labour market during the transition to market economy. In the case of Slovenia, the importance of structural problems constraining intersectoral mobility seems to be particularly important. Costs of transition in this respect were borne disproportionately the least skilled being affected the most (Orazem and Vodopivec, 1995). Observing the unfavourable human capital characteristics of farm holders in Slovenia (e.g. age, education, skills) reflected from the available statistical sources (SORS, 2002), one can infer that they tend to have been among the ones affected by transition.

The problem of (in)efficient labour allocation on agricultural households in Slovenia is complex. Elements of this problem emerge on both, supply and demand side of labour market. As key determinants to the present situation, one can point out reasons such as low level of educational and professional attainment on one and unfavourable local labour market conditions on the other side. Both groups of determinants operate in mutual connectedness.

Also complex and long-run oriented should be the approach towards salvation of the problems linked with inefficient labour allocation on agricultural households. On the basis of model results, this approach should consist of the following elements: investment in human capital of agricultural household members, incentives for more improved economic efficiency of farm production, stimulation of alternative income sources and self employment on agricultural holdings, and greater accessibility of jobs outside agriculture.

⁸ Differently as in the case of farm holdings, employment choice of other farm household members is in most cases limited to various alternatives of off-farm employment (Juvančič, 2002).

7. References

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8. Annex

A1: Description of explanatory variables

Table: Definition of explanatory variables and descriptive statistics of data used in the model of employment mobility of holders

		Original database average (stand. dev.)	Selected farms average (stand. dev.)	Holder employed off farm average (stand. dev.)	Holder employed on farm average (stand. dev.)
Number of agricultural holdings		72,438	22,055	13,127	8,928
Logarithmic transformation of the economic size of farm in 2000 (in ESU)	<i>L_ESU00</i>	0.945 (1.008)	0.903 (1.089)	1.409 (1.042)	0.558 (0.980)
Logarithmic transformation of holder's potential yearly off-farm income (in Slovene Tolars)	<i>H_LINC</i>	13.415 (0.628)	13.628 (0.444)	13.753 (0.377)	13.445 (0.471)
Holder's age in 2000	<i>AGE</i>	57.29 (13.352)	51.552 (9.572)	49.396 (8.116)	54.720 (10.612)
Holder's gender (0=F; 1=M)	<i>GENDER</i>	0.720 (0.451)	0.815 (0.389)	0.861 (0.346)	0.747 (0.435)
Holder's marital status (1=married; 0=single)	<i>M_STATUS</i>	0.702 (0.456)	0.803 (0.398)	0.835 (0.368)	0.757 (0.376)
Number of household members aged < 15 years	<i>N - 15</i>	0.560 (0.917)	0.617 (0.940)	0.615 (0.924)	0.620 (0.963)
Number of household members aged between 15 and 65 years	<i>N 15-65</i>	2.441 (1.450)	2.950 (1.327)	3.037 (1.232)	2.823 (1.445)
Number of household members aged > 65 years	<i>N + 65</i>	0.723 (0.764)	0.428 (0.641)	0.343 (0.574)	0.552 (0.711)
Farm labour input (in Annual Work Units)	<i>AWU</i>	2.238 (1.198)	2.222 (0.783)	1.702 (0.875)	2.986 (0.710)
Farm successor identified (1=Y, 0=N)	<i>F_SUCC</i>	0.242 (0.443)	0.215 (0.427)	0.174 (0.393)	0.275 (0.465)
Formal agricultural education (1=Y, 0=N)	<i>H_EDAGR</i>	0.054 (0.226)	0.065 (0.246)	0.045 (0.208)	0.093 (0.290)
Educational attainment of holder – grammar school or less (1=Y, 0=N)	<i>H_ED_P</i>	0.607 (0.488)	0.550 (0.498)	0.410 (0.492)	0.756 (0.429)
Educational attainment of holder – vocational school (1=Y, 0=N)	<i>H_ED_V</i>	0.255 (0.436)	0.292 (0.455)	0.372 (0.483)	0.175 (0.380)
Educational attainment of holder – secondary school or more (1=Y, 0=N)	<i>H_ED_H</i>	0.138 (0.225)	0.157 (0.364)	0.218 (0.413)	0.068 (0.251)
Coefficient of regional unemployment rate (Slo=1)	<i>I_UNMPL</i>	1.105 (0.307)	1.121 (0.311)	1.092 (0.313)	1.165 (0.304)
Coefficient of population density (Slo=1)	<i>I_PDENS</i>	1.065 (1.207)	1.076 (1.200)	1.098 (1.233)	1.044 (1.148)
Location of farm in a less-favoured area	<i>LFA</i>	0.810 (0.390)	0.808 (0.394)	0.806 (0.395)	0.811 (0.392)
Location of farm in Central Slovenia	<i>C_SLO</i>	0.099 (0.299)	0.099 (0.299)	0.103 (0.304)	0.092 (0.290)
Location of farm in Western Slovenia	<i>W_SLO</i>	0.200 (0.400)	0.179 (0.384)	0.209 (0.407)	0.136 (0.342)
Location of farm in Eastern Slovenia	<i>E_SLO</i>	0.698 (0.459)	0.719 (0.450)	0.685 (0.465)	0.769 (0.421)

A2: Sample selectivity test

The problem of partial observability can be presented algebraically. Let us denote the farm survival variable with binary outcomes as y_1 . Next we observe the holder's employment status in 2000 (let us denote it as y_2), which similarly results in binary outcomes. The observed values of y_2 are therefore:

$$y_2 = \begin{cases} 1, & \text{if } y_2 = 1 \wedge y_1 = 1 \\ 0, & \text{if } y_2 = 0 \wedge y_1 = 1 \end{cases}$$

In the model, the values of y_2 can be determined only for these observations which are included in the sample, whereas we are lacking the information about employment decisions of farm holders that have been rejected from the sample. It is also possible that employment status of farm holders and farm exits are correlated.

When checking reliability of our model results, we have to find out whether these results were influenced by the sampling procedure. Procedure, proposed by Meng and Schmidt (1985) is relatively simple. It consists of a bivariate probit model with partial observability using the whole dataset. In terms of variable codes named above, this means that the first endogenous variable applies to y_1 and the second one to y_2 (providing that the value of y_1 in the analysed observation is 1). This procedure therefore implies testing of asymptotical efficiency of model parameters with regard to the models of employment decision described in the paper. In case where the models do not differ considerably in their signs and scales, we can determine that partial observability does not represent a serious econometric problem. Results of the sample selectivity test are presented in the table below.

Results of the sample selectivity test reveal that the holder's employment status in 1991 has influenced farm exit behaviour (the employment status coefficient in the farm exit equation is significant). However, there are no major deviations in the signs and scales of coefficients in the equation referring to the employment status with respect to the coefficients of the tested models. This finding enables us to state that model bias due to the pattern of farm exit behaviour does not represent a major econometric problem.

Table: Meng and Schmidt (1985) test of the model of employment mobility of holders

Explanatory variables	Y ₁ = farm survival P(Y ₁)=1		Y ₂ =holder's off-farm employment P(Y ₂)=1	
	Coefficient	t-value	Coefficient	t-value
Constant	1.277	6.335	-2.101	-7.598
H_EMPL91	3.747	14.518	0.897	52.933
L_LU_91*	0.414	42.527		
L_HA_91*	0.307	30.573		
L_ESU			-0.213	-31.061
H_LINC			0.177	9.562
AGE	-3.555	14.747	-0.454	-10.698
AGE_2	2.242	18.700	0.275	10.496
H_GENDER			-0.006	-0.733
I_UNMPL	-.136	-3.158	-0.583	-18.816
LFA	0.060	2.654	-0.029	-1.736
N-15			-0.037	-4.948
N+15			0.064	12.276
H_ED_P			-0.619	-26.008
H_ED_P			0.007	0.300
W_SLO	0.076	0.447	0.461	3.709
E_SLO	0.327	1.868	0.572	4.482
C_SLO	0.042	0.243	0.504	4.029
χ^2 (degrees of freedom)	12.150,94 (10)		10.922,69 (15)	
LL[β] (LL[0])			-35.779,44 (-45.729,53)	
LRI			0,2176	
ρ – correlation of residuals (t-value)			-0,687 (-33,096)	

* Alternative coefficients for farm size (logarithmically transformed data about livestock status expressed in Livestock Units (L_LU_91) and utilised agricultural area expressed in hectares(L_HA_91)) were used due to inexistence of the data on economic size of farms for 1991.

A3: Estimation of the income function

The income status of farm household members was not reported in the Census databases. This was an important impediment for further empirical analysis since individual's income status or income expectations are usually regarded as key determinants of employment choice (see e.g. Lass et al., 1991; Huffman et al., 1991; Schmitt, 1997). To overcome this deficiency, we have decided to calculate the potential income of farm holders using results of an income function, estimated from an independent source of data. Similar approach was adopted in Pfafermayr et al., 1991 and Weiss, 1997.

The source of data was Household budget survey (HBS) dataset for the period 1997-99. Since relatively good indicator of the economic size of farms (Economic Size Units, ESU) was available in Agricultural census 2000 dataset, our focus was to assess the wage that individual can earn with off-farm work.

There are two important limitations linked with this approach. The first one applies to the fact that the HBS data has only relevant data for a representative sample of households and can not be matched with the data for farm holders in the census dataset. This implies that the incomes estimated from the income function do not reflect the actual off-farm incomes of farm holders, but rather potential ones. The second limitation is linked to the limited scope of possible explanatory variables of the income function. Unfortunately the HBS and Census datasets were matching adequately only in two variables - age and educational attainment.

The explanatory variables of income function could therefore consist only of age, education and interaction variables. Results of the income function are available upon request from the authors.

With regard to the results of similar studies (e.g. Zweimueller and Winter-Ebner, 1994; Pfaffermayr et al., 1991; IMAD, 2000) we were assuming that there is an inter-regional variability in income data. Unfortunately the dataset limitations did not allow to test this assumption (location of farms from the census dataset could be detected by the municipality code, whereas households from the HBS only had a reference to the territorial strata, i.e. type of settlement). Therefore, the income estimates obtained from the income function were multiplied by the index of income tax basis at the NUTS 3 territorial level (NUTS 3 regions were assumed to represent potential commuting zones of farm holders in case of their off-farm employment).

A4: Quasi-elasticity coefficients

Table: *Quasi-elasticity coefficients for probability of holder's off-farm employment in 2000*

Explanatory variable	Quasi-elasticity coefficients (level of statistical significance)		
	Model 1		Model 2
	Holder employed off-farm	Holder employed on-farm	All farms
<i>H_EMPL91</i>			0.536***
<i>L_ESU00</i>	-0.192***	-0.520***	-0.327***
<i>H_LINC</i>	1.239*	-0.236	0.275
<i>AGE</i>	2.068***	-0.348*	0.434
<i>AGE_2</i>	-1.390***	0.088	-0.521**
<i>H_GENDER</i>	0.165***	-0.044***	-0.100***
<i>M_STATUS</i>	0.087***	0.008*	0.050**
<i>N-15</i>	-0.018**	0.000	-0.010*
<i>N_15-65</i>	0.069**	0.002	0.069***
<i>N+65</i>	0.013*	0.000	0.011*
<i>AWU</i>	-0.008*	0.001*	0.000
<i>F_SUCC</i>	-0.010**	0.000	-0.011**
<i>H_EDAGR</i>	-0.004*	-0.001*	-0.009***
<i>H_ED_P</i>	-0.202	-0.009	-0.282
<i>H_ED_V</i>	-0.118	0.000	-0.080
<i>H_ED_H</i>	-0.060	0.000	-0.035
<i>I_UNMPL</i>	-0.187***	-0.004	-0.163***
<i>I_PDENS</i>	-0.044***	-0.001**	-0.043***
<i>LFA</i>	-0.003	-0.003**	-0.036*
*	P<0.05		
**	P<0.01		
***	P<0.001		