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LABOUR ADJUSTMENTS IN AGRICULTURE: EVIDENCE FROM ROMANIA

Barbara Tocco^{†‡}, Sophia Davidova[†], Alastair Bailey[†]

[†]School of Economics, University of Kent, Canterbury, CT2 7NZ, United Kingdom

[‡] Corresponding author: bt86@kent.ac.uk



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Barbara Tocco, Sophia Davidova and Alastair Bailey

Abstract

This paper explores the process of structural change in the post-transition Romania. A multinomial logit provides the technique to investigate the determinants of labour adjustments in the period 2003-06. The results suggest that male, younger and better educated individuals are more likely to leave agriculture and flow to industry and services, whereas self-employed farmers and family workers are less inclined to leave the agricultural sector. The findings are important from a policy point of view, suggesting the need for investments in human capital specifically in education with the purpose of enhancing the mobility of labour and facilitating a more efficient labour allocation. At the same time favourable labour market conditions need to be in place to sustain job creation and a smooth transition across activities.

Keywords: labour adjustments; inter-sectoral movements; agriculture; multinomial logit; Romania.

JEL classifications: J24, J43, J62, O13, Q12

1. Introduction

One of the roles of agriculture in economic development is traditionally seen as releasing labour for the rest of the economy. This can provide the double benefit of supplying hard-working self-reliant workers for rapid economic growth in the non-agricultural sectors and at the same time spurring agriculture to improve its labour productivity and raise rural living standards. Romania seemed perfectly poised to offer these developments after the collapse of the centrally planned system in 1989-90. It had one of the largest agricultural sectors in the Central and Eastern European countries (CEECs), and incipient manufacturing and service sectors which had great potential to be invigorated by joining the EU single market. This seemed to offer an opportunity to see classic labour market interactions between agriculture and the rest of the economy which motivated this study.

The objective of this paper is to identify the determinants of labour adjustments with respect to the agricultural sector, which have characterized the post-transition period in Romania. In particular, we examine both supply and demand-side characteristics which explain inter-sectoral movements of labour. The emphasis on Romania is deliberate and stems from the significant role of its agricultural sector in the national economy. Romania joined the European Union in the 2007 enlargement with Bulgaria. As reported by the Eurostat, Romania is one of the poorest countries within the European Union with 41% of the people at risk of poverty or social exclusion. One of the striking features characterising this country is the pronounced share of employment in the agricultural sector. In 2010, agriculture accounted for 30% of total employment with more than 2.7 million people engaged in the

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sector. The 2007 Farm Structure Survey (FSS) recorded 3,931,350 agricultural holdings in Romania with only 22% of these holdings with an economic size of at least one European size unit (ESU). A quite unique characteristic, even in comparison to other CEECs, is the unfavourable production structure - the heavy reliance of people on subsistence and semi-subsistence agriculture², with household production for its own final consumption rather than sales to the market, and the very low labour productivity of farming, at less than 25% of the EU average. Outmigration from agriculture has not been fast enough and thus it suggests that more attention should be given to the supply side of the labour market with emphasis on the causes of labour immobility (Lianos, 1971). The remainder of the paper is structured as follows: the next section reviews the relevant literature on the allocation of labour in rural areas while focussing on the interactions between agriculture and the rest of the economy. Sections 3 and 4 present the empirical specification and data and variables employed respectively. Section 5 is concerned with the predicted probabilities and extends the analysis. Section 6 discusses the results and section 7 concludes.

2. Review of Previous Studies

The starting point for any empirical investigation has been provided by the two-sector model of rural-urban migration by Todaro (1969) and Harris and Todaro (1970), where individuals are predicted to migrate if the expected urban-rural income differential exceeds migration costs, where the expected income in the urban sector equals the market wage times the probability of finding employment.

Migration proceeds in response to urban-rural differences in expected earnings so that a worker will only leave the current employment when the expected value of moving is greater than the income currently received. The magnitude of the flow depends on the transaction costs, i.e. inter-sectoral relocation costs, search costs of finding employment, costs of physical relocation. Therefore, the integration of rural factor markets in the general economy is important as it facilitates the outflow of agricultural labour through the stimulation of off-farm and other rural activities. Integration would reduce the labour market constraints, leading to lower mobility costs and facilitating the shift to other sectors. However the information on the location and availability of jobs may not be perfect, so that imperfect and asymmetric information creates mobility costs (Sadoulet and de Janvry, 1995).

Hence, the choice of occupation is determined by the utility differential from the two sectors (agriculture and non-farm employment), minus the transaction costs and the costs of the loss of the agricultural skills (Kancs et al., 2009). The individuals' utility is derived from both income and non-income benefits (Sadoulet and de Janvry, 1995). Non-pecuniary benefits may be associated with the job attributes of a particular sector: working in agriculture may be associated with tradition and cultural reasons, or because they enjoy the autonomy of self-employment rather than working in a company (Bojnec and Dries, 2005). Other non-monetary attributes refer to the residence where the individuals live, commuting time, transport facilities and other amenities (Zanni et al., 2008). Conversely, better social conditions and less income risk may be pull-factors for employment outside agriculture.

The costs of switching jobs as well as the probability of finding another job depend on the individual human capital characteristics, such as age and education of the individuals, as well as on regional and economic conditions, such as the degree of urbanisation and local employment conditions. As supported by a large body of literature, education is one of the most important variables for entry in the non-farm economy: schooling, which is often used as a proxy for knowledge and skills, is positively and significantly associated with participation in rural non-agricultural wage employment (Huffman, 1980; Sumner, 1982; Kimhi, 1994; Corsi and Findeis, 2000; Goodwin and Holt, 2002; Juvančič and Erjavec, 2005; Benjamin and Kimhi, 2006), and decreases participation in agricultural activities (Lopez, 1984; Fall and Magnac, 2004; Rizov and Swinnen, 2004).

As households' decisions stem from the maximisation of utility derived from income and non-income factors, changes in labour policies and institutional reforms (such as privatisation,

² According to the 2007 FSS almost half of the small holdings in the EU-27, mainly subsistence farms, were found in Romania.

liberalisation, restructuring, etc.) also affect the opportunity cost of labour and are therefore important determinants of labour adjustments (Swinnen et al., 2005).

The human capital theory also represents an important contribution to the labour reallocation literature, as it predicts that the younger and the more educated individuals are those more inclined to migrate. The young will be more mobile as they can reap the benefits over a longer period of time, and the better-educated have more transferrable skills and more access to information, and they face lower transaction costs in switching jobs and moving from one region to another. As human capital is a key factor for the quality, mobility and flexibility of labour, it is thus crucial for an efficient allocation of labour at both micro and sector level (Bojnec and Dries, 2005). Overall, inadequate human capital represents an important constraint for the reallocation of agricultural labour and for economic activities in rural areas in general (Rizov and Swinnen, 2004).

Several studies have stressed the importance of pluriactivity of farm workers for analysing structural change. Nonetheless, empirical evidence has produced opposing results. On the one hand, part-time farming has been interpreted as a 'stepping stone' out of agriculture (Pfeffer, 1989). Some studies have found that part-time farms, compared to their full-time counterparts, have a lower expectation of continuing farming with lower probabilities of both survival and expansion (Pfeffer 1989; Weiss, 1999; Bojnec et al., 2003). On the other hand, some studies have shown that part-time farms are associated with lower farmers' exit rates as income from off-farm employment has a stabilising effect on the total household income and on structural change in agriculture (Glauben et al., 2003; Breustedt and Glauben, 2007).

For a comprehensive review of major studies and project reports on agriculture and rural labour markets see Tocco et al. (2012).

3. Empirical Specification

Labour adjustments in agriculture are modelled by an occupational choice model where we focus on the determinants of labour flows out of the agricultural sector. The methodology used follows Bojnec and Dries (2005), which examine the inter-sectoral movements of agricultural labour. In particular we differentiate between labour movements from the agricultural sector to the industrial or services sector on the one hand and into unemployment or out of the labour force on the other³. Hence, the categorical dependent variable can take three mutually exclusive unordered outcomes: agriculture, industry/services, non-employment. The model employed is a multinomial logit (Greene, 2003), which can be specified as:

$$Prob(Y_i = j) = \frac{e^{\beta_j' x_i}}{\sum_{k=0}^m e^{\beta_k' x_i}}, \quad \text{for } j = 0, \dots, m. \quad (1)$$

The estimated equations provide a set of probabilities for the m occupational choices for a decision maker with characteristics x_i , i.e. to stay in the same occupation or to flow to one of the j alternatives. The model is unidentified since there are many parameter values that lead to the same probabilities: a convenient normalisation that solves the problem is to set $\beta_0 = 0$. The probabilities sum to one, which implies that only $m - 1$ parameter vectors need to be estimated to determine the m probabilities. This means that the remaining coefficients β_j measure the change relative to the reference group $Y = 0$. Thus, the probabilities are:

³ In order to gain a better understanding of the importance of agriculture in Romania a second model has been estimated, focussing on the movements of labour into agriculture. Since our main interest is to examine the determinants of labour moving out of agriculture, the first model constitutes the core of this paper.

$$\begin{aligned}
Prob(Y_i = j) &= \frac{e^{\beta_j' x_i}}{1 + \sum_{k=1}^m e^{\beta_k' x_i}} , \quad \text{for } j = 0, \dots, m \\
Prob(Y_i = 0) &= \frac{1}{1 + \sum_{k=1}^m e^{\beta_k' x_i}} .
\end{aligned} \tag{2}$$

Therefore, we are comparing each outcome, or occupational choice (j), with the base category ($Y = 0$) of individuals who did not change sector between two periods or in other words who are still engaged in agriculture in the second period⁴. Hence, the coefficients of the multinomial model are interpreted in comparison to the base category so that a positive coefficient means that, as the regressor increases, individuals are more likely to choose alternative j than alternative 0.

For simplicity, we will also report the results as odds ratios or relative-risk ratios (Cameron and Trivedi, 2009). The odds ratio of choosing alternative j rather than alternative 0 is given by:

$$\frac{Prob(Y_i = j)}{Prob(Y_i = 0)} = \exp(\beta_j' x_i) , \tag{3}$$

so that e^{β_j} gives the proportionate change in the relative risk of choosing alternative j rather than alternative 0 when x_i changes by one unit. Thus, if the coefficient is positive, the odds ratio will be greater than 1, and if negative it will be less than 1.

4. Data and Variables

The main data set is provided by the European Union Labour Force Survey (EU-LFS). Due to the fact that household numbers are randomised we cannot track individuals across different waves. Nonetheless, we are able to exploit the presence of retrospective questions concerning the individuals' employment status in the previous year, since the interviewed individuals at each period (t) provide information in regards to their situation one year prior to the survey ($t-1$), meaning that we can observe changes in labour outcomes for the same individuals across two consecutive years. Therefore, the data set is a pooled-cross section of consecutive years, accounting for the overall period 2003-2006⁵. In order to analyse the determinants of labour flows out of agriculture we define our sub-sample as consisting of all those individuals who were employed in agriculture in $t-1$. Since we are only interested in the determinants of labour adjustments in Romania, we are only looking at those individuals who are employed (or out of labour force) in Romania at period t . Although neglecting international migration could potentially bias our results as the parameters might be underestimated, in this particular case, and for the period under analysis, it would not seem to affect our estimation

⁴ One of the issues with such specification is that we have a selected non-random sample of the population, i.e. those employed in agriculture in $t-1$. Due to unobservable individual characteristics, people employed in a particular sector in a certain date may not be randomly drawn from the population as a whole. Hence, we could have an initial condition problem which may introduce a bias. In order to control for the initial condition problem a selection model would be preferred, estimating the probability of working in the agricultural sector in the first stage and examining the determinants of labour adjustments in the second stage. Although we acknowledge that the latter methodology would be more accurate, the modelling of a selection mechanism is beyond the scope of this study and thus will be employed in a further paper.

⁵ We are aware that the period of study is quite short for a dynamic analysis of structural change in the economy but we are constrained by data limitations. Nonetheless, the results still prove to be insightful when looking at the determinants of labour flows across sectors.

majority⁶. Thus, the final sample comprises of people employed in agriculture in t-1 and consists of 71,862 individuals.

As mentioned previously, the categorical dependent variable represents three mutually exclusive outcomes according to the main occupational choice in period t: employment in the agricultural sector (=1), employment in the industrial or services sector (=2), and non-employment, i.e. combining unemployment and inactivity into a single group (=3)⁷. The independent variables used in this analysis can be divided into individual and family characteristics, job related characteristics and labour market conditions. They refer to the period t-1, unless otherwise specified, and are part of the EU-LFS; additional variables have been extracted from the EU New Cronos Database online.

The first set of variables relate to the personal characteristics of individuals. Dummies are used to capture the gender effect (**female=1**) and the marital status (**married=1**). As a proxy for the individual's stock of human capital we include the highest level of educational attainment: low education (**educlow=1**) if the individual has only received lower secondary education, medium education (**educmedium=1**) if the individual has received upper secondary education, and high education (**educhigh=1**) if the individual has received tertiary education. In order to disentangle the different effects of education and control for specific agricultural human capital we include a dummy for those who have received agricultural education (**agriedu=1**).

The age variable is used to investigate the life-cycle decisions of individuals. Since our variable is not a continuous one, we have created six different age bands: 15-24 (**age15_24**), 25-34 (**age25_34**), 35-44 (**age35_44**), 45-54 (**age45_54**), 55-64 (**age55_64**), 65 and over (**age65_99**). We excluded those individuals aged less than 15, as they are excluded from the labour force, without restricting the upper age limit, since a large number of people engaged in agricultural activities have passed the retirement age. The excluded group is the age group 45-54 as it is predicted to incorporate the turning point of the non-linear age function. Lastly, we include a dummy for the presence of children under 15 in the household (**children=1**). Since it may seem plausible that differences exist between men and women, we also include an interaction dummy for capturing the effect of children on the occupational choice decisions of women (**female_children=1**).

The second set of variables relate to the specific employment characteristics in t-1, classifying the individual according to the status in employment, namely whether the individual was self-employed with or without employees (**selfempl=1**), a family-worker (**familywork=1**) or an employee (**employee=1**) receiving any form of compensation - wages, salaries, payment in kind and so forth.

Additional available information concerns the region at the European NUTS-2 level where the individual was residing in the previous period. Therefore, we incorporate a last set of additional variables, extracted from the EU New Cronos Database, to control for the labour market conditions at the regional level. These include the region population density (**popdensity**), expressed in inhabitants per km², and the region employment growth outside agriculture (**emplgrowthnonagr**). Following Dries and Swinnen (2002) we include a proxy for the reservation wage, measured by the ratio of the average wage per region over the national wage (**regwagelag**). Due to potential endogeneity as the outflow of agricultural labour affects the off-farm labour supply and thus may itself affect the wages paid in the region, we include this variable by its lagged value. Lastly, we include year dummies for each of the pooled cross-section **yr2004_5** and **yr2005_6** and we omit the base year (**yr2003_4**).

Some descriptive statistics of the variables employed is presented in Table 1.

⁶ The number of people who were employed in a different country in period t is small. In total, 167 individuals emigrated abroad in the years 2003-2006, the majority of which to Italy and Spain, representing only 0.23% of sample.

⁷ The classification of the labour force status, i.e. whether the individual is employed, unemployed or inactive, follows the ILO guidelines.

Table 1. Descriptive Statistics of People Engaged in Agriculture at t-1.

(Obs: 71,862)			
Variable	Range	Mean	Std. Dev.
<i>Individual and Family Characteristics</i>			
female	0 – 1	0.48	0.50
married	0 – 1	0.70	0.46
low education	0 – 1	0.61	0.49
medium education	0 – 1	0.38	0.48
high education	0 – 1	0.01	0.11
agricultural education	0 – 1	0.05	0.22
age 15-24	0 – 1	0.08	0.28
age 25-34	0 – 1	0.17	0.37
age 35-44	0 – 1	0.18	0.39
age 45-54	0 – 1	0.20	0.40
age 55-64	0 – 1	0.19	0.39
age 65-99	0 – 1	0.17	0.38
children	0 – 1	0.32	0.47
<i>Job Related Characteristics</i>			
self-employed	0 – 1	0.54	0.50
family worker	0 – 1	0.40	0.49
employee	0 – 1	0.07	0.25
<i>Labour Market Conditions at Regional Level</i>			
population density	61 – 1,259	97.67	90.35
wage ratio	0.6 – 2.3	0.82	0.18
employment growth	-5.2 – 9.8	1.97	4.47

5. Probabilities and Model Extension

The probabilities of labour flowing from the agricultural sector in period t-1 to other occupational choices (industry and services) and to non-employment (unemployment and inactivity) in time t are summarised in Table 2.

Table 2. Predicted Probabilities of Labour Choices.

Status in Period t-1	Status in Period t			Total
	Stay	Other Employment	Non-Employment	
Agriculture	65,743	1,653	4,466	71,862
	(91.49)	(2.3)	(6.21)	(100)

Note: Numbers in brackets represent percentages of the total sample.

During the years 2003-06, there was little mobility in agricultural labour from one period to the next. The low mobility of agricultural labour suggests that structural change has not been particularly significant during this period of analysis. In fact, only 2.3% of agricultural labour moved to other sectors to seek other employment opportunities, equivalent to 1,653 people. A much larger outflow was associated with retirement and inactivity, representing 6.2% of the sample.

Additionally, from the EU-LFS it is possible to see the number of employed people who have a second job in period t and the economic sector of this second job. Therefore, the first model (Model 1) is modified and extended to consider only those individuals who, being engaged in agriculture in t-1, are in any type of employment in period t, hence excluding the non-employment category. According to their main employment sector we investigate the extent to which people have a second job and the sector of this (Table 3).

Table 3. Labour Movements from Agriculture: Importance of Having a Second Job.

Status in Period t	Economic Sector of Second Job			Total
	Agriculture	Industry and Services	None	
Agriculture	592 (0.9)	127 (0.19)	65,024 (98.91)	65,743 (100)
Industry and Services	330 (19.96)	1 (0.06)	1,322 (79.98)	1,653 (100)

Note: Numbers in brackets represent percentages of the total sample.

From the following table we can see that almost 20% of those individuals who were estimated to have switched sector from agriculture to better employment opportunities, i.e. industry and services, still work in agriculture as second job. This would imply that Romanian households are still very reliant on agriculture and due to household food security and social capital individuals are quite reluctant to leave their farms. This also suggests that agriculture might be perceived as a risk-reducing strategy for those individuals who are willing to find other employment opportunities outside the agricultural sector, so that those who move to industry and services can retain their farming activities instead of quitting altogether.

In this respect it is necessary to adopt a different approach than the one in previous studies. We estimate an additional multinomial logit (Model 2) on the sub-sample of people employed in agriculture in t-1 while controlling for the second job occupation in period t, distinguishing among those who switched to industry and services while retaining agriculture (**switch and keep agriculture**) from those who moved to industry and services and exited farming (**switch and leave agriculture**). The reference group is again those individuals who remained in agriculture across the two periods. Hence, we examine whether further differences exist among those who flow to industry and services while retaining agriculture as a second job and those who flow to industry and services and leave agriculture completely.

6. Estimation Results

The multinomial logit results of the two models are reported in Table 4 and Table 5 respectively. All likelihood ratio chi-square tests are significant at the 1% level, with the Wald tests and likelihood

ratio tests providing support for our models. Moreover, the Hausman and Small-Hsiao tests support that the IIA (independence of irrelevant alternatives) assumption has not been violated.

6.1 Determinants of Flows out of Agriculture

Starting with the first model (Model 1), the labour flows are modelled according to their likelihood of leaving agriculture and to move to industry and services on the one hand, and to non-employment on the other. The estimation results confirm the predicted signs and are generally consistent with the previous studies. Starting with the individual and family characteristics, the significant gender effect on the labour occupational choices suggests that women have a lower likelihood of switching to industry and services rather than staying in agriculture and that at the same time they are more likely to become unemployed or to leave the labour force altogether. This would confirm that men play a more active role in the labour market in general than women (Bojnec and Dries, 2005) and that they are on average more mobile in terms of sectoral adjustments. We expected married individuals engaged in farming activities to be less mobile (Weiss, 1999; Bojnec et al., 2003; Bojnec and Dries, 2005; Van Herck, 2009) and thus less likely to change employment status, although the estimated coefficient would seem to suggest that marital status does not play a significant role when looking at labour flows out of agriculture. On the other hand, there is a significant and negative effect on the likelihood of flowing to non-employment.

Consistent with the human capital literature, the highly statistically significant education variables imply that individuals with higher levels of education are more likely to leave agriculture to work in industry and services. Medium education is also positively associated with the probability of flowing to non-employment, which may be due to frictional unemployment while waiting for better employment opportunities. We assumed agricultural specific human capital to be associated with a higher expectation of continuing farming (Weiss, 1999) although our results suggest that agricultural specific education only reduces the likelihood of exiting to non-employment. We also expected a negative sign for the movement from agriculture to industry and services due to the associated loss of human capital (Juvančič and Erjavec, 2005; Benjamin and Kimhi, 2006; Van Herck, 2009), but the estimations produced a small positive and insignificant coefficient.

The expected non-linear age function is confirmed in this analysis, so that younger individuals are those who have a longer period to reap the benefits of migrating for better employment opportunities, and are thus associated with a higher likelihood of leaving agriculture for industry and services, up to a point where this probability diminishes so that older individuals are more likely to stay in agriculture (Sumner, 1982; Corsi and Findeis, 2000; Ahituv and Kimhi, 2002; Bojnec and Dries, 2005; Breustedt and Glauben, 2007). As we assumed, the turning point of the function is somewhere between 45 and 54 years, which is our excluded category. Moreover, individuals between 15 and 24 years are also positively associated with the probability of flowing to non-employment, which could be also due to frictional unemployment while looking for better employment opportunities. On the other hand, the positive coefficients in the non-employment outcome for those over 55 and even higher for those over 65 are most likely associated with the retirement of these individuals or with inactivity. Whereas the presence of children under 15 in the household is associated with a higher likelihood of switching to industry and services, which may be connected with the need of higher income and better living standards for the family, the probability of individuals of flowing to non-employment would only concerns women, due to the fact that women play a more active role in the family unit, in terms of child bearing, house-work and other household-related tasks.

The job-related characteristics also confirm the predicted signs, so that family workers and self-employed individuals in the agricultural sector have a lower likelihood of flowing to industry and services in comparison to those employed in the sector. At a first glance it seems that being a family-worker or self-employed are important non-pecuniary attributes related to the pride, autonomy and sense of responsibility associated with farming activities (Van Herck, 2009). In this respect, looking at the magnitude of the parameters, it would seem that self-employment has even a larger effect than being a family-worker. On the other hand, as shown in the descriptive statistics, the Romanian agricultural sector is mainly characterised by self-employed individuals, followed by family-workers, and lastly by a small percentage of employed people. Hence, the results may simply reflect the

Table 4. Labour Flows out of Agriculture.

Variable	Industry and Services			Non-Employment		
	Coefficient	Odds Ratio	Marginal Effect	Coefficient	Odds Ratio	Marginal Effect
female	-0.356*** (0.078)	0.701	-0.005***	0.330*** (0.042)	1.390	0.013***
married	-0.076 (0.069)	0.927	-0.001	-0.485*** (0.038)	0.616	-0.021***
educmedium	0.677*** (0.059)	1.969	0.011***	0.102** (0.045)	1.108	0.004**
educhigh	1.126*** (0.159)	3.083	0.03***	-0.116 (0.199)	0.891	-0.005
agriedu	0.060 (0.088)	1.062	0.001	-0.253** (0.109)	0.776	-0.009***
age15_24	1.028*** (0.103)	2.796	0.022***	0.985*** (0.078)	2.678	0.056***
age25_34	0.575*** (0.085)	1.777	0.011***	-0.111 (0.079)	0.895	-0.005
age35_44	0.398*** (0.082)	1.489	0.007***	-0.013 (0.076)	0.987	-0.001
age55_64	-0.560*** (0.111)	0.571	-0.007***	0.271*** (0.070)	1.311	0.012***
age65_99	-1.322*** (0.182)	0.267	-0.015***	2.104*** (0.059)	8.197	0.170***
children	0.158** (0.071)	1.171	0.002**	0.092 (0.063)	1.096	0.004
female_children	-0.170 (0.110)	0.843	-0.002*	0.148* (0.078)	1.159	0.006*
selfempl	-0.416*** (0.083)	0.659	-0.006***	-0.381*** (0.093)	0.683	-0.015***
familywork	-0.241*** (0.090)	0.786	-0.004***	0.042 (0.094)	1.042	0.002
popdensity	-0.001*** (0.000)	0.999	-0.000***	0.000 (0.000)	1.000	0.000
regwagelag	0.646*** (0.154)	1.909	0.009***	0.161 (0.102)	1.175	0.006
emplgrowthnonagr	0.053*** (0.011)	1.054	0.001***	0.0613*** (0.007)	1.063	0.002***
yr2004_5	-0.666*** (0.126)	0.514	-0.01***	0.203** (0.097)	1.225	0.009**
yr2005_6	-0.167** (0.082)	0.846	-0.003***	0.953*** (0.074)	2.593	0.042***
Constant	-3.992*** (0.185)	0.018		-4.036*** (0.154)	0.018	
Likelihood Ratio	5593.58***					
Number of observations	71,862					

Note: Standard errors in parentheses. Levels of significance: ***1%; **5%; *10%.

different shares and instead confirm the very low mobility of agricultural labour. In general, it seems plausible to conclude that employees represent the most mobile segment of the labour force, since these individuals are more responsive to market prices and to better employment opportunities.

Lastly, individuals' decisions to move across sectors appear to be associated to the labour market conditions at the regional level, so that higher employment growth in the non-agricultural sector would result in a higher likelihood of leaving agriculture, to both industry and services and to non-employment (frictional unemployment). This would imply that individuals' migration decisions are highly responsive to job opportunities and therefore that job creation would represent an important determinant for the outflows of agricultural labour. The highly statistically significant coefficient of the reservation wage on the likelihood of labour flowing out of agriculture to industry and services also confirms that relative growth results in a strong pull effect of other sectors on agricultural labour. Hence, regional economic growth is an important demand-side determinant of labour movements which would trigger the process of structural change. The negative sign of the regional population density is opposite to prior expectations as the higher the density the lower is the likelihood of agricultural labour flowing to industry and services. In the literature this variable has often been used to proxy job opportunities, suggesting that less populated rural areas would exhibit lower off-farm opportunities for agricultural labour (Juvančič and Erjavec, 2005) whereas more densely populated regions are generally associated with higher exit rates from agriculture, also suggesting higher opportunity cost of land in these areas (Goetz and Debertin, 2001; Breustedt and Glauben, 2007; Van Herck, 2009). In contrast, other studies have found instead that a high population density is likely to reduce farm exit rates. As argued by Glauben et al. (2003), the findings may simply suggest that urban areas have undergone greater structural change in the past than rural areas. Nonetheless, our results might be a consequence of greater competition which is prevailing in more urban areas and which may thus prevent individuals in finding other employment outside agriculture⁸.

The time dummies, mainly included to control for different year effects in the pooled-sample, indicate that the main outflows of agricultural labour towards industry and services occurred during the first years of analysis, i.e. between 2003 and 2004, and seem to have decreased in the consecutive years (from 2004 to 2006), whereas movements to non-employment have progressively increased with major flows occurring in the last period of analysis, i.e. between 2005 and 2006, which may have been associated with an increased share of retired farmers.

6.2 Determinants of Flows to Industry and Services: Retain or Leave Agriculture

The second multinomial logit (Model 2) excludes those in non-employment in period t . It controls for second job occupation distinguishing among those who switched to industry and services while retaining agriculture and those who moved to industry and services and left the agricultural sector altogether, always in comparison to the reference group of individuals who remained in agriculture across the two periods (Table 5). The signs and the significance of the coefficients for the category 'switch and exit agriculture' are very similar to those obtained in the previous model (Model 1) in regards to labour flowing to industry and services (Table 4), which demonstrate the robustness of the results. Hence, these results are not discussed in order to avoid repetitiveness. The only main difference worth mentioning concerns the now significant and positive sign of agricultural education, so that higher values are associated with the likelihood of switching the sector and leaving agriculture altogether. Although at first it may seem counter-intuitive, it should be noted that only a small share of the sample has got specific agricultural training (5%). Since agricultural education is a specific type of education, we would not be surprised that it may also facilitate labour movements out of agriculture in general, since any education may facilitate such a switch.

⁸ The descriptive statistics of the eight regions at the NUTS-2 level suggest that two of these regions, namely North-East and South-Muntenia have a higher number of inhabitants in the rural areas than in the urban areas, and the same two regions present the highest density of population, with the exception of the Bucharest-Ilfov region. Hence, the high population density which is predominant in the rural areas of these regions would be in line with our results of high density and low mobility of agricultural workers.

Table 5. Labour Flows to Industry and Services: Retain or Leave Agriculture.

Variable	Switch and Keep Agriculture			Switch and Exit Agriculture		
	Coefficient	Odds Ratio	Marginal Effect	Coefficient	Odds Ratio	Marginal Effect
female	-0.423** (0.184)	0.655	-0.001**	-0.344*** (0.085)	0.709	-0.005***
married	-0.057 (0.156)	0.945	0.000	-0.061 (0.076)	0.941	-0.001
educmedium	1.058*** (0.137)	2.88	0.003***	0.584*** (0.065)	1.794	0.008***
educhigh	2.333*** (0.299)	10.305	0.022***	0.794*** (0.187)	2.211	0.015***
agriedu	-0.384* (0.213)	0.681	-0.001**	0.163* (0.096)	1.177	0.002
age15_24	0.377 (0.237)	1.457	0.001	1.179*** (0.115)	3.250	0.026***
age25_34	0.279 (0.178)	1.322	0.001	0.645*** (0.096)	1.906	0.011***
age35_44	0.170 (0.172)	1.185	0.000	0.449*** (0.093)	1.567	0.007***
age55_64	-1.037*** (0.282)	0.355	-0.002***	-0.453*** (0.122)	0.636	-0.005***
age65_99	-2.202*** (0.595)	0.111	-0.003***	-1.183*** (0.193)	0.306	-0.011***
children	0.439*** (0.158)	1.552	0.001**	0.088 (0.078)	1.092	0.001
female_children	-0.159 (0.239)	0.853	0.000	-0.180 (0.123)	0.835	-0.002
selfempl	-0.087 (0.202)	0.917	0.000	-0.481*** (0.090)	0.618	-0.007***
familywork	0.415* (0.214)	1.515	0.001*	-0.382*** (0.098)	0.683	-0.005***
popdensity	-0.001 (0.001)	0.999	0.000	-0.001*** (0.000)	0.999	-0.000***
regwagelag	-0.466 (0.364)	0.628	-0.001	0.868*** (0.170)	2.383	0.012***
emplgrowthnonagr	0.052** (0.022)	1.053	0.000**	0.0513*** (0.012)	1.053	0.001***
yr2004_5	-0.771*** (0.256)	0.462	-0.002***	-0.622*** (0.143)	0.537	-0.008***
yr2005_6	-0.533*** (0.172)	0.587	-0.001***	-0.076 (0.093)	0.926	-0.001
Constant	-4.984*** (0.451)	0.007		-4.362*** (0.205)	0.013	
Likelihood Ratio	1231.62***					
Number of observations	67,396					

Note: Standard errors in parentheses. Levels of significance: ***1%; **5%; *10%.

We will focus on a few striking differences between the coefficients of the determinants of switching while retaining agriculture rather than quitting the sector. The age variable does not seem to have a significant effect on the likelihood of switching while retaining agriculture for the younger groups, whereas all age categories are highly statistically significant for the outcome switch and quit agriculture. Moreover, the presence of children (under 15) in the household is positively associated with the probability of retaining agriculture rather than leaving it altogether, which may be associated with the need of off-farm employment as an additional source of income. Additional disparities among the two outcomes concern the job related characteristics, i.e. being self-employed and being a family-worker, which are both negative determinants for switching and leaving agriculture. On the other hand, self-employment does not seem to be a significant determinant for the decision of retaining agriculture when switching the main occupation, whereas family-workers seem to be positively associated with such decisions. Family-workers are certainly those who may seek additional employment while still carrying out farming activities on the family business. Furthermore, the labour market characteristics, such as the reservation wage and the regional density, are not significant for the decision of retaining agriculture, whereas they play a key role in determining an exit from agriculture. It is possible that those individuals who are observed to flow to industry and services and retain agriculture might have simply changed the time they spend in their main occupation. Therefore, the category of those who switch but retain agriculture should be controlled for when analysing the determinants of structural change.

Lastly, the empirical analysis has also examined the determinants of labour movements from industry and services towards agriculture⁹. Although these flows are small in relative terms when compared to the movements out of agriculture, they are still important to consider. For example, in absolute terms, 1,421 people moved to the agricultural sector in the period 2003-06 in comparison to 1,653 who moved from agriculture to industry and services. This suggests that agriculture still represents an important source of additional income, especially for those less educated, and a retirement choice that can top-up the low pensions for the elderly.

7. Conclusions

The collapse of the communist system in 1989 and the transition from a centrally planned economy to a market economy has had a deep influence on the labour markets of the Central and Eastern European Economies. In Romania, the land reform and the privatisation of non-land assets gave rise to more than 4 million individual private households and small family farms which became the predominant type of farming in the country. Although these small-scale semi-subsistence farms might be expected to disappear as a consequence of economic growth, in the last decade the process of structural change has been relatively slow. The large share of people engaged in farming activities despite the very low levels of productivity suggests that agriculture provides a source of minimal income for many rural household and acts as a buffer stock. Therefore, it becomes necessary to understand the dynamics of structural change and to identify the determinants of labour adjustments.

By looking at the post-transition period in Romania, this paper focussed on the outflows of labour from the agricultural sector. The results are generally consistent with previous studies and suggest that individual characteristics, job-related attributes and labour market conditions are all important determinants for inter-sectoral labour flows. In particular, male, younger and better educated individuals are more likely to leave agriculture and flow to industry and services, whereas self-employed farmers and family workers are less inclined to leave the agricultural sector. Furthermore, the reservation wage and employment growth outside agriculture are positively associated with a higher movement of agricultural labour to non-farm activities, whereas a high population density has the opposite effect. In the other direction, the outflows of labour from industry and services to agriculture are associated with the retirement of people and with unemployment, so that low levels of education and old age would constitute positive determinants.

The policy implications of these findings point to the need for investments in human capital specifically in education, with the purpose of enhancing the mobility of labour and thus facilitate a

⁹ These estimation results are not included in the paper but are available upon request.

more efficient labour allocation. By the same token, demand-side conditions must not be neglected, as improving the supply side of labour alone would only result in a surplus of labour in the off-farm market with little scope for switching employment sector. Hence, favourable labour market conditions need to be in place to sustain job creation and a smooth transition across activities. One of the thematic axes of the EU's rural development policy is to improve the quality of life in rural areas and encourage diversification of the rural economy. Therefore, priority should be placed on facilitating market access of semi-subsistence farmers and creating alternative sources of income from non-agricultural activities in rural areas. Overall, a significant amount of workers is expected to leave agriculture for jobs in other sectors as economic growth continues and even increases following market integration in the European Union.

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