Lancaster University Management School
Working Paper
2003/085

State Transitions in Polish Agriculture

Hilary Ingham and Mike Ingham

The Department of Economics
Lancaster University Management School
Lancaster LA1 4YX
UK

The LUMS Working Papers series can be accessed at http://www.lums.co.uk/publications
LUMS home page: http://www.lums.lancs.ac.uk/

State Transitions in Polish Agriculture

Hilary Ingham* & Mike Ingham**

* Department of Economics, Lancaster University
** ACOST & Department of Economics, Lancaster University

Address for correspondence

Hilary Ingham
Department of Economics
Lancaster University
Lancaster LA1 4YX

e-mail: **h.ingham@lancaster.ac.uk**
tel: 00 44 (1)254 593925
fax: 00 44 (1)254 594244

Acknowledgement
The authors wish to acknowledge the financial support of DFID for research project R8097. They would also like to thank participants at the Basees annual conference for helpful comments on an earlier version of this paper.

Abstract

Poland's imminent entry into the EU re-emphasises the long-standing need for the restructuring of the country's agricultural sector and the associated re-allocation of its bloated workforce. The transition matrix of net flows derived from an annual panel of micro-data taken from the LFS confirms the impression of the stagnation that is conveyed by gross movements that are computable from the published statistics. Multinomial logit estimation of the probabilities of exit from Polish farming lend weight to the conclusion that radical policy innovations are required if many of Europe's ambitions and targets are to remain credible in the years to come.

Keywords: Poland, Agricultural Restructuring, Worker Flows, EU Accession

JEL Classification: J43, J62, O13, P23, Q12, R58

1. Introduction

Although hailed as an event that will enhance the world standing of the EU (Kok, 2003), the forthcoming enlargement will impose severe strains on many of its ambitions and policies. One notable case in point is provided by the European Employment Strategy (EES), which is a key tool underpinning the agenda set at the Lisbon Council of 2000 to create 'the most competitive and dynamic knowledge-based economy in the world, capable of sustainable economic growth with more and better jobs and greater social cohesion' within the ensuing decade (EU, 2000). The ambition encompasses a return to full employment in the context of high employment rates, enhanced labour market flexibility, increased productivity and a reduction in regional disparities (CEC, 2003). With one eye cast towards the acceding countries, the European Commission recently recognised the need to ensure an 'orderly flow from agriculture and industry to services' if the goals espoused in the EES are to be achieved (CEC, 2003a).

Most notably in the case of Poland, by far the largest but by no means the most advanced of the new entrants with a purchasing power standard per capita GDP of just 40.5 per cent of the EU average, all of this is problematic. That country's official statistics report that agriculture's share of total employment has remained almost unchanged since 1989 at over a quarter of the workforce, while its contribution to national output fell from 12.1 per cent to 4.7 per cent in the years to 2001 (Czyżewski *et al*., 1999; GUS, 2002: 551). At the same time, economic growth has stalled, the national unemployment rate stood at 18 per cent in 2003 (GUS, 2003), employment rates lag well below EES targets (GUS, 2003a: 40) and the World Economic Forum's Global Competitiveness Report ranks Poland behind not only all of the current EU-15, but also lower than emerging economies such as Mexico,

Philippines, Costa Rica and Peru (Zinnes *et al*., 2001).[1] Furthermore, notwithstanding efforts to reform the Common Agricultural Policy (EU, 2003), the country's terms of accession include significant concessions to its farming sector (Wilkin, 2003).

Against this background, the current paper sets out to determine the size and direction of the gross flows out of Polish agricultural employment and the factors that might underpin them. The next section provides basic evidence on the labour market adjustment that has occurred within Poland since 1989 and highlights the limitations on interpretation from the use of the net flow rates that are typically available from the official statistics. Greater insights can be gained from the analysis of individual flow data derived from the Labour Force Survey (LFS), which is described in section three, and these constitute the primary focus of attention of the remainder of the work. Section four introduces the transition matrix to be analysed and summarises the flows contained within it. The model specification and estimator are discussed in section five, section six presents the multinomial regression results obtained and section seven discusses certain simulations based upon them. A summary discussion concludes the paper.

2. Restructuring in the Polish Economy

The Polish economy exhibited some rather peculiar characteristics at the close of the communist era. While the high degree of employment concentration was typical, its location and contractual form was not. In particular, almost sixty per cent of jobs were to be found in agriculture and industry, with the former dominated by private sector undertakings and the latter by public sector enterprises. It was anticipated that the liberalisation, stabilisation and restructuring package embodied in the Balerowicz

[1] Zinnes *et al*. (2001) provide an excellent discussion of the possible definitions of competitiveness, of which factor productivity is but one.

Plan would have significant repercussions for the labour market, particularly as over-employment was believed to be of the order of 25 per cent (Góra, 1993, Rutowski, 1990). In the event, real GDP declined by 13.1 per cent and employment fell by 15.1 per cent between 1989 and 1993, although not all sectors suffered equally. Nevertheless, agriculture and industry still accounted for more than fifty per cent of total employment in 1993, as shown in Table 1.[2]

Table 1 here

While '[t]he large-scale movement of labour from agriculture and manufacturing industry into the service sector is evidently one of the major tasks of economic restructuring' (Jackman and Pauna, 1977: 373), Poland's employment structure failed to change radically in the early transition years. Thus, while jobs in public sector agriculture collapsed in the wake of the liquidation of the state farms, private sector farming survived relatively unscathed, not least because it offered some work opportunities for individuals laid off from other sectors of the economy. The fact that industrial employment did not fall by more than the 28 per cent actually observed has been attributed to the power of the Works' Councils and the delay in the large-scale privatisation programme. Private sector services such as trade, telecommunications and finance and insurance did expand, but their combined employment share in 1993 still lagged behind far those of both agriculture and industry.

The period from 1994 began with GDP climbing above its 1990 figure and thereafter increasing by 39 per cent in the years to 2001. However, the growth was

[2] The data presented in Tables 1 and 2 cover all establishments and are based on official estimates of the numbers in employment produced by the Polish Central Statistical Office. For a fuller discussion of the different employment estimates used in the literature, see Ingham and Ingham (2002). The choice of the two sub-periods described in this section, 1989-1993 and 1994-2001, was dictated by the fact that the industrial classification changed in 1994 when Poland adopted the European NACE classification.

jobless, as shown in Table 2.[3] During this time, there was no shift of agricultural workers into higher value added activities, with farm employment increasing by more than six per cent and accounting for almost thirty per cent of all jobs in the economy in 2001.[4] Nevertheless, some rather more predictable labour reallocation did occur, with manufacturing, mining and transport suffering significant job losses, while hotels and restaurants, real estate, renting and business activities evidenced strong gains, albeit from low bases. More surprising, perhaps, was the growth in employment shares registered by some public sector service activities.

Table 2 here

That almost 75 per cent of Poland's workforce was employed in the private sector in 2001 (GUS, 2002a: 14) might appear to indicate a satisfactory transition, but agriculture accounted for almost forty per cent of the total.[5] This, along with the absolute numbers involved, serves to distinguish the country's employment distribution from those of both the EU member states it will join in 2004 and the other acceding countries. However, this simple observation begs two important questions. First, why have such high levels of employment in agriculture persisted even as the economy has been subjected to strong market forces? Second, what are the prospects for change in the future?

The first question has been addressed by a number of authors and a variety of explanations have been put forward. Political factors have clearly been important, with various minority governments reliant on the support of farmers' parties that, in

[3] The GDP figures are taken from various issues of *Poland: Quarterly Statistics* published by the Central Statistical Office.

[4] To put the Polish experience into context, Boeri and Terrell (2003: 54) report that the Russian Federation experienced modest growth (+0.04%) in agricultural employment during the period 1989-1998 whereas other transition economies witnessed job contraction in the sector – Czech Republic (-6.2%), Hungary (-9.1%) and Slovakia (-6%).

[5] It would be erroneous to equate movements into the private sector with labour market restructuring as this can involve nothing more than the redefinition of an enterprise's ownership status. For further discussions of this point and the contrast between 'insider' and 'outsider' privatization, see the papers by Aghion and Blanchard (1994) and Aghion and Carlin (1997).

general, are fiercely protective of the rights of rural individuals to pursue their traditional livelihoods. Also, allowing the sector to absorb individuals who might otherwise have flowed into unemployment has proved politically expedient; an important consideration in an economy in which the open unemployment rate has recently exceeded twenty per cent (GUS, 2003). In addition, the generous provisions of the agricultural pension scheme (KRUS) have enabled many to continue operating as nominal or 'hobby' farmers, with the transfer payment being their main source of financial support (Gomulka, 2000; Orłowski, 2002). This has fuelled some debate about whether such individuals should be reclassified as economically inactive, although any such change would militate against the EU's target of an employment rate of seventy per cent by 2010. Mobility has also been hampered both by the low human capital levels of agricultural workers (Ingham and Ingham, 2002a) and the acute housing shortages in the urban areas of Poland (Juraś and Marzał, 1998). Furthermore, property rights that remain ill defined, coupled with a general resistance to sell land for a variety of reasons, continue to hamper large-scale farm reform (Pouliquen, 2002; Swinnen, 1999).

In the medium to long term, it is inconceivable that the current configuration of the sector can be preserved, notwithstanding the fact that the concessions granted to Poland during the accession negotiations will tend to ossify existing farming practices at the expense of rural diversification and development (Pelkmans, 2002). With Poland's competitiveness depending in no small part on the reallocation of labour out of agriculture into higher value added activities, this is clearly counter-productive. What follows therefore seeks to identify those factors that have promoted successful exits from farming in the recent past in an attempt to inform future policy formulation in an area that represents Poland's highest outstanding transition hurdle. This

necessitates moving from the official firm survey statistics, which provide the longest time series of largely comparable data on Polish employment but do not provide information about individuals, to the Labour Force Survey, which is described in the next section.

3. The Polish Labour Force Survey

Poland has conducted a quarterly LFS since May 1992.[6] Its design is similar to those undertaken in the EU countries and it samples in excess of fifty thousand people aged 15 and above at each wave. The sample remained fixed for the first four surveys, but it has been selected via a rotation system since the second quarter of 1993. In any given quarter, the LFS consists of two e-samples introduced in the previous period, one new one and one introduced one year previously. This means that each e-sample is included in the Survey for two quarters, discarded for two and then returned for two more quarters. Subsequently, the e-sample is not used again.

The sampling procedure adopted generates both a quarterly and an annual panel. Attention here focuses on the latter for two reasons. First, yearly panels are more suitable when people change their labour market status infrequently. Second, the use of a quarterly panel to investigate flows into and out of agricultural employment introduces seasonal bias. For example, there were almost two hundred and fifty thousand fewer workers on private agricultural holdings in the rural areas of Poland in November than in August 1998 (GUS, 2002b: 60). On the other hand, yearly panels are susceptible to round tripping, since individuals who leave their origin state only to return to it by the end of the year are recorded as non-movers. Using the constant

[6] Between May 1992 and February 1999 the Survey was conducted during a reference week that included the 15^{th} day of the middle month of the quarter. The next Survey was not until QIV 1999 and since then interviewing has taken place on a continuous basis with $(1/13)^{th}$ of the sample of dwellings being surveyed in each week of the quarter.

sample available for the first four Surveys, Góra and Lehmann (1995) were able to estimate the significance of this problem. Their results indicated substantial round tripping by the unemployed, with almost one-quarter of those who were originally without a job and who found work at some point during the year returning to unemployment by the end of the twelve month period. However, they found no evidence of significant round tripping by those in other labour market states.

The period chosen for analysis runs from February 1998 to February 1999, which was the last LFS prior to the introduction of continuous sampling. The earlier of these exercises interviewed 54.4 thousand individuals living in 21.7 thousand households and the annual panel produced 25,208 usable responses, implying an attrition rate of less than five per cent (GUS, 1999). In the Survey, an individual is enumerated as being in employment according to the standard International Labour Organisation convention; that is, if they either worked for at least one hour during the reference week or they formally held a job even if they did not work.[7] Also, an individual is recorded as being employed in agriculture if this is the sector in which they held their 'primary' job, which is the job from which they derive the largest part of their income. Adopting this rule gave Poland an agricultural workforce of 2.9 million in February 1998 (GUS, 2002b: 98), suggesting that the official employment count (GUS, 1999a) identified approximately 1.7 million farmers for whom agriculture is either a secondary source of employment or a 'hobby'.

4. The Transition Matrix and Descriptive Data

This section provides the building blocks for the analysis to follow. It first describes the transition matrix employed and then summarises the data.

[7] This definition differs from that adopted by the European Community Household Panel (the base survey for its LFS), which only classifies individuals as employed if they work a minimum of 15 hours (Eurostat, 1999).

Transition Rates

Four mutually exclusive, exhaustive labour market states form the focus of the analysis:

- working in agriculture (EA)
- working in a non-agricultural sector (E)
- unemployment (U)
- economic inactivity (N).

The transition probabilities for movement between these states are based on the standard Markovian process described by Toikka (1976), which regards labour market flows between times t_0 and t_1 in the following manner:

$$\begin{pmatrix} EA_{t0}EA_{t1} & EA_{t0}E_{t1} & EA_{t0}U_{t1} & EA_{t0}N_{t1} \\ E_{t0}EA_{t1} & E_{t0}E_{t1} & E_{t0}U_{t1} & E_{t0}N_{t1} \\ U_{t0}EA_{t1} & U_{t0}E_{t1} & U_{t0}U_{t1} & U_{t0}N_{t1} \\ N_{t0}EA_{t1} & N_{t0}E_{t1} & N_{t0}U_{t1} & N_{t0}N_{t1} \end{pmatrix}$$

Each cell in the matrix represents the number of people moving from one state to another.

The probability of making any particular transition is defined as the number of individuals in the flow divided by the number in the origin state of interest. For example, $EA_{t0}E_{t1}/EA_{t0} = ea_{to}e_{t1}$ is the probability of moving from a job in agriculture to a job in another sector between t_0 and t_1. The transition probability matrix is therefore:

$$\begin{pmatrix} ea_{t0}ea_{t1} & ea_{t0}e_{t1} & ea_{t0}u_{t1} & ea_{t0}n_{t1} \\ e_{t0}ea_{t1} & e_{t0}e_{t1} & e_{t0}u_{t1} & e_{t0}n_{t1} \\ u_{t0}ea_{t1} & u_{t0}e_{t1} & u_{t0}u_{t1} & u_{t0}n_{t1} \\ n_{t0}ea_{t1} & n_{t0}e_{t1} & n_{t0}u_{t1} & n_{t0}n_{t1} \end{pmatrix}$$

In this framework, the possible 'outcomes' (labour market transitions) remain the same from trial to trial, are finite in number and have probabilities that depend only on the outcome of the previous trial.

Summary Flows

Basic information on the panel analysed here is given in Table 3. The data indicate an activity rate of 55.4 per cent, which compares with the full Survey figure of 57.1 per cent (GUS, 2002b: 21), meaning that those who are out of the labour force are slightly over-represented in the panel. Agricultural employment is also overstated at 21.8 per cent, compared with 19.0 per cent overall (*ibid*: 98). The panel and aggregate unemployment rates were similar; 11.4 and 11.1 per cent, respectively (*ibid*: 21). It might be noted that the annual average LFS unemployment rate reached its lowest ever recorded level in 1998 (10.2%), but that figure had risen above 18 per cent by 2001 (*ibid*: 164). The prospects of moving out of agriculture might therefore have been better during the sample period than at any other time during Poland's current epoch.

Table 3 here

The gross flows presented in Table 3 show the probability of an individual being in a particular labour market state in 1999, contingent upon their status in 1998. Over this period, the recorded status of the majority of the sample did not change, with approximately ninety per cent of the employed, either in agriculture or elsewhere, and the economically inactive in 1998 being in the same state in 1999. The unemployed were the most mobile individuals, with almost half experiencing a move, over one third of whom left the labour force. These aggregate findings are broadly in line with those reported in Góra and Lehmann (*op. cit.*) for Poland and the results for Britain in the 1980s found by Wadsworth (1989). However, they differ significantly

from the findings of Bellmann *et al*. (1995) for the East German labour market. The latter authors found considerably higher transition probabilities, although their period of analysis coincided with a major shake-out of labour, primarily from the state-owned industries, and the difference in the results is therefore unsurprising.[8]

The terminal locations of those originally employed in agriculture are given in the first row of the Table. As Góra and Lehmann (*op*. *cit*.) found that approximately 83 per cent of farm workers in the two panels they analysed did not move, the current results suggest that mobility out of the sector declined somewhat during the nineteen-nineties. Less than two and one-half per cent of agricultural workers s secured employment in another sector of the economy, five per cent withdrew from the labour force and just over one per cent became unemployed. The last of these findings should be interpreted in the context of the unemployment benefit regulations prevailing under the provisions of the 1994 Act on Employment and Counteract[ing] Unemployment. These determine that any individual who either owns agricultural real estate or is working on a family holding in excess of two hectares, albeit without receiving an explicit wage, is ineligible for unemployment benefit (GUS, 1999b).

In contrast to the findings reported here, Bellmann *et al*. (*op*. *cit*.) found that 45 per cent of agricultural workers in the former East Germany left farming during 1990-91. Of these, approximately half found jobs elsewhere, 27 per cent left the labour force, 18 per cent became unemployed and approximately six per cent joined a government-funded programme. The magnitude of this exodus is explained by the collapse of the state farms that dominated agricultural production. The same fate also befell Poland's state sector, but its impact was much smaller than in Germany, given the importance of private sector farming.

[8] As Poland's first Labour Force Survey was not conducted until May 1992, by which time the official employment count had already fallen by some two million (GUS, 1997: 217), it not possible to produce directly comparable evidence.

The low mobility observed in the panel means that there was a net reduction of employment in the sector of only 2.7 per cent between February 1998 and February 1999. Applying that rate of attrition to the February 1999 LFS agricultural employment percentage implies that it would take 22 years for agriculture to account for ten per cent of the workforce and fifty six years to reduce it to four per cent, which would make Poland comparable to the current EU average. However, that figure is inflated by the cohesion countries. Of these, Greece still retains 15.8 per cent of its workforce in farming and Portugal 12.5 per cent. While both of these have seen annual reductions in farm employment of a little over three per cent since joining the EU, which is slightly greater than that found here for Poland, the difference is not dramatic.[9] Furthermore, the former two countries are still confronted with pronounced agro-rural problems and Poland's terms of accession look likely to impede the restructuring of its farming sector (Wilkin, *op. cit.*).

5. Modelling labour market transitions in Poland

The number of exits from Polish agriculture is too slow to satisfy the evident need for the modernisation of the country's rural economy. While the sheer numbers involved means that there will be no simple short run remedy, this section seeks contributory insights through the estimation of a multinomial logit model of exits that controls for a variety of personal and locational characteristics. To the extent that systematic relationships are apparent, they may serve to inform the policy design process. Individuals still recorded as working in agriculture in 1999 having been similarly enumerated in 1998 form the base group.

[9] The EU employment statistics and calculations are based on various issues of Eurostat's LFS.

Most of the exogenous variables are self explanatory, with precise specifications provided in the Data Appendix, although some require elaboration. The first are the employment status measures. Two dummy variables are included in the empirical specification; *Self-employed*, which identifies individuals working on their own account, and *Employed*, which identifies persons working for a public or private employer and receiving remuneration. This means that the base group is composed of unpaid family workers, defined in the LFS as people working without pay in an economic enterprise operated by a related person living in the same household. In the panel utilised, approximately twenty per cent of the sample working in agriculture in 1998 were in this category.[10]

The regional (voivodship) indicators (*Tiers 1-4)*, are designed to account for differing economic conditions across regions. Intuitively, the spatial indicator would be a set of regional dummy variables, but as Poland had 49 voivodships at the time the panel was observed, some degree of aggregation was necessary.[11] One possibility would have been to aggregate the regions into predetermined categories, such as 'heavily industrial' 'diversified', 'agricultural' etc., in line with previous work by Góra and Lehmann (*op. cit.*) and Scarpetta and Huber (1995). However, this procedure is open to more or less subjective assignments and the alternative adopted here was to use cluster analysis to group the voivodships according to a number of major economic indicators.[12] The technique adopted was a non-hierarchical procedure that produced clusters of regions such that the similarity within and the dissimilarity between the groups was maximised.[13]

[10] The true cost of the workers concerned, who worked an average of 26 hours, can hardly be assumed to be zero.
[11] The number of voivodships was reduced from 49 to 16 under the 1999 local government reorganization, but the locational measures for the panel relate to the situation in 1998.
[12] The indicators used, along with the resulting clusters, are given in the Data Appendix to the paper.
[13] Further details of the methodology (FASTCLUS) can be found in the SAS online documentation.

The results produced an optimal grouping of four clusters. Of these, the first (*Tier 1*) had only a single member – Warszawskie - the region that included the capital city. A second small cluster (*Tier 2*) identified four more voivodships - Gdańskie, Katowickie, Krakowskie and Poznańskie – that housed major cities. The remaining regions were approximately evenly divided between the other two clusters, of which *Tier 4* voivodships had noticeably lower GDPs per capita than those in *Tier 3* (GUS/US, 1999) and were located more in the east and the south east of the country. In addition, the voivodship clusters are also incorporated into the *Peripherality* variable, which measures the straight-line distance from the capital of the voivodship in which the individual lived to the capital of their nearest *Tier 1* or *Tier 2* voivodship. The inclusion of this variable was designed to capture the fact that even if an individual lived in a region where labour market opportunities were poor, proximity to one of the 'more advanced' voivodships might have been expected to increase their probability of finding a job outside agriculture.

The general multinomial logit

The underlying logit model is:

$$\Pr(Y = j|x_i) = e^{\beta_j' x_i} \Big/ \sum_{k=0}^{J} e^{\beta_k' x_i}$$

$$j,k = 0,1,...,J$$

where j=0,1,…,J represents the possible labour market transitions, x_i is a vector of relevant independent variables measured at t_0 and β_j is the unknown parameter vector. However, the model is indeterminate in this most general form because defining β^*_j as $\beta_j + q$, for any vector q, and then re-computing the probabilities yields an identical set

of results (Greene, 2003: 721). Common practice therefore invokes the normalisation that $\beta_0 = 0$ and the probabilities become:

$$\Pr(Y = j|x_i) = e^{\beta_j' x_i} \Big/ 1 + \sum_{k=1}^{J} e^{\beta_k' x_i}$$

for j=1,2,….,J

and

$\beta_0 = 0.$

The log-likelihood for the sample is found by deriving, both for each of the i individuals and for each of the J-1 possible transitions, the variable d_{ij} which takes the value 1 if transition j is made by a particular individual and 0 if it is not. Since any individual can only be observed to make one of the possible transitions, only one of the d_{ij}'s will be 1 for each observation in the sample. This gives a log-likelihood function:

$$\ln L = \sum_{i-1}^{n} \sum_{j=0}^{J} d_{ij} \ln \Pr ob(Y_i = j)$$

from which the parameter estimates are generated using an iterative maximum likelihood procedure.

Interpretation of the coefficients in the multinomial regression is not straightforward and recourse is often made to the marginal effects of the characteristics on the probabilities. These are normally calculated at the mean values of the regressors and are given by:

$$\frac{\partial P_j}{\partial x_i} = P_j \left[\beta_j - \sum_{k=0}^{J} P_k \beta_k \right] = P_j \left[\beta_j - \overline{\beta} \right]$$

However, the current exogenous variable set contains mainly categorical elements for which such measures are meaningless. For example, a one per cent increase in self-employment is not possible; an individual either does, or does not, work on their own account. Also, unlike the results for a standard regression model, for any particular x_i, $\delta P_j/\delta x_i$ will not necessarily have the same sign as β_{jk} in the multinomial logit because every sub-vector of β enters every marginal effect, both through the probabilities and through the weighted average.

An alternative approach is to interpret the results in the light of the J log-odds ratios:

$$Ln\left(\frac{P_{ij}}{P_{ik}}\right) = x_i'\left(\beta_j - \beta_k\right)$$

which equals

$$x_i'\beta_j$$

if k=0.

If this odds ratio is specified in levels, as opposed to its natural logarithm, the model becomes a multiplicative one, with terms $e^{xi'\beta j}$. This means that $e^{\beta j}$ is the factor by which the odds change when the i^{th} variable increases by one unit.[14] If β_j is positive this factor will be greater than one and if β_j is negative it will be less than one. These values will be reported along with the parameter estimates in the application to follow.

6. Exits from Polish Agriculture

In the current application, $j=0,1,2,3$ as described above and the results obtained from estimating the logit are reported in Table 4. There, each of the three pairs of columns

[14] This is only true if the i^{th} variable is not included in any interaction terms, in which case the product of the affected exponentials is required.

relate to one of the possible transitions out of agriculture, with those working in the sector at both ends of the sample period forming the base group.

Table 4 here

The model correctly predicts over ninety per cent of observations and the likelihood ratio test rejects the joint hypothesis that all of the β coefficients are equal to zero. In addition, the Nagelkerke pseudo R^2 statistic indicates that the model explains approximately twenty per cent of the 'variation' in the outcome variable.[15] The final statistic, McFadden's R^2, is the proportion of the kernel of the log likelihood explained. In addition, two statistics are available to test for parameter significance. The first is the Wald test that is applied to the parameter estimates in each equation individually. However, this statistic has a tendency to fail to reject the null hypothesis when coefficient values are large (Hauck and Donner, 1977).[16] The alternative is a likelihood ratio test based on the difference in the value of the model's likelihood function when each variable is removed in turn. This test examines the significance, of the parameter estimates for the model as a whole, not just in individual equations.[17] The discussion of the results to follow is based primarily on this likelihood ratio test.

The first column of Table 4 presents the results obtained for those individuals who secured employment outside agriculture. In general, the odds of making this transition were considerably lower for women, who comprised 44 per cent of the farming workforce in 1998, than they were for men, even though economy-wide female employment fell only marginally while that of males declined by almost two per cent.[18] However, the difference between the sexes, while still evident, was less marked for those aged below 45. All else equal, the odds of moving to a different

[15] The Nagelkerke R^2 is a modification of the Cox and Snell R^2 and is a preferable diagnostic as the latter measure can never equal one.
[16] Unfortunately, Hauck and Donner do not define 'large'.
[17] In large samples the two tests are equivalent (Rao, 1973).
[18] References to additional data made in the text are drawn from the results presented in GUS (2002b).

sector were maximised at age 30. At the same time, it is notable that the possession of vocational education increased the odds of moving to alternative employment by a factor of 2.5.[19] The odds of gaining work in an alternative sector were much lower for the self-employed, a group that continues to account for two-thirds of Polish farmers (GUS, 2003b), and correspondingly greater for employees. However, the additional dummy variable that identifies the small number of agricultural workers remaining in Poland's state sector indicates that the latter finding relates solely to those in the private sector.

These findings are consistent with the underlying features of the Polish economy. First, following the decision at the Amsterdam Summit in 1997 that Poland's accession negotiations could begin, at least some landed farmers began to expect the value of their land to increase significantly on entry into the EU. Second, the notorious farmers' pension scheme, with its generous entitlements and lax enforcement, has long been recognised as a constraint on the rational restructuring of the sector (Ingham and Ingham, 2002).[20] Third, ongoing ill-defined property rights impede sales of agricultural land (Ingham and Ingham, 2002a). Finally, state sector farm employees are extremely well paid by Polish standards, while those employed in the private sector are the lowest paid group identified in the regular earnings surveys (e.g. GUS, 1999c).

On the other hand, not all of the locational and local economic environment indicators have immediately predictable impacts. Thus, while individuals resident in voivodships with higher unemployment rates were less likely to obtain a job outside agriculture, as were those deemed by Polish administrative conventions to live in rural

[19] It was not possible to include a full set of educational dummy variables because of the four-way split for the independent variable and the resulting number of zero cells caused, in part, by the scarcity of individuals with higher and post-secondary levels of education in agriculture.
[20] Even after the protracted and often bitter deliberations over Poland's accession negotiations the government still has no plans to reform KRUS.

areas, other results were more surprising.[21] First, residents in a Tier 4 region, which are here taken to be the least developed in the country, were actually more likely to move into alternative employment. This is not the result of any straightforward unemployment effect: there is no simple correlation between the unemployment rate and regional designation, while average unemployment rates in Tier 3 and Tier 4 regions differ little (GUS, 1999b). One possible explanation of this result is that the latter areas have lower technology economies that still afford relatively unskilled farm workers alternative work opportunities, although this is not a reassuring supposition. At the same time, an individual's proximity to a Tier 1 or Tier 2 capital had no influence on exits from agriculture into other employment. This could be the result of the important distinction between spatial and economic distance in Poland, with poor communications frequently seen as one of the major constraints on the country's future development (CEC, 2002: 42).

The odds of moving from agriculture into unemployment were minimised at the age of 21, while women over the age of 45 were the age/sex cohort most at risk. The latter finding in particular is troubling insofar as women were more likely at the time - and continue to be - somewhat more prone than men to long-term unemployment and hence less successful at re-entering work (GUS, 1999b; 2003c). Self-employment reduced the likelihood of becoming unemployed considerably. This result is not unexpected; both for the reasons outlined above in the case of transitions from agriculture to other employment and because farmers owning more than two hectares of land are not eligible for unemployment benefit (GUS, 1999b). Conversely, the odds of paid employees moving into unemployment were vastly greater than for other groups, although those working for state enterprises faced a slightly lower risk

[21] Polish urban/rural designations are determined by administrative conventions and do not rest upon objective criteria such as those employed by the EU and the OECD.

than those in the private sector. Finally, the results show that vocational education not only increased the odds of moving into other employment, it also raised the chance that an individual would move from the farm into unemployment.

The chances of moving from agriculture to unemployment increased roughly in proportion to percentage point increases in the unemployment rate. With registered voivodship unemployment rates in 1998 ranging from 2.7 per cent to 21.7 per cent, this represents a significant influence on the fortunes of agricultural workers.[22] The coefficients on the peripherality variables indicate that the odds of moving from farming to unemployment are maximised at a distance of 57 miles from a Tier 1 or a Tier 2 capital. This non-linearity could possibly reflect a trade-off between the declining revenues of farming operations as the distance from major markets increases and the increasing costs of search for alternative opportunities.

Transitions into unemployment are clearly one way in which the size of Poland's semi-subsistence agricultural sector could decline. However, attitudes towards this possibility would presumably be conditioned on the causes underlying such flows and the chances of those involved re-entering work in alternative sectors. Here attention focuses on the first of these issues. As noted above, employees are vastly more likely to enter unemployment than the self-employed. Of the ex-farm workers without jobs at the close of the data period, 53 per cent had been dismissed, mostly because of the reorganisation or bankruptcy of their previous place of work. The impression that the flow was not the result of any orderly restructuring is reinforced by the fact that 71 per cent of those involved were registered as unemployed and therefore must not have owned a farm larger than two hectares.

[22] Voivodship unemployment rates derived from the LFS are not reliable.

The results in the final column of Table 4 relate to individuals who withdrew from the labour market after leaving agriculture. As might be expected, the young and the old were the more likely to become inactive, with the odds of making this transition being minimised at age 43. Also, those involved were much more likely to be older females, while the impact of education was small. Once again, however, the results indicate that the exit from farms out of the labour market was dominated by private sector employees, although apparently this was not simply on the grounds of normal retirement, with over forty per cent of the newly inactive with agricultural backgrounds being designated as disabled. Only the rural dummy from amongst the spatial indicators had a major impact on the flow, serving to reduce the odds of leaving the labour market by two-thirds. Overall, it is difficult to escape the conclusion that the majority of Poland's farmers have lifetime attachments to their holdings.

7. Implied Probabilities

While the implications of the above results for the probability of individuals with particular attributes, living in particular types of location are reasonably self-evident, it is nevertheless useful to focus upon certain typical characteristic vectors in order to highlight the dilemmas posed for those seeking to ensure a restructuring of Polish agriculture within a tolerable period of time. The discussion first concentrates on transitions from farming into employment in other sectors of the economy before moving to a consideration of the probability that an agricultural worker will leave the labour market. Given the country's extremely high rate of unemployment and the fact that it has increased in the period since the year to which this analysis refers, no detailed consideration of the move to agriculture to unemployment is offered,

although it is evident from the above that such flows are dominated by private sector employees. Also, the focus will not be directed towards pathological cases. For example, the probability of moving to alternative employment was extremely high (0.78) for a 25 year old private sector employee possessing vocational education and living in a non-rural area within a Tier 4 region that lies 150 miles away from a Tier 1 or Tier 2 voivodship and has an unemployment rate of 7.7 per cent.

The figures in columns 3 and 4 of Table 5 relate to the probability of a farmer aged 45 living in a rural area within a region that lies seventy miles from a Tier 1 or Tier 2 voivodship securing work outside agriculture. In line with the results presented above, these probabilities are always considerably lower for women than for men. If the local area unemployment rate is set to 12 per cent, a fairly typical level for the period covered, and the selected individual is a self-employed male, does not possess vocational education and does not live in a Tier 4 region, there is only a one in one hundred chance that they would have secured alternative work. Possession of vocational education more than doubles this probability, although it remains extremely low. Also, the results in Table 4 indicate that vocational education not only raised the odds of moving into alternative employment, it also increased the chance that an individual would move into the unemployment pool. Further scrutiny of the data indicates that eighty per cent of such individuals lost their jobs involuntarily and so the result is not apparently capturing a quit to search decision by those with the highest re-employment probabilities. If this reference individual also lives in a Tier 4 region the likelihood of finding alternative work doubles again although, as noted above, this finding may be a reflection of other economic weaknesses.

Table 5 here

The implied impact of a sharp upturn in the health of the local labour market in which the individual resides, as measured by a reduction in the unemployment rate to five per cent, also provides no grounds for optimism.[23] Even in the best case scenario of an individual with vocational education living in a Tier 4 region, the only one reported here, the probability of moving into alternative employment remains less than ten per cent. Much larger impacts come about if the self-employed male discussed above is transformed into an employee. Even with an unemployment rate of twelve per cent there is then a one in four chance that alternative employment would have been secured in the best case setting. If, as shown, the prevailing unemployment rate falls to five per cent, this chance increases to thirty per cent. Nevertheless, the probability of such an outcome remains below the threshold of one half that is usually considered critical.

One of the widely acknowledged constraints on the restructuring of Polish agriculture is the unwillingness of farmers to sever their links with the land. The problems this creates are frequently compounded when a small farm inheritance is divided between multiple offspring. In order to give some impression of the magnitude of the problems that older self-employed farmers constitute, Table 6 presents the probabilities of labour market exit at different, advanced ages. The area in which the individual is placed is rural, lies at a distance of seventy miles from a Tier 1 or a Tier 2 voivodship and has an unemployment rate of 12 per cent. The featured farmer advances in age from 65 to 70 and then to 75 if male and from 60 to 65 to 70 if female. In the first instance, the individual is a self-employed male aged 65. The summary finding is that, whatever the combination of education and Tier 4 residence, there is only a one in twenty probability that they would leave the labour

[23] Only Warsaw and two of the Tier 2 voivodships had unemployment rates below 5 per cent in 1998, while the lowest recorded unemployment rate in a Tier 4 region in 1998 was 7.7 per cent.

force. If instead the individual was a sixty year old female, the chance of them retiring increases somewhat, but still never reaches 0.08. Even in the most favourable case, the probability of a male aged 70 retiring never exceeds 0.07. Even at age 75, there is still less than a one in ten chance that he will leave the labour market. As only two of the farming employees in the sample were over the age of 65, the exercise of changing the farmer's status from self-employed to employed is not repeated here. Evidently the latter will always retire.

8. Concluding discussion

Poland's accession will introduce anther labour market of significant size to those already contained within the EU-15, but one that lags far behind in terms of its development and in which restructuring has fallen short of expectations in the years since 1989. In particular, a significant reform of the archaic agricultural sector and attendant reallocation of its labour force has yet to take place. The implication is that severe strains will be imposed on many of the EU's medium-term aspirations and the policy challenges will be demanding. Using micro-data from the LFS, this paper has shown that the impression of stagnation within the sector that can be drawn from the official statistics does not disguise a more dynamic reality in which counter flows cancel out in the aggregate. Transitions from agriculture are extremely small and, if current trends persist, it will take many years for the sector to approach a size that might be considered remotely tolerable within the EU. If this outcome came to pass, the threat to cohesion would be immense.

Multinomial logit estimation of the flows through a four-way transition matrix revealed that older workers do not leave the sector unless they are employees. However, the vast majority of Polish farmers are either self-employed or contributing family workers. The former, in particular, do not leave the farm even on reaching the

age of retirement and appear to remain more or less until death. This leads to the well rehearsed conclusion that the farmers' pension scheme must be reformed, perhaps by enforcing strict eligibility criteria based on the release of land. There may also be a case for policies that discourage self-employment based on agricultural production activities. This would clearly be discriminatory and fiercely opposed by the farming community and its powerful political lobbies, but subsistence agriculture is certainly not the type of activity that the institutions of the EU wish to encourage when they call for an expansion in entrepreneurship.

The results produced some evidence that exits from farming are fostered by the possession of education. This is certainly a plausible finding, although it must be treated with caution, both because of the rarity of individuals with schooling that extends beyond vocational secondary and because its presence stimulates flows not only into other sectors of activity but also into unemployment. In a country in which the prevailing unemployment rate is 18 per cent, arguments regarding the release of labour into the jobless pool for later absorption by expanding sectors of activity lose much of their appeal. Nevertheless, longstanding proposals to improve educational standards of Poland's agricultural and rural populations appear worthy of hastened execution. Finally, the present findings provide no reassurance that flows from farming are sensitive to the rate of unemployment, which suggests that a simple reflation would be insufficient to bring about agricultural restructuring. This, however, is entirely consistent with the inertia it exhibited during the several recent years in which Poland returned one of the highest growth rates in Europe.

References

Aghion, P. and Blanchard, O. (1994), 'On the Speed of Transition in Central Europe', in: *NBER Macroeconomics Annual*.

Aghion, P. and Carlin, W. (1997), 'Restructuring Outcomes and the Evolution of Ownership Patterns in Central and Eastern Europe', in: Zecchini, S. (ed.).

Bellmann, L., Estrin, S. and Lehmann, H. (1995), 'The Eastern German Labor Market in Transition: Gross Flow Estimates from Panel Data', *Journal of Comparative Economics*, Vol. 20, No. 2, 139-70.

Boeri, T. and Terrell, K. (2003), 'Institutional Determinants of Labor Reallocation in Transition', *Journal of Economic Perspectives*, vol. 16, no. 9, pp. 51-76.

CEC (Commission of the European Communities) (2003), 'Proposal for a Council Decision on Guidelines for the Employment Policies of the Member States', COM (2003) 0176, April.

——— (2003a), 'Communication from the Commission to the Council, The European Parliament, The European Economic and Social Committee and the Committee of the Regions', COM (2003) 37 final, January.

——— (2002), 'Regular Report on Poland's Progress Towards Accession', COM (2002) 700 final, October.

Czyżewski, A., Orłowski, W.M., Zienkowski, L. and Żółkiewski, Z. (1999), 'Agriculture within the Economy-Wide Context: Transition and Long-Run Trends', *Research Bulletin*, vol. 8, no. 2, pp. 29-61.

EC (European Commission) (1999), 'Dynamic Measures of Economic Activity and Unemployment: Patterns and Transitions over Time', Statistics in Focus, Theme 3 –17/1999.

EU (European Union) (2003), 'The Reformed CAP: Accomplishing a Sustainable Agricultural Model for Europe, available at: http://europa.eu.int/comm/agriculture/mtr/capsum_en.pdf.

——— (2000), 'Presidency Conclusions – Lisbon European Council', available at: http://ue.eu.int/Newsroom/LoadDoc.asp?BID=76&DID=6017&from=&LANG=1.

Gomulka, S. (2000), 'Pension Problems and Reforms in the Czech Republic, Hungary, Poland and Romania', Discussion Paper no. 480, Centre for Economic Performance, London School of Economics.

Góra, M. and Lehmann, H. (1995), 'How Divergent is Labour Market Adjustment in Poland?', in: OECD.

Greene, W.H. (2003) *Econometric Analysis*, 5th edition, Upper Saddle River, New Jersey: Pearson Education Inc.

GUS (Główny Urząd Statystyczny) (2003), *Bezrobocie Rejestrowane*, available at: http://www.stat.gov.pl.*Polska – Unia Europejska*, Warsaw.

——— (2003a), *Polska – Unia Europejska*, Warsaw.

——— (2003b), *Aktywność Ekonomiczna Ludności Polski III Kwartał 1992-2002*, Warsaw.

——— (2003c), *Bezrobocie Rejestrowane w Polsce I Kwartał 2003*, Warsaw.

——— (2002), *Rocznik Statyst*yczny 2002, Warsaw.

——— (2002a), *Pracujący w Gospodarce Narodowej w 2001 R.*, Warsaw.

——— (2002b), *Aktywność Ekonomiczna Ludności Polski w Latach 1992-2001*, Warsaw.

——— (1999), *Labour Force Survey in Poland February 1998*, GUS.

——— (1999a), *Pracujący w Gospodarce Narodowej w 1998 R.*, Warsaw.

——— (1999b), *Bezrobocie Rejestrowane w Polsce I-IV Kwartał 1998*, Warsaw.

——— (1999c), *Zatrudnienie i Wynagrodzenia w Gospodarce Narodowej w I-III Kwartale 1998 R*, Warsaw.

——— (1997), *Rocznik Statystyczny Pracy 1997*, Warsaw.

——— (1995), *Pracujący w Gospodarce Narodowej w 1994 R.*, Warsaw.

——— (1994), *Pracujący w Gospodarce Narodowej w 1993 R.*, Warsaw.

Góra, M. (1993), 'Labour Hoarding and its Estimates in Central and Eastern European Economies in Transition', in: OECD, *Employment and Unemployment in Economies in Transition*, Paris.

——— (1995), 'The Labour Market in Poland', *Eastern European Economics*, vol. 33, no. 5, pp. 75-96.

GUS/US (Główny Urząd Statystyczny/Urząd Statystyczny) (1999), *Product Krajowy Brutto Według Województw za Lata 1995-1997*, Katowice.

Hauck, W. and Donner, A. (1977), 'Wald's Test as Applied to Hypotheses in Logit Analyses', J*ournal of the American Statistical Association*, Volume 72, Issue 360, 851-53.

Ingham, H. and Ingham, M. (2002), 'How Big is the Problem of Polish Agriculture?', SURDAR Working Paper no. 2, Lancaster University.

——— (2002a), 'EU Expansion to the East: The Problem of Agriculture', in: Ingham, H. and Ingham, M. (eds), *EU Expansion to the East: Prospects and Problems*, Cheltenham, UK and Mass., USA: Edward Elgar.

Jackman, R. and Pauna, C. (1997), 'Labour Market Policy and the Reallocation of Labour Across Sectors', in: Zecchini, S. (ed.).

Juraś, J. and Marzał, T. (1998), 'Housing Market and Policy in Poland', in: Domański, R. (ed.), *Emerging Spatial and Regional Structures of an Economy in Transition*, Warsaw: Polish Academy of Sciences.

Kok, W. (2003), 'Enlarging the European Union: Achievements and Challenges', Robert Schuman Centre for Advanced Studies, European University Institute.

OECD (1995), *The Regional Dimension of Unemployment in Poland*, Paris.

Orłowski, W. (2002), 'Poland's Accession to the European Union and Prospects of Restructuring the Agricultural and Rural Areas', *ZBSE Research Bulletin*, vol. 11, no. 2, pp. 5-24.

Pelkmans, J. (2002), 'Economic Implications of Enlargement', Bruges Economic Policy Series, Briefing no. 1.

Pouliquen, A. (2001), 'Competitiveness and Farm Incomes in the CEEC Agri-Food Sectors: Implications Before and After Accession for EU Markets and Policies', European Commission.

Rao, C.R. (1973), *Linear Statistical Inference and its Applications*, 2nd ed., NewYork: John Wiley and Sons.

Rutowski, M. (1990), 'Labour Hoarding and Open Unemployment in Eastern Europe: The Case of Polish Industry', Discussion Paper no. 6, Centre for Economic Performance, London School of Economics.

Scarpetta, S. and Huber, P. (1995), 'Regional Economic Structures and Unemployment in Central and Eastern Europe: An Attempt to Identify Common Patterns', in: OECD.

Swinnen, J.F.M. (1999), 'Land Reform Choices in Central and Eastern Europe', *The Economics of Transition*, vol. 7, no. 3, pp. 637-64.

Toikka, R.S. (1976), 'A Markovian Model of Labor Market Decisions by Workers', *American Economic Review*, Volume 66, Issue 5, pp. 821-834.

Wadsworth, J. (1989), 'Labour Market Transitions in England and Wales: Evidence from the Labour Force Survey, Working Paper no. 1164, Centre for Labour Economics, London School of Economics.

Wilkin, J. (2003), 'Integration of Polish Agriculture with the European Union's Common Agricultural Policy (CAP)', in: Lubiński, M. (ed.), *Poland: International Economic Report 2002/2003*, Warsaw: World Economy Research Institute, Warsaw School of Economics.

Zecchini, S. (1997), 'Lessons from the Economic Transition: Central and Eastern Europe in the 1990s', Dordrecht/Boston/London: Kluwer Academic Publishers.

Zinnes, C., Eilat, Y and Sachs, J. (2001), 'Benchmarking Competitiveness in Transition Economies', *Economics of Transition*, vol. 9, no. 2, pp. 315-353.

Table 1 Employment change (%) 1989-1993

Industry	Total			Public sector			Private sector		
	Share 89 (%)	Share 93 (%)	%Δ 89-93	Share 89 (%)	Share 93 (%)	%Δ 89-93	Share 89 (%)	Share 93 (%)	%Δ 89-93
Agriculture	27.81	26.45	-19.27	6.41	2.98	-69.65	52.29	42.80	-12.21
Industry	28.59	24.41	-27.52	37.97	34.08	-41.38	17.86	17.68	6.20
Construction	7.07	5.78	-30.62	8.30	3.54	-72.10	5.66	7.33	38.90
Forestry	0.77	0.57	-37.23	1.44	1.19	-46.07	0.00	0.14	∞
Transport	4.58	3.81	-29.25	7.35	6.81	-39.49	1.41	1.73	31.87
Telecommunications	0.99	1.19	1.62	1.86	2.82	-0.93	0.001	0.05	4400.00
Trade	8.33	13.88	41.35	4.27	2.19	-66.53	12.98	22.02	81.95
Communal services	2.54	2.26	-24.37	3.34	4.06	-20.59	1.63	1.01	-33.23
Housing	1.19	1.11	-20.94	0.96	1.24	-16.22	1.46	1.03	-24.51
Science and development of technology	0.66	0.47	-40.47	1.19	1.08	-40.42	0.07	0.04	-41.51
Education	6.25	7.30	-0.84	11.11	17.31	1.78	0.69	0.33	-48.67
Culture and art	0.75	0.67	-23.73	1.21	1.26	-31.72	0.22	0.26	26.26
Health care and social services	4.94	5.63	-3.24	8.60	12.77	-2.98	0.75	0.66	-6.54
Sport, tourism and leisure	0.76	0.56	-37.21	0.77	0.53	-54.78	0.76	0.59	-16.80
Administration and justice	1.31	2.15	39.45	2.39	5.06	38.14	0.07	1.12	94.34
Finance and insurance	0.86	1.55	54.00	1.25	2.53	32.13	0.40	0.87	131.40
Other	2.60	2.20	-28.01	1.59	0.56	-77.12	3.75	3.35	-4.24
TOTAL			-15.11			-34.68			7.26
Total	1989				17,389,400				
Employment	1993				14,761,200				

Source: GUS (1994, 1997).

Table 2 Employment change (%) 1994-2001

Industry	Total			Public sector			Private sector		
	Share 94 (%)	**Share 01 (%)**	**%Δ 94-01**	**Share 94 (%)**	**Share 01 (%)**	**%Δ 94-01**	**Share 94 (%)**	**Share 01 (%)**	**%Δ 94-01**
Agriculture, hunting and forestry	27.02	29.24	6.19	2.65	1.41	-66.41	42.94	38.64	9.10
Mining and quarrying	2.52	1.48	-42.53	6.22	4.84	-50.94	0.13	0.34	227.10
Manufacturing	20.58	17.05	-18.55	23.45	7.87	-78.86	18.72	20.15	30.55
Electricity, gas and water supply	1.80	1.67	-8.64	4.44	6.01	-14.74	0.09	0.21	195.29
Construction	5.72	5.02	-13.59	3.17	1.28	-74.56	7.37	6.29	3.42
Trade and repair	12.68	13.42	4.07	2.13	0.87	-74.39	19.54	17.66	9.63
Hotels and restaurants	1.18	1.48	23.54	0.49	0.55	-30.21	1.62	1.80	34.19
Transport, storage and communication	5.66	4.87	-15.38	10.71	9.99	-41.25	2.37	3.14	60.58
Financial intermediation	1.69	1.95	13.63	2.86	2.10	-53.83	0.93	1.90	148.78
Real estate, renting and business activities	3.55	5.74	59.02	3.60	4.03	-29.40	3.52	6.32	117.83
Public administration and defence; compulsory social security	2.52	3.58	39.93	6.39	14.17	39.70	0.002	0.01	619.21
Education	5.99	6.19	1.60	14.85	23.30	-1.15	0.23	0.41	116.55
Health and social work	6.67	5.92	-12.73	16.36	19.84	-23.58	0.38	1.22	291.75
Other community, social and personal service activities	2.28	2.32	0.07	2.53	3.66	-8.72	2.12	1.87	6.88
Other	0.10	0.05	-51.98	0.17	0.08	-70.93	0.05	0.04	-13.14
TOTAL			-1.70			-37.01			21.25
Total Employment	1994				14,924,016				
	2001				14,670,553				

Source: GUS (1995, 2002a)

Table 3 Labour outflow probabilities from agriculture: Feb. 1998-Feb. 1999

Status at t_1	***EA***	***E***	***U***	***N***	***Stock at t_0***
Status at t_0					
EA	0.9118	0.0245	0.0137	0.0500	2,698
E	0.0039	0.9244	0.0331	0.0386	9,681
U	0.0295	0.2599	0.5411	0.1695	1,593
N	0.0072	0.0326	0.0229	0.9373	11,236

.

Table 4 Multinomial estimates of outflows from agriculture

	EA→E	***Exp(β)***	***EA→U***	***Exp(β)***	***EA→N***	***Exp(β)***
Constant[a]	-4.396[b] (5.78)	-	-10.815[b] (12.76)	-	-0.485 (0.27)	-
Age[a]	0.179[c] (2.91)	1.196	0.125 (0.74)	1.134	-0.086[b] (6.31)	0.917
Age squared[a]	-0.003[b] (4.47)	0.997	-0.003 (1.70)	0.997	0.001[b] (10.40)	1.001
Peripherality[a]	0.005 (0.13)	1.005	0.114[b] (9.15)	1.121	0.009 (1.02)	1.009
Peripherality squared[a]	0.000 (0.42)	1.000	-0.001[b] (8.29)	0.999	0.000 (1.73)	1.000
Unemployment rate[a]	-0.054[c] (2.78)	0.947	0.073 (2.11)	1.076	-0.008 (0.11)	0.992
Female[a]	-0.818 (1.08)	0.441	1.227[c] (3.32)	3.412	0.549[b] (6.70)	1.731
*Female*aged < 45*[a]	0.509 (0.39)	1.664	-2.289[b] (7.41)	0.101	-0.891[b] (6.16)	0.410
Employee[a]	1.031[b] (4.97)	2.803	2.542[b] (14.33)	12.710	0.567 (2.20)	1.762
Self employed[a]	-0.652[c] (3.36)	0.521	-0.862 (1.64)	0.422	-0.607[b] (8.21)	0.545
State employee[a]	-1.344[b] (3.87)	0.261	-0.207 (0.19)	0.813	-2.377[b] (5.08)	0.093
Vocational education[a]	0.948[b] (8.24)	2.579	0.994[b] (5.11)	2.701	-0.156 (0.45)	0.855
Rural[a]	-1.206[b] (10.97)	0.299	-0.010 (0.00)	0.990	-1.068[b] (12.19)	0.344
Tier 4 region	0.738[b] (5.12)	2.092	0.105 (0.06)	1.111	0.158 (0.48)	1.171
N			2,698			
Pseudo R^2			0.112			
Cox & Snell			0.209			
Nagelkerke			0.155			
McFadden						
Correct predictions			91%			
-2 Log likelihood						
Intercept only			2,000.198			
Final model			1,679.909			

Notes:

1. The model parameter significance tests are based on the change in the value of –2 log likelihood when the effect is removed from the final model. The '*a*' superscript indicates that the null hypothesis is rejected at the 5% level.
2. The individual parameter significance tests for each of the β vectors are based on the Wald statistic, which is equal to the square of the ratio of a coefficient to its standard error for variables with a single degree of freedom; '*b*' indicates that the null hypothesis is rejected at the 5% level, '*c*' at the 10% level.

Table 5 Predicted probabilities for moves from agriculture

Characteristics		*EA→E* Age=45, Rural, Peripherality=70		Characteristics		*EA→N* U=12%, Peripherality=70	
Self-employed		**Male**	**Female**	**Self-employed**		**Male**	**Female**
U=12%				**Age=65(M), 60(F)**			
Voc. Ed.	**Tier 4**			**Voc. Ed.**	**Tier 4**		
0	0	0.0102	0.0045	0	0	0.0478	0.0668
1	0	0.0260	0.0116	1	0	0.0412	0.0577
0	1	0.0212	0.0095	0	1	0.0556	0.0773
1	1	0.0529	0.0240	1	1	0.0479	0.0669
U=5%				**Age=70(M), 65(F)**			
Voc. Ed.	**Tier 4**			**Voc. Ed.**	**Tier 4**		
0	0	0.0149	0.0066	0	0	0.0603	0.0800
1	0	0.0375	0.0169	1	0	0.0521	0.0693
1		0.0306	0.0137	0	1	0.0699	0.0925
1	1	0.0753	0.0347	1	1	0.0604	0.0802
Employed				**Age=75(M), 70(F)**			
U=12%				**Voc. Ed.**	**Tier 4**		
Voc. Ed.	**Tier 4**			0	0	0.0794	0.1000
0	0	0.0527	0.0126	1	0	0.0687	0.0868
1	0	0.1255	0.0320	0	1	0.0917	0.1152
0	1	0.1042	0.0485	1	1	0.0795	0.1007
1	1	0.2309	0.0646				
U=5%							
Voc. Ed.	**Tier 4**						
0	0	0.0751	0.0183				
1	0	0.1732	0.0460				
0	1	0.1452	0.0697				
1	1	0.3047	0.0915				

Data Appendix

Covariates:

Age	Age in years
Distance	Straight-line distance of home voivodship capital to nearest Tier 1 or Tier 2 voivodship capital (miles)
Unemployment rate	The November 1998 unemployment rate in the individual's voivodship

Binary factors:

Female	1 if female, 0 otherwise
*Female*aged < 45*	1 if female and < 45, 0 otherwise
Married	1 if married, 0 otherwise
Employee	1 if a paid employee, 0 otherwise
Self employed	1 if self employed, 0 otherwise
State	1 if employed in state sector, 0 otherwise
Rural	1 if living in a rural area, 0 otherwise
Vocational education	1 if highest educational attainment is vocational education, 0 otherwise
Tier 3 region	1 if an individual resided in a Tier 3 voivodship, 0 otherwise
Tier 4 region	1 if an individual resided in a Tier 4 voivodship, 0 otherwise.

Voivodship clusters:

Indicators used:

- Employment share in services, relative to Poland's average, at end 1998
- Employment share in industry, relative to Poland's average, at end 1998
- Change in total employment, relative to Poland's average, 1994-98
- Value added per capita, relative to Poland's average, 1997 (1998 data was published on the new voivodships)

Tier 1: Warszawskie

Tier 2: Gdańskie, Katowickie, Krakowskie, Poznańskie

Tier 3: Bielskie, Bydgoskie, Częstochowskie, Elbląskie, Gorzowskie Wielkopolskie, Jeleniogórskie, Kaliskie, Kozalińskie, Legnickie, Leszcyńskie, Łódzkie, Olsztyńskie, Opolskie, Pilskie, Płockie, Słupskie, Szczecińskie, Toruńskie, Walbrzyskie, Wrocławskie, Zielonogórskie

Tier 4: Bialskpodlaskie, Bialostockie, Chelmskie, Ciechanowskie, Kielce, Konińskie, Krośnieńskie, Lubelskie, Łomżyńskie, Nowosądeckie, Ostrolęckie, Piotrowskie, Przemyskie, Radomskie, Rzeszowskie, Siedleckie, Sieradzkie, Skierniewickie, Suwalskie, Tarnobrzeskie, Tarnowskie, Włoclawskie, Zamojskie